British Birds

April 2013 • Vol. 106 • 181–238

Organochlorine pesticides and birds

Avian drop-catch play

Raptor migration over Malta

British Birds

Established 1907, incorporating The Zoologist, established 1843
Published by BB 2000 Limited, trading as 'British Birds'
Registered Office: c/o Chappell Cole & Co, Heritage House, 34B North Cray Road, Bexley, Kent DA5 3LZ

ISSN 0007-0335

www.britishbirds.co.uk

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Annual subscription rates
Individual subscriptions: UK – £52.00
Overseas (airmail) – £59.00
Libraries and agencies – £97.00

Back issues
available from **www.britishbirds.co.uk** or the subscriptions office.
Printed by Hastings Printing Company

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Front-cover photograph: Adult Little Gull *Hydrocoloeus minutus*, Lancashire & North Merseyside, April 2009. *Steve Young*

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British Birds

Volume 106 • Number 4 • April 2013

The impact of organochlorine pesticides on the British countryside is something that I remember reading about as a teenage birder in eastern England in the early 1980s – when seeing any raptor other than a Common Kestrel was a red-letter day. Witnessing the effects first-hand, in the late 1950s, must have been quite another matter, however. Most raptors have recovered strongly, following the eventual withdrawal of organochlorines from agricultural use in Britain, but the speed and the scale of the impact of these pesticides is sobering. Ian Newton's paper in this issue, the second in our short series of papers to mark the centenary of Stanley Cramp's birth, is an excellent overview of this subject, which also looks at the impact of organochlorine pesticides in other countries, and deals with more recent pesticide- and pollutant-related problems.

At the end of this issue is the first offering in a new series. *Talking point* will be an occasional platform for *BB* readers to offer an editorial column. Peter Bircham has delivered a thought-provoking piece about the place of the amateur in British ornithology, and it will be interesting to see whether his points resonate with a wider audience. I have always felt that one of the main reasons that *BB* has survived into its second century is that it offers a place for solid, careful observations – whether of bird behaviour, population trends, unusual species, or whatever – in a format that adds to our collective knowledge without the necessity for complex analysis. Don't get me wrong, I am keen to integrate both amateurs and professionals as contributors – the two are best served together in my view – but *BB* has a long track record of giving the amateur a voice. And long may that continue. Visit www.britishbirds.co.uk to let us know what your views are – and if you feel moved to offer a contribution on a topic that might generate debate.

Roger Riddington

British Birds aims to: ❖ provide an up-to-date magazine for everyone interested in the birds of the Western Palearctic; ❖ publish a range of material on behaviour, conservation, distribution, ecology, identification, movements, status and taxonomy as well as the latest ornithological news and book reviews; ❖ maintain its position as the journal of record; and ❖ interpret scientific research on birds in an easily accessible way.

BB eye

Ghosts

It has some of the hallmarks of a Conan Doyle murder mystery, complete with period costume, a shooting, a body, a fairytale Victorian Highland setting, suspects, big-city and small-town locations, journeys in between, and – for good measure and Hollywood appeal – a strong American angle. In fact, the central character is a 'Yank' – *Accipiter gentilis atricapillus* to be precise – the fabled Northern Goshawk.

It's spring 1869 and there is unrest in the British Empire – Canada, this time. The finishing touches are being put to the *Cutty Sark* in a Glasgow shipyard. She will be one of the last of the tea clippers built, as the age of sail gives way to steam power. The journal *Nature* is also launched, and the *People's Friend*. A gamekeeper called Stewart is patrolling the slopes of Schiehallion – the 'hill of the fairies', some say – in Perthshire. Spying a bird of prey, in the tradition of the day he shoots it dead.

By and by, he gets into conversation with a road surveyor called Menzies, who relieves the keeper of the bird, which has been crudely gutted. Menzies takes it to the town of Brechin, on the east coast, and a shop owner there by the name of Lyster. Lyster can turn his hand to taxidermy, and sells many things, chief among which are fishing lures, for which Red Kite *Milvus milvus* feathers are particularly suited. But the skin he is presented with is not of a kite – or gled, as they were then known. In any event he has better things to work with, and puts it aside.

Some time later a man called Gray drops in. He's a keen ornithologist in his spare time and an inspector of banks by day. It's not in great nick by this time but he recognises the bird skin as that of a Goshawk. He takes ownership of the specimen, and arranges for it to be sent on to Glasgow. There, he has another taxidermist clean, stuff and mount it. Goshawks were by this time rare, even in Scotland. It would be extinct as a breeder in Britain in little more than a decade. Having collected his order from the stuffer, it is only now that Gray realises there is something particularly unusual about this Goshawk. It is of the North American race *atricapillus*. At face value, this is the first record of its kind for Britain. The record is generally accepted; indeed, Gray later becomes a renowned and respected ornithologist.

Fast-forward a century, and cutting a long story short, this American Gos is dropped from the Scottish List. No-one today seems very sure why. By this time there were several records of American Goshawk from Ireland and one from England (Tresco, Scilly, 28th December 1935). In each case the birds were evidently shot, enabling close inspection.

Forward again, this time to the present day, when the Perthshire record is reviewed once more, and officially rejected.

Over at the National Museum of Scotland in Edinburgh, experts are once again peering at the mummified corpse. The identity of the bird is not in dispute, but there is apparently sufficient doubt over provenance, with the possibility that a different (American) Goshawk skin replaced that deposited by Gray in the Glasgow shop.

The verdict suggests a general doubt over the American Goshawk's ability to cross

5,000 km of ocean, a doubt in which it is easy to share. Even with a hurricane at its tail (there was such a weather event and a major fall of Goshawks in the USA in the late 1860s) and/or with the help of a boat, believing the Gos can achieve this feat assumes a voyage of weeks or even months rather than days, and a diet of seabirds caught on the wing, over the waves, en route... unless Roger the cabin boy had taken pity on the stowaway in the rigging, and was bringing it ship's rations, or rats.

Some ornithologists I've spoken to have shrugged at the idea of *atricapillus* being capable of crossing the Atlantic. 'Northern Harrier [*Circus cyaneus hudsonius*] and American Kestrel [*Falco sparverius*] can do it,' they'll say. But this is to equate the talents of Mo Farah with those of Usain Bolt. The Gos, we know, is a bird that will spend most of an average day loafing, waiting for prey to come within ambush range: a sprinter, not a distance runner. They are three times as heavy as harriers. We know they can cross the North Sea, but show a peculiar reluctance to do so, if the low number of records for Shetland, the oil rigs and coming in off the east coast are anything to go by (one Scandinavian ring-recovery, ever).

But is it any more feasible that a Victorian trader would import such a specimen, and not label or market it for maximum value as an exotic? That it would be so casually or carelessly switched by a professional taxidermist for no apparent additional fee?

In the end, we can only speculate. Despite some of the finest minds having been trained on it, the Perthshire Goshawk saga will probably remain one of the great unsolved mysteries of ornithology, and just one of the many riddles surrounding the enigmatic, spectral, much-studied but only partially understood (and dare I say widely overlooked) Northern Goshawk.

With thanks to Bob McGowan and Andrew Kitchener at the NMS for their insights. Bob's full account of the history of this specimen will appear in a future issue of *BB*.

Conor Jameson

Footnote: the Irish American Goshawk records are also currently under review. The fact that two of the Irish records occurred within days of each other (both birds shot), and within weeks of the Perthshire bird, merely adds further intrigue to the overall tale.

Conor's book *Looking for the Goshawk* will be published by Bloomsbury on 11th April.

Photo Researchers/FLPA

118. Adult Peregrine Falcon *Falco peregrinus* and juvenile Northern Goshawk *Accipiter gentilis*, Connecticut, October 2007.

News and comment

Compiled by Adrian Pitches

Opinions expressed in this feature are not necessarily those of *British Birds*

Missing: 50,000 Red-breasted Geese

Researchers in Bulgaria have taken the largest-ever catch of Red-breasted Geese *Branta ruficollis* and fitted satellite-tracking devices in a bid to unlock one of the more significant mysteries of the natural world. Just over ten years ago, more than 50,000 of these tiny, brightly coloured geese seemingly disappeared from their wintering grounds along the Black Sea coast in Bulgaria, Romania and Ukraine.

Kane Brides/WWT

119. Satellite-tagged Red-breasted Goose *Branta ruficollis*, Bulgaria, February 2013.

Co-ordinated international counts have not since recorded a significant increase, leaving scientists speculating whether the missing geese – half the world population – have relocated to unknown sites in southwest Asia or fallen foul of hunting, development and changes in farming.

Teams from the Wildfowl & Wetlands Trust (WWT) and the Bulgarian Society for the Protection of Birds (BSPB) caught 91 Red-breasted Geese in February and fitted tags to 11 individuals, which will enable the birds' movements to be followed along their 6,000-km migration route to breeding grounds in Arctic Russia.

Conservationists working to save the Red-breasted Goose are being realistic about the chances of rediscovering the 'lost' population, however. Nonetheless, the data gathered will also help conservationists to work with farmers, planners and developers in Bulgaria.

Peter Cranswick, Head of Species Recovery at WWT, has been at the heart of the international effort to catch and tag the geese. He said: 'Almost overnight, we were unable to account for around half the world's Red-breasted Geese. The reasons are still unclear and we are tracking these individual birds to find out more. The data we get will be invaluable to our work with local communities in Bulgaria – the farmers, shooters and landowners – to work out how we support the remaining geese, while still meeting their needs.

'It is also possible that, as the climate has changed, some birds have started to winter farther east. We hope our tagged birds will reveal as yet unknown sites, so we can assess their importance and – if necessary – ensure their protection.'

The project 'Safe Ground for Redbreasts' LIFE09/NAT/BG/000230 is funded by the contribution of the LIFE financial instrument of the European Community.

Gamekeeper's illegal use of cage trap

A North Yorkshire gamekeeper has pleaded guilty to the illegal use of cage traps and taking a live bird of prey. At Scarborough Magistrates Court, Shaun Allanson admitted to intentionally taking a Common Buzzard *Buteo buteo* using a cage trap baited with a live pigeon, and also to operating a second cage trap, again baited with a live pigeon. These offences took place at Blansby Park, a shooting estate near Pickering. Allanson was sentenced to a 120-hour community order to do unpaid work.

On 28th August 2012, an officer from Natural England discovered the Buzzard in a cage trap eating a pigeon. The officer released the Buzzard and informed the police. As a result, North Yorkshire Police made a number of visits to the estate, where they discovered a second cage trap baited with a live pigeon.

Allanson was arrested by North Yorkshire Police in October. The RSPB, who were contacted by the police for advice, believe that the traps were being used to target Northern Goshawks *Accipiter gentilis*, which have suffered from illegal persecution in North Yorkshire. Although cage traps are legal in certain circumstances for predator control, it is unlawful both to use a pigeon as bait and to capture birds of prey.

Guy Shorrock, Senior RSPB Investigations Officer, said: 'Mr Allanson has lost his job as a result of this conviction. We would like to see more shooting estates taking raptor persecution seriously and dismissing their staff when they are convicted of serious offences.'

Licensing of upland grouse moors and gamekeepers

An e-petition calling for the licensing of upland grouse moors and the gamekeepers employed there has been uploaded to the DirectGov website. If it attracts 100,000 signatures, this will trigger a debate in Parliament and potentially legislation would follow.

Here's the text: 'Given the continuing levels of illegal persecution of birds of prey, the Government is called upon to introduce a system of operating licences for upland grouse shoots. Following any proven offence of persecution on the shoot concerned, i.e. illegal trapping, use of poisons, shooting or the interference with or destruction of nests, the licence would be revoked for a period of not less than two years and commercial shooting activity cease.

'Linked to the above the Government is called upon to introduce an accreditation scheme or licensing system for all gamekeepers, be they employed in a full-time or part-time capacity. If an individual then has any proven involvement with raptor persecution, the licence would be withdrawn for a period of three years along with the right to hold a gun licence. Any repetition of an offence would result in the licences being withdrawn for life.'

The e-petition is active until February 2014 and currently (mid March) has 3,500 signatures. If you wish to sign the petition, please go to: http://epetitions.direct.gov.uk/petitions/46473 A previous e-petition calling for the introduction of vicarious liability for landowners in England failed to go forward because it did not attract enough signatures.

Poisoning of Irish White-tailed Eagles

Raptor persecution is not restricted to Britain, as the recent deaths of two White-tailed Eagles *Haliaeetus albicilla* in southwest Ireland have illustrated. Despite changes to legislation in 2010, which effectively banned the use of poisoned meat baits, this archaic practice is still being carried out by a small minority in the Irish countryside.

In January the carcase of a female White-tailed Eagle was discovered by a member of the public near Glengariff, in Co. Cork. Subsequent toxicology analysis confirmed that the bird had died from poisoning. A second White-tailed Eagle was also found dead in the same month near Caherdaniel, in Co. Kerry, and although poisoning is suspected it has not been possible to confirm the cause of death.

White-tailed Eagles were once relatively widespread in Ireland, but became extinct during the nineteenth century, largely as a result of human persecution. Since 2007, a total of 100 eagles have been released in Killarney through a reintroduction project managed by the Golden Eagle Trust. Although 2012 marked the first breeding attempt in Ireland in over 100 years, the issues that originally led to these magnificent birds being wiped out over a century ago have unfortunately not disappeared. Twenty-six eagles have been found dead since their reintroduction began in 2007, and it has been confirmed that at least 12 of these were poisoned.

Commenting on the death of the White-tailed Eagle in Cork, the Minister for Arts, Heritage and the Gaeltacht, Jimmy Deenihan, said: 'The poisoning of an eagle in Co. Cork is very serious. Eagles are protected by law, they are majestic birds of prey, and their reintroduction to Ireland is an important and very worthwhile project. My Department is providing any assistance it can to the Gardaí in the investigation of this matter.'

For extended versions of many of the stories featured here, and much more, visit our website www.britishbirds.co.uk

Richmond Park Woodchat Shrike revisited – 60 years on

The 50th anniversary of the Suffolk 'Houbara' (Macqueen's Bustard) *Chlamydotis macqueenii* (*Brit. Birds* 106: 4) prompted memories of another high-profile rarity for *BB* subscriber Barry Marsh.

A Woodchat Shrike *Lanius senator* discovered in Richmond Park, Surrey/Greater London, in April 1953 presented Barry with a photographic opportunity that tested his ingenuity to the full. His photo appeared in Vol. 46 of *BB* and is reproduced here.

Barry says: 'The photograph by today's superb standards is poor, but many readers of *BB*, particularly photographers, may wonder what kind of camera and lens I used. Photographs of free-flying passerine migrants in those days were very much the exception.

