WELSH BIRDS

Vol 3 No.1 2001

Cymdeithas Adaryddol Cymru
Welsh Ornithological Society

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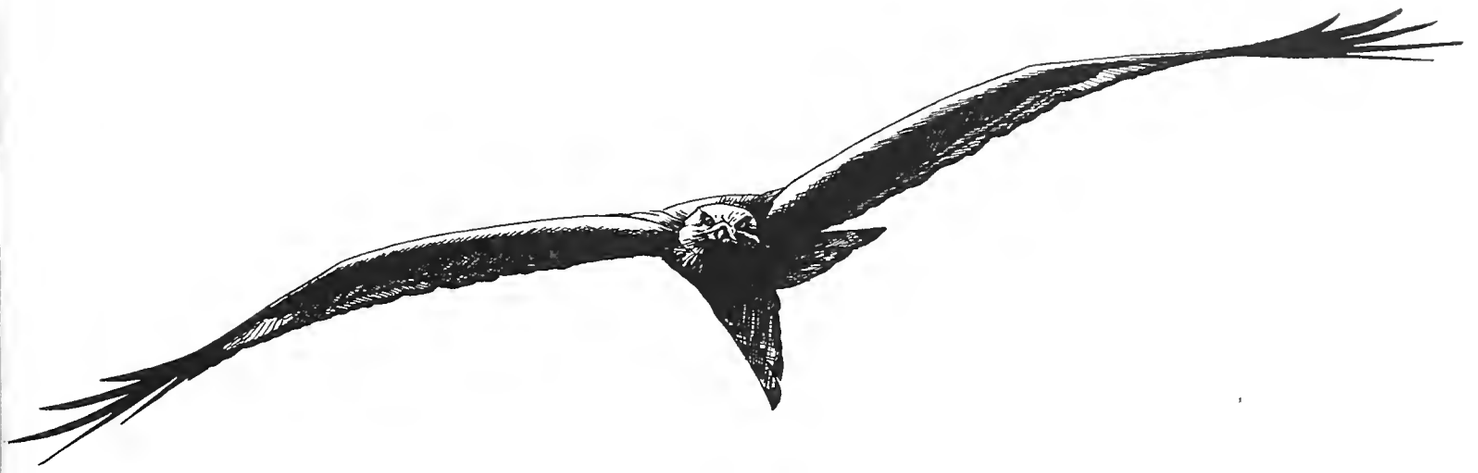

Edited by Michael Shrubb and Graham Williams

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EDITORIAL

The map opposite shows the present arrangement of bird recording areas in Wales used in Welsh Birds. Following the creation of Unitary Authorities as the basis of local Government, the Welsh Ornithological Society switched to the Watsonian Vice-county system (see the Ray Society, publication No. 146) as the basis of bird recording in Wales. These are treated as synonymous with the pre-1974 administrative Counties used by the Society until 1996. Using the Watsonian vice-county system therefore retains historical continuity in recording. This would have been lost in any attempt to follow the Unitary Authorities, the only one of which involves no changes from the county system created in 1974, let alone its historic predecessor, being Powys, which comprises the vice-counties of Breconshire, Radnorshire and Montgomeryshire. Note, however, that the name of Gwent has been retained for the vice-county of Monmouth to prevent confusion with the new Unitary Authority of Monmouth, which covers only part of the vice-county. Full details of recording areas and arrangements in Wales are published annually in the Welsh Bird Report.

ACKNOWLEDGEMENTS

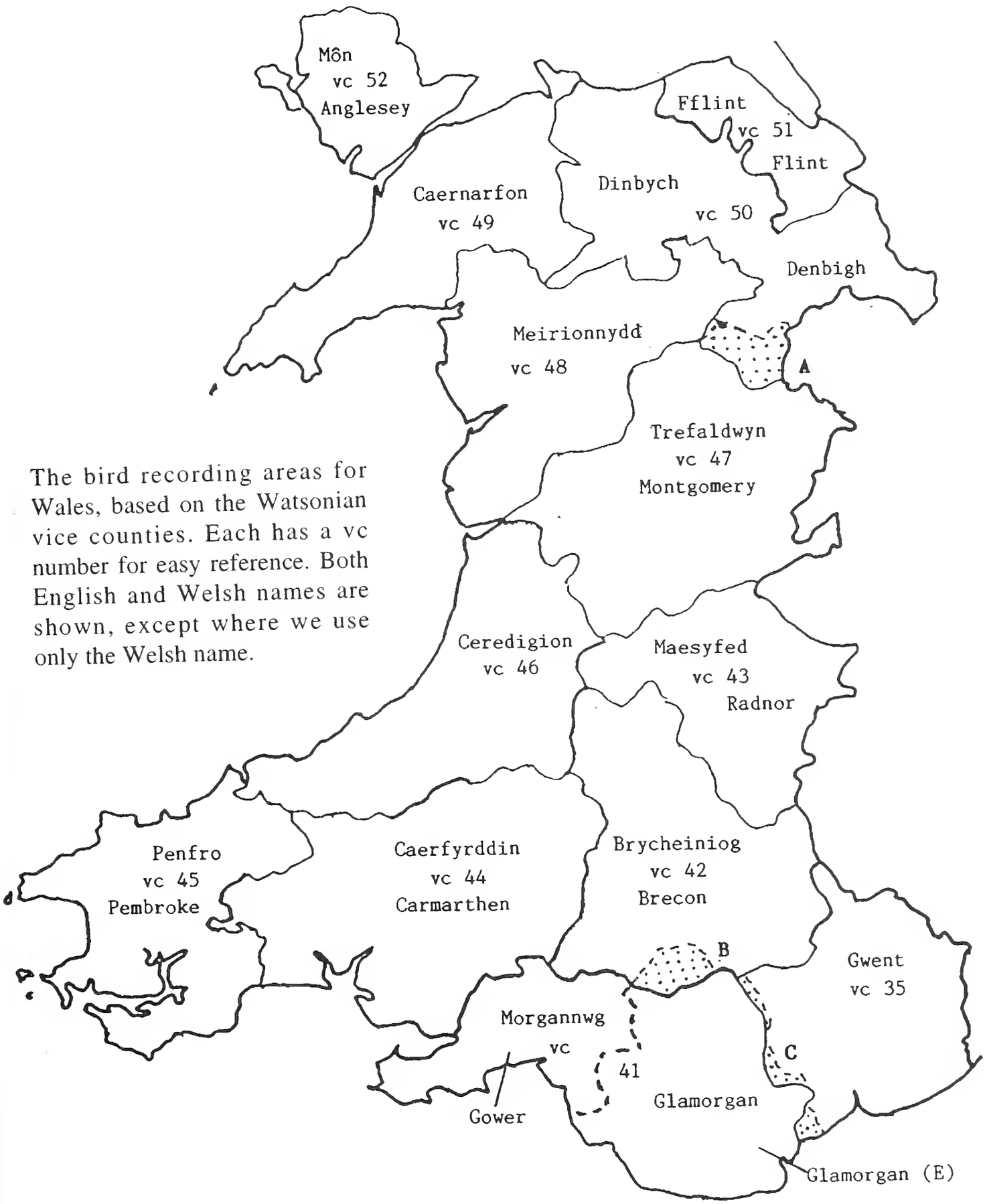
Once again it is a pleasure to acknowledge the help of a number of people in putting this issue together. As always we are grateful to Bob Mitchell, Steve Roberts and Colin Richards for illustrations for the journal. Their unfailing support is of great assistance. The Editor also acknowledges the very considerable help of those who have acted as Referees for papers, namely Dr. Jeremy Wilson and G.A. Williams.

Finally I have to announce that this is my last issue of Welsh Birds. After 10 years, first with the Welsh Bird Report and then with the journal Welsh Birds I have decided that it is time to step down. A decade seems to me to be a very fair stint in what has been a very interesting and worthwhile job. It is important that new ideas and management are introduced from time to time. My successor is Graham Williams, who will be well-known to every bird-watcher in Wales for his very successful work over a long period with the RSPB and as co-author of the standard work on Welsh birds, Birds in Wales. I am very happy to hand over to one who is so well-versed in Welsh ornithology and I am confident that he will receive the same level of support that I have enjoyed. As announced in the 1999 Report, the responsibility for producing the Welsh Bird Report will now rest with Jon Green, who has ably coped with much of the last two reports, help for which I have been extremely grateful. Their addresses are listed under the Officers of the Society inside the front cover.

It remains for me to simply say thank you to all those who have given me unstinting help over the past decade, County Recorders, contributors, illustrators, photographers and referees. I am very conscious that their assistance has been crucial in establishing the Society's Journal. My best thanks to all.

Michael Shrubb

The Bird Recording Areas in Wales



The bird recording areas for Wales, based on the Watsonian vice counties. Each has a vc number for easy reference. Both English and Welsh names are shown, except where we use only the Welsh name.

A REPORT ON BIRD RINGING IN WALES DURING 1999

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INTRODUCTION

This is the twelfth annual report on bird ringing in Wales. The totals for 1999 show a welcome, if modest, increase on 1998 - at least for full grown birds. The total for *pulli* is the lowest since records began in 1988, a time when several large nest box schemes were not included. From comments received during 1999 it would appear the main reason for the low total was poor weather during the spring and early summer. This has the double effect of preventing ringers getting around nest boxes to prepare them for the season and lowering fledging success for the birds. Totals are not likely to improve as long as we continue to have such wet springs and summers.

METHOD OF ENQUIRY AND RESPONSE

As is usual this report is based on the information sent back to me by ringers who responded to my letter sent out during 2000. They were asked to supply ringing totals for the year, indicate any major changes in effort and let me know the details of any interesting ringing recoveries received during the year. I know that the start of the year involves much form filling and my thanks go to all those who take the trouble to reply. For 1999 replies were received from 37 ringers and 6 groups.

THE RINGING TOTALS

Despite the full grown total still being little more than half those achieved during the mid-1990s record totals were achieved for a couple of species and unusually high totals set, albeit low numbers and for a scarce species. Record full grown totals were achieved for Manx Shearwater (1,441); Curlew Sandpiper (8); Curlew (175); Nightjar (4); Barn Owl (19); Whinchat (130); and Cetti's Warbler (22). The impressive Whinchat total was through the efforts of two ringers operating in north Gwent and just over the border in Powys. As well as targeting nestlings they also started trapping adults at the nest this year as well. The high shearwater total is due to increased effort to catch adults on Bardsey. The Curlew total is likewise due to targeting by SCAN ringing group, as is the second highest Oystercatcher total (751). The Cetti's Warbler total may actually reflect the fact that the species is still expanding its range in South Wales. Other highs were achieved for House Sparrow (248), the result of a continuing study.

With such a low total it is not surprising that there were some new record lows as well as many nearly record lows. There were record lows for Chiffchaff (531); Blue Tit (1,225); Marsh Tit (12); and Spotted Flycatcher (39). Other noteworthy lows included: Goldcrest (735); Lesser Whitethroat (15); Great Tit (537); and Pied Flycatcher (464). Most of the song-bird totals were generally well down on the totals seen throughout the 1990s and reflect both the inability of ringers to get out to study sites because of the weather and the lower numbers of birds fledging affecting catches later in the autumn.

This year was very poor for rare or scarce migrants, reflecting the generally poor autumn migration. There were none of the scarce warbler species normally seen on Bardsey and for the second year running there were no Aquatic Warblers caught in Wales only the third year since 1988 that one has not been caught. Bardsey did manage two Wrynecks and two Golden Orioles and also the highlight this year, an Eye-browed Thrush, trapped in October and an addition to the Welsh list.

The *pulli* total, at 11,927, is the lowest since records were first gathered for this report in 1988 and barely 50-60% of the totals regularly achieved during the 1990s. The main loss is through low totals for Pied Flycatcher, Blue Tit and Great Tit, all 30-50% down on previous years, although as with the full grown birds numbers of song-birds were generally on the low side. Despite the low total records were set for Kittiwake (256); Barn Owl (117); and Nightjar (8). The increase in Barn Owls is good news although it is not known if this is due to more effort or more nest boxes occupied. The Merlin total at 38 was the highest for some years and for reasons unknown the Sparrowhawk total of 8 was the lowest ever. This may indicate some sort of decline as a decline in ringer effort is not really reflected in any of the other totals for birds of prey. The Red Kite total has finally levelled off and will probably stay at this sort of number now that the population has expanded so much. Breeding birds are so widespread in Wales now that it has become almost impossible to maintain a track on every pair.

RINGING PROJECTS

There was no information on any new ringing projects for the 1999 season and it seems that many projects are still on-going. I will make my usual plea for ringers to look at what they are doing and see if there is any way that the information gathered in their projects can be put out to a wider audience.

PUBLICATIONS INVOLVING RINGING IN WALES

Once again there is rather a lack of publications:

Howlett, P.M. (2000). A report on bird ringing in Wales during 1998. *Welsh Birds Vol. 2 No.5*(2000) 232-241. Welsh Ornithological Society.

Anning, D. & Stansfield, S. (1997). Ringing Report 1999. *Bardsey Observatory Report No. 43: 1999*. 45-54.

REFERENCES

Cramp, S and Perrins, C.M. (eds) *The Birds of the Western Palearctic*.

ACKNOWLEDGEMENTS

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Table 1: Systematic list of birds ringed in Wales during 1998 and 1999

	1998		1999	
Species	*FG*	*Pull*	*FG*	*Pull*
Little Grebe	-	-	-	-
Fulmar	8	-	5	2
Manx Shearwater	859	158	1441	276
Storm Petrel	122	-	215	-
Leach's Petrel	1	-	-	-
Cormorant	-	266	-	370
Shag	2	307	5	305
Grey Heron	-	-	-	-
Mute Swan	58	130	39	133
Canada Goose	253	-	210	-
Shelduck	1	14	1	-
Mallard	4	-	-	-
Teal	1	-	1	-
Goosander	-	-	-	-
Honey Buzzard	-	-	-	2
Red Kite	-	146	-	138
Hen Harrier	-	36	-	24
Sparrowhawk	7	17	10	8
Goshawk	-	200	-	49
Buzzard	1	50	2	31
Kestrel	-	39	-	33
Merlin	-	24	-	38
Hobby	-	8	-	7
Peregrine	1	28	-	18
Water Rail	-	-	10	-
Coot	1	-	-	-
Moorhen	29	2	19	-
Oystercatcher	280	2	751	5
Little Ringed Plover	-	20	-	-
Ringed Plover	28	-	17	-
Grey Plover	1	-	3	-
Lapwing	4	47	1	1
Knot	35	-	28	-
Sanderling	-	-	3	-
Little Stint	4	-	1	-
Dunlin	590	-	521	-
Curlew Sandpiper	2	-	8	-
Ruff	-	-	-	-
Jack Snipe	5	-	9	-
Snipe	10	-	17	-
Woodcock	-	-	2	-
Whimbrel	-	-	6	-
Curlew	93	-	175	1
Bar-tailed Godwit	-	-	10	-
Black-tailed Godwit	1	-	-	-
Spotted Redshank	-	-	1	-
Redshank	332	1	445	-

	1998		1999	
Species	*FG*	*Pull*	*FG*	*Pull*
Common Sandpiper	-	-	2	-
Turnstone	-	-	38	-
Black-headed Gull	1	68	18	-
Less. Black-backed Gull	18	954	7	772
Herring Gull	17	562	6	622
Gt. Black-backed Gull	-	150	-	75
Kittiwake	22	125	66	256
Common Tern	-	590	-	552
Little Tern	-	-	-	33
Guillemot	3	401	42	457
Razorbill	79	208	92	254
Puffin	21	54	30	11
Stock Dove	1	16	1	2
Woodpigeon	9	6	6	-
Collared Dove	3	-	4	-
Cuckoo	-	1	-	-
Barn Owl	13	89	19	117
Little Owl	2	6	-	-
Tawny Owl	8	31	3	20
Long-eared Owl	5	5	1	2
Nightjar	1	3	4	8
Swift	5	3	16	-
Kingfisher	15	-	16	-
Hoopoe	-	-	-	-
Green Woodpecker	-	-	-	-
Gt Sp. Woodpecker	13	-	16	-
Less. Sp. Woodpecker	-	-	1	-
Wryneck	-	-	2	-
Skylark	-	4	-	3
Sand Martin	122	-	68	-
Swallow	411	255	436	260
House Martin	76	2	86	2
Rock Pipit	-	-	1	-
Tree Pipit	2	7	8	-
Meadow Pipit	22	55	50	112
Yellow Wagtail	9	-	3	9
Grey Wagtail	14	39	20	102
Pied Wagtail	14	67	27	39
Dipper	41	152	40	239
Wren	396	26	501	22
Dunnock	238	33	274	20
Robin	470	45	529	27
Nightingale	-	-	-	-
Black Redstart	1	-	-	-
Redstart	28	141	30	74
Whinchat	27	747	130	661
Stonechat	12	170	15	132

	1998		1999	
Species	*FG*	*Pull*	*FG*	*Pull*
Wheatear	11	60	11	72
Ring Ouzel	-	-	-	2
Blackbird	318	55	389	60
Eye-browed Thrush	-	-	1	-
Fieldfare	-	-	1	-
Song Thrush	127	33	152	32
Redwing	26	-	120	-
Mistle Thrush	3	14	2	1
Cetti's Warbler	15	-	23	-
Grasshopper W.	13	-	23	-
Aquatic Warbler	-	-	-	-
Lanceolated Warbler	-	-	-	-
Sedge Warbler	728	-	819	-
Reed Warbler	1061	8	1088	10
Booted Warbler	1	-	-	-
Icterine Warbler	-	-	-	-
Melodious Warbler	1	-	-	-
Subalpine Warbler	-	-	-	-
Barred Warbler	-	-	-	-
Lesser Whitethroat	14	-	15	-
Whitethroat	108	-	189	4
Garden Warbler	135	4	90	4
Blackcap	438	5	489	-
Greenish Warbler	-	-	-	-
Pallas's Warbler	-	-	-	-
Yellow-browed Warbler	1	-	-	-
Wood Warbler	4	26	2	4
Chiffchaff	676	6	531	-
Willow Warbler	1242	74	1265	44
Goldcrest	1022	-	735	-
Firecrest	1	-	2	-
Spotted Flycatcher	44	35	39	22
Pied Flycatcher	544	5185	464	3489

	1998		1999	
Species	*FG*	*Pull*	*FG*	*Pull*
Long-tailed Tit	240	-	204	-
Marsh Tit	16	8	12	1
Willow Tit	21	-	36	-
Coal Tit	177	34	227	20
Blue Tit	1757	1404	1225	897
Great Tit	829	620	537	472
Nuthatch	40	42	42	76
Treecreeper	27	-	47	-
Golden Oriole	-	-	2	-
Woodchat Shrike	1	-	-	-
Jay	4	-	3	-
Magpie	10	22	2	15
Chough	3	257	4	229
Jackdaw	17	16	6	13
Carrion Crow	1	26	1	12
Rook	1	47	1	-
Raven	-	155	-	74
Starling	75	7	57	-
House Sparrow	126	-	264	5
Tree Sparrow	-	-	-	-
Chaffinch	507	11	521	1
Brambling	19	-	8	-
Greenfinch	883	10	825	15
Goldfinch	68	9	80	7
Siskin	333	-	118	-
Linnet	14	28	8	15
Twite	1	-	-	-
Redpoll	87	-	33	-
Bullfinch	74	5	112	-
Common Crossbill	-	-	-	-
Yellowhammer	27	9	7	-
Little Bunting	-	-	1	-
Reed Bunting	174	10	167	7
Totals	16917	14735	17564	11927

SELECTED RINGING RECOVERIES

As is customary in this report the usual plea goes out for non-ringers to let me know of any recoveries they find (obviously informing the BTO first!), it is very difficult to find out about interesting recoveries found by the general public and the BTO's own ringing report is still running a few months behind schedule.

The recoveries are arranged by species, with ringing details on the first line and recovery details on the second. The symbols and conventions used are outlined below; age is given according to the Euring code, the figures DO NOT represent years. Scientific names are given in the main systematic list.

Age when ringed

1 pullus (= nestling or chick)
2 fully grown, year of hatching unknown
3 hatched during calendar year of ringing
4 hatched before calendar year of ringing but exact year unknown
5 hatched during previous calendar year
6 hatched before previous calendar year but exact year unknown
7 definitely hatched 2 years before year of ringing
8 hatched more than 2 calendar years before year of ringing

Sex
M = male, F = female

Manner of recovery

X found dead
XF found freshly dead or dying
XL found dead (not recent)
\+ shot or intentionally killed by man
+F shot or intentionally killed by man-fresh
I found sick or injured-not released
SR found sick or injured released with ring
V alive and probably healthy, caught and released not by a ringer
VV as V but sighting in field (includes colour mark records)
R caught and released by ringer
B as R - breeding
RR as VV but by a ringer
BB as RR ñ nesting

Storm Petrel

2443682	4	10.07.99	Strumble Head, Ceredigion.
	R	24.07.99	Bardsey Island, Caernarfonshire.
			82 km NNE 14 days.
	R	26.07.99	Calf of Man, Isle of Man.
			225 km N 16 days.
2513302	4	24.07.99	Mynydd Gilan, Abersoch, Caernarfonshire.
	R	25.07.99	Calf of Man, Isle of Man.
			142 km NNW 1 day.
	R	31.07.99	Menawethan Island, Scilly Isles.
			338 km SSW 7 days.

These two birds show how this species can wander around the Irish Sea during July. Another also went the other way, caught one night in Pembrokeshire it was caught two nights later off Finistere in France. During August they will gradually drift northwards.

Cormorant

L03335	1	11.07.83	Puffin Island, Anglesey.
	X	07.02.99	Côtes-du-Nord, FRANCE.
			497 km S 5690 days.
5186745	1	08.07.95	Puffin Island, Anglesey.
	X	12.04.99	Blackpool, Lancashire.
			85 km NE 1374 days.
5197589	1	21.06.97	Puffin Island, Anglesey.
	+	15.12.97	Staffordshire.
			133 km E 177 days.5187984
	1	20.06.98	Puffin Island, Anglesey.
	X	04.01.99	Holt, Norfolk.
			344 km E 198 days.
5197836	1	20.06.98	Puffin Island, Anglesey.
	X	20.02.99	Lealholm, North Yorkshire.
			243 km NE 245 days.

Most first-year Cormorants from Puffin Island move down into the Bay of Biscay and more recently into Essex and other areas of southern England. The birds to Lancashire and North Yorkshire are, therefore, slightly unusual. L03335 is fairly old but known ages of birds from Puffin Island are limited because ringing only started in 1982. 5197589 is only one of several birds that were shot or trapped under licence at fish farms.

Mute Swan

U6689	4M	04.08.95	Porthmadog Harbour, Caernarfonshire.
	V	17.01.99	Sandy Water Park, Llanelli, Carmarthenshire.
			137 km S 1262 days.
U6691	3	08.08.95	Porthmadog Harbour, Caernarfonshire.
	V	29.01.99	Westport Lake, Stoke-on-Trent, Staffordshire.
			148 km E 1270 days.
Z83719	5F	11.09.94	Port Talbot, Glamorgan.
	SR	18.07.99	Stathe, Burrowbridge, Somerset.
			86 km SE 1771 days.

The last bird is the first movement of any distance by a swan ringed in the Port Talbot area. This is in contrast to the birds ringed in Porthmadog, Rhyl and Cardigan which feature here and in previous reports and which regularly move between inland sites in England and the Welsh coast. For what ever reason the birds in the Glamorgan area seem to be very sedentary.

Canada Goose

5205453	4F	15.03.99	Stubbers Green, West Midlands.
	R	04.07.99	Llangorse Lake, Powys.
			118 km SW 111 days.

A very sedentary species with few long-distance movements. Although Llangorse birds frequently move off-site it would appear that birds coming in from elsewhere is more unusual.

Common Scoter

A bird cleaned and released after the Sea Empress oil-spill was recovered in Udorskiy, Russia in 1998 - shot! This is only the seventh recovery for this species in the British ringing scheme and shows that at least one or two birds can survive cleaning after an oil-spill.

Red Kite

GF52914	1	09.06.95	nr Cilycwm, Dyfed.
	X	20.10.99	Ballyvaldon, Blackwater, Wexford, EIRE.
			185 km W 1594 days.

The first ever overseas recovery of a Welsh Red Kite and only the second bird to have been found well away from Wales, the other being one found on a gas rig 40 km off the Norfolk coast. It shows that the potential exists for natural colonisation/re-colonisation of Eire.

Goshawk

GH18201	1M	24.05.84	Forest of Dean.
	X	19.07.99	nr Chepstow, Gwent.
			5535 days.
GJ99987	1M	25.05.84	Gwent.
	X	16.05.99	nr Chepstow, Gwent.
			5469 days.

A decent age for this large bird of prey, oldest wild birds are in the region of 20 years.

Buzzard

GF69509	1F	27.06.96	Talymaes, Crickhowell, Powys.
	X	04.02.99	Llanarmon Dyffryn Ceiriog, Clwyd.
			106 km NNW 952 days.

A long-distance movement for a Welsh Buzzard, very few move more than a few kilometres away from their natal area.

Peregrine

GH21385	1M	03.06.85	nr Abergavenny, Gwent.
	X	07.07.99	nr Kingsbridge, Devon
			170 km SSW 5147 days.
GN04037	1M	07.07.98	nr Merthyr Tydfil, Glamorgan.
	X	12.12.99	nr Portsmouth, Hampshire.
			177 km SE 285 days.

Two fairly long-distance movements showing juvenile dispersal. Males are much more likely to move away from their natal areas than females as they would be competing for territory with breeding males.

GH21385 is also a good age for a Peregrine.

Oystercatcher

FA23567	5	24.10.87	Penmon, Anglesey.
	X	17.06.99	Rothesay, Isle of Bute, Scotland.
			282 km NW 4254 days.
FA72159	8	07.10.95	Ogwen Estuary, Caernarfonshire.
	X	25.08.99	Bigton, Shetland.
			771 km N 1418 days.
FP00435	8	19.09.98	Llanfairfechan, Caernarfonshire.
	X	11.09.99	Nordland, NORWAY.
			1672 km NE 357 days.

A selection of the numerous recoveries for this species showing the diversity of breeding localities of birds wintering in Wales. FA23567 was found dead with wool around its legs, a frequent cause of death for birds breeding anywhere near sheep.

Ringed Plover

EA12425	3	16.08.91	More og Romsdal, NORWAY.
	R	23.01.93	Bangor, Caernarfonshire.
	R	25.01.97	Bangor, Caernarfonshire.
			1191 km SW 1989 days.
NV65073	6M	15.05.99	Battlehill, Annan, Dumfries & Galloway, Scotland.
	R	03.09.99	Ynyslas, nr Borth, Ceredigion.
			279 km S 111 days.

Waders can be very site faithful, both in breeding and wintering, as demonstrated by EA12425. Most of the Ringed Plover wintering in Wales come from a long way to the east but NV65073 suggests that birds breeding in northern Britain also winter here.

Dunlin

NT09781	6	21.02.99	Ogwen Estuary, Caernarfonshire.
	R	19.04.99	Friesland, NETHERLANDS.
			614 km E 57 days.
NT52026	3	02.09.99	Ynyslas, nr Borth, Ceredigion.
	R	11.09.99	Banks Marsh, Ribble Estuary, Lancashire.
			154 km NE 9 days.

Although waders can be caught at the same locality on the same date each year they do move between estuaries as shown by NT52026. The other bird was caught just before leaving on its journey back to its Arctic breeding grounds and would have followed a route that took in the Netherlands and onwards through the Baltic.

Curlew

FA44875	6	03.10.93	Aber, Caernarfonshire.
	X	31.05.99	Tornio, Lappi, Finland.
			2106 km NE 2066 days.

A typical movement for a Welsh Curlew. There was also a report of bird ringed in November 1974 retrapped in Germany in 1996 which is a good age for this species.

Redshank

DS64248	2	04.10.75	Tal-y-Cafn, Caernarfonshire.
	X	02.03.98	Varde, Jylland, DENMARK.
			827 km E 8185 days.
DK64415	6	07.11.98	Ogwen Estuary, Caernarfonshire.
	X	10.07.99	Nordur-Isafjardur, ICELAND.
			1767 km NW 245 days.

These two birds show the breeding areas of the two distinct populations of Redshank that winter in Wales. Note the age of DS64248, 23 years is pretty spectacular for a relatively small bird.

Lesser Black-backed Gull

GF91139	1	28.06.98	Llyn Trawsfynydd, Meirionnydd.
	VV	27.08.98	Isla Cristina, Huelva, SPAIN. 37° 12′N 7° 19′W.
			1764 km S 60 days.

There were at least 48 field sightings of colour-ringed birds reported during 1999.The majority of these seen at various localities down the Atlantic coasts of France, Portugal and Spain with a couple going as far south as Agadir in Morocco. GF91139 was the most rapid southerly movement reported this year, it would probably not have fledged properly for

another 20 or so days after ringing so actually spent very little time getting down to Spain.

Black-headed Gull

339381	1	17.06.96	Lankupiai, Klaipeda, LITHUANIA. 55° 29′N 21° 22E.
	X	13.02.99	Pontsticill, Glamorgan.
			1679 km WSW 971 days.

The ring from this bird was found by metal detector at a Peregrine site, and shows the diversity of their prey given other species mentioned later in the report.

Sand Martin

3876223	3	30.08.91	Saint-Vigor-d′Ymonville, Seine-Maritime, FRANCE. 49° 29′N 0° 21′E.
	R	01.07.97	Tircanol, Glamorgan.
			387 km NW 2132 days.
N089508	3J	24.07.98	Llangorse Lake, Powys.
	R	16.08.99	nr Bishop Monkton, North Yorkshire.
			269 km NE 388 days.

Ringing of migrants on route between wintering and breeding quarters is essential to identify areas that are important stop-over sites, unfortunately the French ringing scheme has not been operating very well in the last few years with few birds being ringed and notification of recoveries taking years to come through. The situation has improved during 2000 and it is to be hoped that this can be maintained. N089508 was caught on autumn migration and probably breeds even further north than Yorkshire given the date it was controlled.

Swallow

N221828	3	28.07.97	Banwen, Glamorgan.
	R	08.05.98	Barcaggio, Corsica, FRANCE. 43° 0′N 9° 24′E.
			1379 km SE 284 days.

Although many British summer visitors migrate down the west side of Europe some take other routes as indicated by this bird.

Dipper

RS92718	1	19.04.97	nr Longtown, Olchon Valley, Hereford & Worcester.
	X	09.10.99	Tarren-yr-Esgob, Powys.
			9 km WNW 903 days.
RW23858	1	28.04.97	nr Llanbedr, Crickhowell, Powys.
	X	26.01.99	nr Crickhowell, Powys.
			3 km W 638 days.

RW26066	3M	13.09.97	Afon Duhonw, Powys.
	X	22.02.99	Cwmhinddu, nr Builth Wells, Powys.
			0 km 527 days.

Nothing remarkable about the distances or ages of these recoveries, just their manner of death - the rings of all three were found by metal detector at Peregrine plucking posts.

Whinchat

J832538	5M	25.06.94	Blorenge Mountain, Gwent.
	R	13.06.99	Blorenge Mountain, Gwent.
			1814 days.
K428227	3M	15.09.96	Dunkirk, Little Downham, Cambridgeshire.
	R	11.05.99	Blorenge Mountain, Gwent.
			236 km WSW 968 days.

At six years old the first bird is a very good age for a small passerine, unfortunately it was not seen back on its territory in 2000. The second bird would have been caught on its southward migration.

Blackbird

RJ13351	6F	06.01.97	nr Pant Einon Hall, Friog, Gwynedd.
	R	15.10.97	Filey Brigg Country Park, Yorkshire.
			300 km NE 282 days.
RP48651	5M	13.03.99	Pentyrch, Glamorgan.
	X	28.05.99	Uvberget, Kopparberg, SWEDEN. 60° 29′N 15° 34′E.
			1533 km NE 76 days.

The first bird had probably only just completed the crossing of the North Sea on its way back for another winter in Wales.

Redwing

5X22167	3	31.10.87	Westmalle, Antwerpen, BELGIUM. 51° 18′N 4° 41′E.
	X	26.10.99	Craig y Fintan, nr Tregaron, Ceredigion.
			598 km W 4378 days.
7X22475	3	13.11.98	Merksplas, Antwerpen, BELGIUM. 51° 22′N 4° 52′E.
	X	26.10.99	Craig y Fintan, nr Tregaron, Ceredigion.
			608 km W 347 days.

Both these birds were taken by a Peregrine, their rings found by metal detector at a roost site. Very few Redwing are caught in Wales, Bardsey being about the only place to catch reasonable numbers, and there are even fewer controls so it is a bit galling to get these two courtesy of a Peregrine. The Redwing wintering in Britain come from two areas: the east - as these two indicate; and a smaller number from Iceland. The Icelandic birds tend to be

much darker and more heavily streaked than the eastern race.

Sedge Warbler

K393508	3	01.08.98	Kenfig Pool, Glamorgan.
	R	19.08.98	Trunvel, Treogat, FRANCE. 47° 55′N 4° 19′W.
			402 km S 18 days.
K393515	3	01.08.98	Kenfig Pool, Glamorgan.
	R	12.08.98	Trunvel, Treogat, FRANCE. 47° 55′N 4° 19′W.
			402 km S 11 days.
K976979	3	24.07.98	Llyn Coron, Anglesey.
	R	03.05.99	Teifi Marshes, Cardigan, Ceredigion.
			127 km N 283 days.
N636595	3	22.08.99	Llyn Coron, Anglesey.
	R	02.09.99	Llangorse Lake, Powys.
			163 km SSE 11 days.

A selection of the recoveries received for this species, the two birds to France providing further evidence of the new lease of life the French ringing scheme has found. Although quick these birds probably got to France with only a couple of stops perhaps in Devon or on the Channel Islands.

Reed Warbler

BB36260	3	21.09.97	Villeton, Lot-et-Garonne, FRANCE
	R	06.08.98	Llangorse Lake, Powys.
			880 km NW 319 days.
K829773	4	31.07.96	Leighton Moss, Lancashire
	R	24.07.99	Kenfig Pool, Glamorgan.
			301 km S 1088 days.
N133854	3	05.08.98	Icklesham, Sussex
	R	07.07.99	Teifi Marshes, Cardigan, Ceredigion.
			390 km WNW 336 days.
N657825	3J	18.07.99	Teifi Marshes, Cardigan, Ceredigion.
	R	31.07.99	Dungeness, Kent.
			406 km ESE 13 days.

A fairly typical range of Reed Warbler movements, quite a number of birds have been trapped in south-east England in autumn indicating a more easterly departure. There was also another bird ringed at Kenfig in June 1998 and found in Marrakech, Morocco in July 1999. The finding details give no idea as to whether it was freshly dead but it would be unusual for a British bird to be so far south at that time of year.

Blackcap

K970024	3J	05.06.97	nr Ynysgyffylog, Gwynedd.
	XF	30.03.98	Feria, SPAIN. 38° 30′N 06° 35′W.
			1590 km S 298 days.

Blackcaps breeding in Wales migrate down to southern Spain and Morocco for the winter as indicated by this individual.

Pied Flycatcher

J574107	1	14.06.95	Newbridge-on-Wye, Powys.
	R	02.06.99	Bovey Tracey, Devon.
			179 km S 1449 days.

Many birds, particularly females, breed close to their natal area, so it is noteworthy when one is found breeding 180km away.

Blue Tit

H697603	3	11.10.92	Gilwern, Gwent.
	X	27.11.99	nr Crickhowell, Powys.
			8 km NNW 2603 days.

Another ring found by metal detector at a Peregrine roost. The only reason one can see for a Peregrine taking something this small would be to feed a chick.

Starling

B238543	1	31.05.92	Pärnu, ESTONIA. 58° 30′N 24° 20′E.
	X	30.07.99	Cefn-ty-ny Graig, nr Abergwesyn, Powys.
			c.2000 km E 2616 days.
P27074	3F	05.08.88	Podnieki, Riga, LATVIA. 57° 4′N 24° 22′E
	X	27.02.99	Abergwesyn, Powys.
			1871 km WSW 3858 days.
RP22468	3F	22.10.97	Landguard Point, Suffolk.
	X	18.02.99	Tarren-yr-Esgob, Powys.
			304 km W 484 days.
XD370192	3F	30.06.94	Rybachiy, Russia.
	X	03.03.99	Craig Cerrig Gleisiad, Brecon Beacons, Powys.
			1644 km WSW 1707 days.

As with the Dippers and Redwing all these rings were found by metal detector at Peregrine sites. An unfortunate end for birds to fly a great distance only to be a snack for a Peregrine. The Landguard bird would have been coming from the same area as the other three, which may have been breeding in the area but could also have come from even further afield.

Greenfinch

VV15846	3M	10.11.96	Nantyglo, Gwent.
	X	22.08.99	Clydach, Brynmawr, Gwent.
			3 km NE 1015 days.

Yet another species on a Peregrine's menu. Perhaps being caught to feed to a chick as something as small as this presumably would not keep an adult going very long.

MOVEMENT, SETTLEMENT, BREEDING, AND SURVIVAL OF RED KITES *MILVUS MILVUS* MARKED IN WALES

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SUMMARY

In their first winter, Welsh kites mainly stayed within or near the current breeding range, usually at good food sources. Most birds were found within 40 km of their birthplace (mean distance 20 km), and only 18 were found more than 70 km away (Figure 1). Dispersal was markedly oriented SW towards two major feeding sites, and large winter roosts were associated with these gatherings. Despite searches and enquiries, records of similar gatherings elsewhere were lacking. In subsequent winters, movements of immatures (i.e. birds that had not yet bred) followed the same general pattern. By their second winter some were developing territorial attachments.

Although peripatetic, first summer birds were usually found within 40 km of birthplace (mean distance 10.7 km) but a proportion was found much further afield, and some of these eventually bred in this more distant first summer location. There was no directional bias in the records, except that more distant records tended to be east of birthplace. In subsequent summers before breeding the pattern was similar, but with a marked tendency for birds to be found west of natal site. Increasingly many birds now behaved territorially and would breed where settled. Before breeding, many birds returned annually to the same winter resort. After breeding, those that did so tended to be adults from hill territories with little productive lowland. Otherwise adults were extremely sedentary, remaining in or near the home range and roosting as a pair; the longest movement recorded was of 32 km.