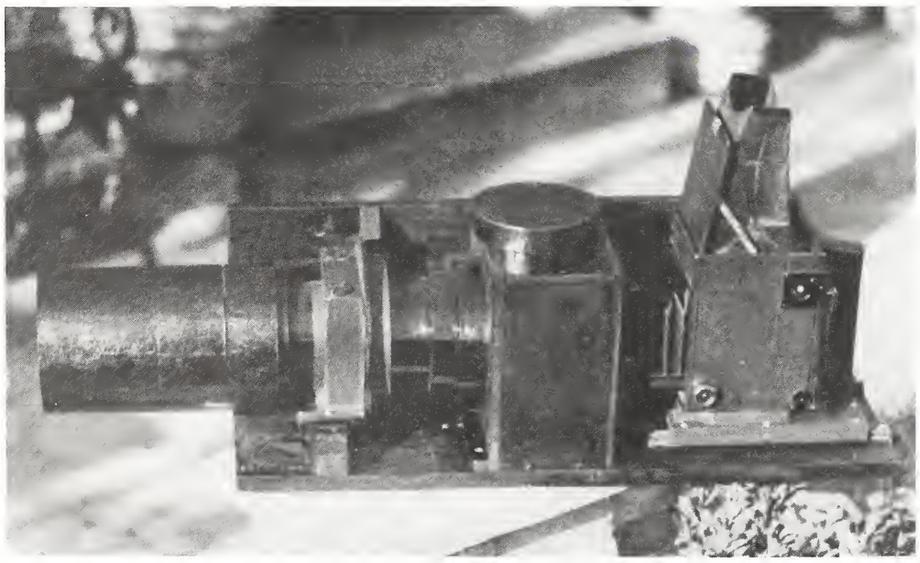
'The lens, lacking any kind of iris, was a Zeiss Telikon 750 mm f6.3 and probably used by a German reconnaissance aircraft during the Second World War. This was connected to a 1/4 plate Soho Reflex Camera with a home-made arrangement that allowed the camera to move to focus, as it was much lighter than the lens. I increased the depth of focus by adding a disc, with right-sized hole, and inserted it into the home-made lens hood, as can be seen in one of the photographs. This leviathan was very heavy!

'The Woodchat favoured a wire fence into which I fixed a slightly higher perch, actually the end of a broom handle, so that I could organise a pre-focus point. The bird took to this like a duck to water. The camera was half hidden on the ground at a distance of about eight or nine yards and the shutter released from a distance with the aid of a long piece of string!' Barry says that he still has the exposed glass plate of the shrike, but no longer owns the camera.

And here's the account from *BB*: 'Several observers have sent us details of a Woodchat Shrike that remained in Richmond Park, Surrey, for some three weeks in April and May, 1953. It was first seen on April 13th (an early date) by A. Crutchley; the identification was confirmed on April 19th by E. D. Bushby, and on the 21st by B. A. Marsh. It was later seen by a large number of observers (including E.M.N., and P.A.D.H.) [Max Nicholson and Phil Hollom] until the morning of May 5th. On May 3rd a photograph was taken by Mr Marsh and this is reproduced on plate 47; unfortunately the front of the head and the underparts are thrown into shadow by the sun's shining directly onto the bird's back, but a good impression is given here of the rather poor plumage in which the bird was. It seemed to be an immature with somewhat worn feathers; and the amount of black on the forehead and round the eye, unmixed with chestnut, suggested a male. The scapular-patches, rump, and underparts were greyish rather than white or cream.' (*Brit. Birds* 46: 305–306)

Owen Marks also wrote in after reading the Houbara

Barry Marsh



Barry Marsh

120 & 121. The April 1953 Richmond Park Woodchat Shrike *Lanius senator*, photographed by Barry Marsh, with the camera involved also shown.

piece. He is one of the select band who saw the famous bustard in 1962 and told N&c: 'I saw the Bustard on 23rd and 29th of December 1962 together with a colleague Colin Kirtland, his father, and my uncle Maurice Atkin. He was able to take a few seconds of the bird on the ground and in flight on an 8-mm cine camera. On 23rd there were only three people viewing and on 29th only two.'

What is certain is that such solitude would not be enjoyed if another Macqueen's Bustard arrived on the UK mainland now!

New species of storm-petrel

A distinctive *Oceanites* storm-petrel, first spotted by Irish birders Seamus Enright and Michael O'Keeffe off the coast of Chile in 2009, has been declared a new species by seabird expert Peter Harrison. In February this year, Harrison led a small team that managed to capture 12 of the mystery storm-petrels at sea near Puerto Montt, Chile.

'These birds are likely to be a completely new species, as they are so different from any other storm-petrels we know,' says Harrison. 'There are just 22 known storm-petrel [species] worldwide.'

The key to the success of this project was the involvement of New Zealanders Chris Gaskin and Karen Baird and their specially designed net guns, which were used to clinch the rediscovery of the New Zealand Storm-petrel *O. maorianus* (see below). Using 'chum' to attract the birds, Harrison's team were able to capture the mystery petrels using net guns and could then take photos, measurements and biological samples.

One of Chile's leading ornithologists, Dr Michel Sallaberry Ayerza, from the University of Chile (in Santiago), collected blood samples and feathers, which will be analysed to confirm the identity of the new species. 'This is a very important discovery for Chile,' said Sallaberry, 'and it seems the birds are in good numbers; in fact during our visit they were the most common seabird in the area. Once the DNA work is completed the next step will be to try to find out more about these birds, where they breed and if they migrate away from the area during the winter, or remain resident.'

The putative new species has been discovered within sight of the beaches at Puerto Montt, which is a popular seaside town for Chileans. The waters of Seno Reloncavi are plied by cruise ships, cargo vessels, and fishing boats.

While the current work provides the basis for a scientific description of the new species, the credit for its discovery must go to Messrs Enright and O'Keeffe, who were seabirding on the Puerto Montt ferry four years ago and noted that the storm-petrels with a lot of white on the underparts were not the local Fuegian subspecies of Wilson's Storm-petrel *O. oceanicus chilensis*, since they had photographed this form off Valaparaiso only a few days before – and the birds had had (at best) some white mottling on the underparts.

Harrison concluded: 'To discover a completely new species is a special moment in any biologist's life. Our discovery is made more significant because the new species is a seabird. Worldwide there are just 350 or so seabird species and storm-petrels are the smallest of all seabirds. Without doubt this discovery is a red-letter event for seabird enthusiasts of the world.'

New Zealand Storm-petrel breeding grounds discovered

And there was more breaking news for Pacific petrel enthusiasts in February. Just days after the 'Puerto Montt petrels' were trapped, nesting New Zealand Storm-petrels were found only 50 km from Auckland.

BirdLife announced that: 'Researchers are elated to discover that the sparrow-sized New Zealand Storm-petrel, thought to be extinct until 2003, is breeding on Little Barrier Island Hauturu in the Hauraki Gulf Marine Park.'

The seabird is listed as Critically Endangered by BirdLife and finding the breeding site is vital for its conservation. Three specimens of the diminutive (35 g) seabird were collected off New Zealand in the 1800s and are held by museums overseas. But it was considered extinct prior to its rediscovery ten years ago. Since then there has been intense speculation as to where the species breeds.

The team that found them camped on the Poor Knights Islands, Mokohinau Islands and Little Barrier Island, and used radio receivers to zero in on the breeding site. 'It's like looking for a needle in a haystack,' said Chris Gaskin of Forest and Bird (BirdLife NZ). A critical breakthrough came last year when the project team found brood patches on New Zealand Storm-petrels caught at sea. This determined the timing of incubation, the best time to find breeding birds on land.

This year 24 birds were caught at sea using specially designed net guns, and tiny (1 g) radio transmitters were fitted to each bird. Automated receivers

narrowed down the search. Team members, based at a remote camp on the north coast of Little Barrier Island and using handheld receivers and spotlights, confirmed that birds were coming ashore under the cover of darkness and moving inland.

Chris Gaskin said: 'We discovered a bird on the ground, possibly having just left its burrow. At the same time team members detected another bird, this one most probably on a nest. It's an amazing result for our enthusiastic and dedicated team.'

National Nestbox Week – in Iraq

It's not unusual for schoolchildren in the UK to be building nestboxes in February to put up in the school grounds. But now schools in Iraq have joined in the fun.

With funding from the UK Government's Darwin Initiative and support from the Royal Botanic Garden Edinburgh and BirdLife International, the local affiliate, Nature Iraq, has provided the materials and expertise for five schools to build nestboxes to put up in their local areas.

Between them they constructed 43 nestboxes for Great Tits *Parus major* and Sombre Tits *Poecile lugubris* and each of the five schools received an Arabic language bird book for children.

For more on this story, see the *BB* website www.britishbirds.co.uk

Nwenar Fatih/Nature Iraq

122. Pupils from Kani Shok primary school in Iraq getting to grips with nestboxes for the school grounds; February 2013.

Can you hear Goldcrest song?

In March last year (*Brit. Birds* 105: 152–153), Richard Porter raised the issue of hearing loss and the declining ability with age of survey workers to hear, for example, Goldcrest *Regulus regulus* song. I am attempting to quantify how that problem develops with age. Please let me know how it is for you: I need only your gender, age and if you can, or cannot, hear Goldcrest song. Please let me know at goldcrest@lanius.org.uk or drop me a line at Oakerley, Clun Road, Aston on Clun, Shropshire SY7 8EW. Many thanks in advance for your help.
(Contributed by John Tucker)

In praise of... Russell Slack

Anyone who has dipped into *Rare Birds: Where and When* by Russell Slack will have appreciated his presentation of data on rare birds in eminently readable form. As a first-rate birder and statistician, he was well placed to compile this valuable compendium. But we have been robbed of his talents at the shockingly early age of 45 following his death from a very aggressive form of liver cancer. Russell, a Yorkshireman, was part of the small team that set up BirdGuides; he was responsible for establishing their Bird News Extra service and helped to develop the monumental DVD-ROM products BWP*i* and the 100-year archive of *British Birds*, BB*i*. Latterly he'd returned to academia at York University. He leaves a wife, Linda, and young daughters, India and Ruby; a fuller obituary will appear in *BB* shortly.

Organochlorine pesticides and birds

Ian Newton

Abstract This is the second paper in a series to mark the research interests of former *BB* editor Stanley Cramp, and looks at the impact of pesticides on birds over the past 50 years or so. Cramp's interest in this subject was related to the effects of organochlorine pesticides, and this paper summarises the way in which these pesticides affected both individuals and populations, and describes how patterns of recovery followed the control and withdrawal of the pesticides involved. Some more recent problems with pesticides are also described, including deliberate poisoning of raptors, incidental poisoning by rodenticides and problems relating to the use of veterinary products.

This is the second paper in *British Birds* aimed to commemorate the contributions to British ornithology made by the journal's former editor Stanley Cramp, born 100 years ago, in 1913. His involvement with the impact of pesticides on birds began in the late 1950s, when thousands of birds were found dead and dying in recently sown cereal fields across Britain. The grains had been dressed with some newly released organochlorine pesticides – the so-called cyclodiene compounds, such as aldrin, dieldrin and heptachlor. The aim was to protect the sown grains against insect attack, reducing the losses for farmers. But it turned out that these pesticides were also extremely toxic to birds and mammals, killing many individuals that fed on treated grains spilled on the soil surface. The birds usually died in convulsions, and were otherwise in good condition. Chemical analyses revealed the presence of organochlorine residues in their body tissues. Affected species included not only seed-eaters, such as finches, buntings, pigeons and gamebirds, but also raptors, such as Eurasian Sparrowhawks *Accipiter nisus*, which fed on the dying birds. The many thousands of birds found dead around arable land were assumed to form a tiny proportion of the total killed, and the situation can be exemplified by an account from an informant from Tunstall in Norfolk: 'The place is like a battlefield. My keeper has found innumerable corpses, including masses of small birds... this slaughter... is going on all around here and quite apart from the game, the destruction of wildlife is quite pitiful.' (BTO archive material).

Stanley Cramp's main role was to collate the information on bird and mammal deaths collected across the UK under the auspices of the BTO, the RSPB and (from 1963) the Game Research Association. He chaired the newly formed 'Joint Committee on Toxic Chemicals', and acted as lead author on six reports presented to the Government during the period 1961–67. The first report was published in 1962, the same year as Rachel Carson's influential book *Silent Spring* (Carson 1962), which drew attention to the problems of organochlorine use mainly in North America. On both continents, it soon became evident that birds of prey were in rapid decline and that broken eggshells were often found in the deserted nests. A breakthrough came in 1967 when Derek Ratcliffe published his discovery of eggshell-thinning in raptors and other species. Through the examination of dated eggshells collected in the past and housed in museums and private collections, Ratcliffe (1967, 1970) was able to date the timing of the start of shell-thinning among several species in Britain to the late 1940s. This was the time when another organochlorine, dichlor-diphenyl-trichloroethane (DDT), came into widespread agricultural use.

The following decades saw a period of intensive research into the effects of organochlorine pesticides on birds and mammals, endless battles with the agricultural and agro-chemical lobbies, and eventually the progressive banning of these chemicals from agricultural use in most parts of the world. This story has been told many times, perhaps most vividly for Britain by Derek Ratcliffe in his book *The Peregrine Falcon* (Ratcliffe 1980, revised in 1993). My own involvement with the organochlorine problem derived mainly from my work on the Sparrowhawk, one of the most affected species, and also from directing the pesticide research at Monks Wood Research Station over a 20-year period. This work included monitoring the organochlorine residues present in the carcases of predatory birds found dead and sent in for analysis by members of the public. My aim here is to summarise some research findings on the effects of organochlorine pesticides on birds, and the general lessons that emerged. Although these chemicals are no longer used in Britain, and their effects may be unfamiliar to younger readers, their period of use was a hectic time for bird protection, and stimulated a steep rise in the conservation movement worldwide. Some of the lessons learnt are just as relevant today, and towards the end of this paper I touch on some more recent problems caused by other pesticides and veterinary products.