Young kites commonly paired and went through part of the breeding cycle before fully mature. These pairs frequently then bred in the same place. Mean age of recruitment to the

breeding population was 2.91 years, with males somewhat earlier, 2.86 years cf 2.98 for females. Males were significantly more likely to breed west of their natal site. Distances from natal to first breeding site were small, averaging 13.7 km for females and 11.7 for males; only 30 out of 144 records were of >20 km. Birds normally mated for life but young birds might divorce and pair again. The pair bond thus became stronger with time and experience. There was a strong tendency for successful sites to remain occupied but unsuccessful ones to be deserted for a new site the following year. Females tended to lay larger clutches with age and older pairs fledged many more young.

About 67% of birds survived to the end of their first year and subsequent annual survival was 82%. At least 41% of fledglings survived to breeding age. The annual survival rate of adults was very similar to Buzzard *(Buteo buteo)* in the same area. Most mortality (57%) occurred during February-May and more adults were found dead then. This seasonal bias probably arose because of the increased presence of poison baits laid in the lambing season. Of known causes of death, poisoning accounted for 38%, probably 56%, of cases, with collisions (18%) and disease or starvation (14%) the other most frequent causes.

INTRODUCTION

This paper summarises certain results from ringing and wing-tagging young Red Kites in Wales. During 1968-1993 647 juvenile kites fledged bearing BTO rings, and of these between 1975-79 and 1983-93 555 also carried two identical plastic wing-tags, with a distinctive year-colour and an individual painted symbol, attached to the patagium on each wing. Ringing with BTO and darvic colour rings continued after 1993 and indeed expanded with the increasing population. The present paper is concerned mainly with tag observations and only limited reference is made to birds ringed since 1994.

The tags allowed the age of a bird to be determined on a brief or distant view, and revealed its individual identity on a close view. Between 1975 and 1983 they were made from hard darvic 2mm sheet, and from 1984 to 1993 from flexible PVC-coated nylon or acrylic webbing. Both types of tag were attached with hard nylon rod, cut into pins, used with nylon washers above the tag and beneath the patagium, and melted at the ends with a flame, to form a head or 'blob' at each end of the pin. The design and recommendation came from N.Picozzi. Nylon pins were preferred to stainless steel dental wire, on the suggestion that wire caused damage to the patagium in use, and also because the wire might remain in place long after the tag itself had gone. In practice the nylon rod and washers proved very satisfactory up to the 1987 generation of tags; but new supplies (in use from 1988) proved to be inferior, and subsequently the survival rate of tags tended to fall. From recovered cast tags it appeared that the 'blobs' were more brittle and broke away more easily than before, or that some washers had broken away more quickly.

Some single tags were always lost fairly quickly. It was observed that some kites chewed at them during preening, and they probably sometimes succeeded in removing tags. However, most birds seemed simply to treat the tags as extra feathers, and many retained a single tag for several years after losing the first. Both types of tag were reasonably durable, and it is believed that very few of the birds tagged up to 1987 lost both tags before they were about four years old, while many retained them later. Darvic tags are known to have survived for up to 11 years, and PVC tags for 10 years. After 1988 tag life tended to fall on average by a year or more, and some birds probably lost both tags before they were three. Obviously this affected the data on recruitment to the breeding population, though there was still much other information, especially on movement and general behaviour, which could be derived from these less durable tags. It is thought that very few tags survived on Welsh-reared kites after

1998, though one was reported in 2000.

Tag monitoring was not particularly systematic. An effort was made to check every breeding bird, but some observers were more assiduous than others, and some adults were never well seen. Outside the breeding season, there was little deliberate searching for tags between July and September, but frequent checking at feeding-stations and roosts, mainly in the south-western part of the range, during October to March. Otherwise most records were of casual encounters, and reports from bird-watchers in general. After about 1992 new feeding sites in the eastern part of the range also began to attract increasing numbers of kites, and more observations were made there.

PART 1: MOVEMENTS

To avoid severe problems of independence in the data (since many individuals were recorded several times in each season) the tables dealing with the direction and distance of displacement from the birthplace (immatures) or previous nest-site (breeding adults) show only one occurrence of each individual at each season. After examining various possible choices, we opted for the furthest (most distant) record of the season, as being the nearest approximation to an ultimate destination, that was available to us. This choice also eliminated many of the records showing little or no movement, especially early or late in the season. For immatures, the 'furthest displacement' might occur at almost any time of year, though the most distant tended to be during the first autumn. In the discussion, however, we also mention some conclusions derived from the larger body of records.

Juvenile/First Winter Dispersal

In July most juveniles were near the nest site. From August onwards relatively few remained near the nest, though some were recorded in the vicinity, through the first winter. Most birds however dispersed or wandered away over relatively short distances during that season.

Records of juveniles between July and March, plotted monthly for each location where they were seen, showed a markedly bimodal distribution. The great majority of all the records (657/733) were at less than 40 km from the natal site, and most of the remainder within 70 km; broadly within the usual winter distribution of Welsh kites at the time. However, a very small proportion of birds (18 individuals) produced 28 records between 82 and 390 km from the birthplace. To avoid undue distortion of the data, these distant birds are treated as a special category and are generally discussed separately, especially where measures of distance are involved.

(a) Juveniles within the Welsh Range.

The great majority of juveniles in their first winter (July to March) apparently moved around within the current breeding area, or at no great distance beyond it. In July-August there were records of tagged juveniles visiting the nests of other families, up to 8 km from the natal site, and feeding with them. The mean distance from the birthplace of all sightings between October and February remained at around 20 km, then declined to 15 km in March, suggesting a tendency to shift back towards the birthplace at the end of winter.

Many juveniles settled at good food sources (abattoirs, refuse tips, feeding stations), often for most of the winter, but sometimes for only brief periods before moving on, perhaps to return later in the season. Movements could evidently be triggered by the exhaustion of the food source, or by the onset or ending of a spell of severe weather, but most had no obvious ultimate cause. Most food sources were not the sole food supply exploited by individual birds, which normally foraged elsewhere for part of each day, especially where food was set out only once a day. Winter roosts were often, but not invariably, associated with good food

sources. Such roosts were composed almost entirely of immature kites; adults tended to segregate and to form smaller roosts elsewhere, probably because most of them stayed nearer their breeding-places in winter, and few of them visited the feeding-sites frequented by the immatures. The 'mainly-immature' roosts sometimes exceeded 50-60 birds in recent years, whereas 'mainly adult' roosts seldom held more than a dozen or so. Some juveniles certainly ranged over 10 km from the roost during the day, and there were records of birds seen over 20 km from a roost site they had recently occupied, and to which they shortly returned, though they may have roosted briefly elsewhere. A number of other records show movements up to 40 km in a few days, though it is likely that these birds had shifted their roost site.

Table 1. Red Kite: Direction and distance of furthest displacements from birthplace in first winter (July-March)

	N & NNE	NE & ENE	E & ESE	SE & SSE	S & SSW	SW & WSW	W & WNW	NW & NNW	Nil	Totals
No movement									7	7
1 - 10 km	6	4	6	10	12	23	5	2		68
11 - 20 km	5	6	5	12	11	23	7	18		87
21 - 30 km	3	6	2	3	17	14	7	17		69
31 - 40 km	9	0	0	1	8	3	1	21		43
41 - 50 km	0	1	0	1	7	1	0	1		11
51 - 60 km	0	0	1	0	4	0	0	0		5
61 - 70 km	0	0	0	0	6	1	0	1		8
70 - 80 km	0	0	0	0	0	0	0	0		0
Over 80 km	0	7	5	3	0	2	0	1		18
Totals	23	24	19	30	65	67	20	61	7	316

Most juveniles were recorded to the west of the birthplace, and particularly to the south-west (Table 1). An apparent lack of records in the 'W to WNW' category may be due to the proximity of the coastline in that sector to many of the nest-sites; an argument that may be considered to apply to all the movement tables.Between 1986 and 1994, when samples were largest, on average exactly 50% (217/434) of the annual output of tagged juveniles were identified at one or both of two major food-sources in the south-western part of the range, during the ensuing winter. Since part of each season's crop will have died, emigrated, or have been present unidentified, it seems very probable that the juvenile population tended to concentrate in the south-west. Observer bias undoubtedly occurred, but at the time no comparable gatherings of young kites were located further north and east, despite searches and enquiries. A tendency to shift to the mildest part of the range in winter might of course be anticipated. Though in general most winters are open and rather mild throughout Central Wales, there are often colder spells when the east has lower temperatures than the west. The effect may be less apparent since 1994, with the development of new feeding stations in the east of the range, and the expansion of the

population there. There has also been a run of very mild winters in recent years.

We accumulated records of 172 individual juveniles spending ten days or more at one location (or returning there frequently) during their first winter. Many of these birds were seen in the same place from October/November to January/February, and there was little indication that they could have moved far away during that time. On the other hand, 48 birds were recorded at two or more locations during the season, after leaving the birthplace, some being identified at three or four widely separated localities. A good many of these shifts seemed to follow the onset of colder weather and snowfall. The general picture, however, is of a population shifting from food-source to food-source, forming aggregations and fragmenting again, but with many individuals prepared to remain quite sedentary near a constant source of food.

A dozen or so multiple tag sightings demonstrate a return towards the birthplace in late winter or early spring. One last seen at its winter resort on 19 February was back near its birthplace (26 km) less than 24 hours later. Others are known to have shifted up to 40 km between dates in February or March and sightings near the birthplace in March or April. There were a few exceptions to this rule, but the reduced mean distance from their birthplace of juveniles in March, and also later in the first spring (see below) suggest it has some validity.

There were three records, from video surveillance cameras, of tagged juveniles landing on the nests of unrelated pairs in March, before the eggs were laid.

b) Long-distance Movements by Juveniles.

A small number of juveniles emigrated from the usual kite range in Wales, and some of these movements occurred very soon after fledging; so soon indeed that the birds involved may not have been fully capable of fending for themselves. This might account for the rather high proportion that were reported dead or dying, or temporarily incapacitated and recovering after care. A lack of records at intermediate distances, between about 60 and 100 km, may suggest that movement tended to occur as a single lengthy flight (perhaps in one or two days) rather than in shorter stages.

Of those which survived, some remained in distant parts through the first winter and beyond, while others are known to have returned to Central Wales during the same season. The evidence suggests that most of the initial distant movements occurred by October. Even when the birds were first identified at a later date, observers frequently noted that a kite had been seen earlier.

Examples of very early departures are as follows; all except one had fledged in early or mid-July:

Kent (315 km) by 13 August
Worcester (110 km) by 'end July'
Stafford (127 km) by 7 August
Oxford (175 km) by late July ('long dead', 5 August)
off Norfolk coast (390 km) on 19 July (fledged late June)
N.Wales (130 km) by 31 July
E.Yorkshire (ca.270 km) by 9 August

Such birds may have been separated from the parents prematurely, and have responded to 'food shortage' by precipitate dispersal. Studies of 'partial migrants' generally propose that irregular emigration is related to external stimuli such as food scarcity (often related to high population levels) and/or exceptional climatic conditions, Welsh kite records are too few to really test a hypothesis that distant movements were more likely to happen in certain years than in others, but multiple distant recoveries of first-winter kites were reported in 1975 (2),

1990 (2), 1992 (5), and 1993 (3), whereas many other years (including most years since 1994) produced none. The first three of the years listed were uncommonly productive breeding seasons, but 1993 was an indifferent one.

Studies on the mitochondrial DNA of Welsh kites, by members of the Department of Genetics at Nottingham University during 1987-93 revealed that female birds could be assigned to only two ancestral lines: a majority alpha (or 'old Welsh') haplotype, and a minority beta haplotype, believed to be of recent immigrant origin, and resembling a frequent German type (May *et al* 1993 a and b). It is likely that the Welsh population derives from only a single native female reared in the early 1930s, and an immigrant female which probably arrived during the 1970s (Davis 1993). Unfortunately males are not susceptible to similar analysis. Of 15 distant emigrants from Wales recorded in 1987-93 eleven were sexed from blood samples, and all were females (the other four were not individually identified, except by year-class). Both haplotypes occurred among the emigrants. Eight were alpha haplotypes and three beta, about the expected ratio from a random sample, and so there was no suggestion that the 'old Welsh' type was less likely to emigrate than the 'German' type, though the longest movement (390 km) was by a beta female. However, the discovery that all the sexed birds among the emigrants were females is particularly interesting, especially in view of the potential implications for interbreeding with the introduced populations in England, or indeed the establishment of new pairs of Welsh origin well outside the present range. The longest movement recorded for a positively-sexed Welsh male kite is about 85 km, within Wales; while the only known male emigrant had travelled a mere 60 km, into Herefordshire..

Extreme examples of erratic movements are recorded among the distant emigrants. One had moved 130 km N from its birthplace, to N Wales, by 31 July, then appeared 245 km SSE from this sighting (and 177 km SE of its natal site) in Wiltshire by 22 August, where it spent the following winter, before suddenly shifting 37 km NE into Berkshire during February, where it met with another Welsh kite! Another moved 125 km ENE to the Worcestershire/Staffordshire border by mid-October, and spent about three weeks there, but was found back in Wales (117 km to SSW) by 13 December, and spent the rest of the winter only 35 km NNW from where it was reared. Other first-winter recoveries include individuals in Oxfordshire (175 km ESE) in September-October; Gloucestershire (150 km SSE) in late August; Kirkcudbright (297 km NNW) in October,; Herefordshire, two birds, one (72 km E) in September, the other (60km ESE) in February; Denbigh (88km NE) in October; Shropshire (82 km NE) by late August; Worcestershire (85+ km E) in October; and Dorset (195 km SE) in February. All distant recoveries of Welsh kites to end 2000 are plotted on the map (Figure 1).

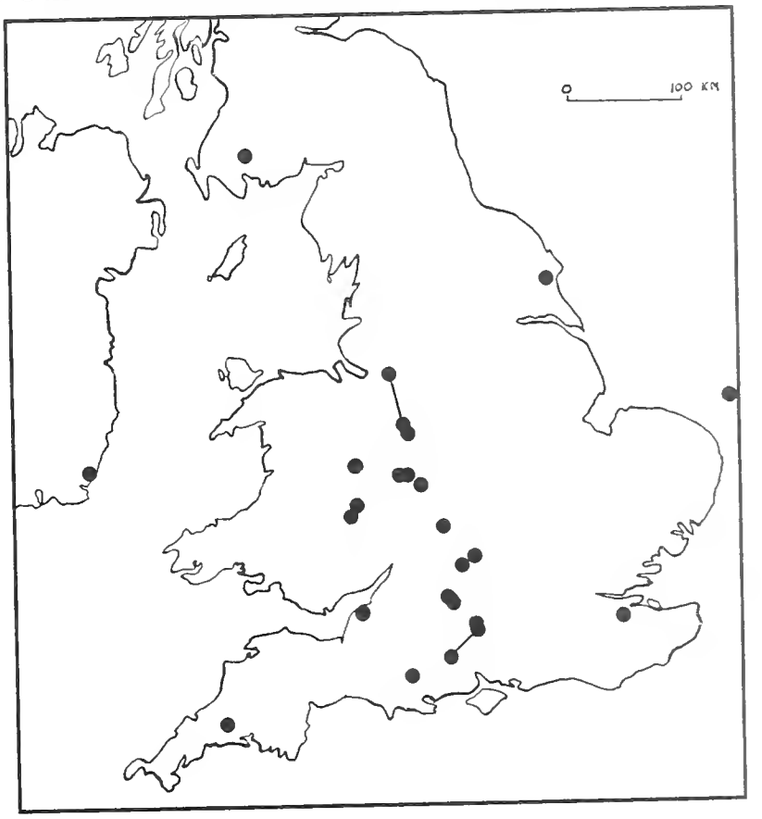

Figure 1: all recoveries of marked Welsh Red Kites outside Wales, to end 2000. Records of individual at two locations are linked by lines.

Movements and locations of immature birds after first winter

Immature birds are defined here as those individuals which have not yet bred. In Welsh Red Kites this embraces all birds up to the end of the second winter, and some up to the end of the fifth winter, or in very rare instances even older

Table 2. Red Kite: Direction and distance of furthest displacements from birthplace in first summer (April-July)

	N & NNE	NE & ENE	E & ESE	SE & SSE	S & SSW	SW & WSW	W & WNW	NW & NNW	Nil	Totals
No movement									4	4
1 - 10 km	3	1	0	4	3	3	3	4		21
11 - 20 km	5	1	1	2	0	2	1	0		12
21 - 30 km	1	1	0	1	0	0	2	4		9
31 - 40 km	0	1	0	0	1	0	0	0		2
41 - 50 km	1	0	0	0	0	0	0	0		1
51 - 80 km	0	0	0	0	0	0	0	0		0
Over 80 km	0	3	1	1	1	0	0	0		6
Totals	10	7	2	8	5	5	6	8	4	55

(a) First summer birds (April to July).

Most birds were at no great distance from the birthplace. Table 2 shows the 'furthest displacements' of 55 individuals at this season. The great majority were within 30 km of the birthplace and there is no obvious directional bias Excluding records of eight distant emigrants, 63 monthly records were all within 40km of where they were reared, with a mean distance from the birthplace of only 10.7 km. A few birds were identified several times during the spring within a limited area, but most were recorded only once, with a presumption that they were peripatetic. Records tended to be nearer to the birthplace than locations where the same individuals were identified in preceding or subsequent winters. A few individuals settled at places remote from either birthplace or winter sites, and it was interesting to observe that several of these birds later bred near their first-summer location.

Thirteen other records, relating to eight individuals, were at 70-185km from the birthplace. Several of these birds were known or suspected to have emigrated in the first-winter period, but one (at 98km NE, in NE Wales) certainly shifted 99km between 18 February and 6 June (it was back near its birthplace in late October). Another bird, which had wintered in N Cheshire, 170km NE of its natal site, from November to 3 April, was seen in Staffordshire 45 km SSE of its winter location (and 140km ENE of its birthplace) on 17 April, but had returned to its winter site by 26 April. It remained there through its first summer and second winter.With only two exceptions the distant birds were located east of the longitude of their natal sites. Apart from the two already mentioned, they were at 110km SE (Monmouthshire)

in June and July; 115km NE (Denbigh) in July; 185km ESE (Wiltshire) in May, and 170km SSW (Cornwall) in July, probably earlier. Two unidentified individuals were seen respectively in Monmouthshire (70+km SE) in April and in Anglesey (90+km NNW) in June. These two are of course omitted from Table 2, since the exact displacements are unknown.

Table 3. Red Kite: Direction and distance of furthest displacements from birthplace in second winter (August-March)

	N & NNE	NE & ENE	E & ESE	SE & SSE	S & SSW	SW & WSW	W & WNW	NW & NNW	Nil	totals
No Movement									0	0
1 - 10 km	4	4	4	5	6	14	3	7		47
11 - 20 km	3	5	7	10	15	17	0	18		75
21 - 30 km	2	5	0	0	10	14	7	7		45
31 - 40 km	6	0	0	1	3	3	6	8		27
41 - 50 km	1	0	0	0	2	2	2	0		7
51 - 60 km	0	0	0	0	2	0	0	0		2
61 - 70 km	0	0	0	0	4	0	0	0		4
71 - 80 km	0	0	0	0	0	0	0	0		0
Over 80 km	0	1	0	0	2	2	0	0		5
Totals	16	15	11	16	44	52	18	40	0	212

(b) Second winter birds (August to March).

The 'furthest displacement' records for 212 individuals (Table 3) (and also the total of 355 monthly records) closely resemble the pattern for first- winter birds, though the distant element is much reduced. The same apparent south-westerly bias is evident, with almost half the records between S and WSW from the birthplace. From the larger database, there is also the same tendency for birds to be seen nearer the birthplace in March (mean 10.5 km) than during the rest of the winter (17.6 km). These figures exclude the records over 80 km.

Three individuals were seen at 84 or 85 km SW or SSW from the natal sites, but still within the area normally occupied by Welsh kites in winter, at the time. Two other birds were seen throughout the second winter at locations in England: 170km NE (Cheshire) and 170km SSW (Cornwall). Both had frequented the same localities in earlier seasons; the Cheshire bird since its first winter (apart from the spring excursion mentioned above) and the Cornish one at least since first-summer. Another bird was reported, but not individually identified, in Somerset in December (probably at least 85 km from its birthplace).

Two second-winter birds illustrate return movement after emigration. These individuals were 98 and 115 km from their natal sites in June of their first summer, and back in the Welsh breeding-area by October (101 km) and February (117 km) respectively, both at no great

distance from where they were reared.

Many birds in second winter, and some in later winters, behaved like first-winter birds in frequenting major food sources such as refuse tips and feeding-stations. Others had evidently formed territorial attachments and apparently tended to forage within a more restricted radius, like adults, and seldom appeared at the major resorts.

Table 4. Red Kite: Direction and distance of furthest displacements from birthplace in second and later summers (as pre-breeders) (April-July)

	N NNE	NE & ENE	E & ESE	SE & SSE	S & SSW	SW & WSW	W & WNW	NW & NNW	Nil	Totals
No movement									2	2
1 - 10 km	2`	0	7	1	4	4	2	3		23
11 - 20 km	1	1	0	0	1	2	2	5		12
21 - 30 km	1	1	0	0	1	1	1	1		6
31 - 40 km	1	0	0	0	1	0	0	1		3
41 -50 km	0	0	0	0	0	0	0	0		0
51 - 60 km	0	0	0	0	1	0	0	0		1
61 - 70 km	0	0	0	0	0	0	0	0		0
71 - 80 km	0	0	0	0	0	0	0	0		0
Over 80 km	0	1	0	0	1	0	0	0		2
Totals	5	3	7	1	9	7	5	10	2	49

(c) Second and later summers (pre-breeding)

Some second-summer birds and most of those in later summers were breeding, and are discussed later. The 'furthest displacement' records for 49 individuals (Table 4), as well as the total 75 monthly records, resemble those from first summer in their proximity to the place of birth, with a mean displacement of only 12.1 km, and none more distant than 53 km, excluding records of two long-distance emigrants. There is however a marked directional bias, with nearly 70% of records to west of the longitude of the birthplace. The distribution much resembles that of first-time breeders, and indeed many of these pre-breeders are behaving territorially and have settled in places where they will breed the following year.

A tagged second-summer female was seen close to the nest (with eggs) of an unrelated pair in April, and tolerated by them; while another second-summer bird (sex unknown) actually brooded the small young of an untagged pair in early May. This suggests that some of the third birds ('aunties') quite frequently seen at active kite nests are pre-breeders. There are other records of tagged visitors to occupied nests; a sixth-year female which had previously bred nearby, but which was unmated in the relevant year, landed on another pair's nest in late March, shortly before eggs were laid; while a breeding male repeatedly visited the sites of two other pairs, both about 2 km from his own nest, during his second and third summers,

while his own mate was on eggs.

In the second and later summers, the emigrant component had almost disappeared. The Cheshire bird previously discussed finally departed on 21 April of its second summer, perhaps to return to Wales, though sadly its return went unrecorded. The Cornish female, however, remained about 170 km SSW of its natal site through the second summer and third winter, and what was probably the same individual (still tagged) was seen not far away in April of its fifth summer. Presumably it never returned permanently to Wales.

Table 5. Red Kite: Direction and distance of furthest displacement from birthplace in third and later winters (as pre-breeders) (August-March)

	N & NNE	NE & ENE	E & ESE	SE & SSE	S & SSW	SW & WSW	W & WNW	NW & NNW	Nil	Totals
No movement									1	1
1 - 10 km	4	2	4	4	0	5	3	6		28
11 - 20 km	2	2	5	7	7	9	0	12		44
21 - 30 km	3	2	0	0	1	8	4	5		23
31 - 40 km	2	1	0	0	1	1	0	2		7
41 - 50 km	1	0	0	0	0	0	0	0		1
51 - 60 km	0	0	0	0	0	0	0	0		0
61 - 70 km	0	0	0	0	2	0	0	0		2
71 - 80 km	0	0	0	0	0	0	0	0		0
Over 80 km	0	0	0	0	1	0	0	0		1

(d) Third and later winters (pre-breeding).

The pattern of distribution shown by the 107 furthest records (Table 5) and also the total database of 171 monthly records is similar to that in the first and second winters. The total list has a mean distance from birthplace (excluding the Cornish bird) of 20.4 km in October to February, falling to 9.2 km in March. The 171 monthly records show a westerly bias, with 65% to west of the birthplace. No bird, apart from the one in Cornwall, was over 67 km from where it was reared.

The emigrant bird in Cornwall, presumed to be the same individual, was reported only in December and March, but is unlikely to have shifted very far between these sightings.

There is in addition an extraordinary recent recovery of a kite ringed (but not wing-tagged) as a chick in 1995 and found dead near Blackwater (Wexford) in Ireland in its fifth winter, in October 1999. We do not know if this bird had bred, nor if it could have been in Ireland for some considerable time. The movement involved is ca.170 km WNW, and the shortest sea crossing between Wales and Ireland about 75 km.

Attachment to winter resorts in successive years

A total of 167 individual kites were recorded frequenting the same winter resort (tip, abattoir,

feeding station) during more than one winter. Of these 98 were identified in only two successive winters (a further 14 revisited after 'missing' a winter); 36 were seen in three successive winters (two others reappeared for a third time after an apparent interval); 15 were seen in four successive winters; and two in five successive winters. Since some birds in older age-groups will have lost their tags, they will be under-represented.

The great majority of these birds were still in the 'immature' category when they were seen. However, 28 birds that had bred also reappeared, for at least one later visit. Most of these had bred quite close to the winter resort, within about 10 km, but several travelled further, up to 32 km. The longer movements involved birds of both sexes, but they tended to be from breeding territories at high altitudes and containing very little productive lowland. Most of these habitual frequenters of winter resorts ceased to reappear once they had bred, however, even though many of them still retained their tags.

By contrast, there are no more than 58 birds on record which spent a substantial part of two or more successive winters at different resorts. Thirty-five of these wintered nearer the birthplace on the later occasions, 16 further away, seven about equidistant. All of these were birds that had not yet bred, but several of them bred later, closer to the second or subsequent winter resort, and this included birds whose second winter resort was further from the birthplace than the first; so most had shifted closer to where they were eventually going to breed. Curiously, not one of these birds was seen visiting the second resort after they were known to have bred.

Sibling encounters after leaving the natal site

There seemed to be little evidence of attachment between siblings (brood-mates) after departure from the natal site; though some may have existed, mainly during the first winter.

Tagged birds fledged from 145 multiple broods (10 x 3, 135 x 2 young), excluding manipulated chicks added to broods of one young. There were 34 records, or series of records, in which two siblings were subsequently seen together, or in the same company, and two records where all three birds of the same brood were together, well away from the nest site. Nearly all these records were in winter concentrations at food sources or roosts, and the siblings were normally part of a larger gathering and rarely seen interacting. During the same period there were of course several hundred records of birds seen apart from their siblings, often at totally different winter resorts. Only ten of the potential 'sibling encounters' extended over more than one winter, always at the same common resort. The remainder were all in the first winter of life.

It seems probable that nearly all these encounters arose purely by chance, since a sizeable part of each season's crop of juveniles might visit a given resort during the subsequent winter, and many would revisit the same resort in later years. There were however a few encounters which suggested some persistent attraction. As examples, two juveniles of 1978 were seen together on several occasions at a winter gathering in January-February 1979, and then together (without company) 11 km away on 23 February, subsequently flying together for 7 km and then returning towards the earlier location. In another situation, two siblings of 1983, the only ones tagged in a certain part of the kite's range in that year, were frequently seen together in the same locality in April-May of their first summer. At a winter resort, an entire brood of three were in the same company from November to February of the first winter, no less than 65 km from where they were reared, which must reduce the likelihood that they came together by chance. Two 1991 siblings were seen repeatedly the following January at a location 85 km SE, though not actually in company. There were several winter records of siblings sitting together in the same tree, which suggested some mutual attachment. However, kites are sociable birds and tend to consort together in close groups. much larger than broods,

at both food-sources and roosts.

One certain and one very probable case of brother-sister pairings were known. The 'very probable' one refers to a situation where one bird's tags were never fully deciphered, though there was very little room for doubt. In both cases one of the pair had had an unsuccessful breeding attempt with a different mate, and subsequently bred with a sibling. In neither case were the siblings known to have consorted as immatures, though one pair came together very near their birthplace, in their third summer. The other pair came together at 26 km from their natal site, one having bred only 6 km from its birthplace in its second summer, and shifted to the new site in it its third. Two fostered young reared in the same nest (but with different natural parents) in 1992 bred as a pair in 1994 and 1995, very close to where they were reared. In a small population, sibling matings might easily arise by chance, and the fairly strong degree of philopatry shown by Welsh kites makes such encounters even more predictable.

Again, there was little evidence from tagging of association between parent kites and their offspring, after the latter had ceased to be dependent. There were many records of immatures remaining in, or returning to, the locality where they were reared, and eventually breeding nearby; but very few of any contact with their parents, apart from a few encounters at winter resorts, likely to be no more than coincidental. There was no hard evidence from tagging of family groups remaining together in the nest locality through the following autumn and winter, though this was often postulated by site owners and watchers. Third birds consorting with a pair seemed unlikely to be related to them.

One instance of a mother-son pairing was recorded. This occurred at the actual nest where the son had been reared, and he apparently replaced his father, a 24-year-old ringed bird found dead at the site. The young male had spent most of his first and second winters at a feeding-station nearby, but had been seen 35 km away during his first summer, and a similar distance away (but in a different direction) towards the end of his second winter, shortly before he returned home. There was no indication that he had encountered his mother between becoming independent and being reunited with her, nearly two years later.

Movements of adults outside the breeding season

Records of adult kites foraging away from their active nests are discussed later. This section is concerned with marked birds that were known to have bred, identified in later autumns and winters (August to March).

Most adult kites in Wales are evidently very sedentary. They tend to remain in or near the home range they frequent in the breeding season, and to roost together as a pair, or in small roosts composed mainly of other adults, probably their close neighbours. Since most winter observations of tagged kites were made at larger roosts and feeding-places, which were much less frequented by adults than by immatures, the data will be biased towards the longer movements of adults.

Among the 77 furthest displacements of adult birds shown in Table 6, 19 individuals were only seen in the vicinity of the previous nest site, only 17 were at more than 10 km from the latest breeding site, and only seven were at more than 20 km. The longest movement was 32 km, in January. Two other birds moved 26-27 km, one being seen in only a single December, the other repeatedly in three successive winters at the same resort; November to January in two winters, December in the third. Other birds were seen 25 km SSW in December-January, and 24 km W in December. It was notable that all these distant adults came from higher/less productive territories or, in the case of the longest movement, from an outlying isolated breeding site, which was not re-occupied subsequently. Some of these movements were

Table 6. Red Kite: Direction and distance of furthest displacements from previous nest site in following winter by breeding adults (August-February)

	N & NNE	NE & ENE	E & ESE	SE & SSE	S & SSW	SW & WSW	W & WNW	NW & NNW	Nil	Totals
No movement									19	19
1 - 10 km	5	4	1	6	7	10	3	5		41
11 - 20 km	2	2	1	0	0	1	0	4		10
21 - 30 km	0	4	0	0	1	0	1	0		6
31 - 40 km	0	1	0	0	0	0	0	0		1
41 - 80 km	0	0	0	0	0	0	0	0		0
0ver 80 km	0	0	0	0	0	0	0	0		0
Totals	7	11	2	6	8	11	4	9	19	77

associated with spells of colder weather, when upland territories were snow-covered.

For all the monthly records in winter (141, including multiple records of some individuals) the mean distance between nest site and autumn/winter sighting was only 7 km. The average recorded displacement fell below this figure in August to October and in February, and exceeded it in November to January, peaking at 10.2 km in December. By March, and often earlier, virtually all established breeders would be settled at the breeding sites. In fact the great majority of autumn/winter sightings could fall within a normal foraging distance from roosts within or near the birds' established breeding territories.

The direction of sightings from the previous nest site shown in Table 6 seems to be at random, with no directional bias.

PART 2: SETTLEMENT AND BREEDING

Pre-breeders on territory

It is common for kite pairs to be formed and to go through part of the breeding cycle (display, nest-building, copulation) without reaching the stage of laying eggs. Presumably many such pairs include at least one bird which is not yet fully mature, since the same pair frequently breeds in the same area, often in the same nest, the following year and subsequently.

Most of the records of tagged birds in these non-laying pairs refer to two or three year old individuals. There are only five Welsh records of first-year tagged kites being apparently paired and settling at a nest site, and in each of these cases the birds quickly lost interest, and ceased to frequent the site during April. There is no record of a Welsh kite breeding in its first year, though this is recorded on a few occasions for other Red Kite populations, including the introduced birds in England (I.Evans, verbally).

Records of tagged kites that were individually identified, and which had one or more pre-breeding years on territory, and then were proved to breed later, are summarised as follows:

Males: ten mated non-breeders in second year only, one in third year, none older.

Females: four mated non-breeders in second year only, one in second and third years, six in third year only, none older.

There are in addition 22 records of tagged paired non-breeders that were not confirmed as breeders in later years; probably in most cases due to tag loss. These were nine birds in second year, twelve in third year, and one in fourth year. Of the nine second-year birds, five were male, one female, three not sexed. Among the other 13, two were male, three female, the rest not sexed. One third-year male was mated, in that season only, to a barren tagged female which continued to hold territory until her twelfth summer, but which never laid eggs after her first attempt at three years old.

Settlement in breeding territories

To the season of 2000, 187 kites were identified as breeders, out of 555 tagged chicks which fledged during 1975-93. A further five birds ringed before 1975 were also known to have bred, but their exact age at first breeding was not established.

Because few Welsh kites join the breeding population at more than four years old, and because older birds will by now have lost their tags, any further recruits from the generations up to 1993 will only be detected by ring recoveries. At the end of 2000, 33.7% (187/555) of tagged kites were known to have survived to breed at least once. This figure is an absolute minimum for several reasons: (a) some tag loss is certain, especially in birds over three years old; (b) some tagged birds will have been missed during fieldwork, especially at nests that failed quickly or which were not reported until after the breeding attempt had ended; (c) the assumption was necessarily made that the same tagged bird was present in a territory in successive years, when the tag inscription could not be read, provided the year-colour was unchanged; and (d) a few further records should emerge with time, from ring recoveries. In fact to the end of 2000 eight birds (3 male, 5 female) had been identified in fifth summer or older, five of which had lost their tags and had never been proved to breed, though very probably they had done so. If these were added to the total of survivors to breeding status, the figure would rise to 35.1%.

The survival table derived from dead ringed kites (see below) suggests that the true figure for survival to the approximate mean age of first breeding (at three years) is around 45-50% of young fledged, a discrepancy of about 12-17% compared with the data from tagging. The limited Welsh data used by Newton *et al.* (1989), which derived only from the more durable early tags, gave 41% survival to first breeding.In addition, 7 birds (2 males, 4 females, 1 unsexed) first bred at unknown age, and were not detected until they were five or older.
The data for age of recruitment of 180 kites to the breeding population are as follows:

In 2nd summer: 45 males, 34 females, 2 unsexed; total 81 birds
In 3rd summer: 28 males, 28 females, 3 unsexed; total 59 birds
In 4th summer: 11 males, 12 females, 1 unsexed: total 24 birds
In 5th summer: 5 males, 5 females; total 10 birds
In 6th summer: 1 male, 3 females; total 3 birds
In 7th summer: 2 males, 1 female; total 3 birds

The mean age at recruitment of all 180 birds of known age is 2.91 years. Excluding the six unsexed individuals, 92 males first bred at mean age 2.86 years, and 82 females at mean age 2.98 years. Males apparently start breeding at a slightly younger mean age than females; and since tag loss distorts the data, especially at four or more years, rather more females than males will be missed, hence the lower number of tagged females recorded breeding. The difference between the sexes has become less marked with the incorporation of more recent generations into the data, particularly an anomalous situation in the 1990 generation, when

far more females than males bred in their second year, the very successful breeding season of 1992.

Different generations showed very considerable variations in the rate of survival to breeding, from only 13% in 1984 to 70% in 1978, though of course the samples for these earlier years are small. The 1984 generation produced particularly odd results, since the only two breeding birds (out of 15 tagged) did not breed until they were five and six years old. Perhaps the likeliest reason for the apparently wide variations in the rate of survival to breeding age is a parallel variation in first-year mortality rates, since considerably more deaths occur in the first year of life than subsequently (see survival table, below). Clearly also there is much variation in the proportion of birds that start to breed at two years old, rather than later. The proportion of each generation's tagged birds that bred in the second year of life varied from none (1984 and 1985) to 32% (1986), with a mean of 15%. In recent years, when samples were greater, the 1990 generation produced 10 second and 12 third-year recruits, whereas the 1991 generation produced 11 second-year and only 3 third-year breeders. The very cold and wet spring of 1994 may have contributed to the latter figures. Food availability and weather conditions could materially affect the rate of recruitment of all first-time breeders in any year.

Table 7. Red Kite: Shift between birthplace and first breeding site.

Data from 144 birds individually identified: 70 males, 69 females, 5 not sexed.

(a) Males (70)	Direction of Shift:	N - ENE	E - SSE	S - WSW	W - NNW	No shift
	No. of birds	15	5	24	25	1
	Mean distance (km)	15.7	7.8	14.8	7.6	0
	Range of distances	3.5 - 57	1.5 - 13.5	1 - 58	0.5 - 28.5	
	25 shifted <5 km, 17 shifted 5.5 - 10 km, 17 10.5 - 20.5 km, 11 >20 km.					
						All 13.7 km
(b) Females (69)	Direction of shift:	N - ENE	E - SSE	S - WSW	W - NNW	No shift
	No. of birds		14	11	25	19 0
	Mean distance (km)	15.3	12.5	13.8	13.0	0
	Range of distances	2.5 - 53	0.5 - 31	0.5 - 53	1 - 33	
	14 shifted <5 km, 23 shifted 5.5 - 10 km, 16 10.5 - 20 km, 16 >20 km.					
						All 13.7 km
(c) All birds (144)	Direction of shift:	N - ENE	E - SSE	S - WSW	W - NNW	No Shift
	No. of birds	29	16	50	48	1
	Mean distance (km)	15.5	11.0	14.5	10.5	0
	Range of distances	2.5 - 57	0.5 - 31	0.5 - 58	0.5 - 33	
	shifted <5 km, 40 shifted 5.5 - 10 km, 34 10.5 - 20 km, 30 >20 km.					
						All 12.9 km

First breeding location related to birthplace

Some 144 first-time breeders (70 males, 69 females, 5 not sexed) were individually identified from the tag inscriptions, allowing measurement of the distance and direction between birthplace and first breeding site. The results appear in Table 7

Although the figures suggest that females tend to breed further from the birthplace than males, the difference is small (13.7 km cf. 11.7 km), and not statistically significant ($z = 0.78$). In fact the two longest recorded shifts, 58 and 57 km, both involved males, the most distant females being at 53, 53, and 50 km.