Some general points about pesticides

As their name implies, pesticides are designed to kill pests, mainly of agricultural crops. They are thus seen as a great boon to human food production and health worldwide. But there are also environmental costs from their use. Firstly, if pesticides destroyed only the target pests and then quickly broke down to harmless by-products, problems from their use would be minimal. But most pesticides are non-specific and kill a wide range of organisms. Secondly, while some break down rapidly, others last for weeks, months or even years in animal bodies or in the physical environment, able to affect animals long after they were applied. Thirdly,

John Hawkins/FLPA

123. Male Eurasian Sparrowhawk at a plucking post with a recently killed Blackbird *Turdus merula*, West Midlands, April 2006. Sparrowhawks became contaminated with residues of organochlorine pesticides, acquiring small amounts from each prey item until enough had accumulated in their bodies to cause critical levels of shell-thinning (in the case of DDT in females) or death (in the case of aldrin/dieldrin in both sexes). Their populations thus declined from the combined impact of lowered reproductive success and increased mortality. Blackbirds obtained their residues mainly from earthworms, which in turn acquired them from the soil.

some pesticides accumulate in animal bodies and readily pass from prey to predator, causing secondary poisoning, or even pass along several steps in a food chain, affecting animals far removed (in terms of trophic position) from the target pest. Depending on their chemical properties, all pesticides lie somewhere within this three-feature spectrum of variation, with respect to specificity, persistence and cumulative propensity. In addition, by contaminating air and water, some pesticides (like other pollutants) can reach areas and affect organisms far removed from points of application. This became shockingly apparent in the 1960s when residues of DDT were detected in penguins and other Antarctic birds, thousands of kilometres from the places where they were made or used (George & Frear 1966). Other problems are caused by pesticide manufacture which, through accidents and discharges, often leads to pollution of rivers, lakes and coastal areas, with loss of aquatic life. These problems are accentuated by many local accidents and abuses, excessive application, drift and careless disposal. Some of these same points apply to some other chemical pollutants, but because pesticides were designed as biocides, and are applied deliberately each year to large land areas, the problems they cause are ever present.

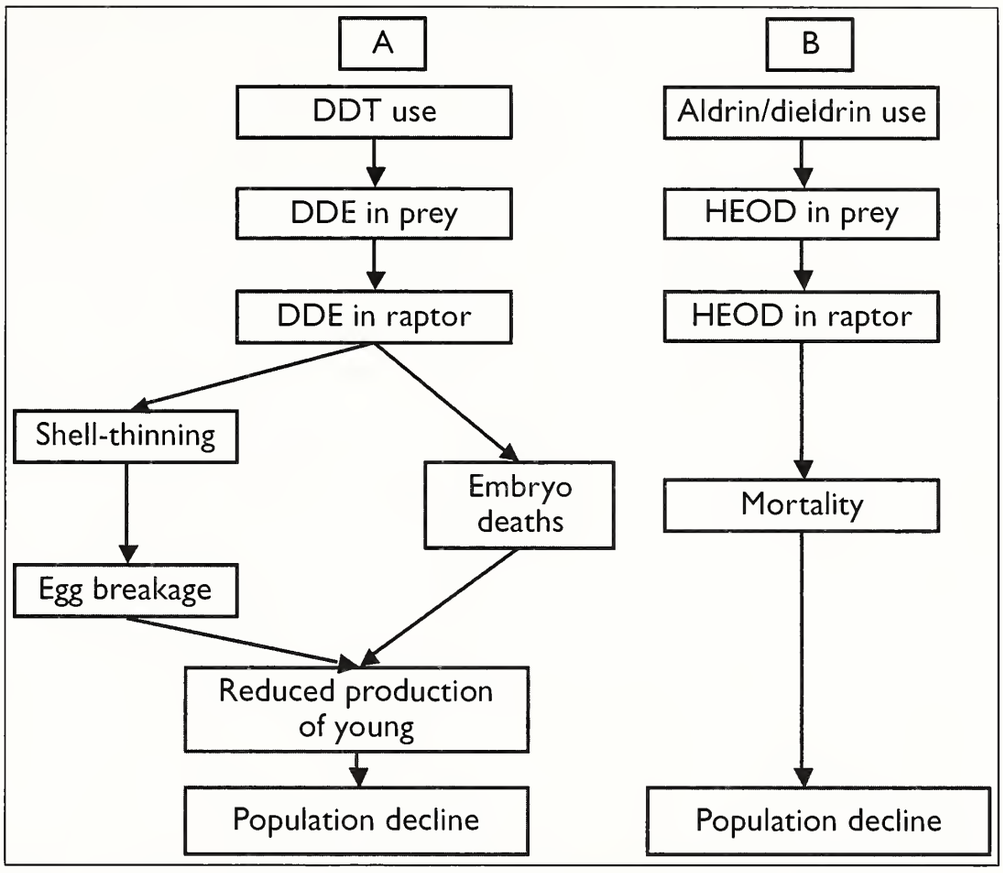


Fig. 1. Modes of action of DDE (from the insecticide DDT) and HEOD (from aldrin and dieldrin) on raptor populations. From Newton (1986).

Organochlorine pesticides and predatory birds

The different types of organochlorine compounds illustrate the two direct effects of pesticides on bird populations (fig. 1). As indicated above, DDT was first introduced into widespread agricultural use in the late 1940s and the cyclodienes after 1955. For a time they were widely used throughout the developed world, but during the 1970s and 1980s, they were banned progressively in one country after another as their environmental effects became increasingly apparent. They continue to be used without regulatory constraint mainly in some tropical and subtropical areas.

Three groups of birds were particularly affected by organochlorines: (1) raptors, especially bird- and fish-eating species such as the Peregrine Falcon *Falco peregrinus*, Sparrowhawk, Osprey *Pandion haliaetus* and White-tailed Eagle *Haliaeetus albicilla*; (2) various other fish-eating birds, such as cormorants and pelicans; and (3) seed-eating species, such as finches and buntings, doves, gamebirds, geese and cranes which, as described above, fed on newly sown seeds of cereals and other plants treated with organochlorines. It was this direct mortality, with thousands of seed-eating birds found dead and dying on newly sown fields, which first alerted ornithologists in Britain to the problems of organochlorine use.

In Britain and Ireland, population declines were most apparent in birds of prey

in the 1950s and 1960s, when Sparrowhawks, Peregrines and Merlins *F. columbarius* disappeared altogether from many regions, and became much rarer elsewhere. Marsh Harriers *Circus aeruginosus*, already fairly restricted in distribution, were eliminated totally, remaining absent as breeding birds in Britain for several years. Other raptors, such as Common Kestrels *F. tinnunculus*, declined sharply in the more arable parts of southeast England, where pesticide use was heaviest, but maintained their numbers elsewhere.

Among seabirds, the largest population effects of organochlorines were seen in pelicans, as noted above, and also in cormorants, but again mainly in places where factory effluent led to exceptionally high pollution. In Europe, spills of the pesticide dieldrin into the River Rhine in 1967 caused mass mortality of gulls and terns in the southern North Sea (Becker 1991). Tern populations were reduced to perilously low levels, from which they took decades to recover. In Britain, analyses showed that organochlorines occurred in the bodies and eggs of many seabird species examined in the 1960s–1990s, but usually at levels too low to have obvious effects.

Modes of action

DDT is not especially toxic to birds, and very high exposures (as in the early forest spraying in North America) are needed to kill birds outright. The main effects are on breeding (fig. 1). Once in the bird's body, most of the DDT is rapidly converted to a much more stable metabolite, DDE, which forms the bulk of the residue detected in bird eggs and carcases. At sub-lethal level, DDE reduces the availability of calcium carbonate during eggshell formation so that the eggs are thin-shelled and break when the birds tread or sit on them. Some thin-shelled eggs survive incubation, but the embryo may die from dehydration caused by excess water loss through the thinned shell. If the resulting reduction in the average breeding rate of individuals is sufficiently marked, it leads to population decline, because reproduction is no longer sufficient to offset normal levels of annual mortality. The effects of DDT/DDE on eggshells, which were initially deduced from field studies by Derek Ratcliffe (1967, 1970), quickly followed by studies in North America (Hickey & Anderson 1968), were subsequently confirmed by experiments on captive birds (Cooke 1973; Lincer 1975; Newton 1979; Risebrough 1986). All these effects were via the female, but DDT and its derivatives are also oestrogenic (mimicking the effects of the hormone oestrogen), and were found to reduce sperm production in domestic fowl (Albert 1962).

Other organochlorines, notably the cyclodienes (e.g. aldrin and dieldrin), are several hundred times more toxic to birds than DDT or DDE (Hudson *et al.* 1984). These chemicals act mainly by killing birds outright, increasing mortality above the natural level sufficiently to cause rapid population decline (fig. 1). Within the bird's body, aldrin is rapidly metabolised to dieldrin, which is often denoted as HEOD. There is no firm evidence that HEOD causes eggshell-thinning. During the period of peak cyclodiene usage in Britain

Mike Jones/FLPA

124. A clutch of normal Sparrowhawk eggs, Shropshire, May 1999. Under the influence of DDE-induced shell-thinning, the eggs were laid as normal, but often broke within a few days, apparently under the influence of normal incubation behaviour. If the eggs survived incubation, developing chicks often died, apparently as a result of excess water loss through a thinned shell, which usually also developed thin hairline cracks.

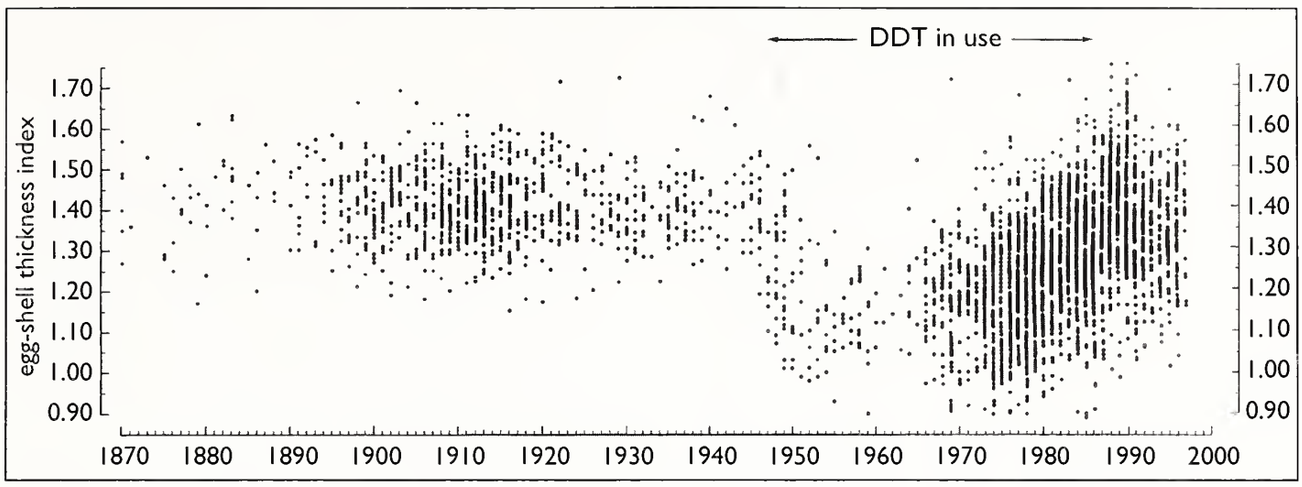
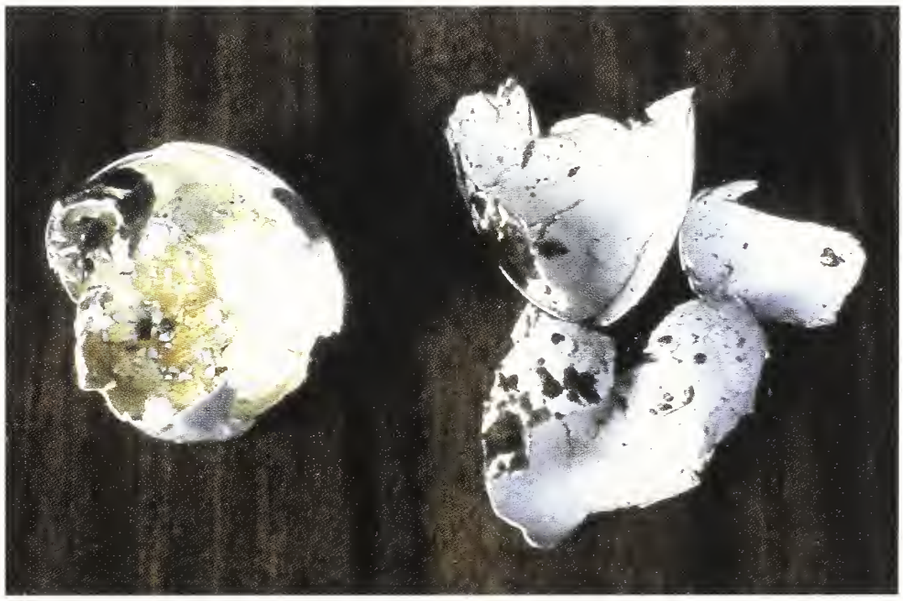


Fig. 2. Shell-thickness index of Eurasian Sparrowhawks *Accipiter nisus* in Britain, 1870–1997; the research programme came to an end in 1998. Shell-thinning became apparent very quickly from 1947, following the widespread introduction of DDT in agriculture. The problem improved from the 1970s, following progressive restrictions in the use of the chemical, which was banned altogether from 1986. Each dot represents the mean shell index of a clutch (or part-clutch), and more than 2,000 clutches are represented from all regions of Britain. Shell index was measured as shell weight (mg)/shell length x breadth (mm). Extended from Newton (1986).

in the late 1950s and early 1960s, widespread mortalities were recorded in seed-eating finches, pigeons and gamebirds, and these poisoned birds were easy pickings for predators and scavengers. In the same period, dieldrin was also used in a 'dip' to kill insect parasites on the skin and in the wool of sheep. It transpired that the dieldrin was also absorbed through the skin into the flesh of the sheep. Golden Eagles *Aquila chrysaetos* feeding on sheep carrion were found to be contaminated by dieldrin, which appeared in their eggs (Lockie *et al.* 1969), but it is not known to what extent it affected either the eagles or the many people in Britain who ate lamb and mutton at the time.

The massive declines in the numbers of some bird- and fish-eating raptors in Europe and North America in the 1960s were thus attributed to the combined action of DDE reducing the breeding rate and HEOD (from aldrin and dieldrin) increasing the mortality rate. The relative importance of these mechanisms of population decline seems to have differed between regions, depending on the relative quantities of the different chemicals used. In Britain and western Europe, deaths from HEOD were probably more important, but in much of North America reproductive failure from DDE seems to have been paramount (Newton 1986).