Some directional bias was evident, with a majority of birds of both sexes (49 males, 44

females) recorded as breeding 'west' of the birthplace rather than 'east' (20 males, 33 females). In this analysis, movements between S and NNW are designated 'west', and those between N and SSE as 'east'. A similar comparison between 'north' (W to ENE) and 'south' (E to WSW) showed no directional preference. However, statistical tests indicate that only males breed significantly more to the west than to the east of the natal site ($P<0.01$) whereas the difference in females is not significant, on this sample.

The findings reflect the apparent westerly bias of movements by immature kites, and may be related to them. It is possible for instance that the recorded shift nearer to the natal site in late winter tends to halt short of the birthplace rather than to overshoot it. On the other hand, there could have been some under-recording of birds settling 'east' of the birthplace, especially if they were less likely to survive there, for example due to additional pressure from game-preserving interests or a more intensive use of poison baits to control agricultural pests. Whatever the reasons, the centre of gravity of the whole Welsh kite population shifted west or south-west during the period of this study, with a faster rate of increase in the west than in the east.

Survival to first breeding in relation to original brood size

On the available data, kites reared from broods of one or two young were equally likely to survive to breed. From b/1, 263 marked young produced 60 individually identified breeders (22.8%), while 316 young from b/2 produced 70 breeders (22.1%), with no apparent difference between elder and younger siblings. The 43 marked young from b/3 however produced only six identified breeders (14.3%), and it would be interesting to have more information about this category.

These figures exclude broods which were augmented or reduced by manipulation. Most manipulated (added) chicks were reared in captivity, very well fed, and released into wild nests quite late in the fledging period. Of 30 manipulated chicks that fledged in 1987-1993 some 13 (43.0%) were subsequently found breeding,and a fourteenth died of egg peritonitis at the point of lay. On these data, the survival of manipulated young was twice as good as that of ordinary wild young.

Intermittent breeding

The tagged kites usually bred annually after the first attempt, but 16 birds were recorded as missing one or more subsequent seasons, ten females, five males, and one not sexed. Six missed a single year and then resumed breeding, and five others missed a single year and then disappeared from the record, probably in most cases because they had lost their tags, since breeding resumed at the same sites without any indications of a change of pair. Five birds missed two or more breeding seasons before they too ceased to be recognised.

Several cases are known to have involved the loss of the previous mate and subsequent re-mating with a new partner, which was probably not yet ready to breed. These new mates included three tagged birds, a first-year male, a second-year male (both of these new pairs bred in the following year), and a third-year male (the female was no longer tagged the next year, but they probably bred together). One male re-mated to a tagged female already known to be barren. She had been paired with a different male in two earlier seasons but had failed to lay eggs, and she again failed to lay with her new mate. Another female, which retained one tag for over 12 years, bred once and then became unable to lay, and continued as a barren non-breeder, mated with a succession of different males, for nine successive seasons. Two males were known to have lost their mates, and failed to secure new ones.

One instance of double non-breeding remains unexplained. Both individuals were tagged.

They bred together in one season, then missed two seasons (though remaining paired), then bred together for two more years, once successfully. Such gaps may be related to some external pressure, such as foul weather with uncommonly low temperatures, in early spring, as already mentioned in relation to age of first breeding.

Persistence of the pair bond

Although tag loss militated against any long-term records of fidelity within pairings, it seemed clear that the normal situation is for bonding to persist during the lifetime of both partners; presumably through shared ownership of the territory or nest sites, even if they become separated during the winter.

Forty-five different pairings, in which both birds were tagged, are on record. Of these 22 were recorded for one breeding season, 12 for two, four for three, six for four, and one for five seasons. In many other cases, the absence of any changes in nest site, breeding behaviour, or timing, suggested that the same pair persisted, although tags had been lost.

Five instances of 'divorce', where both tagged birds survived to a later breeding season but were no longer paired, are on record:

1. A pair, both first-time breeders, bred in 1980 and failed. The male remained at the same site in 1981 and bred with a different female. He died early in 1982. The original female shifted 26 km and bred with another male, her brother, in 1981. She stayed with him for at least four seasons.

2. A pair, both first-time breeders, bred in 1990 but were robbed by an egg collector. In 1991 the male remained at the 1990 site but bred with a new female, while the original female shifted to an adjacent territory about 1 km distant and bred with another male, She remained there at least three years.

3. Two two-year-old first-timers bred in 1988, but failed to rear young. The nextyear, the male had shifted 11 km and the female 7 km, and both bred with new (tagged) partners. Both remained with these new mates for several years.

4. A second-year male bred unsuccessfully in 1991, with an untagged female, close to his birthplace. In 1992 he bred 12.5 km away, at the place where he had spent his first and second winters, with a tagged second-year female. Again the nest failed. In 1993 the male was back at his 1991 site, with an untagged mate, and bred successfully. Meanwhile his 1992 female took a new mate, and bred close to the 1992 site in 1993 and 1994.

5. A second-year female bred for the first time in 1991, with a tagged fourth-year male, not individually identified but probably also a first-time breeder. They failed to rear young. In 1992 the female had shifted 2.5 km and mated with a second-year bird, but no eggs were laid. They bred together in the two following years. Meanwhile a male with the same year-colour as the 1991 male, and presumably the same individual, remained at the 1991 site and bred with another female.

What all these cases have in common, is that all involved pairs that had bred together only once, as first-time breeders, and had failed to rear young. It seems therefore, as one would expect, that the pair-bond is at its most fragile in the earliest stages, and that it becomes stronger with shared time and experience.

Fidelity to nest sites

Some kite pairs refurbish the same nest year after year, while others habitually build a new nest almost every year, often within a few metres of the previous year's. Some pairs frequently alternate between different sites, some distance apart, others shift over

considerable distances (up to several kilometres) without returning to earlier sites within their original home range, though they may eventually do so. Loose colonies or clusters of breeding pairs may develop, and then the alternative sites of an original single pair may be redistributed among two or more pairs. Many kite pairs are not combative, and they may defend only a very small territory around the active nest tree. Nests as little as 250 m. apart are recorded in Wales (even closer, elsewhere), though in wide areas of the Welsh countryside a normal spacing of about 3 to 4 kilometres seems to be the rule.

Since it is often uncertain from individual nest records, if the same nest was in use in successive years, and even the grid references are not invariably precise, a 'site' in this analysis is taken to be within 250 m. of the previous year's nest. A record is used if one or both adults carried tags, and there is no duplication for sites where both were tagged.

The record of site fidelity is of course much influenced by tag loss, but the available data give some indication of the levels of attachment. Sixty-one individual tagged kites remained at the same site for two successive years, 18 for three years, 3 for four years, one for five, and one for ten years. In addition there were seven records of birds returning to a site after one or more years breeding elsewhere. On the other hand, 44 tagged kites were recorded breeding at two sites, 21 at three sites, nine at four sites, and two at five different sites, while they retained their tags.

Records indicate that kites are far more likely to move site if they fail to rear young, than if they succeed. The following data derive from 184 records of pairs where one or both adults were tagged, and the 'failures' include a few sites where no eggs were laid:

Nest succeeded, same site in following year	65
Nest succeeded, different site in following year	21
Nest failed, same site in following year	26
Nest failed, different site in following year	72

Most shifts between sites were quite small. Eighty-five birds shifted up to 2 km between years, 31 shifted 2.25 to 4 km, 7 shifted 4.25 to 6 km, and only 8 over 6 km. All the shifts up to about 4 km may be considered to be within the pair's normal home range, and all those up to 6 km involved ground previously unoccupied by breeding kites. The longest shift, of 30.5 km, by a tagged female, was from a site where probably no eggs were laid, to a definite breeding situation. The bird's birthplace was about halfway between the two sites, and a favoured winter resort, as a pre-breeder, was nearer to the second site. The second-longest shift, 26 km, also by a female, involved a 'divorce', and a re-mating to the female's brother, already mentioned earlier. It is not known if the relationship had any bearing on the outcome. The third and fourth longest shifts, 14.25 and 12.5 km, involved the same male in different years, and were also discussed earlier, under 'divorce'. This was a particularly interesting situation, since he bred near his birthplace in years 1 and 3, and at his habitual winter resort in year 2. Open hill ground, not currently occupied by breeding kites, lay between the two localities. The fifth-longest shift, 11 km, involved a male which bred unsuccessfully near his immature winter quarters and then moved back close to his birthplace, where he bred successfully, and remained. There were no intervening territories.

Two movements of 9.5 km both occurred in fringe territories where there were no other breeding kites in the direction of the shift, and new ground was occupied. One bird was male, and had failed the previous year; the other was a female which had built a nest but had not laid, in the initial year. The final shift, of 7 km, concerned a female which had failed, jumped an intervening territory which happened to be the one where she was reared. The two

successive nesting sites lay either side of her natal site, and about equidistant from it. She divorced the male mentioned above, which shifted 11 km.

To summarise, shifts between nest sites affected both sexes, and all age-groups still carrying tags. they occurred more commonly after failure than after successful breeding. They apparently seldom involved encroachment upon other territorial pairs, and the larger shifts tended to traverse ground not occupied by other pairs.

Matings with close relatives

It is virtually inevitable that in very small closed breeding populations there will be pairings between close blood-relations. This is especially true of the Welsh Red Kite population, which was shown by DNA analysis to be derived from only two female lines of descent, and which probably derived from only a single female line between the 1930s and the 1970s, when the second is thought to have been introduced by an immigrant bird.

The recent tagging programme produced three examples of pairings between close relations, two brother-sister matings and one between mother and son. The first brother-sister pairing resulted in four breeding records between 1981 and 1984, two of which produced fledged young (2 x b/1). The pair may have persisted for two further seasons, and another chick fledged in 1986. The nests were 25-26 km from the natal site of the pair. The second brother-sister pairing produced four young (2 x b/1, 1 x b/2) from four nesting attempts between 1990 and 1993, and probably continued after one bird had lost its tags, to produce b/2 annually, 1994 to 1998. This pair bred 6 km from their birthplace. The mother-son pairing persisted for only two seasons, 1992 and 1993, and the eggs failed to hatch in both years. The male replaced his father, a 24-year-old bird who died in March 1992, and the breeding site was the same nest in which the son was reared.

At least two of the offspring of these 'non-eugenic' pairings, both males, produced young of their own in later years.

Timing of breeding in relation to age and experience

Table 8. Red Kite: Timing of breeding in relation to age of female.

Date of laying first egg: Period	1 (late Mar)	2 (1-10 Apr)	3 (11-20 Apr)	4 (21-30 Apr)	5 (early May)	Mean period
First breeding attempt (69)	3	23	30	9	4	2.83
Second attempt (40)	1	22	14	3	0	2.48
Third & later attempts (60)	6	43	11	0	0	2.08
Second-year breeders (25)	0	7	10	6	2	3.12
Third-year breeders (24)	3	16	22	3	0	3.02
Fourth-year breeders (36)	2	21	10	2	1	2.42
Fifth-year breeders (26)	1	16	8	0	1	2.38
Sixth & later yr breeders (47)	6	29	11	1	0	2.15

Exact laying dates were seldom available, but many could be allocated within a ten-day period, with sufficient accuracy to allow analysis.

The data for tagged kites presented in Table 8 indicate that females tend to breed progressively earlier as they become older and more experienced; at least up to the limits of

tag survival. The same analysis was carried out for males, and produced much the same results, but of course the two sets of data are not independent, since tagged males were often mated with tagged females, and in any case must tend to pair with females of similar age.

Breeding performance in relation to age and experience

Two sets of data are presented in Table 9, relating to the size of clutches laid, and the size of the final brood.

(a) Clutch Size The figures for tagged females suggest that the number of eggs they lay tends to increase progressively from the second to at least the fifth year of age, though the samples are rather small and the increase is not large. Analysis by the number of breeding attempts produces a less well-defined progression, with no difference between first and second attempts, but a higher figure for later attempts combined. The similar data for clutches produced by the consorts of tagged males showed a similar tendency for clutches to increase

Table 9. Red Kite: Breeding performance of females in relation to age and experience.

(a) Females v. Age.

	Clutch size (n=89)			Final brood size (n=193)			Failures
	Eggs	*Sample*	*Mean(n)*	*Brood*	*Sample*	*Mean(n)*	*(%)*
Second year of age	1	2		0	29		
	2	5		1	4		
	3	5		2	0		
	4	0	2.25 (12)	3	1	0.32 (34)	85.3
Third year of age	1	1		0	23		
	2	12		1	17		
	3	4		2	5		
	4	1	2.28 (18)	3	0	0.60 (45)	51.1
Fourth year of age	1	2		0	18		
	2	11		1	15		
	3	10		2	4		
	4	1	2.42 (24)	3	0	0.62 (37)	48.6
Fifth year and older	1	3		0	37		
	2	10		1	27		
	3	20		2	12		
	4	2	2.60 (35)	3	1	0.70 (77)	48.1

(b) Females v. Experience.

	Clutch size (n=89)			*Final brood size (n=191)*			
First breeding attempt	1	4		0	57		
	2	18		1	15		
	3	14		2	5		
	4	1	2.32 (37)	3	1	0.36 (78)	73.1
Second breeding attempt	1	2		0	20		
	2	12		1	22		
	3	7		2	5		
	4	1	2.32 (22)	3	0	0.68	42.6
Third and later attempts	1	2		0	26		
	2	8		1	25		
	3	19		2	14		
	4	1	2.63 (30)	3	1	0.85	39.4

in size with the increasing age and experience of the male; but again the data are not independent, and since presumably he has little if any direct influence on clutch size, this will only reflect the fact that males tend to be mated with females of similar age and experience.

(b) Final Brood Size The age and experience of both sexes is likely to be reflected in the final outcome of each breeding attempt, and this is supported by the available data. For both sexes, the production of fledged young is almost twice as great in the third year of age as it is in the second, and a further improvement is suggested for fourth-year breeders. In females, though not in males, the production of young apparently continues to increase during the fifth year and beyond. Since the mean brood size of successful nests remains remarkably constant, varying only from 1.19 to 1.40 young per successful nest, and apparently almost independent of age and experience, the main cause of the increases in mean final brood size is seen to be the reduction in the proportion of total failures, which are significantly higher at the first breeding attempt ($P<0.01$)

Adult foraging range from active nests

Before the contribution made by tagging, there was very little direct information about the foraging range of adults from the active nest. There were however many records of individual kites, nearly all believed to be males, being watched flying from a nest until out of sight, up to 4 km.. Records also showed several instances of specific prey items being brought to nests from known sources, for example Black-headed Gull *Larus ridibundus* chicks from the nearest gullery, up to 4 km distant. Records beyond 5 km were suspected but could not be confirmed beyond doubt. Females apparently spent little time away from the nest site, and subsisted mainly upon food brought by the male, at least until the young were large enough to be left unattended, at two to three weeks old. Even later in the fledging period, observations suggested that females generally hunted within a few hundred metres of the nest, and normally within sight of it.When the young were well feathered (4 - 5 weeks) it became quite common for both adults to be absent from the site, however.

Rather remarkably, all records of tagged breeding adults with active nests, and at over 2 km from the nest site, related to males. There were about 30 records of males 2 to 4 km from the

Table 10. Red Kite: Survival table from recoveries of ringed birds, to 1990 generation in June 2000 (n=70)

	No. dead	No. alive	Annual survival	Cumulative survival
		70		
First year of life	24	46	0.66	0.66
Second year	10	36	0.78	0.51
Third year	7	29	0.81	0.41
Fourth year	4	25	0.86	0.36
Fifth year	5	20	0.80	0.29
Sixth year	9	11	0.55	0.16
Seventh year	2	9	0.82	0.13
Eighth year	1	8	0.89	0.11
Ninth Year	1	7	0.88	0.10
Tenth year	1	6	0.86	0.09
Over ten years	6			

Mean annual survival post first year = 81%

nest, one record at 5.5 km, and two (different birds) at 9 km. A male which had bred the previous year was found grounded (and later died) 11 km from the nest site in early April, at a time when the female had not yet laid. Unfortunately there was no absolute certainty that he was still attached to the site, though this seems very probable.

Only radio-tagging could produce really detailed information on this aspect of kite behaviour.

PART 3: SURVIVAL AND MORTALITY

Survival data from marked Welsh kites

Table 10 gives survival data for 70 kites ringed as young in Wales between 1968 and 1990, which had been found dead by the end of June 2000. Although the sample is not very large, the results appear coherent and credible (ignoring an inconsistency in the sixth year, which can hardly reflect reality). The figures suggest about 66% survival at the end of the first year, and subsequent annual survival of at least 81%. Survival to the end of the third year (i.e. close to the mean age of first breeding) seems to be at least 41%, and some 9% of birds will live for over ten years. Any further recoveries in the 'over ten' category would increase the annual survival figures by about one percentage point for each additional record. Few further recoveries of 1968-90 young are to be expected, however, and the annual survival figures for these generations seem likely to remain below 90%. Ring loss is considered to be a negligible

Table 11. Common Buzzard Buteo buteo: Survival table from recoveries of birds ringed in Central Wales during 1967 - 1978, until June 2000 (n=36)

	No. dead	No. alive	Annual survival	Cumulative survival
		36		
First year of life	19	17	0.47	0.47
Second year	6	11	0.65	0.31
Third year	1	10	0.91	0.28
Fourth year	1	9	0.90	0.25
Fifth year	1	8	0.89	0.22
Sixth year	1	7	0.88	0.19
Seventh year	1	6	0.86	0.17
Eighth year	0	6	1.00	0.17
Ninth year	0	6	1.00	0.17
Tenth year	0	6	1.00	0.17
Eleventh year	1	5	0.83	0.14
Twelfth yeat	1	4	0.80	0.11
Thirteenth year	0	4	1.00	0.11
Fourteenth year	1	3	0.75	0.08
Fifteenth year	0	3	1.00	0.08
Sixteenth year	1	2	0.67	0.06
Seventeenth year	0	2	1.00	0.06
Eighteenth year	0	2	1.00	0.06
Nineteenth year	0	2	1.00	0.06
Twentieth year	1	1	0.50	0.03
Twentyfirst year	0	1	1.00	0.03
Twentysecond year	1	0	0.00	0.00

Mean annual survival post first year 84%.

factor; a 24-year-old bird's ring was little worn.

Newton, Davis and Davis (1989), using breeding and tag data up to 1986, postulated an adult annual survival rate of 95%. This was based upon the recorded annual increases in the population of territorial kites, the annual production of young three years earlier (adjusted to agree with an observed mean at that time of 3.6 years for tagged first-time breeders), and an estimated survival rate to first breeding of 41% of fledged young, also derived from tag observations. The method was dependent upon the accuracy of the various counts and estimates involved, and it was recognised that some of these might depart fairly substantially from reality. The tag results were relatively limited at that time, and we now believe that survival to first breeding may be higher than 41%, though tag loss and observer frailty prevent a more precise assessment. Newton *et al.* calculated that if survival to first breeding were as high as 50%, their estimate of adult survival would be reduced by 2%, to 93%. Perhaps of more significance, however, would be the impact upon the data of inconsistencies in the annual population counts, which are thought to have been of variable quality, to have invariably been lower than the actual number, and to have been biased against breeders that failed quickly. The likelihood is, that even a 93% annual adult survival estimate is too high.