In Britain, the numbers of Peregrines and Sparrowhawks fell by more than 50% in the north and west of Britain, but the Peregrine disappeared altogether from the south and east, and the Sparrowhawk almost so, despite its much greater numbers (Newton & Haas 1984). This pattern of decline matched the



Ian Newton

125. In the years of extreme shell-thinning, from the 1950s to the 1970s, broken eggs like these were frequently found in Sparrowhawk nests or on plucking posts, to which the females often carried the shells. They did not last long, however, being eaten either by the hawks themselves or by other birds taking advantage of an easy source of calcium.

distribution of arable land, which was greater in southern and eastern districts, leading to greater pesticide use there. But it was the speed of the declines that shocked ornithologists. Both species went from abundant to scarce within three years following the introduction of aldrin and dieldrin in the late 1950s. This could only have happened with increased mortality. Carcases of these and other species were found in these years, and in some the cause of death was confirmed by chemical analyses.

Population recoveries

Owing to their environmental impacts, and contamination of the human food chain, the use of these chemicals was progressively reduced in Britain from the mid 1960s, but it was not until the mid 1980s that their use was effectively eliminated here (under EU influence). From the mid 1960s to the mid 1990s, shell thickness, breeding success, survival and population levels of the affected species largely recovered, enabling them to recolonise areas from which they had been extirpated. Peregrines and Sparrowhawks reoccupied almost all their former range by the mid 1990s (see figs. 2 & 3; Newton & Haas 1984 for Sparrowhawk and Crick & Ratcliffe 1995 for Peregrine). All these improvements were associated with a reduction in the residues of organochlorine chemicals in eggs and tissues (fig. 3). In Britain, the recovery of Sparrowhawk numbers in different regions followed the decline in HEOD residues in Sparrowhawk liver tissue to below 1 ppm geometric mean in wet weight (fig. 4).

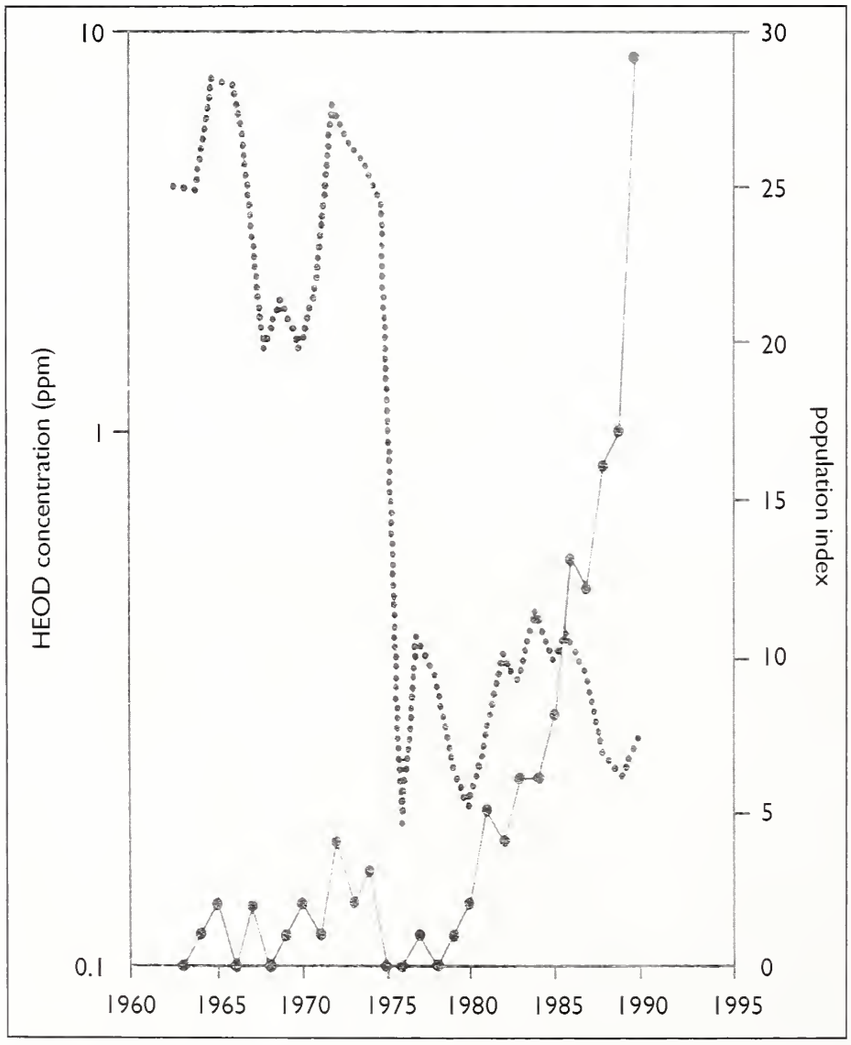


Fig. 3. Trend in geometric mean HEOD levels (dotted line) in the livers of Sparrowhawks found dead in east-central England in relation to an index of population level in the same area (continuous line) from 1963 to 1990. HEOD is the chemical residue derived from the insecticides aldrin and dieldrin and the population index is based on the number of carcases received for analysis. As aldrin and dieldrin were removed from use, HEOD residues in Sparrowhawk bodies declined, and numbers recovered. From Newton & Wyllie (1992).

Worldwide contamination of Peregrines

Worldwide environmental contamination with DDT was well reflected in the patterns of shell-thinning in Peregrines, which breed on all continents except Antarctica (fig. 5; Peakall & Kiff 1988). The greatest degree of shell-thinning (average 26%) was found in eastern parts of the USA, from which Peregrines disappeared altogether within 20 years of DDT coming into wide-scale use (Cade *et al.* 1988). Marked shell-thinning also occurred in Peregrines nesting across the arctic regions of Eurasia and North America (17–25% in different regions), reflecting the fact that these falcons and their prey migrated to wintering areas farther south, in areas of high DDT use. The smallest levels of shell-thinning occurred in falcon populations that were resident in areas with little or no DDT use, and where they fed on prey species that were also year-round residents. An example was the Peregrine population

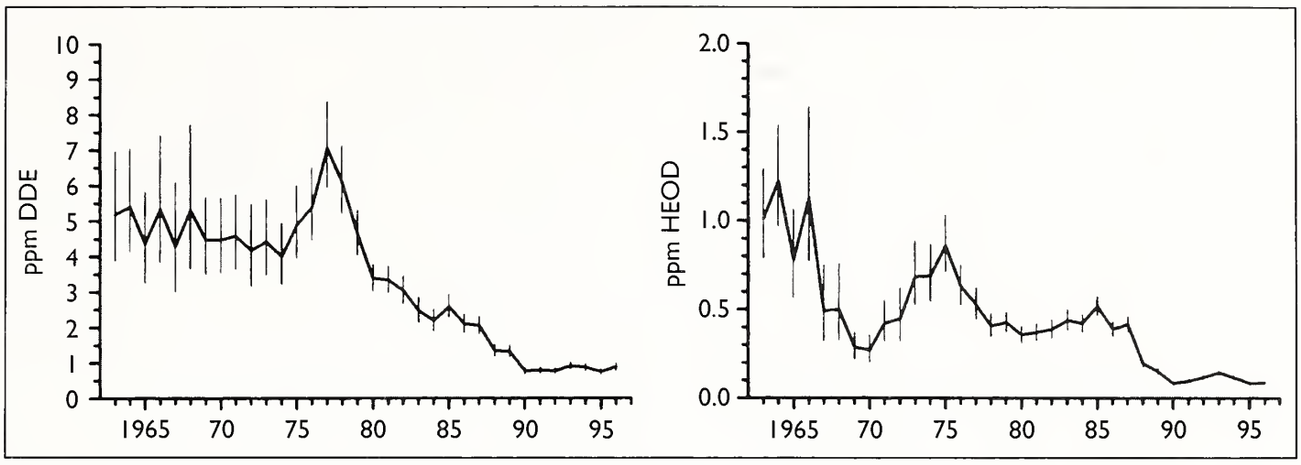


Fig. 4. Trends in the levels of DDE and HEOD in the livers of Sparrowhawks sampled over a 35-year period. DDE is derived from DDT, and HEOD from aldrin and dieldrin. The three-year moving geometric mean levels (with geometric standard errors) show a progressive decline over the period shown, following successive restrictions in the use of such pesticides. From Newton *et al.* (1998), based on analyses at Monks Wood Research Station.

of the Scottish Highlands, at that time dependent mainly on Red Grouse *Lagopus lagopus*. The falcons showed only 4% shell-thinning in the Scottish Highlands, compared with more than 19% in most of the rest of Britain (Ratcliffe 1980).

Comparing various Peregrine populations studied across the world, mean levels of DDE residues in eggs were highest in those populations showing the most shell-thinning. All populations with an average of less than 17% shell-thinning maintained their numbers, while all those with more than 17% declined, some to the point of extinction (fig. 5; Peakall & Kiff 1988). An average of 17% shell-thinning thus emerged as critical to population persistence, associated with an average of 15–20 ppm DDE in the wet weight of egg content. These were average figures applicable at the level of populations and did not apply rigidly to individual eggs. Approximately the same mean level of shell-thinning was also associated with population declines in other raptor species (Newton 1979). The fact that, in many Peregrine and other raptor populations, decline was more rapid than expected on DDT alone presumably reflected the fact that mortality was also increased to varying degrees by aldrin/dieldrin poisoning.

Species variations in sensitivity

Some kinds of birds proved more sensitive to DDT/DDE than others. For any given concentration of DDE in their eggs, raptors and pelicans showed the greatest degree of shell-thinning, and gulls and gallinaceous birds the least. Raptors and pelicans thus emerged as particularly vulnerable to DDE, partly because their position high up in food chains led them to accumulate large amounts, but

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126. Clutch of Peregrine eggs, Wales, April 2006. Peregrines often use old Common Raven *Corvus corax* nests on cliff ledges and, although they do no nest-building of their own, they often arrange local material around the eggs, as shown here. It was concern over unprecedented levels of egg breakage in Peregrine nests that led Derek Ratcliffe to examine the shells in collections, and discover the phenomenon of shell-thinning, which followed the widespread post-war introduction of DDT.

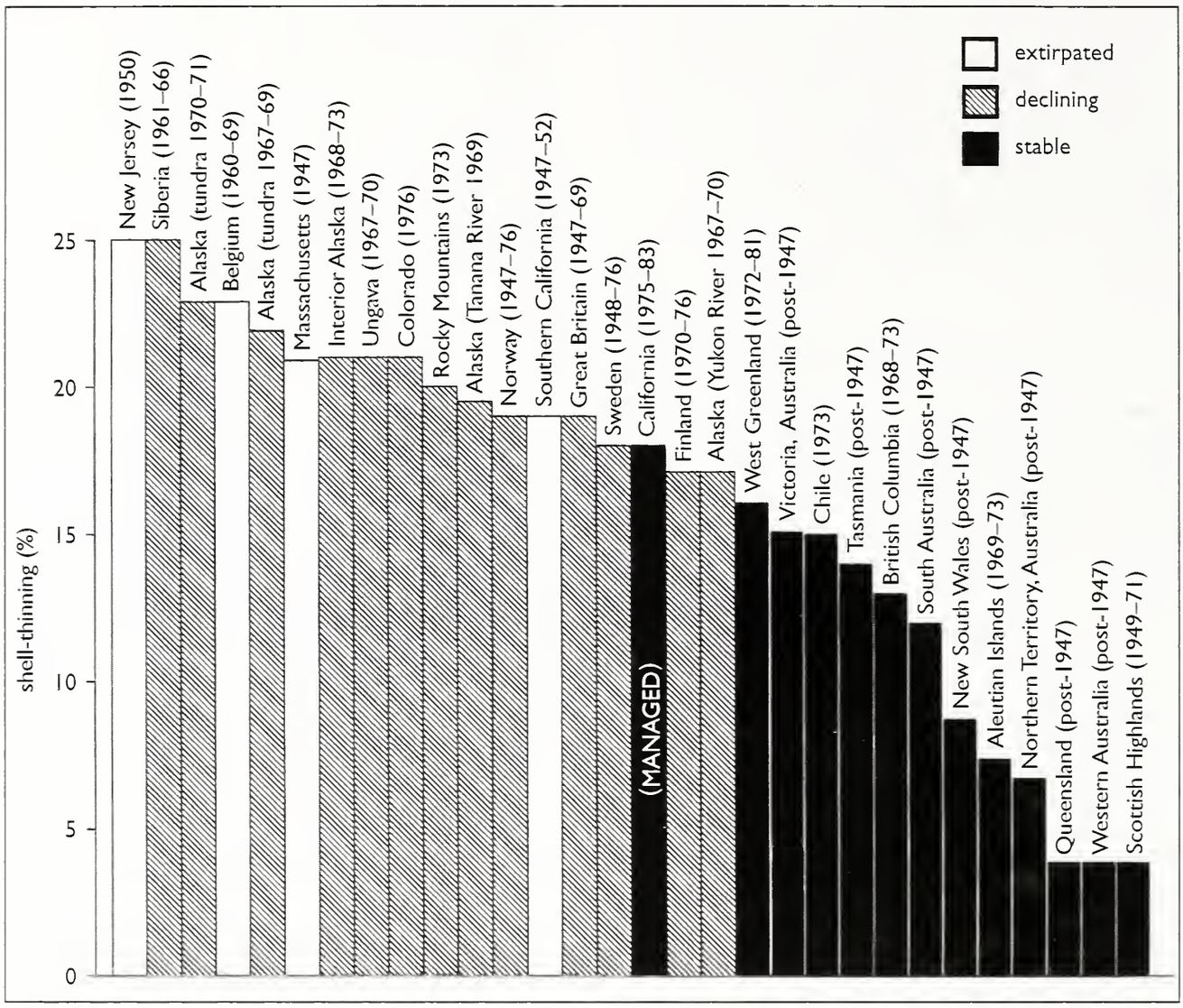

Fig. 5. Shell-thinning and population trend in Peregrine Falcons *Falco peregrinus* in different parts of the world. All populations showing more than 17% shell-thinning (associated with a mean level of 15–20 ppm DDE in fresh egg content) declined, some to the point of extinction. In the one exception (California, 1975–83), extra eggs and young were added by biologists to maintain numbers. From Peakall & Kiff (1988).

also because of their high physiological sensitivity (Newton 1979). The greatest degree of shell-thinning recorded in any species involved Brown Pelicans *Pelecanus occidentalis* in California, which were contaminated by the effluent from a DDT factory. On Anacapa Island, off Los Angeles, only two chicks resulted from 1,272 nesting attempts in 1969. Virtually all the eggs collapsed on laying, and the shells were on average 50% thinner than normal (Risebrough *et al.* 1971). This species was the most sensitive to DDE of all those studied, an average of 3 ppm in the content of fresh eggs being associated with nearly total breeding failure (Blus 1982). The European populations of pelicans could be similarly sensitive, but I know of no relevant information.