Some comparison may be made with a raptor of similar size and requirements, living in the same area of Wales, the Common Buzzard *(Buteo buteo)*. The data in Table 11 derive from 36 young buzzards ringed by two of the present authors during 1967-78, and reported dead up to June 2000. The sample is small, but again the figures seen coherent, and in view of the 22-year time lapse, a mean adult annual survival rate of 84% appears reasonably definitive.

Causes of mortality

One hundred and fifty-five Welsh kites were reported dead within Wales between 1950 and 1999; most of them of course in the latter part of this period, as the population increased. Of these, 108 carried rings and 47 apparently did not. Wherever possible, recently-dead specimens were submitted for post-mortem and toxic chemicals analysis, which was carried out mainly by MAFF/ADAS veterinarians and scientists. In other cases, the likely cause of death was apparent to the observer. In all, 99 kites died from known or apparent causes, and

Table 12. Red Kite: Causes of death of full-grown birds in Wales, 1950 - 1999 (n=155)

	Total dead	% (of attributions)
1. Cause quite unknown.	56	
2. Cause attributed.	99	
(a) Poison (from post mortem analysis) (Strychnine 2, Alphachlorolose 4, Dieldrin 1, Endrin 1, Diazinon 5, Propetamphos 1, Fenthion 22, Carbofuran 1, not identified 1)	38	38
(b) Strong circumstantial evidence of poison	18	18
(c) Collision (wires, branches, vehicles, etc.)	18	18
(d) Predators (raven 4, fox 1)	5	5
(e) Shooting	3	3
(f) Disease/decreptitude/starvation	14	14
(g) Severe weather	3	3

the reasons for the deaths of the other 56 remained obscure, often because the corpse was at an advanced stage of decay.

Table 12 lists the known or apparent causes of death for those birds for which an attribution could be made.

There seems no reason to suppose that the recorded deaths and attributions were not representative of the population as a whole, so we conclude that a majority of dead kites in Wales had died prematurely from poisoning. This evidently resulted mainly from the setting of illegal meat baits, presumably intended for other predators, such as crows and foxes. Some baits were thought to have been set by gamekeepers, but the great majority of deaths by poison occurred where there was no organised game preservation, and baits were believed to have been exposed by shepherds. A few poison incidents, involving sheep-dip chemicals (Diazinon, Propetamphos) probably derived from the carcasses of recently-dipped sheep, or from careless disposal of dip, perhaps through affected earthworms. The single record of Dieldrin poisoning was probably also secondary. Recently there have also been a few deaths known or believed to have been from secondary rodenticide poisoning (Warfarin, Brodifacoum). The records of Strychnine, Endrin, and Alphachlorolose (with one exception) date from the 1970s or earlier, and the poison of choice since 1979 has been Fenthion. Since this organo-phosphorus compound was legally used only in warble-fly treatments applied to the backs of cattle, its recent dominance of the poison record in Welsh kites can only be due to deliberate misuse. The first appearance of a new poison, Carbofuran, in a Welsh kite in 1999, gives rise to particular concern, since it has recently become frequent on illegal baits set by keepers in Scotland and NE England. The 18 birds cited as having circumstantial evidence of poisoning include at least four evidently involved in strychnine episodes, but not subjected to analysis, and others associated with rodenticide campaigns. In addition to the dead poisoned kites, three others were found narcotised, probably by sub-lethal amounts of alphachlorolose, and recovered under care; while three nestlings were shown by post mortem analysis to have been poisoned, two with Malathion and one with Warfarin (after being fed on poisoned rats).

The other common causes of death were collisions, caused by flying into wires or branches, or being struck by road vehicles, trains, or aircraft; and a catch-all category which includes disease and old age (egg peritonitis, *E. coli* septicaemia, cancer, arthritis) and starvation. Most of the 'very thin' casualties were juveniles in their first autumn and winter, which had perhaps failed to make an adequate living, after separation from their parents. Severe winter weather seemed rarely to be a direct cause of death, as did predation (four out of five records refer to attacks by Ravens *Corvus corax*) or shooting, though the latter event may be peculiarly prone to concealment by those responsible.

In addition to the Welsh kites discussed above, three ringed immigrant kites were reported dead in the Welsh kite area. These were a German-ringed juvenile, associated with a strychnine incident in which a Welsh kite also died; a second-year bird from the S.England re-introduction, which contained traces of Ivermectin; and a second-year from the E.Midlands re-introduction, whose cause of death was quite unknown.

Apart from the casualties in Wales, eight Welsh-ringed kites were reported dead in England, one in Scotland, and one in Ireland. None was available for post mortem examination, so poisons were not detected. Two birds died from collision (wires, train), and the one in Scotland was shot by a farmer. No cause was suggested for the other seven deaths.

Timing of mortality

Table 13 shows the number of Welsh kites reported to have died in each calendar month, omitting 15 birds which could not be dated to the nearest month. The list includes ten Welsh birds found dead outside Wales. The figures in brackets give the numbers that were poisoned, the main observed cause of death.

Table 13. Red Kite: Timing of recorded deaths in Wales, 1950 - 1999 (n=150)

Died in:	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Totals
Juveniles	7 (2)	4	3	6 (2)	2 (2)	3 (2)	1	4 (1)	6 (4)	11 (8)	5 (1)	4	56 (22)
Over one year old	5 (1)	1	6 (4)	4 (1)	3 (1)	2 (1)	5 (2)	6 (4)	8 (1)	28 (14)	13 (2)	6	87 (31)
Age unknown			1			1 (1)		1	3 (2)	1			7 (3)
Totals	2 (3)	5	0 (4)	10 (3)	5 (3)	6 (4)	6 (2)	11 (5)	17 (7)	40 (22)	18 (3)	10	150 (56)

Figures in parentheses indicate poisoned birds.
Some deaths which could not be attributed to a particular month are omitted.

Some 57% of recorded deaths occurred between February and May, a period which also produced 66% of the deaths from poisoning. It was likely that kite watchers would come across more dead kites during field work in spring, but this seems in fact to have introduced only a relatively small bias into the data. Most dead birds were reported by others, and actual visits to nest sites became more frequent after May than earlier. Late winter and early spring was evidently the period during which most poison baits were laid, coinciding with the lambing season. The spring peak was more pronounced for older birds than for juveniles (63% against 46% of deaths), probably partly because there were additional hazards, especially for females, in the breeding season, and also because adults were more likely to be found by the kite watchers, if they died near the nest. Juveniles showed greater mortality than older birds in the late summer and autumn, probably due to their inexperience. About 45% of recorded juvenile deaths were in July to December, compared with 24% of older birds.

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BREEDING BIOLOGY OF SWALLOWS *HIRUNDO RUSTICA* ON TWO FARMS STRADDLING THE NORTH WALES BORDER

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DEDICATION

In memory of the late Peter Walker, of Dinbren Isa, Llangollen - a dedicated farmer-conservationist and keen supporter of our study.

SUMMARY

Swallows' breeding output and selection of buildings for nesting was studied at 2 farms near the N Wales border. At one farm, at 240 m asl, numbers ranged from 8 to17 breeding pairs during 1993-2000, overall clutch size (4.66) and proportion of clutches of 5 (56%) were high, but production of young (73.59%) was low, due especially to predation, with Magpies mainly implicated, and egg failure along with starvation and desertion of young. At the lowland (105 m asl) farm, numbers were lower and fluctuated less, clutch size was also lower but overall production of young was much higher, due to low rates of both predation and starvation and desertion of young. Generally, enclosed buildings were preferred to open-sided ones, and success was lower in buildings with large entrances and in lofts. Explanation, in terms of predation pressure, is offered.

INTRODUCTION

Declines in numbers of Swallows *Hirundo rustica* in Continental Europe and Britain were reported from the 1970s and 1980s (Cramp 1988; Marchant *et al.*, 1990). This trend was attributed to modernisation of farm architecture, intensification of agriculture and desiccation of climate in the birds' South African winter quarters (*ibidem*; Møller, 1989). More recently, an increase in the British Swallow population has been detected by the Breeding Bird Survey (1994-1999), organised by the British Trust for Ornithology (Bashford & Noble, 2000).

Most published studies of the Swallow's breeding biology in Britain date from before 1980 (Boyd, 1936; Adams, 1957; McGinn & Clark, 1978; McGinn, 1979). In an intensive study in Denmark Møller (1983) investigated the reasons behind the Swallow's preference for particular "colony sites" and for particular nest locations within buildings. Subsequently, the same author (1989) studied density dependence in causes of Swallow mortality.

Of the Swallow in Wales, Lovegrove *et al.* (1994) report the "widespread opinion that numbers ...in the early 1990s [were] noticeably lower than previously." The dearth of supporting data noted by these authors is matched by the small amount of published data on the species' breeding biology in Wales, the only exception known to the present authors being samples from the 1934 and 1935 Swallow enquiries, as reported on by Boyd (1936).

Since the late 1980s, we have monitored breeding of Swallows at 2 farms straddling the North Welsh border. In the present paper we report on breeding statistics and examine possible causes for choice of, and success levels in, particular buildings. A later paper will investigate causes of differences in numbers between farms.

METHODS

Methods

At The Gadlas farm, near Ellesmere, in Shropshire, MSJ recorded contents of all nests of Swallows from 1987, checking nests at approximately 7-day intervals. At Dinbren Isa, near Llangollen in Denbighshire, JLR began checking nests in 1988 but did not attempt full coverage until 1993, since which time nest contents have been recorded at roughly 10-day intervals. Nests in a tall building were not monitored fully until 1995.

Because our birds were not individually recognised it was not possible to be sure how many pairs bred in each season, or which later broods belonged to which birds. To reach a minimum total of breeding pairs, we took the highest count of separate active nests in a given season, this usually occurring around June 10. Totals of breeding attempts and production of young per pair were arrived at by dividing totals of nests and of young fledged by the above figure. In this paper occupation of a building is measured by the number of active nests of Swallows found in it within the study period, whilst successful breeding is where a clutch

gives rise to at least one fledged chick. Where nest contents could not be accurately determined, the pair involved was discounted from calculations of clutch and brood sizes, but not from occupation figures and totals of successful breeding attempts. In calculations of clutch size, etc. in different buildings, we excluded (presumed) third clutches from analyses, as these, whilst probably indicating reproductive fitness in the birds that laid them, were almost invariably smaller and less productive than first or second layings.

Two indices of laying season are given: firstly, the date of the first egg to be laid in a given year and, secondly, the mean of the first egg dates of first clutches, excluding any possible first clutches begun after June 19. Where laying dates are not known exactly they are worked back to following criteria given in Mc Ginn & Clark (1978).

When testing for correlation involving occupation rates for individual buildings, we omit Buildings 4 and 6 from our calculations, the former because occupation by Swallows ceased after 1997, when its entrance was reduced to a tiny slit, the latter because its high occupation rate is likely to have been due to its very large size, not to the factors operating in other buildings.

For purposes of comparison, levels of light inside buildings, measured using the light metre on a Canon EOS camera, were shutter-speed readings in fractions of a second at 100 ISO on f4.5. Readings were taken at approximately mid-day - at The Gadlas in early July and at Dinbren in late June.

Study area

Land at The Gadlas (105m asl.) is flat, and on heavy marl. Until April 1993 it was primarily a dairy and stock raising enterprise, with some growing of barley. Since then it has been given over to raising of beef cattle. About 80 cattle are wintered indoors and all but the calves are put out to pasture from around 20 April. There are 957 m^2 floor area of buildings with access for Swallows; the 7 buildings used for nesting comprise 549 m^2 and 5 of these are of brick construction, with wood-supported slate roofs. The 5 farm cats keep mouse *Muridae* and Rat *Rattus norvegicus* levels very low and appear to inflict minimal losses on the Swallows. Magpies *Pica pica* were first seen to show interest in a Swallows' nest in 1999.

Dinbren Isa, at 240 m. asl. and 16.5 km from The Gadlas, is a hill farm lying in places on shales, elsewhere on a medium loam. Throughout the study period it has been entirely a sheep farm (though with 2-3 recreational horses). Lambing takes place largely inside the farm buildings, the flock being indoors from early January until the second week of May. (From 1999, following a reduction in the flock, the last sheep have been put out in late April-early May.) There are 993 m^2 of farm building (including loft) floor area available to Swallows for breeding, whilst the floor area of the buildings where nesting has been known to occur is 688 m^2. Roofs are of slate, corrugated asbestos or corrugated iron. Rats and mice are controlled by poison as the need arises. The farm's 2 cats have not been seen actively to hunt Swallows.

RESULTS

Annual numbers, laying season and breeding production

As shown in Table 1, numbers of breeding Swallows at The Gadlas increased from 2 in most years between 1987 and 1992 to 3-5 (mostly 4) after that year. Buildings at a neighbouring smallholding, which had supported about 3 breeding pairs of Swallows, were demolished in 1993, and its Swallows are believed to have moved to The Gadlas as breeding ceased at the original site from that year. At Dinbren, since 1992, when recording of numbers began, the Swallow population has been much higher, averaging 10.8 pairs as against 3.0 at The Gadlas and its fluctuations have remained out-of-line with the much smaller changes in

Table 1. Annual breeding numbers, season of laying and success of Swallows on 2 farms near the north Wales border, 1987- 2000. As birds could not be recognised individually, number of pairs is the number of simultaneously active nests at ca.June 10th. First egg date is absolute 1st egg date with mean date for 1st clutches in (); May 1st = 1, June 1st = 32. Clutch size is for presumed 1st and 2nd layings only. Where exact fledging totals for a nest were unknown, the middle value of possible extremes is taken.

Correlations at Dinbren - total clutches laid per pair with total pairs, rs = —0.682, n = 8, P<0.10 (2-tailed); clutch size with total pairs, rs = —0.783, n = 8, P<0.10 (2-tailed); absolute annual 1st egg date and mean annual 1st egg date for 1st clutches, rs = 0.804, n = 8, P<0.10 (2-tailed).

	Number of pairs		1st (mean 1st) egg date		No. of clutches (mean clutches/pr)		Mean clutch size		Mean young fledged per pair	
Year	Gadlas	Dinbren	Gadlas	Dinbren	Gadlas	Dinbren	Gadlas	Dinbren	Gadlas	Dinbren
1987	2		9(10.5)		4(2)		4.25		8.5	
1988	2		15(26)		3(1.5)		5.33		7.0	
1989	2		15(18)		4(2)		4.75		9.0	
1990	1		11		2(2)		5.0		8.0	
1991	2		14(15)		4(2)		4.5		7.5	
1992	2	12	33(34.5)		4(2)		4.25		7.5	
1993	3	8	12(17.7)	1(16.1)	6(2)	17(2.13)	4.83	4.93	8.7	9.0
1994	4	10	5(18.3)	3(22.1)	8(2)	18(1.8)	4.50	4.63	8.25	6.90
1995	4	9	4(18.3)	7(24.4)	7(1.75)	17(1.9)	4.60	4.75	7.75	7.0
1996	4	13	4(10.5)	5(22.5)	8(2)	25(1.9)	5.10	4.36	8.0	6.50
1997	4	17	1(24.3)	15(24.4)	7(1.75)	30(1.8)	4.60	4.64	6.25	4.40
1998	3	9	8(10.7)	5(21.7)	6(2)	19(2.1)	5.0	4.82	7.70	7.0
1999	5	9	3(9.3)	2(14.2)	7(1.4)	18(2)	4.40	4.85	4.60	5.11
2000	4	10	6(16.8)	1(20)	7(1.75)	21(2.1)	4.43	4.29	5.25	7.10
All years	42	97			77	164				
Mean all years	3.0	10.8	10(16.9)	4(21.1)	1.83	1.93	4.63	4.66	7.20	6.30

numbers noted at the other farm.

Laying season in the study period varied markedly between the 2 farms, between years and within years. Only at Dinbren was there a tendency towards correlation between the date of the first Swallow egg of the season and the mean first egg date of first clutches. Mean laying dates were much influenced by the small sample at The Gadlas and by a tendency, on both farms, for one pair to lay very much ahead of others. This possibly explains why, at The Gadlas, the first egg of the year has appeared considerably earlier since the increase in population in 1993.

Pairs of Swallows at The Gadlas laid marginally fewer clutches, but reared 0.9 more young per pair than Swallows at Dinbren (Table 1). Neither difference was significant (z = 1.048 for clutches, 1.516 for young per pair, both ns). The latter difference was largely accounted for by the much higher levels of predation and complete nest failure at Dinbren (see below).

Møller (1989), in a period of strong fluctuations in his Danish Swallow population, found correlations between end-of-season Swallow populations, including fledged young, and breeding numbers in the following season. Clutch size, too, but not number of clutches or young reared per pair, was related to population.

Table 2. Clutch size and fledged brood size of Swallows on 2 farms near the north Wales border. Records for the Gadlas are for 1987-2000, for Dinbren for 1993-2000. Differences in fledging rates between farms were insignificant, except that mean fledging success for all nests with completed clutches was lower at Dinbren - z = 2.36, P<0.05.

	First layings						Second layings						Mean young
	No. of clutches of						No. of clutches of						per nesting
	2	3	4	5	6	Mean±1SE	2	3	4	5	6	Mean±1SE	attempt ±1SE
Gadlas		1	10	26	4	4.80 ± 0.1		2	17	15	1	4.43 ± 0.11	
Dinbren	1	1	13	53	7	4.85 ± 0.08	1	4	29	34	2	4.46 ± 0.09	

	No. of fledged broods of							No.of fledged broods of							
	1	2	3	4	5	6	Mean±1SE	1	2	3	4	5	6	Mean±1SE	
Gadlas	1		4	14	19		4.32 ± 0.14		2	5	16	10		4.03 ± 0.15	3.91 ± 0.15
% fledged (all nests)							83.2							85.8	84.38
Dinbren	5*	2	5	27	21	2	4.01 ± 0.17	2	2	11	27	18	2	4.02 ± 0.14	3.43 ± 0.10
% fledged (all nests)							68.3							79.81	73.59

Table 3. Causes and rates of breeding failure of Swallows on 2 farms near the north Wales border, 1987-2000. The proportion of nests predated was significantly higher at Dinbren, Chi^2 = 6.51, df 1, P<0.05.

	Dinbren								*Gadlas*	
	1993	1994	1995	1996	1997	1998	1999	2000	1993-00	1987-00
Total nests clutches started									164	77
Nests with complete clutches	15	17	16	25	31	18	15	19	156	77
Total eggs in complete clutches	72	77	76	112	142	86	67	81	716	355
%Eggs failed/lost at hatching	11.1	2.6	7.89	10.71	7.75	4.65	17.91	8.64	9.08	12.82
%Growing chicks died	1.39	2.6	9.21	9.82	20.42	5.81	4.48	0	7.47	1.69
%Predated egg or chick stage	0	9.09	3.95	4.46	20.07	16.28	13.43	6.17	9.99	1.13
%Nests predated by Magpies*	0	11.1	5.88	4	19.4	15.8	22.2	5	10.91	1.30

Notes: *Magpies presumed, see text. Percentage is of all nests where at least one egg laid

These causes are detailed in Table 3, which shows that of all eggs laid at Dinbren, 9% failed at egg stage or shortly after the hatch, 7.5% failed due to death of growing young, and 10% failed due to predation, as against, respectively, 12.8%, 1.7% and 1.1% at The Gadlas. Only in the proportions of predation was the difference found to be significant, using the clutch as the unit of analysis.