Another general finding was that, among raptors, species that ate mainly birds declined more rapidly and to a greater extent than those that ate mainly mammals. Years later, an explanation for this difference emerged: birds are less able to metabolise and excrete organochlorines than mammals, so birds tend to accumulate these chemicals to a greater level in their bodies (Walker 1983). Hence, bird-eating raptors were much more likely to accumulate critical levels from their prey than mammal-eaters, such as Kestrels, and thereby suffered greater mortality and shell-thinning. The bird-feeders also top longer food chains than the mammal-feeders do, giving more opportunities for residues to concentrate. The relationship between vulnerability and feeding habits was shown repeatedly in many studies in different regions (Newton 1979), but perhaps most vividly in a forest area in the northwestern USA. This study involved a single experi-

mental spraying of DDT (at 0.8 kg per ha) conducted in 1974, two years after the chemical had been banned from general use in the USA. In insectivorous American Kestrels *Falco sparverius*, residues in blood plasma peaked one year after the spraying, with a mean value of 0.78 ppm. In comparison, residues in three species of *Accipiter*, ranked in ascending order of proportion of birds in the diet, were 2.6 times higher in Northern Goshawk *A. gentilis*, 3.8 times higher in Cooper's Hawk *A. cooperii* and 6.1 times higher in Sharp-shinned Hawk *A. striatus*. The last species had almost disappeared from the area two years after the spraying (Henny 1977). Sharp-shinned Hawk is the ecological equivalent of the Eurasian Sparrowhawk.

Food-chain effects

Because of their high fat-solubility and persistence, organochlorines readily pass up food chains. Increasing concentrations at successive trophic levels were evident in many (but not all) studies in which different kinds of organisms from the same place were examined (Newton 1979). Within areas, concentrations were low in herbivorous animals (first trophic level), higher in their predators (second trophic level), and higher still in their predators (third trophic level) and so on up the food chain. It is not trophic level as such that is important, but the rates of exposure (or intake), which, because of accumulation, tend to be highest in top carnivores. In addition, rates of accumulation were often greater in aquatic than in terrestrial systems because many aquatic animals absorb organochlorines through their gills as well as from their food. Fish rapidly pick up fat-soluble pollutants from water, and concentration factors of 1,000 or 10,000 times between water and fish were not uncommon (Stickel 1975).

Chemical persistence

The problems caused by organochlorines, as already indicated, result partly from their extreme persistence, a quality that adds to their effectiveness as pesticides. The longevity of chemicals in any medium is usually measured by their 'half-life', the period taken for the concentration to fall by half, given no further exposure. The half-life of DDE in soils has been variously calculated

John Hawkins/FLPA

127. Female Peregrine at nest, Wales, June 2005. From the 1950s onwards, DDT residues became so widespread in the environment that Peregrine populations throughout the world showed some degree of shell-thinning, some sufficiently to cause the extinction of regional populations. In some populations, as in Britain, additional mortality occurred through aldrin/dieldrin poisoning, adding to the shell-thinning problem created by DDT.

at between 12 years in some cultivated soils and 57 years in some uncultivated soils (Cooke & Stringer 1982; Buck *et al.* 1983). So even after the use of DDT is stopped, soil-dwelling organisms can remain a source of residue for some bird species for years to come. HEOD is much less persistent, with an estimated half-life in soil of 2.5 years, but it is probably much longer than this in some areas (Brown 1978). In the tropics, however, the turnover of DDT and other organochlorines may be faster than in temperate areas, because higher temperatures and light values favour faster degradation and evaporation to the atmosphere (Berg 1995).

Organochlorines can disappear from animal bodies much more rapidly than from soil, but again DDE lasts longer than HEOD. In pigeons, the half-life of DDE has been measured at 240 days, compared with 47 days for HEOD (Walker 1983). These rates vary between species, and with the condition of the individual. However, the persistence of organochlorines in the body means that their effects can become manifest weeks or months after acquisition. Death is most likely to occur at times when body fat is metabolised, releasing organochlorines into circulation and enabling them to reach lethal levels in the nervous system (Bernard 1966). Such delayed mortality occurred among female Eiders *Somateria mollissima* nesting on the Dutch Wadden Sea, where nest numbers declined by 77% between 1960 and 1968, mainly through deaths of incubating females (Swennen 1972). The birds became contaminated via their food (mussels) from organochlorines discharged into the River Rhine, but died mainly during incubation. At this time female Eiders do not normally feed, but depend on their body fat. Discharges to the river were stopped in 1965, and within three years the Eider population began to recover. Similarly in North America, wintering Snow Geese *Chen caerulescens* initially survived winter contamination with organochlorines, but succumbed during northward migration when fat mobilisation freed the accumulated residues. The geese were exposed in Texas but died in Missouri, more than 1,000 km to the north (Babcock & Flickinger 1977).

Michael Durham/FLPA

128. Male Merlin with prey, Dumfries & Galloway, June 2006. As a raptor that feeds primarily on birds, the Merlin suffered heavily from organochlorine pesticides, showing marked eggshell-thinning and population decline, especially in the more southern parts of its British range. In the upland breeding areas, DDT and dieldrin were used for a time as sheep dips, but probably most contamination came from lowland wintering areas, from avian prey species which were eaten there or which carried residues in their bodies to their upland breeding areas.

More recent problems

While the organochlorines affected bird populations through having direct effects on the reproduction and

mortality of individuals, most other pesticides have affected birds indirectly, through destroying the organisms that form their food. This is the main way in which modern pesticides affect bird populations. It is a different aspect that takes us outside the scope of this paper, but the problems are well described in the recent monograph on partridges by Dick Potts (2012). The word 'pesticide' is a general term that includes both animal-killing and plant-killing chemicals. Most insecticides kill many kinds of invertebrates; some fungicides kill some invertebrates as well as removing the fungal food supplies of others; while herbicides may remove the food plants of yet other insects as well as the seeds eaten by granivorous birds. As long as pesticides continue to be used at their present scale, it is unlikely that bird food supplies on farmland will ever reach the levels prevailing in pre-pesticide days.

Apart from the organochlorines, the main types of pesticides applied against animal pests since the 1950s include the organophosphates, carbamates, pyrethroids and most recently the neonicotinoids. These latest pesticides are chemically similar to nicotine, the natural insecticide found in tobacco leaves. They were developed as neurotoxins during the 1990s but have come into widespread use only in more recent years. It is too soon to assess their full effects on biodiversity, but the omens look bad, since they are extremely toxic to a wide range of insects. They are also systemic, being taken into plants and killing any insects which suck the sap or eat the leaves. Particular concerns have been expressed over their potential effects on bees. They have been found in nectar and pollen, but only at extremely low levels. They are known to affect bee behaviour, but as yet the evidence for colony-level effects is still open to debate. They have nevertheless been banned from use in several countries, but not from Britain and Ireland. They are not cumulative in the same way as the organochlorines, and are less persistent, but they can last more than a month in bright sunlight, and up to several years in darker situations, washing from soil into watercourses. They are not especially toxic to mammals and probably not to birds so, as with many other pesticides, their main impacts are likely to result from their effects on lower organisms that

John Hawkins/FLPA

129. Female Peregrine (and recently fledged young) with plucked pigeon *Columba livia*, Wales, May 1991. Feral and racing pigeons form a major part of the diet of Peregrines, and in the late 1950s and 1960s were a major source of aldrin/dieldrin residues, at a time when these pesticides were used for dressing grain intended for sowing.

Roger Wilmshurst/FLPA

130. Female Sparrowhawk at nest with young, Sussex, June 1980. Most Sparrowhawk broods normally contain 3–6 young, but during the years of extreme shell-thinning in the 1950s–1970s, many broods were smaller, owing to egg breakage.

form the food of birds.

In addition to the general depression of the food supplies of birds on farmland, three other chemically induced problems have developed in recent decades, as discussed below.

In parts of Britain, mainly on game-rearing estates, raptors are often killed by poison baits, used deliberately against predators. Typically, gamekeepers apply the poison to carcases of rabbits or other animals, which are then laid out for raptors and other scavengers to find and eat. Habitual carrion feeders, such as Golden Eagles, Common Buzzards *Buteo buteo* and Red Kites *Milvus milvus*, are especially vulnerable, but almost any raptor species can be killed in this way, as can corvids, gulls and other scavengers. Over the years, various poisons have been used for this purpose, including strychnine, the narcotic alpha-chloralose, the organophosphate phosdrin (or mevinphos), and various other pesticides, the current favourite being the carbamate compound carbofuran. Some gamekeepers do not appreciate the level of toxicity of some of the undiluted pesticides they handle. One keeper in Scotland was convicted in 2011 for possessing 10 kg of carbofuran. This was said to be sufficient, if fed as individual doses, to kill every raptor in Britain. Such illegal use of poisons is almost certainly the major factor restricting the numbers and distributions of at least Red Kites and Golden Eagles in Britain, but it is also responsible for killing large numbers of Common Buzzards, Goshawks and others every year (Smart *et al.* 2010; Whitfield *et al.* 2003, 2007; RSPB 2011).

Over much of Britain, as in many other regions, rats and mice have become resistant to the long-established anti-coagulant rodenticide warfarin. This chemical has therefore been largely replaced by newer compounds, such as difenacoum, bromadiolone, brodifacoum and flocoumafen. These 'second-generation' rodenticides act in the same way as warfarin, but are more toxic and more persistent, giving rise to secondary poisoning in rodent predators (Newton & Wyllie 2002). In

Britain, Barn Owls *Tyto alba* killed by second-generation rodenticides have been found frequently since the 1980s, many showing the typical symptoms of haemorrhaging. Among 836 Barn Owl carcases from Britain examined over the period 1983–98, rodenticide residues were found in 28% overall, but the proportion increased over the years from 5% in 1983–84 to 40% in 1997–98 as these compounds came into wider use. Only 7% of the contaminated owls (or 2% of the overall sample) were judged on post-mortem symptoms and residue levels to have died from rodenticide poisoning. This mortality therefore seemed insufficient to have caused widespread population decline of Barn Owls in Britain, in contrast to some other parts of the world (Duckett 1984). Deaths from rodenticide poisoning have been reported from other rodent-eating species in Britain and Ireland, including other owls, Kestrels and Red Kites. Their use around farms and Pheasant *Phasianus colchicus* pens may have slowed the expansion of Red Kites in Britain. The more potent of these chemicals are still restricted to use in buildings or sewers, but if they were passed for outside use in Britain, for which there is continuing pressure, they could kill much greater numbers of Barn Owls, Red Kites and other species. There is already considerable non-compliance.

Environmental problems resulting from use of veterinary products

Some veterinary products also cause problems for wildlife. Examples from Britain and Ireland include the anthelmintics which are fed to farm animals to destroy or expel parasitic worms in the gut. The most widely used has been ivermectin, employed with similar products since the 1980s (Wall & Strong 1987). These persistent chemicals are excreted over a period of weeks in the faeces, and kill most of the animals that would normally feed on the dung, together with others in the soil below. Dung-flies and dung beetles are major casualties, and have now become scarce over much of Britain. Adverse effects of ivermectin on the decomposing fauna of cattle dung, especially Diptera, lasted up to 30 days post treatment (Madsen *et al.* 1990). These insects had previously provided a food source for birds, notably wagtails and corvids, but this source is now much reduced on British farmland. One incidental consequence is that cow-pats, which in the past disappeared within weeks, can now remain in the fields for months on end. Replacement compounds have similar effects.

Anthelmintics have also become a standard part of Red Grouse management, usually fed to the birds on 'medicated grit'. The aim is to rid the birds of the strongyle parasites which have been associated with periodic crashes in grouse numbers, giving

Hugh Clark/FLPA

131. Male Common Kestrel at nest with young, Sussex, July 2012. The Kestrel suffered marked mortality in areas of heavy aldrin and dieldrin use as seed-dressings, but showed relatively little shell-thinning. It declined mainly in intensive arable districts, but generally maintained its numbers elsewhere.

Robert Canis/FLPA

132. Barn Owl hunting rough grassland on the Isle of Sheppey, Kent, January 2012. The Barn Owl is the commonest victim of poisoning by second-generation anti-coagulant rodenticides. These chemicals are persistent, and pass directly from rodent to owl. Despite frequent deaths, no major impact on owl population levels has yet been detected.

rise to regular cycles in abundance. If grouse numbers can thereby be maintained at a high level every year, driven shooting can be undertaken every year, and the general profitability of the enterprise is raised. However, I know of no study of the impact of these drugs on other moorland animals.

Elsewhere, other veterinary products have had more direct effects on birds. By far the most significant are the non-steroidal anti-inflammatory drugs (NSAIDS), which are frequently fed to sick cattle, especially in the Indian subcontinent. Being sacred animals to Hindus, cattle are often left to die natural deaths, when they become available to vultures, which can thereby acquire the drug, and die within days. The most common symptom seen in dead vultures is a deposit of white uric acid crystals among the viscera, a condition known as visceral gout. The large *Gyps* vultures are especially susceptible, suffering huge mortality, the population of the subcontinent having been reduced by more than 99% over a 15-year period. At least three species were affected, and are now at perilously low levels, namely the White-backed Vulture *Gyps bengalensis*, Slender-billed Vulture *G. tenuirostris* and Long-billed Vulture *G. indicus* (Pain *et al.* 2008; see also *Brit. Birds* 106: 58–59). The main drug responsible was diclofenac (sold in Britain under the name Voltarol), but other similar drugs, such as ketoprofen, have also been implicated. Occasional individuals of other raptors have been found dead from the same cause. These drugs are used in Europe but not so widely, and could potentially kill vultures in the south of the continent, but I know of no proven cases. The birds seem much less susceptible to a similar drug meloxicam, which hopefully will gradually replace the lethal ones, allowing vultures to recover. There are several other, less widely used chemicals in this group, however, and it remains to be seen which ones are toxic to raptors and which are not.

Discussion

Pesticides were originally developed 'in good faith' to enhance crop production, and in ignorance of their subsequent environmental impacts. It is an open question whether the rapidly expanding human population could have been supported at its current level without them. Nevertheless, widespread monitoring of bird populations, followed by appropriate research and experiment, has played a crucial role in highlighting some of the long-term consequences of pesticide use and in confirming pesticides as a major factor in reducing not just pest numbers but the entire spectrum of biodiversity in farmed landscapes (and beyond, in the case of organochlorines). Moreover, pesticides have had a far greater impact than the direct and indirect effects on birds discussed above, for they are central to the kinds of farming now practised throughout the lowlands of Britain and Ireland (Shrubb 2003). In particular, the use of herbicides and other chemicals has enabled farmers to do away with crop rotation. The same types of crop can now be grown year after year on the same land without the risk of weeds, pests or diseases getting out of hand. Without an ability to control competitive weeds, insect pests and disease, more traditional forms of mixed farming would have had to be retained, and with them much greater diversity in the plants and animals of farmland, of which bird populations are just a part.