At Dinbren the great majority of failures due to predation (90%, n = 18) were believed

to have been caused by Magpies, with mice or rats probably implicated in the remaining 2 cases. At this farm Magpies frequently perched, chattering loudly, on roofs of buildings containing Swallows' nests and were mobbed energetically by the Swallows (*pers. obs.*). Several times they were seen entering or leaving these buildings, the nests in which were subsequently found empty (Jean Walker, *pers. comm.*; *pers. obs.)*. The first proven case of predation by Magpies on Swallows was at The Gadlas in 2000, when MSJ saw the predator leaving a building carrying a live chick. The previous year Magpies had harassed a pair of Swallows at a different building on the same farm, apparently causing desertion of the nest (MSJ, *pers. obs.*)

The rates of apparent predation by Magpies on Swallows' nests at Dinbren varied between years but were highest from 1997 to 1999. They showed no correlation with rates of death of growing young (Table 3).

In Møller's (1989) Danish Swallows, predation and other causes of clutch or brood depletion were not density dependent. At Dinbren, too, neither predation, nor losses prior to or at the hatch, nor deaths of growing young, were related to population (Table 3).

Table 4. Egg histories by clutch size of Swallows on 2 farms near the north Wales border, 1987-2000. Mean fledging rates were significantly higher at Gadlas, z = 2.98, P<0.01.

	Size (& number) of clutches	Number of eggs	Total chicks fledged	Mean fledged brood per clutch	%young fledged from eggs
Gadlas					
	3 (4)	12	9	2.25	
	4 (27)	108	93	3.44	86.1
	5 (41)	205	178	4.34	86.8
	6 (5)	30	20	4.0	66.7
Totals	(77)	355	300	3.90	84.51
Dinbren					
	2 (2)	4	1	0.50	25.0
	3 (10)	30	21	2.1	70.0
	4 (47)	188	148	3.15	78.7
	5 (88)	440	312/313	3.55	71.0
	6 (9)	54	45	5.0	83.3
Totals	(156)	716	527/528	3.38	73.7

Success rates of different clutch sizes

Clutches of 5, the modal clutch at both farms, fledged a higher proportion of young than those of 4 at the Gadlas, but not at Dinbren (see Table 4). Predictably, the production of fledged young from a clutch was proportional to its size (except for clutches of 6 at The Gadlas, but the small sample here was heavily influenced by a case of complete nest failure). Gadlas Swallows produced considerably more young per egg laid than those at Dinbren (84.51%, as against 73.7%), while its mean fledged brood per clutch laid, including third layings, was highly significantly greater than at Dinbren (Table 4).

Breeding output in different buildings

Swallows on both farms bred more frequently and with greater success (measured as proportion of nests rearing at least one chick) in some buildings than in others (see Table 5), and at Dinbren success and rates of occupation showed strong significant positive correlation. There, too, early laying was related to frequency of occupation, this being strongly statistically significant, whilst clutch size tended to be lower in buildings with later first egg

Table 5 Comparison of occupation and success rates, and laying dates, of Swallows in different buildings on farms near the N Wales border, 1987-2000

Buildings with fewer than 5 layings are combined as Others. Clutch and brood sizes are from first and second complete layings only. Laying date is mean first egg date for all first clutches started before June 20. 1 = May 1, 32 = June 1. * Building 4 was locked and entrance reduced from 3.2 m2 to 0.02 m 2 from 1997 (under Farm Safe!).

Correlations at Dinbren (Buildings 4 and 6 are excluded from tests involving frequency of occupation): a) frequency of occupation - with success, rs = 0.879, n = 9, P<0.02 (2-tailed); with mean 1st egg date, rs = 0.867, n = 9, P<0.02 (2-tailed); with clutch size, rs = 0.744, n = 9, P<0.10 (2-tailed); with brood size from all layings, rs = 0.794, n = 9, P<0.02 (2-tailed). b) clutch size with 1st egg date, rs = 0.454, n = 11, ns; with success, rs = 0.764, n = 11, P<0.02 (2-tailed).

	FARM BUILDINGS											
Dinbren	1	2	3	4*	5	6	7	8	9	10	11	Others (n=4)
Number of layings	16	17	16	9	15	19	16	9	15	13	9	12
Number (%) of successful nests	16 (100)	17 (100)	16 (100)	9 (100)	13 (87)	16 (84)	14 (88)	6 (67)	10 (66.7)	9 (69)	1 (11)	10 (83)
% predation	0	0	0	0	6.7	15.8	6.25	22	7.8	23	100	
Mean first egg date	13	14.9	17.7	27	21.1	18.6	14.6	34	16.7	27.3	32	
Mean clutch (n)	4.88 (16)	5.07 (15)	4.93 (15)	4.78 (9)	4.92 (13)	4.79 (14)	4.71 (14)	4.22 (8)	4.08 (13)	4.55 (11)	4.5 (6)	4.27 (11)
Mean brood fledged per laying 4.38 (16)	4.27 (15)	4.47 (15)	4.11 (9)	3.85 (13)	2.94 (16)	3.57 (14)	2.56 (9)	2.23 (13)	2.58 (12)	0.5 (8)	2.91 (11)	
Gadlas	1	2	3	4	5	6	7					
Number of layings	29	24	13	7	2	1	1					
Number (%) of successful nests	29 (100)	23 (96)	11 (85)	6 (86)	1 (50)	1 (100)	1 (100)					
Mean first egg date	10.5	17.9	18	27			25					
Mean clutch (n)	4.68 (28)	4.58 (24)	4.62 (13)	4.71 (7)	4 (2)	5 (1)	5 (1)					
Mean brood fledged per laying (n)	4.21 (28)	3.96 (24)	3.69 (13)	3 (7)	2 (2)	5 (1)	5 (1)					

Table 6 Characteristics of buildings occupied by Swallows on farms near the N Wales border, 1987-2000

Key to types of building: G = ground floor; L = loft; S = small, single-storey building; T = tall single-story building; D = Dutch barnLight value in fractions of a second exposure at f4.5, 100 ASA, measured by Canon EOS, mid-day: Gadlas in early July.n July, Dinbren in late June.+ Door was locked and entrance reduced to 0.02 m2 in 1997; after this year no clutches were laid. Associations (both farms): a) with occupation by Swallows: presence of stock in buildings, Chi sq. = 0.23, df 1, ns; low light values (< 1/6 second exposure), Chi sq. = 4.29, df 1, P<0.05; b) higher frequency (>4) of occupation with low (<2.5m) and smallish (<7 m2 but > 0.25 m2) entrances of buildings, Chi sq. = 6.95, df 1, P<0.01; c) success (> 90%) with low-above-ground (<2.5 m) and smallish entrances - Chi sq. = 9.1, df 1, P<0.01; d) predation with buildings with loft-style or very large entrances, Chi sq. = 4.64, df 1, P<0.05."

F A R M B U I L D 1 N G S

DlNBREN	1	2	3	4+	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Total clutches laid	16	17	16	9	15	19	16	9	15	13	9	4	3	3	2	0	0	0	0	0	0	0	0
% succcss (1+ fledged)	100	100	100	100	87	84	87.5	67	66.7	69	11	75	100	100	50	0	0	0	0	0	0	0	0
Sheep inside till mid-May	X	X			X	X					X	X			X			X	X	X	X	X	
Type of building (see key)	S	G	S	G	G	T	L	L	S	L	T	T	S	T	T	S	S	D	T	D	T	S	S
Height of entrance	1.9	2.4	1.9	2.1	2	4.3	1.4	0.94	2.2	1.778	2.7	2.8	2.16	3.6	3.2	2.2	2	5	3.6	4	3.4	3.2	1.81
Maximum height of entrance above ground							3.6	4.53		5.52													
Area of entrance	1.74	1.2	6.48	3.18	2.66	26.83	1.1	0.51	20.67	2.27	9.85	29.81	0.21	16.75	13.41	.03	2.17	50.8	10.91	29.94	17.98	5.53	3.3
Light value*	1/8	1/15	1/3	1 1/2	1/3	1/15	3/4	3/4	1/8	1/6	1/4	3/4	1/2	1/15	1/3	1/2	1/10	1/30	1/4	1/10	1/6	1/10	1/6

GADLAS	1	2	3	4	5	6	7	8	9	10	11	12
Total clutches laid	29	24	13	7	2	1	1	0	0	0	0	0
% success (1+ fledged)	100	96	85	86	0	100	100	0	0	0	0	0
Cattle in building			X	X			X	X	X			
Type of building (see key)	S	S	S	S	L	S	S	S	G	S	D	S
Height of entrance	2.03	2.4	1.93	2	3.66	2.1	2.4	2.3	2.7	3.2	5	1.8
Maximum height of entrance above ground					4.9							
Area of entrance	0.49	1.1	2.1	1.3	23.4	53	2.8	0.2	17	13.5	44.5	0.6
Light value*	1/2	1/4	1/3	1	1 1/2	1/5	1/3	1/5	1	1/6	1/6	1/10

dates. Predictably, breeding success showed strong significant correlation with clutch size.

At The Gadlas, though the small number of buildings obviated testing for significance, the building occupied most frequently (Building 1) had the earliest mean laying date, highest clutch size and largest mean fledged brood size.

Preferred characteristics of buildings

Why are some sites more attractive and productive for Swallows than others? Whilst Møller (1983) found that most of his study's Swallows in Jutland bred in buildings housing domestic animals, and tended to breed in darker rather than lighter sites, Boyd (1936) had felt that nesting site itself rather than presence of farm stock was more important. (Møller's study concentrated on characteristics of positions of nests within buildings, as opposed to differences in rates of occupation or output between buildings.)

At both Dinbren and The Gadlas, all buildings (with openings capable of admitting Swallows), regardless of age or construction, offer apparently suitable nesting positions, particularly as the Swallows breed just as readily in nests attached to the sides of rafters, etc. as resting on them ($Chi^2 = 0.39$, df 1, ns).

At Dinbren, the most frequently occupied buildings (>5 laying attempts) were those where low (< 2.5m), unobstructed entrances of rather small size (< 7.5 m^2 and > 0.25 m^2) created a sense of enclosure; this preference was highly significant (Table 6). Buildings with nearly closed doors or windows reducing access to small slits (Buildings 13 and 16) were used less often, or not at all. The low-entranced Building 4 was used regularly and successfully until 1997 when its door was locked to comply with *Farm Safe* regulations, much reducing the entrance. Open-sided Dutch barns were avoided. The only exceptions to this overall pattern of occupation were Building 17, a garden shed with tall objects stored close to its 3 very low (2m) entrances and Building 23, a long, narrow adjunct to the house back-door, with broad window ledges and frequent presence of cats and dogs.

At the Gadlas, with its small sample, patterns of occupation were nevertheless similar. The most regularly occupied building (Building 1) was enclosed, with a low and small entrance. The very small entrance area of Building 8, the rather large entrance area of Building 11 (in comparison with the 4 more favoured buildings) and the combination of low height and small area of entrance of Building 12 with its regular occupation by farm cats all match the criteria for occupation of buildings at Dinbren.

Occupation of buildings was found to be strongly associated with a low level of light, where this was taken as below 1/6 second exposure (see Note on Table 6 and Methods), and with all buildings on both farms included in testing. However, as there was no tendency for frequency of occupation to increase with decreasing levels of light, the above association was probably an artefact of the preference for buildings with smallish entrances.

High success rates (>90% production of at least one fledged young) on both farms showed highly significant association with well enclosed, low buildings with low (<2.5 m) and rather small (<7 m^2) entrances. Lofts with small entrances (Buildings 7, 8 and 10 at Dinbren and Building 5 at The Gadlas) had lower success rates, as did buildings with tall entrances (or a long but low open side) that nevertheless retained a sense of enclosure (Buildings 6, 9, 11 and 12 at Dinbren). The latter category of buildings suffered significantly higher rates of predation than low buildings with small entrances. At both farms, in contrast with the situation relating to occupation, there was no association between success and light levels in buildings ($Chi^2 = 0.05$, ns)

Much of Dinbren's floorage of building - excluding the 3 lofts - was used for indoor lambing up to the middle of May, whilst cattle are kept in some of The Gadlas' buildings

during spring and summer. However, no association was found between presence of stock and either occupation (see Table 6) or success ($Chi^2 = 0.76$, ns).

DISCUSSION

Numbers and laying season

Møller (1983), working in an area of mixed farming in Jutland, found a correlation between the area of farm buildings ("stables") available and numbers of Swallows breeding. Dinbren, with 993 m^2 of usable buildings, and an average of 10.8 pairs annually, supports more than double the population predicted for its size in Møller's study. In contrast The Gadlas, which has only slightly less floor area of buildings than Dinbren, supported well below the expected number of pairs until 1993. After that year, when its population doubled, apparently due to immigration by birds which had previously nested in the (now destroyed) buildings of a neighbouring farm, its numbers were still less than half those at Dinbren.

Møller (1983) also found that in peak years more Swallows settled on larger farms. In our peak years of 1996 and 1997 larger numbers of Swallows bred at Dinbren but not at The Gadlas, despite the two farms' similarity in size. Clearly Dinbren is more attractive to Swallows, a fact perhaps reflected in its slightly higher average clutch size, as older, more experienced birds, tend to lay larger clutches (Herroloen, 1957-1959).

The lack of correlation between laying seasons at Dinbren and the Gadlas, while suggesting that different conditions prevail at the 2 farms, may also be due to the small sample at The Gadlas and to the tendency for certain individual birds to lay well in advance of the rest, thereby distorting means.

Clutch size and breeding success

Overall, clutch size at both farms was at the higher end of the range found in other studies, both in Continental Europe and Britain, though with the proviso that the other results are averages of regions, not single farms. Dinbren's average of 4.85 for first clutches and 4.66 for all layings compares with 4.85 for first layings in West Germany (Löhrl & Gutscher, 1973), 4.3-4.6 for all layings in BTO Nest Record Cards (originating primarily from the southern half of Britain) in Adams (1957), 4.66 for all clutches from lowland Scotland (Mc Ginn & Clark, 1978) and 4.59 for all clutches from the Manchester area (Spence, 1984).

Dinbren Swallows laid clutches of 5 more often in first layings than in other reported studies, with its respective rates, for first and second clutches, of 71% and 49% comparing with 60% and 32% in W. Germany (Löhrl & Gutscher, 1973) and 61.4% and 55.3% from near Manchester (Spence, 1984). Its overall rate of 56% for all layings - including third clutches - compares with 58.7% from the Manchester area study (Spence, 1984), 51% in Southern Scotland (Mc Ginn & Clark, 1978), 43% for Britain generally (Adams, 1957) and 38% from northern Scotland (Mc Ginn, 1979). The Gadlas's overall rate of 53.2% falls roughly in the middle of the above values.

Breeding success, as measured by proportion of eggs giving rise to fledged young, was low at Dinbren in comparison to most other studies. Rates for first and second clutches at Dinbren, 68.3% and 79.81% respectively, compare with 87.3% and 87.7% for W Germany (Löhrl & Gutscher, 1973) and 85.9% and 91.6% in Westfalen, Germany (K-H. Loske, in Cramp 1988). Dinbren's production rate of 73.59% from all clutches is higher than the 71.9% reported in Adams (1957), but below the Southern Scottish study's 76.3% (Mc Ginn & Clark, 1978), and well below the 82.86% from near Manchester (Spence, 1984) and the failure of 10% of all eggs laid to produce young as reported by Boyd (1936) for the British Swallow enquiry. The Gadlas' values of 83.2% for first layings, 85.8% for second layings and 84.38%

for all clutches fall near the upper end of the range found in other studies.

Causes of breeding failure

Dinbren's low production of young despite its high clutch size is due to the high rates of predation, egg failure and death of young occurring at the farm. The higher production rate of second clutches at Dinbren may be due to generally warmer weather in July leading to enhanced brood success, either directly, or through better-fed broods not attracting predatory Magpies by calling for food between visits by adults, though the independence of predation rates (apparently) by Magpies and starvation-induced deaths of Swallow chicks argues against the latter.

Although the Magpie is described in Cramp & Perrins (1994) as a common frequenter of farmyards, predation on Swallows' nests is not mentioned in the works cited here (or Goodwin, 1986 or Birkhead, 1991) and may be a relatively recent phenomenon. The first observed instance of harassment of Swallows by Magpies at the Gadlas was in 1999, followed in 2000 by the first confirmed case of predation. At Dinbren presumed predation by Magpies increased markedly from 1997. Although such predation does not correlate with chick starvation at Dinbren, the Magpie is an opportunist feeder (Goodwin, 1986) and habits learned - or enhanced - in 1997, when many Swallow chicks died of starvation and the high predation rate may have been induced by their hunger calls, may have been applied in subsequent years. Additionally, Dinbren's much larger Swallow colony may be more cost-effective in time and energy to plunder than that at the Gadlas.

Occupation, breeding output and characteristics of farm buildings

With its rather high population of Swallows, fluctuating markedly between years, Dinbren makes a good base for study of preference and output of farm buildings. That such preference exists is shown by the major differences in occupation rates for different buildings (on both farms) and by the considerable number of buildings, accessible to Swallows, regularly left unoccupied. (Only one building at Dinbren with a cluster of old nests, Building 16, has not been used by Swallows in the study period - throughout which time the upper door has been closed and the window space reduced to 0.03 m^2).

Herroelen (1957-1959) found that older, experienced Swallows tend to breed earlier and lay larger clutches. At Dinbren, the tendency for the largest clutches to be laid earliest, and in those buildings most often occupied, suggests that the "fittest" birds repeatedly choose certain buildings, particularly as the Swallow's annual survival rate is relatively low (Møller, 1989).

Møller's (1983) finding that buildings housing animals are preferred over those without them is not confirmed by our study. As Swallows do not normally hunt within buildings (*pers. obs.*) any extra insects generated by animals there are unlikely to produce an advantage. Löhrl & Gutscher (1973) found that Swallows breeding in buildings unoccupied by animals reared no fewer young, despite the lower temperatures prevailing there.

Like Møller (1983), we found that buildings with Swallows breeding tended to be darker rather than lighter at Dinbren and the Gadlas, but there was no correlation between frequency of occupation, or success, and levels of light intensity, as might have been expected if darkness were actively preferred. Rather, we suspect that this might be an incidental result of the birds' preference for buildings with particular types of entrance, especially given that Building 2 at Dinbren is extremely well-lit, yet is one of the most regularly occupied and most productive of all.

That buildings with relatively small entrances are used most often by Swallows, regardless

of their level of illumination, suggests that a sense of enclosure might be an important attraction to prospecting birds. That entrances of an area of less than 0.25 m^2 seem to deter Swallows would not be surprising if security for birds entering the building were also important. Building 17 at Dinbren has what appears an ideally sized entrance, but close to it are stored tall objects from which a cat could spring at a Swallow entering the building. Building 5 appears to be an exception, with its tall and large entrance, but the building's interior is still large in relation to the entrance (*ca.*1000 m^3 as against 27 m^2) thereby retaining a sense of enclosure - and its occupation figures have been inflated by 3 and 4 pairs of Swallows settling, respectively, in the peak years of 1996 and 1997.

Of buildings occupied by Swallows, the least productive of fledged young are of 2 types: those where the feeling of enclosure is lost through a whole side being open (Dinbren's Buildings 9, 11, 12 and 15), and lofts. Both categories are prone to predation by Magpies, which seem more ready to enter low-level buildings through a fully open side, perhaps because this offers a wider escape path, and which seem bolder over entering even quite enclosed lofts. Perhaps the latter are less fearsome for Magpies because they can be flown into at a level well above the ground, where this species might feel less vulnerable. Both Birkhead (1991) and Goodwin (1986) mention the importance of trees as cover for (escaping) Magpies. Our observations suggest that Magpies prefer to make higher-level approaches to buildings and, retaining the wariness of Man noted by Birkhead (1991) in birds feeding in built-up areas, make their attacks chiefly early in the morning (*pers. obs.*; Jean Walker, *pers. comm.*). The lofts at Dinbren can actually be seen into by Magpies perched on the roofs of lower buildings, or in trees in the farm's garden. Their enclosedness may be the proximate factor that initially draws Swallows to occupy them, with the generally higher rates of failure as the ultimate factor determining their occupation by younger, inexperienced birds. Conversely, the big Dutch barns on both farms, lacking any sense of enclosure and visible into from high perches, are never occupied by Swallows.

In contrast with Dinbren, The Gadlas has ample low buildings, with small entrances, to accommodate its small Swallow population. It also has no trees close to the farm's buildings, a fact which may make the Magpies less willing to approach it. Interestingly, this farm's first case of harassment of a Swallows' nest by Magpies occurred as late as 1999, at the farm's first loft nest in 13 years of study.

ACKNOWLEDGEMENTS

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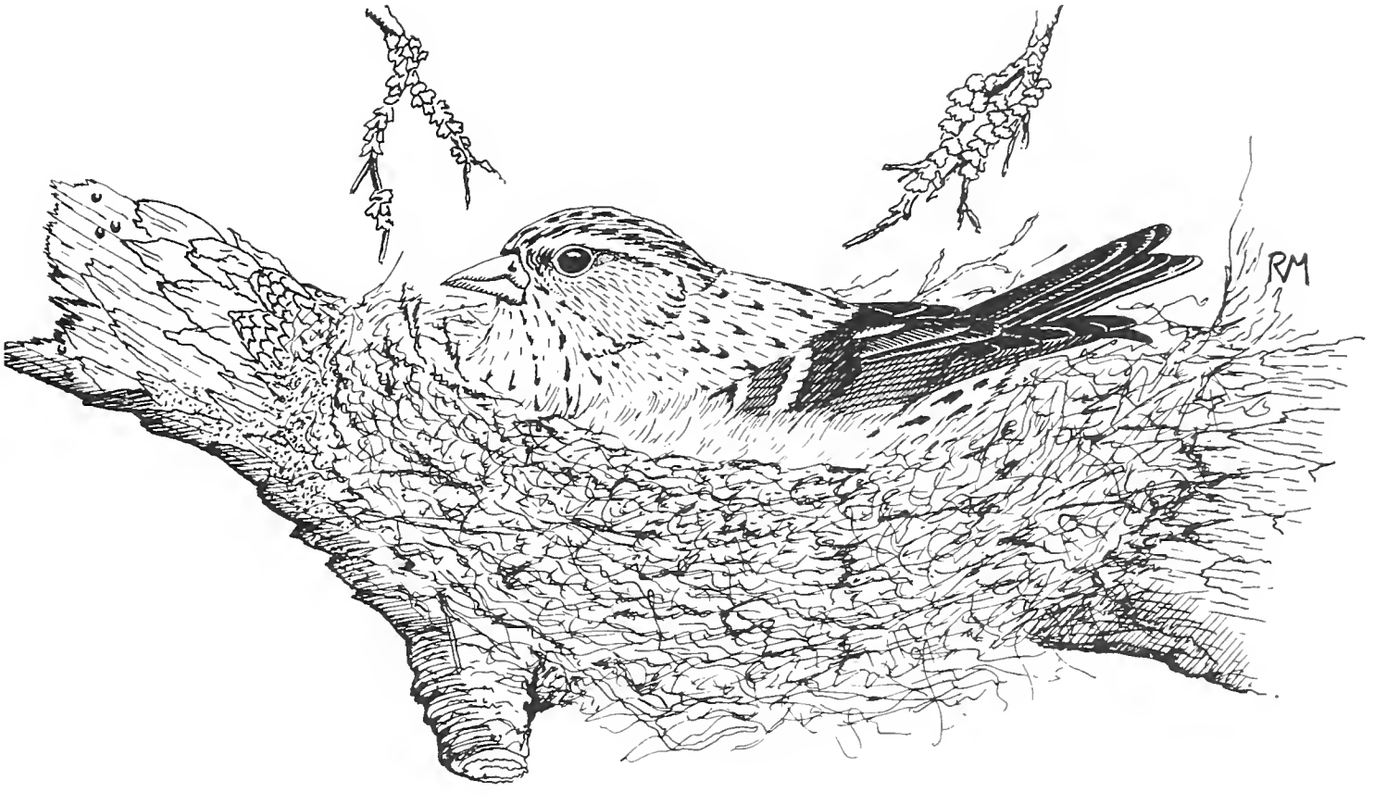

NESTS OF SISKINS IN NORTH EAST WALES

JOHN LAWTON ROBERTS, "BELMONT", BERWYN, LLANGOLLEN, DENBIGHSHIRE. LL20 8AL

MICHAEL S. JONES, 2 NEW VILLAS, DUDLESTON HEATH, ELLESMERE, SHROPSHIRE. SY12 9JY

JOHN HAWKINS, "OAKHURST", PENTRECOED, ELLESMERE, SHROPSHIRE. SY12 9EL

Nests of Siskins *Carduelis spinus* are notoriously hard to find. Knowing of no published details of these from Wales, we report here on 5 nests seen by us near Llangollen, Denbighshire. Nests A to D were in a wood of self-set Scots Pine *Pinus sylvestris*, at *ca*. 400m asl, and all were close to clearings. Nest E was in a block of line-thinned

Sitka Spruce *Picea sitchensis* in a mixed plantation at 420 m, adjacent to *Calluna* moorland.

NEST A (1988)

June 1: (few signs of Siskins in April-May.) A hen watched "cradling" (settling, as if brooding) in two positions amongst fine twigs near tip of bent over top of Scots Pine, *ca* 6 m from ground. Cock close by, giving "wheezing" call (apparently the note described as part of song in Cramp & Simmons, 1994).

June 4: nest well formed in one of previously "cradled" positions, hen inside, cock close, one or both birds "wheezing".

June 10: 07.19h, hen flew to nest carrying pale, fluffy material in bill. Soon seen shuffling in nest, where still sitting at 07.30h.

June15: nest inspected using tower scaffold. No signs of pair. Nest empty, small, hemispherical, moss exterior with some lichens attached, thick lining pad mainly of sheep's wool.

June: 18-22: a party, including not-long-fledged young - possibly a first brood from Nest A's pair - drinking at a pool 15 m from nest tree.

NEST B (1990)

April 13: Many Siskins and Crossbills *Loxia curvirostra* in wood. Heavy pine cone crop. 07.10 hen Siskin flew twice to same spot in low pine, first time pursued by cock, both birds "buzz calling". Nest rounded, pale outside, at 5.5 m, fitted amongst twigs well before tip of bough (1 ? m from trunk), not in needles, so fairly obvious from beneath. Hen seen sitting in nest, then standing on rim.

April 20: 08.50h hen close to nest, in which 1+ egg, longish, small, pale blue flecked red-brown, much as Linnet's *Carduelis cannabina.*

April 22: 15.10h 3 eggs; hen in vicinity but did not return to nest. Many other Siskins seen, almost all still in pairs.

April 29: 4 eggs in nest, but lining damp and nest clearly deserted.

May 4 and 7: mainly cocks seen, much singing, but by May 12 fewer cocks and by May 18 only a few Siskins overall.

NEST C (1998)

May 2: Many Siskins in wood. Found nest at 6.7 m from ground on bough of pine, well before tips, 2 m from trunk, obvious from below. No lichens in nest, which whitish. Mostly grass and hair, with stiff grasses and a few fine pine twigs criss-crossed as base. Lining of hair. Chicks (3) at advanced "in-pin" stage. A few scattered pieces of droppings on nest rim. Cock seen twice feeding chicks, alone.

May 3: as we built scaffold for photography, cock fed chicks several times, usually accompanied by hen which did not feed chicks. She once pulled at material near base of nest. Droppings now forming layer around nest rim.

May 4: remiges of chicks more than 1/3 showing. Droppings forming continuous layer on rim of nest; none now removed by adult. Wool hanging below nest. Hen usually accompanied cock; again, did not feed chicks. (During the afternoon she was found to be building a second nest: see NEST D.) Feeding intervals, in minutes, as follows (warm sun throughout), starting with feed at 13.10h: 30, 14, 22; in next watch, starting with feed at 16.15h, 14, 4, 11, 23, 12, 21.

May 5: remiges of chicks nearly 2/3 showing. Frequent fluttering and preening. Droppings forming 3 overlapping strata on nest rim. Weather cool, windy; frequent drizzle. Feeding intervals (in minutes), from 16.45, when first feed: 34, 36, 58.

May 14: nest empty, part-flattened, young clearly fledged. Ring of droppings around rim bulging with mould.

NEST D (1998)

May 4: hen from NEST C watched gathering hair from part-fallen Chaffinch nest under pine and later seen flying repeatedly to rather loose, hemispherical nest held by fine terminal twigs, needles and cones worked into side-walls, at *ca* 5.5 m in crown of pine. Almost all moss, lined with hair. Very difficult to see. This *ca* 10m from first brood nest. Cock seen accompanying hen almost to nest.

May 14: far fewer Siskins seen in wood. Female sitting boldly on 4 eggs, pale blue, reddy-brown flecks, Linnet-like.

May 17: hardly any Siskins (or Redpolls) in wood. Nest deserted (eggs cold and wet), but still well shaped, as if sat in till very recently.

NEST E (1998)

May 10: . Cock Siskin gave persistent nasal alarm calls (a new call, to us) and nest seen at 5.5 m in Sitka close to forest walkway and beside drainage ditch; small, hemispherical, mostly moss, some grass and feather in outside wall, lining wool and a few feathers, base of fine twigs, including spruce, criss-crossed - against main stem of tree, resting on small branches. Four eggs , darker blue than at Nest D, russety-brown flecked, as Linnet's. Hen gave same calls as cock, from *ca.* 1 m, as we inspected nest.

May 17: (nest contained 4 eggs a few days after first found) hen brooding 3 chicks, naked, *ca.* 2 days old, and 1 egg. A cock, dead, at base of tree, no obvious injury - recently dead, as not smelling, despite hot weather.

May 24: 19.00h 3 chicks, feathers less than 1/3 emerged, very few droppings on nest rim, hen close, a cock singing some metres away.

May 25: little change in chicks, or quantity of droppings on nest. Frequent showers. Nest watched from photographic hide. Only hen fed, at intervals of *ca* 30 minutes. In heaviest rain she brooded chicks, wings part open; as rain ceased, she became alert, looked around and left. One dropping taken per visit, from chick - not, usually, from nest rim.

May 27: frosty. One chick's remiges more than 1/3 emerged, others' less advanced; body feathers only slightly green. Droppings in 2 discontinuous strata on nest rim. Feeding intervals, in minutes, starting 06.15 (ie first feed observed) 45, 37, 40 (incl. 17 minutes brooding in rain), 36, 24, 41.

May 28: frosty and fog. Dry. Major differences in feather growth of 3 chicks: almost 2/3, just over 1/3 and well under 1/3 emerged. Feeding intervals, in minutes, starting from feed at 09.10h: 28, 38, 46, 37. Three times a cock sang fairly close as hen approached nest; once a scuffle, apparently involving hen. Only she fed chicks.

June 1: 20.30h one chick ready to fledge; one dead on nest, a foot entangled in lining of nest; third presumed already fledged. Pile of wet droppings probably from entangled chick.

Young apparently reared by hen alone.

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RESULTS OF THE UK RED KITE SURVEY 2000

Spring and summer 2000 saw the first combined UK survey of breeding Red Kites using methods agreed by the UK Red Kite Steering Group. In Wales the method was based on surveying a large sample of 2 x 2 km "tetrads" and extrapolating the results for the whole of the Principality. A similar method was also carried out on the re-introduced birds in the Chilterns. In other parts of the country, where much smaller numbers of re-introduced kites were involved, all efforts were put into attempting to find each and every pair based on information gathered in previous seasons, searching likely areas and responding to records from the general public.

In Wales the RSPB provided most of the necessary funding. This became necessary when the Countryside Council for Wales (CCW) withdrew previously agreed funding because the National Assembly for Wales failed to provide them with a large enough budget to fulfil their work plan. Although funded by RSPB, the Welsh part of the survey was organised by The Welsh Kite Trust. Three hundred tetrads were selected at random - 150 in an area defined as the "core area" and 150 in the periphery. Fieldwork was largely conducted by either one of four fieldworkers employed by the RSPB, by a member of the Welsh Kite Watchers' Group (including Welsh Kite Trust contractors) or by a volunteer. Additional work was completed by Forest Enterprise rangers, Welsh Water rangers and staff from CCW. Information was also sought from any other tetrad which could be surveyed using the same method and 13 additional squares were also covered.

Participation in the survey was excellent and only one of the 300 randomly selected tetrads was not completed. Each tetrad was visited three times unless the habitat was totally unsuitable for nesting kites (for example if it was all built-up or there were no trees in the square). Visits were spread out over the main nesting season with the first one in the period mid February to mid March, the second in mid March to mid April and the third in mid April to mid May. There had to be a minimum interval of 10 days between subsequent visits to the same square. The amount of time spent in each tetrad on each occasion was flexible and depended on the amount of suitable nesting habitat it contained. It was recommended that, as a guide, 4 hours should be spent on each visit, and in total some 3,100 hours of fieldwork was completed on the tetrad survey in Wales alone.

Following data analysis at the RSPB headquarters in Sandy by Simon Wotton, population estimates for the various Red Kite breeding locations have been produced as follows:-

	BREEDING PAIRS	95% CONFIDENCE LIMITS	TERRITORIAL PAIRS	95% CONFIDENCE LIMITS
WALES	*259*	*200-318*	*337*	*268-406*
THE CHILTERNS	*109*	*96-124*	*126*	*107-145*
EAST MIDLANDS	**16**			**16**
SOUTHERN ENGLAND	**3**			**8**
YORKSHIRE	**3**			**3**
NORTH SCOTLAND	**32**			**36**
CENTRAL SCOTLAND	**8**			**8**
UK TOTAL	*430*	*372-490*	*534*	*446-621*

Figures in italics derived from tetrad survey. Bold figures represent number of pairs actually located

The figure of 259 breeding pairs for Wales seems a very reasonable figure. The Welsh Kite Trust/Welsh Kite Watchers' Group annual monitoring of kites found 206 laying pairs and suspected the presence of up to 30 others. We have always accepted that we may have been missing between 10 and 20 % of all nests. The figure of 337 "territorial pairs" however, seems far too high. This probably results from the double counting of non-settled pairs or wrongly attributing territorial behaviour to wandering kites. Defining a breeding pair was fairly clear-cut but establishing whether a kite was or wasn't acting territorially on a particular visit was not so easy. If there was any doubt the birds were recorded as a "possible pair". I suspect that the real figure for the number of territorial pairs in Wales is very much in the lower end of the 95% confidence range given.

During the course of this survey observers were asked to record any interesting additional species encountered; in particular Lapwing, Curlew, Little Owl, Green Woodpecker, Tree Sparrow, and Yellowhammer. The results of this are reported separately.

All the organisations involved would like to thank those who took part in the survey, especially the volunteers, without whose help it would not have been possible.

Tony Cross, Project Officer - Welsh Kite Trust.

LATE NESTING BY GRASSHOPPER WARBLER
LOCUSTELLA NAEVIA

On 17th September 2000 whilst attempting to ring Mute Swan cygnets on Cors Caron near Tregaron I came across the severed wing of a small passerine under the handrail of one of the footbridges near the observation tower. The bird had obviously fallen victim to a passing raptor or corvid. The wing was fresh and still flexible. Apart from a few small body feathers there were no other remains. On closer inspection the wing proved to be that of a juvenile bird not long out of the nest. The bases of all the primaries and secondaries were still enclosed in their waxy sheaths. In the preceding August I had been fortunate enough to find and film a nest of Grasshopper Warblers so instantly recognised the wing as that of a young Grasshopper Warbler. The wing measured 60 mm maximum chord and I would estimate that the bird would have been about 12-days old. Given an incubation period of 13 days and assuming a clutch of five eggs the estimated first egg date for this clutch would have been somewhere around the 18th August. BWP gives little information on duration of breeding season in Britain but shows eggs in nests up to mid August and young up to the end of the first week of September. This nest would appear to be two weeks outside the given range. Interestingly though, BWP does state that there is a resurgence in song in mid-September but does not give any possible explanation for this. Riddiford and Findley show that the peak Autumn passage of Grasshopper Warblers occurs from late August to late September with good numbers still passing through some observatories in October. Although this must be one of the latest breeding attempts on record for this species, late nesting by Grasshopper Warblers may actually be under recorded rather than unusual.

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A.V. Cross

INTRASPECIFIC PIRACY IN PEREGRINE

On Oct.8th 2000 I was watching a small flock of Bar-tailed Godwit *(Limosa lapponica)* feeding on the mudflats at Traeth Abermenai, Anglesey. As I watched all the waders on the shore were thrown into panic by the arrival of a hunting Peregrine *(Falco peregrinus)*. The godwits flew up and, as they rose, one was struck by the falcon and fell dead onto the mud. The Peregrine followed it down plucked out a few feathers and began to eat. It had been eating for c.5 minutes when a second Peregrine appeared and, after circling overhead, landed precisely on top of the dead godwit, causing the first Peregrine to retreat hastily backwards for about a metre. The new bird was evidently a female, noticably larger than the other, which was a male. A stand-off now ensued, with the intruder mantling the prey and the male making a horizontal threat posture but clearly not prepared to come any closer. Both birds remained thus, immobile, for at least 5 minutes, until the female seized the godwit in her talons and flew off with it, pursued and dive-bombed by the original owner. This continued until they were lost to sight, so I did not find out which finally secured the prey. Both Peregrines appeared to be adults.

Rhion Pritchard

WELSH BIRDS

'Welsh Birds' is the journal of the Welsh Ornithological Society and is published twice annually, in June and Deeember. The December issue is primarily devoted to the Welsh Bird Report and the annual Report on Bird Monitoring in Wales. The annual Report on Bird Ringing in Wales now appears in the June issue.

Papers for Welsh Birds are welcomed by the Editor on any aspect of Welsh Ornithology. The Soeiety is anxious that the journal should accurately reflect present ornithologieal activity in Wales. Thus we hope that all workers, professional or amateur, with results of bird studies in Wales, will always consider publishing information about these here. All papers will be reviewed by the Editor and an independent referee. Authors should follow the format of papers published in the journal and guidelines for authors have been drawn up and are available from the Editor (address inside front cover). Papers are aecepted and published in either Welsh or English. Papers in Welsh should be supplied with eaptions to tables and figures in both Welsh and English and with an English summary. This follows standard international practiee.

Short notes on interesting or unusual features of behaviour recorded in Wales are also weleome. An aecumulation of such items is of considerable value. Notes should be short and suecinct, ideally of not more than half a page in length. Notes may also be submitted in either Welsh or English.

Each volume eomprises at least 6 issues, to make more satisfactory volumes for binding, if readers so desire. A member, David Chatfield, has recommended Prineipal Bookbinders Ltd, Ynyseedwyn Indistrial Estate, Ystradgynlais, Swansea SA9 1DT, who have done an excellent job for him. Binding will be in blaek buekram, with gold lettering and the Society's logo on the spine, at a priee of £15 per volume.