Looking back, the organochlorine episode had a big impact on the perception of pesticides by the general public. It highlighted for the first time the potentially severe environmental consequences that could result from the widespread use of chemicals, hitherto regarded by most people as wholly beneficial. The effects of DDT were not apparent immediately, but only after several years, and could not have been predicted beforehand by the testing procedures in operation at the time. They provided the first example (after nuclear fallout) of a genuine and well-documented global pollution problem, on a scale that we now take for granted. They led to wide debate on the value of circumstantial versus experimental evidence, for at first the case against the organochlorines rested entirely on correlations, a point exploited to the full by the agricultural and agrochemical lobbies. This in turn led to the suggestion, perhaps for the first time by non-ecologists, that the

Mark Thomas, RSPB

133. Four Northern Goshawks and a Common Buzzard (centre) found dead in a Devon wood in 2011, all confirmed as poisoned by a cocktail of illegally used poisons, including carbofuran.

precautionary principle should be applied, and that no pesticide should be widely used until its potential effects were understood. This appreciation led to an overhaul in the procedures required for testing pesticides before they were cleared for general use.

In the years since the organochlorines, each major new group of chemicals has had some substantial impact on the natural world, often unpredicted despite aspects such as toxicity and persistence being assessed beforehand. It is clearly difficult to predict all the environmental impacts that different chemicals might have, and which bird species are likely to be most vulnerable. Who could have guessed, for example, that one group of raptors could have been so susceptible to one particular group of drugs, widely used on domestic animals and people? However thoroughly pesticides or drugs are tested beforehand on a limited number of organisms, we cannot necessarily predict their effects on others unrelated to the test species. Nor can we be sure how much predicted collateral damage regulating authorities will let through at different times as 'acceptable risk'. Only careful monitoring and study of wild populations can reveal such effects, as is the case now with the neonicotinoids. Encouragingly, though, the events of recent decades have confirmed that, if remedial action is taken and if remnant populations still persist, such populations can and do respond by recovery. In other words, reducing the use of the offending chemicals can rapidly bring measurable conservation benefits. The illicit use of pesticides for unintended purposes, as by game managers, is of course a different matter. The needs here are for much stronger enforcement of existing legislation and much heavier penalties, together with vicarious liability (making landowners and game managers responsible for the actions of their keepers). This is now the case in Scottish law, but it remains to be tested in the courts. And the poisoned baits have still to be discovered and reported.

Stanley Cramp, who played such a crucial initial role and lived through the whole of the organochlorine era in Britain, would no doubt have been pleased with the eventual withdrawal of these chemicals, and the recovery of bird populations that followed. But like other conservationists, he would probably have been dismayed at the other pesticide-related, drug-related and other pollutant problems that have arisen in more recent years.

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Avian drop-catch play: a review

Stephen Hewitt

Alan Harris

Abstract Repeated dropping and catching of non-food objects by birds in flight has been recorded in over 25 species, of which raptors, gulls and corvids are the most well-represented groups. Drop-catching of prey objects has also been recorded. Anecdotal reports and quantitative studies are reviewed here. The evidence suggests that, for most species and in most situations, the behaviour is play. It may also serve the adaptive functions of physical training and practice of motor skills, among others. A few reports indicate that drop-catching might sometimes be used in courtship display, but more evidence is needed. In hirundines, the behaviour may differ from that in larger species in motivation and function.

'Play is repeated, incompletely functional behaviour differing from more serious versions structurally, contextually or ontogenetically, and initiated voluntarily when the animal is in a relaxed or low-stress setting.' (Burghardt 2005)

Animal play behaviour is a fascinating subject and entertaining to observe, yet avian play has received limited attention or recognition from ornithologists (Fagen 1981). Many birdwatchers might be surprised at the extent to which birds do indeed play and at the wealth of published information on the subject. For example, well-observed instances have been regular in the Notes section of *BB* for decades. This paper presents a review of one of the most obvious of these play activities, drop-catching.

Drop-catching occurs when a bird in flight repeatedly releases and recaptures an object (Ficken 1977). The object is most often a non-food item, is frequently caught after a dive and is usually abandoned afterwards. The behaviour occurs regularly alongside other types of object manipulation such as dropping an item to the surface and retrieving it, here termed 'drop-retrieval'. In

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many species, drop-catching is clearly related to foraging activity, whereby birds drop food items such as nuts or shellfish onto hard surfaces in order to break them open. It is also related to kleptoparasitism. It can be performed by birds in isolation, by individuals in groups or simultaneously by many birds (Denny 1950; Hayman 1953; Humphreys 1964; King 1969; Coomber 1977; Brackbill 1978; Beck 1982; Gamble & Cristol 2002).

Probably because of its similarity to object play in humans and other mammals, avian drop-catching has long been considered play behaviour. An admirably frank early observer described a series of drop-catches by a Black-headed Gull *Chroicocephalus ridibundus* and concluded: 'In any case the whole thing was quite obviously play' (Hervey 1951). The few quantitative studies of drop-catching have also concluded that it is play (Bildstein 1980; Beck 1982; Gamble & Cristol 2002).

As well as (presumably) being enjoyable for the birds involved, drop-catching can captivate as a spectator sport. It is easy to become engrossed in the bird's behaviour. Indeed, on a number of occasions this writer has found himself urging birds on to make catches after they have performed ever more ambitious drops and dives!

Drop-catch behaviour – the bird families involved

Frigatebirds

Great Frigatebirds *Fregata minor* playfully pick up and drop non-food objects while juvenile Ascension Frigatebirds *F. aquila* drop seaweed and feathers in flight which are then caught and passed on by conspecifics (Stonehouse & Stonehouse 1963; Thompson 1964, in Ficken 1977).

Raptors

Object play is common in raptors and a wide range of food and non-food objects are drop-caught (table 1). In one notable instance, Coomber (1977) observed an immature Golden Eagle *Aquila chrysaetos* dropping and catching a stick at least 17 times in around ten minutes.

Perhaps more than other groups, raptors primarily use their feet (talons) for carrying and catching objects, although the bill is sometimes used. There may be extensive manipulation of objects prior to, during, and after drop-catch sequences. In flight, Common Buzzards *Buteo buteo* will rapidly switch a stick from one foot to the other. On the ground they pounce on small objects, toss them into the air and repeatedly jump

Joe Devlin

Joe Devlin

134 & 135. Juvenile Peregrine Falcon *Falco peregrinus* drop-catching a dead bird at McCourt's Lake, Co. Armagh, September 2012. The Peregrine spent some time in flight eating the (unidentified) prey item; then, when there was not much left, it performed two successful drop-catches. Like the crow in plates 138–141, it made an unsuccessful third drop-catch and then abandoned the object.

up and down. Prairie Falcons *Falco mexicanus*, Northern Harriers *Circus cyaneus hudsonius* and Golden Eagles behave similarly. Such evocative descriptions are remarkably similar to object play in carnivorous mammals (Munro 1954; Coomber 1977; Bildstein 1980; Paull 1981; Prytherch 2009).

Both adults and immatures will perform this behaviour and it is common in juveniles (Munro 1954; Weir & Picozzi 1975; Coomber 1977; Bildstein 1980; Prytherch 2009). While a number of studies suggest that males play more frequently (e.g. Kitowski 2005), Bildstein (1980) noted more instances of play in adult female than in adult male Northern Harriers.

Interesting variations may involve the active training of offspring, such as Montagu's Harriers *C. pygargus* simulating aerial food passes with non-food objects. Adult females and immatures perform these simulated passes, despite never or rarely conducting functional food passes. Adult Common Kestrels *F. tinnunculus* will drop sticks and sheep's wool for fledglings to catch (Shrubb 1993; Pandolfi 1996). Prytherch (2009) noted that juvenile Common Buzzards will sometimes intercept an object dropped by a conspecific.

Other delightful observations include Red Kites *Milvus milvus* throwing a small object to each other, using a spinning aerial technique 'like a discus thrower' (Ferguson 2010), although Red Kites will also drop-catch in more typical manner. Notably, five Red Kites playing with sheep droppings in Ulster were all immatures (Adam McClure pers. obs.). Finally, and while not drop-catching per se, an immature White-tailed Eagle *Haliaeetus albicilla* has been photographed repeatedly gathering up lumps of snow in its talons, rising into the air and launching them (Scott 2010). A snowballing White-tailed Eagle must be a remarkable sight!

Raptors have been recorded drop-catching from August to March inclusive and the behaviour is regular outside of breeding territories (Munro 1954; Weir & Picozzi 1975; Bildstein 1980).

Gulls and terns

Drop-catching and related play behaviours are common in a number of gull species (table 2). As expected, gulls pick up, manipulate and catch objects only in their bills. They are among the most antic of groups, with drop-catches repeated up to 30 times in succession and often interspersed with drop-retrieval, object manipulation and aerial chasing. Separate gull species may drop-catch

Table 1. Drop-catching raptors.

Species	Objects involved	Source
Red Kite *Milvus milvus*	Unidentified object, leaves, sticks, sheep droppings	Ferguson (2010); Robert Straughan pers. comm.; Adam McClure pers. obs.
White-tailed Eagle *Haliaeetus albicilla*	Snow (only dropped, no records of drop-catching)	Scott (2010)
Lammergeier *Gypaetus barbatus*	Bones?	Huxley & Nicholson (1963), in Fagen (1981)
Marsh Harrier *Circus aeruginosus*	Prey item (lark)	Armstrong (1943)
Northern Harrier *Circus cyaneus hudsonius*	Corn cobs	Bildstein (1980)
Montagu's Harrier *Circus pygargus*	Sticks, grass	Pandolfi (1996)
Common Buzzard *Buteo buteo*	Sticks, prey items, cones, twigs, dry cow-pats	Weir & Picozzi (1975); Paull (1981); Prytherch (2009); SH pers. obs.
Golden Eagle *Aquila chrysaetos*	Sticks	Coomber (1977)
Common Kestrel *Falco tinnunculus*	Feathers, sticks, sheep's wool	Shrubb (1993)
Prairie Falcon *Falco mexicanus*	Dry cow-pats	Munro (1954)
Peregrine Falcon *Falco peregrinus*	Prey items (birds)	Armstrong (1943); Joseph Devlin pers. obs.

Carl Jackson

136. Second-winter Ring-billed Gull *Larus delawarensis* drop-catching a stick, Huntington Beach, California, USA, January 2011.

simultaneously and interspecific chasing sometimes occurs. Although it can be performed by single birds, in group bouts the behaviour is often contagious. The activity is particularly common over water (Humphreys 1964; Warden 1982; Terry 1990; Hewitt 2011).

The most complete quantitative studies of drop-catching in gulls are by Gamble & Cristol (2002) and Beck (1982). At a site in Virginia, USA, where American Herring Gulls *Larus smithsonianus* gathered to break clams, Gamble & Cristol (2002) found that drop-catching involved mostly non-food objects, was performed more often by juveniles and was performed more often over soft substrates. Any clams that were drop-caught were significantly less likely to be eaten. Notably, gulls of all ages drop-caught, despite also performing fully functional foraging drops. Perhaps strangely, considering the often social nature of the behaviour in gulls, it was found that instances of drop-catching decreased as the number of conspecifics in a bird's immediate vicinity increased. The authors tested their data against three hypotheses: the behaviour is play; it exposes nearby kleptoparasites; or it repositions clams before foraging drops. Seven of the eight predictors of the play hypothesis were met while few of the kleptoparasitic or repositioning predictors were. Beck (1982) also concluded that drop-catching is a form of play but considered it as a subcategory of 'play-dropping', which includes drop-retrieval. It was regular in both juvenile American Herring and immature Great Black-backed Gulls *L. marinus*.

Both studies found drop-catching to be more common in mild weather. This corresponds with Burghardt's (2005) fifth criteria for play – that it should occur in a relaxed or comfortable situation. Interestingly, the authors differed on why the behaviour occurred more often in windy conditions. Beck suggested that this helps physical training while Gamble & Cristol believed it might reduce flight costs. Alternatively, Burghardt suggested that in high winds the gulls 'might be testing their limits or challenging themselves'. Hayman (1953) described Black-headed and Common Gulls *L. canus* drop-catching leaves in mild and windy weather, while Wheeler (1943) observed an immature Pacific Gull *L. pacificus* drop-catching in strong winds.

Fred Wasmer

137. First-winter Ring-billed Gulls *Larus delawarensis* drop-catching items of flotsam at Lauderdale-by-the-Sea, Florida, USA, January 2008.

During 18 visits to a Staffordshire mere, Hewitt (2011) noted drop-catching by gulls only on the three days that fishing boats were absent. This might be further evidence that a relaxed environment is important. Rain, however, does not seem to discourage the activity (Warden 1982; pers. obs.). The behaviour has been recorded in gulls in every month of the year except July (Hervey 1951; Humphreys 1964; Beck 1982; Gamble & Cristol 2002;

Table 2. Drop-catching gulls and terns.

Species	Objects involved	Source
Black-headed Gull *Chroicocephalus ridibundus*	Mussels?, leaves, weed, twigs, bits of reed	Hervey (1951); Hayman (1953); Hewitt (2011); SH pers. obs.
Pacific Gull *Larus pacificus*	Mussels	Wheeler (1943)
Ring-billed Gull *Larus delawarensis*	Leaves, sticks, shellfish, organic flotsam, human detritus	Brackbill (1978) plus records online [1]
Common Gull *Larus canus*	Leaves, unidentified non-food objects, bits of reed *Phragmites*, sticks	Hayman (1953); Warden (1982); Terry (1990); SH pers. obs.
Lesser Black-backed Gull *Larus fuscus*	Sticks, weed, leaves	Humphreys (1964); Hewitt (2011)
American Herring Gull *Larus smithsonianus*	Bark, sticks, weed, shell fragments, human detritus, clams	Beck (1982); Gamble & Cristol (2002)
Glaucous-winged Gull *Larus glaucescens*	Stones	Balcombe (2007)
Herring Gull *Larus argentatus*	Sticks, weed, leaves	Nisbet (1952); Hewitt (2011)
Great Black-backed Gull *Larus marinus*	Bark, sticks, weed, shell fragments, human detritus	Beck (1982)
Caspian Tern *Hydroprogne caspia*	Mussels	King (1981)
Sandwich Tern *Sterna sandvicensis*	Fish	Hollom (1955)
Common Tern *Sterna hirundo*	Unidentified object, crab	Powell (1955); King (1970)

[1] http://fredwasmer.com/drop_catch_behavior_ring_billed_gull_florida.htm
http://www.flickr.com/photos/8425606@N04/5404342213
http://jrscience.wcp.muohio.edu/birds/ohio_birds/Ring-Billed_Gull_Playing_C.html

http://jrscience.wcp.muohio.edu/birds/ohio_birds/Ring-Billed_Gull_Playing_C.html; pers. obs.), which suggests it occurs year-round.

In terns, drop-catching seems similar to that in gulls but there are fewer recorded accounts. Hollom (1955) observed a Sandwich Tern *Sterna sandvicensis* dropping and catching an object up to ten times, including a few drop-retrievals. It is notable that two of the three recorded observations have involved pairs during the breeding season; King (1981) speculated that the behaviour was part of pre-nuptial display.

Swifts

Mercer (1990) reported an Alpine Swift *Apus melba* dropping and catching what was probably a piece of white paper three times. Adult African Black Swifts *A. barbatus* have been recorded repeatedly dropping and catching a feather. The birds were probably already nesting, were not seen to bring the feather to a nest and the loose association between them did not suggest display (Collins 1999; C. Collins pers. comm.). Wright & Wright (2012) observed a group of Common *A. apus* and one Alpine Swift chasing a Common Swift that was carrying a small plastic bag in its bill. The bag was dropped and recaught, but perhaps not by the same bird.

These reports are highly suggestive of play as performed by the larger species but are also reminiscent of 'feather competition' in hirundines, the motivation for which is perhaps less clear (see below).

Corvids

Corvids are recognised as among the most intelligent of all animals. They indulge in several kinds of probable play including aerial acrobatics, sliding down inclines, hanging upside down and manipulating objects (Ratcliffe 1997; Heinrich & Smolker 1998). Drop-catching has been recorded in a number of corvid species (table 3).

There are no references to corvids drop-catching simultaneously but Common Ravens *Corvus corax* and Carrion Crows *C. corone* will drop items for them to be caught by conspecifics (Heinrich 1999; www.flickr.com/photos/50814175@N05/6297725989). In accordance with their cognitive abilities and playful nature, corvids are accomplished drop-catchers. Observed sequences in a Hooded Crow *C. cornix* were repeated 'many dozens of times at heights of about 200 feet, letting the object fall for 40 feet or more before retrieving' (King 1969). Both bill and feet are used for catching and carrying, and a favoured activity appears to be transference of an object from bill to feet between drops (King 1969; McKendry 1973). Hayman (1953) noted a Carrion Crow releasing an object from its bill and immediately catching it with its feet.

Heinrich (2010) recorded an observation of an unidentified crow species in the Middle East. The crows repeatedly caught paper that was carried high into the air by the wind, then brought the paper to the ground and released it for it to be sucked up again.

Table 3. Drop-catching corvids.

Species	Objects involved	Source
Jackdaw *Corvus monedula*	Walnut?	Armstrong (1943)
Carrion Crow *Corvus corone*	Stick, bone?	Hayman (1953); McKendry (1973)
Hooded Crow *Corvus cornix*	Stone?, unidentified round object, sticks, pine cones	Denny (1950); King (1969); Elizabeth Close pers. obs.; SH pers. obs.
Carrion/Hooded Crow	?	Persson (1942); Stevenson (1950), both cited in *BWP*
American Crow *Corvus brachyrhynchos*	Stick	Kilham (1989)
Common Raven *Corvus corax*	Sticks, heather, turf, sheep droppings, sheep's skull, feather, rock, Coyote *Canis latrans* tail	Thompson (1964), in Ficken (1977); Ratcliffe (1997); Heinrich & Smolker (1998); Heinrich (1999).
White-necked Raven *Corvus albicollis*	Plastic bag, paper	M. Ferri pers. obs.; see [1]

[1] http://tech.groups.yahoo.com/group/Swallows-Martins-Swifts-Worldwide/message/8616

138–141. This sequence of photographs of a Hooded Crow *Corvus cornix* drop-catching was taken at Drumbanagher, Co. Armagh, October 2012 (the four consecutive images cover a span of six seconds). The object was a redwood *Sequoia* cone, small and hard. The crow transferred the cone from foot to bill a few times and made at least two successful drop-catches before failing to catch the cone on the third drop. The cone was then abandoned. Hooded Crows in an adjacent field paid no attention to the drop-catching bird.

Another interesting record is from Armstrong (1943), who cited an observation by an associate of Gilbert White of a Jackdaw *C. monedula* repeatedly dropping and catching a walnut. This eighteenth-century sighting might well be the earliest historical record of drop-catching and possibly the only reference to the behaviour in that species. Jackdaws do, however, drop horse chestnuts to break open the seed coat and expose the flesh (Gibson 1992).

Since it is difficult to age and sex corvids in the field, few accounts have details of either. Lawrence Kilham's (1989) observation of a drop-catching American Crow *C. brachyrhynchos* was of a non-breeding first-year, within the territory of a breeding pair. In early spring and autumn in Co. Armagh, immature Hooded Crows regularly drop-

catch objects (E. Close pers. obs.). Corvids have been recorded drop-catching in the months of September to February inclusive (Denny 1950; Hayman 1953; King 1969; Heinrich & Smolker 1998; E. Close pers. comm.; pers. obs.).

Hirundines

A number of hirundine species will repeatedly drop-catch feathers in what is often termed 'feather competition' or 'feather fighting'. It has been discussed as possible play in Sand Martins *Riparia riparia* and Tree Swallows *Tachycineta bicolor* (*BWP*; Ringelman 2007).

As with the larger species, drop-catches are repeated many times and can be performed by solitary birds or in groups. In groups, the feather is often caught and redropped by a conspecific, rather than by the original bird(s). Feathers are sometimes abandoned after a series of drop-catches (Thompson 1990; Disley 1996; Ringelman 2007; pers. obs.). Thompson (1990) observed the behaviour in two juvenile Barn Swallows *Hirundo rustica* and *BWP* states that it is common in recently fledged Sand Martins.

There are, however, a number of key differences between drop-catching in hirundines and in the larger birds. Feathers are an important resource and Ringelman (2007) found that after drop-catches they were usually taken to a box to line a nest. In addition, Ringelman could not induce juvenile Tree Swallows to play, despite releasing feathers at the study site. It is difficult to ascribe an adaptive function to the behaviour (as play) in hirundines, as they could presumably physically train or practise prey-capture by hunting in earnest; and the behaviour cannot be related to kleptoparasitism or forage-dropping of prey.

Ringelman (2007) also suggested that the behaviour could be social display by birds attempting to gain extra-pair copulations. It would be interesting to discover whether hirundines (and indeed swifts) drop-catch on their wintering grounds, when they are not breeding or gathering nest material. Prof. Charlie Collins recalls seeing Tree Swallows dropping and swooping after feathers in the post-breeding migration period, when they were definitely not nesting (pers. comm.).

Discussion

Causal factors

Birds that are most regularly recorded drop-catching (raptors, gulls and especially corvids) are among the most cognitively advanced groups, and with the largest brains. They are also species in which a wide range of social, locomotor and object-play behaviours are evident (*BWP*; Burghardt 2005; Sol *et al.* 2007).

Although Burghardt (2005) observed that large brains are not necessary for simple or primary play to arise, a link between brain size, cognitive ability and more complex play has been documented in mammals. It is possible that drop-catching, like associated food-dropping, involves reasonably sophisticated cognitive abilities (Beck 1982; Iwaniuk *et al.* 2001; Cristol & Switzer 1999, in Shuttleworth 2010).

Another key characteristic of many drop-catching species is that they take a number of years to reach sexual maturity. Others (such as some raptors and even swifts) can be sexually mature but may nevertheless delay breeding until their second or third years (*BWP*). Diamond & Bond (2003) found that avian social play was significantly associated with delayed reproduction and this is another attribute shared by the most playful of mammals, such as Chimpanzees *Pan troglodytes* and canids.

Hirundines are the major exception to these rules, reaching sexual maturity and usually breeding after one year. They also have a much smaller relative brain size than raptors, gulls or corvids (*BWP*; Sol *et al.* 2007). This is perhaps further evidence that drop-catching in hirundines differs from that in other taxa.

Adaptive function

In most species the most commonly proposed adaptive functions for drop-catch play are the benefits of physical training and practice of motor skills, although there is little experimental evidence that play has such benefits in any species.

Exploration

Gamble & Cristol (2002) suggested that drop-catching might aid young birds in exploring and discovering novel food items.

However, object play can be distinguished from simple exploration by the repetition of similar acts long after the animal concerned knows what the object is and what can be done with it (Burghardt 2005).

Physical training and practice of motor skills

Beck (1982) considered physical training to be a key function, since repeated vertical flights would exercise muscles not used in other contexts. Great Black-backed Gulls play-dropped objects but did not drop prey as foraging adults, suggesting that the behaviour was not important as practice. However, the possibility that drop-catching is practice for kleptoparasitism was not discussed. In addition, such physical training might be achieved as effectively by playful dives, without the need for object manipulation.

Other studies have considered the practice of motor skills (such as hunting and foraging) to be the key function. Supporting this hypothesis, the behaviour is most common in inexperienced, immature birds (Bildstein 1980; Gamble & Cristol 2002; Prytherch 2009). Bildstein (1980) found that Northern Harriers played most regularly with objects that were close in size to their typical prey. Munro (1954) noted a Prairie Falcon drop-catching a piece of manure 'about the size of a robin'.

Thompson's (1998) self-assessment theory suggests that, in terms of effective practice, particular play sequences are repeated until a certain success rate is reached, after which a slightly different behaviour is adopted until that too is mastered, and so on. Avian object dropping seems particularly suited to test this theory. Often a bird will first drop and retrieve an object from the surface before switching to drop-catching, as did a Carrion Crow observed by Hayman (1953), a Lesser Black-backed Gull *L. fuscus* observed by Humphreys (1964) and a Common Gull observed by Terry (1990). Although drop-catches can be repeated many times in an almost identical manner, perhaps small (intentional or otherwise) variations facilitate self-assessment (see Burghardt 2005). These might include the distance the object falls, angle of dive or changing wind speed and direction.

One problem with the practice hypothesis is that adult birds will also drop-catch. Adults are expected to have mastered all the activities necessary for survival, making practice through play unnecessary. However, play in adults might still refine and maintain behaviours that are uncommonly used in earnest (Hall 1998). Moreover, Gamble & Cristol (2002) suggested that drop-catching might be practice for kleptoparasitism, something that cannot be performed at will by an individual bird.

Alternatively, play behaviour might have a separate motivation and function in adult and immature birds (as suggested for domestic cats *Felis catus* by Hall 1998), although simultaneous drop-catching by adults and juveniles and drop-catching by gulls of all ages in similar circumstances suggests otherwise (Bildstein 1980; Gamble & Cristol 2002; Hewitt 2011).

As Gamble & Cristol (2002) pointed out, a combination of motor practice, physical training and exploration is possible.

Display?

In many groups, display seems to have been discounted as a possible adaptive function. This is perhaps because the behaviour is performed in a similar manner by many closely related species, while a primary function of courtship display should be to distinguish them. Heinrich (1999) judged the teasing of predatory mammals by Common Ravens to be play (rather than display) as it was often performed by juveniles, in isolation and was unconnected to other social displays. In most groups these points also appear to stand for drop-catching.

In a few species, however, drop-catching can appear display-like. Terns and hirundines have already been discussed in this regard. Weir & Picozzi (1975) observed adult male Common Buzzards occasionally drop-catching during pair-forming or pair contact flights. Although it was observed that males left females or groups before performing drop-catches, the circumstances still seem suggestive of courtship display. In contrast, Prytherch (2009) did not observe drop-catching by displaying adult Common Buzzards in his 30-year study, while finding it prevalent in juveniles outside of occupied territories. Prytherch also found it very rare

for juveniles to perform the more typical adult displays.

Of course, 'showing off' can be an element of play in humans and other animals so perhaps drop-catching should occasionally be expected as display. Kilham (1989) recorded play-like displays, with object manipulation, by breeding pairs of American Crows. Similarly, Armstrong (1940) documented the playful aspects of several bird displays and how they can be continued as if for enjoyment after their serious functions have been achieved.

Psychological benefits?

Play might plausibly reduce stress. In Common Ravens it has been shown that another seemingly enjoyable behaviour, allopreening, can reduce production of the stress hormone corticosterone. Observations of other species suggest something similar (Stowe *et al.* 2008; Birkhead 2012). Further psychological benefits of play are possible, but difficult to prove (Burghardt 2005).

Proximate experience

Although drop-catching probably serves some ultimate adaptive function, the 'immediate function of the drop-catch as play should be to provide pleasure' (Gamble & Cristol 2002). It is unlikely that animals try consciously to educate themselves or to physically train through play. Instead, they perform such behaviour for the immediate reward or enjoyment it brings (Heinrich 1999; Burghardt 2005; Balcombe 2007).

Drop-catching is voluntary and sometimes contagious. It resembles the object play of domestic dogs and cats, behaviour that is usually viewed as pleasurable. It is performed when ample foraging opportunities are available and by birds that are probably capable of foraging drops (Humphreys 1964; Ficken 1977; Gamble & Cristol 2002).

Black-headed and Common Gulls will continue to drop-catch non-food objects while nearby conspecifics are being fed bread by humans and noisy chases of food-carrying birds are ensuing (pers. obs.). It is unclear why gulls would continue to 'practise' already-mastered food-dropping or kleptoparasitic skills while immediate opportunities to perform the serious behaviours are available. The fact that they continue to drop-catch in such circumstances suggests that the behaviour is self-rewarding.

Acknowledgments

The author would like to thank Elizabeth Close, Joseph Devlin, Adam McClure and Robert Straughan for contributing personal observations; R. Hays Cummins, Carl Jackson and Fred Wasmer for helpful replies to e-mails about their respective sightings and also for giving permission to use their photographs; Charlie Collins for supplying the text of his observation and other useful information; and the *British Birds* reviewers, who gave helpful criticism and advice on the initial draft.

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Short paper

Raptor migration in Malta has been monitored regularly in recent years from Buskett, a wooded garden in the southwest of the island. Observations in autumn have long pointed to the relative importance of Malta for migrating raptors crossing the central Mediterranean. In recent years, systematic observations from other localities have shown that raptor migration occurs on a considerably larger scale than has been reported previously. This paper presents a summary of the data collected so far.

Richard Johnson

aptor migration in Malta has been monitored regularly in recent years, with systematic watching from traditional sites, more commonly in autumn than in spring. Since 2005, systematic observations from other localities have produced interesting results.

In spring, raptors migrate over Malta on a broad front, generally from late February to mid May, occasionally early June, with peak passage between mid March and early May. Since the birds are often widely spread across the islands, it is difficult to monitor migration from a single site. Autumn passage occurs from mid August to early November, with peak numbers between mid September and early October. Although still essentially on a broad-front pattern, autumn passage tends to be more concentrated than in spring; more raptors are usually observed in the afternoon, taking advantage of thermals, with many birds seen over the higher ground in the southwest of the main island of Malta (Sammut & Bonavia 2004).

Malta's orientation and topography accentuate this pattern. In autumn, a majority of raptors arrive over the northeast-facing coastline and converge in the southwest, the point of departure for the crossing to Africa, where significant numbers may attempt to roost before tackling the crossing (fig. 1). Some of the raptor observation points make ideal roost sites.

Study area and methods

The study was conducted over two periods. During 2005–08, observations were made from Clapham Junction. Also known as Misrah Ghar il-Kbir (35°51'N 14°23'E), this site is situated 217 m above sea level on the southwest coast, 2 km east of Dingli and 0.5 km from Buskett. Although close to the traditional site at Buskett, it was chosen as the main watchpoint as it offers a better vantage point in a greater variety of conditions.

During 2009–12, Clapham Junction remained the main watchpoint, but other observation points (Fawwara, Dingli Cliffs, Laferla Cross, Girgenti and Buskett) were added so that a more complete picture of migrating raptors was possible. It was clear from observations elsewhere that a proportion of active migrants were being missed from Clapham Junction.

During both phases of the survey, observations at Clapham Junction were made daily from early August to late October, by three or more observers from 13.30 hrs until dark. The other sites were manned more sporadically from late August to mid October with one or more observers covering the same time period.

The resulting data represent only a proportion of the raptors passing through Malta. Simultaneous observations from different sites have shown that birds appearing in the morning and early afternoon tend to arrive at various points along the northeast coast of Malta, and to continue to Africa without lingering. These migrants are easily missed from the main sites. In addition, on days with no cloud cover, some raptors pass through at very high altitude, invisible to the naked eye and sometimes not identifiable even with binoculars.

Results

Migration patterns

The majority of raptors (75%) approached the survey area from directions between NW and NE, 58% of these from the N–NE sector. On certain days, particularly with strong winds, some 18% of raptors approached the islands from the E–SE sector. These birds, primarily Marsh Harriers *Circus aeruginosus*, Honey-buzzards *Pernis apivorus* and falcons, tended to move along the southwest coast before heading out to sea in a W–SW direction. On a much smaller scale, this pattern was also noted among raptors approaching from W–NW; these birds moved along the cliffs and then out in a SE direction. Raptors that pass along the cliffs in strong winds (mainly between N and E) before heading out, mainly to the SW, were better observed from Buskett, Fawwara and Laferla Cross than from Clapham Junction.

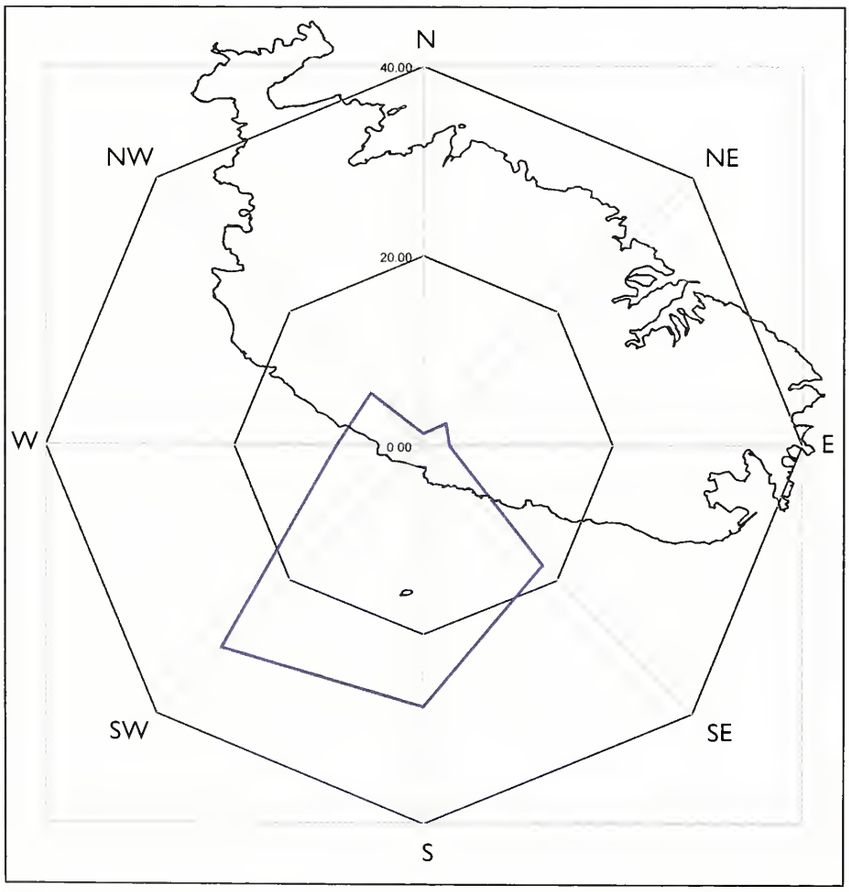
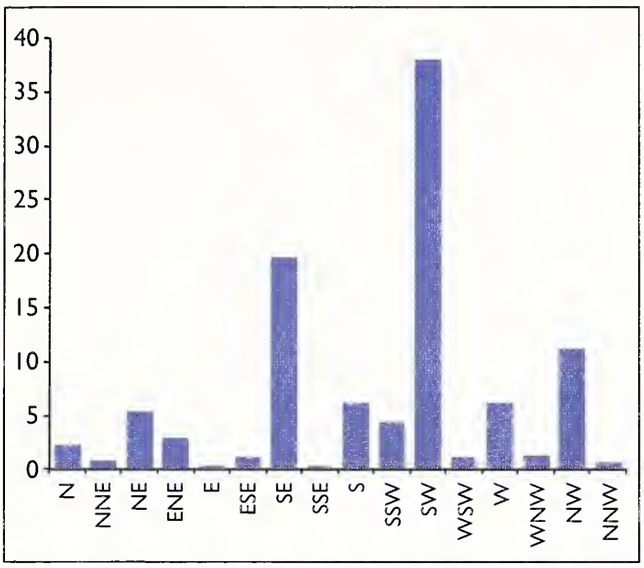
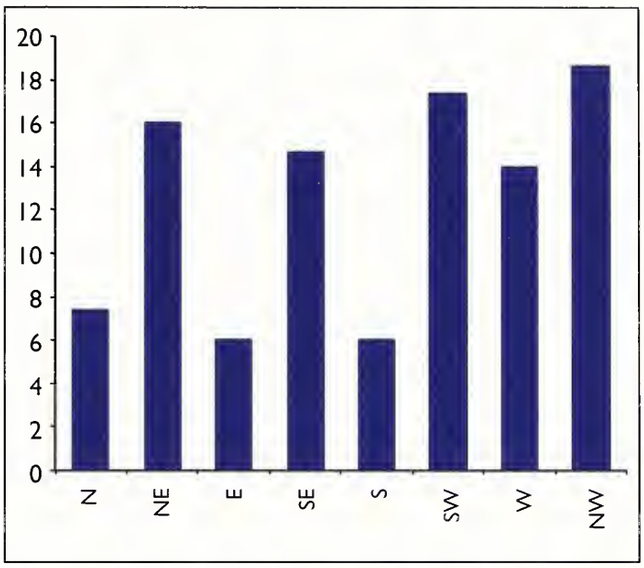


Fig. 1. The outbound direction of migrant raptors (all species, n=17,316) recorded in autumn; data from Clapham Junction, Malta, 2005–12. Figures are percentages – so, for example, a little over 30% of raptors were seen leaving to the southwest.

Weather conditions had an obvious effect on the total numbers and species recorded. Light winds from the southern quarter offer optimum migration conditions for soaring flight and thus larger numbers of raptors tend to be recorded, especially species that are reliant on soaring flight, such as Honey-buzzards. Our results show that around 40% of raptors were recorded during





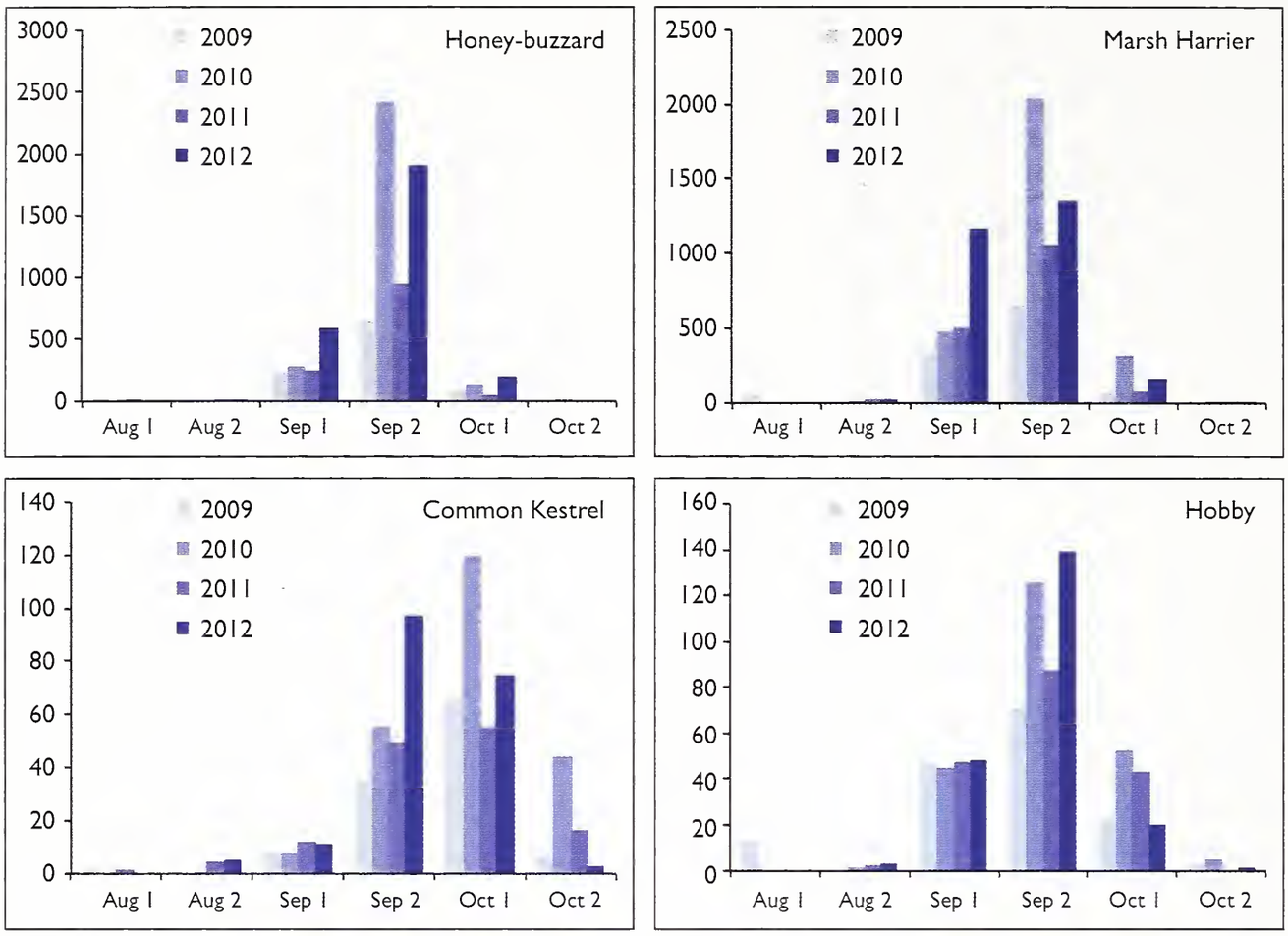
Figs. 2 & 3. Records of raptors (all species, n=12,147) in autumn in relation to wind direction (fig. 2) and the prevailing wind directions during autumn (fig. 3). Figures are percentages; data from Clapham Junction, Malta, 2009–2012.

SW winds, which make up about 17% of the wind directions recorded during the survey (figs. 2 & 3). During strong winds, falcons, harriers and species that are less reliant on soaring flight became more evident, while the numbers of species that are reliant on soaring flight dropped. The Marsh Harrier is a notable exception and although it occurs in greater numbers during years with optimum wind conditions (such as autumn 2010 and 2012; table 1), influxes can occur in almost any wind direction, when winds are either light or strong.

Our records suggest that three species at least – Marsh Harrier, Honey-buzzard and Hobby *Falco subbuteo* – migrate at night. It has long been known that some Marsh Harriers migrate at night, as on many

Natalino Fenech

142. Juvenile Honey-buzzard *Pernis apivorus*, Buskett, Malta, September 2012. The Honey-buzzard is one of the most abundant raptors on autumn passage through Malta.



Figs. 4–7. Timing of migration of four key species during 2009–12; data show total number recorded in each half-month period from early August until late October, all sites in the study area. Fig. 4 shows Honey-buzzard *Pernis apivorus*, fig. 5 Marsh Harrier *Circus aeruginosus*, fig. 6 Common Kestrel *Falco tinnunculus* and fig. 7 Hobby *F. subbuteo*.

occasions birds have been noted flying out to sea at dusk and continuing over the horizon. Meyburg *et al.* (2011) used satellite tracking to confirm that some Hobbies migrate at night. Our observations also show many instances when large numbers of Hobbies were recorded in the late afternoon yet none were seen leaving the roost early the following morning; it seems most likely that these birds had departed during the night. Honey-buzzards were also suspected to migrate at night, based on a similar discrepancy between birds counted roosting and those leaving the roost the following morning. This was especially evident during large movements. For example, 700 Honey-buzzards were counted on 19th September 2008, with over 300 roosting within the immediate vicinity of the watchpoints, yet fewer than 50 left the roosts the following morning from the whole area. On 28th September 2011, two Honey-buzzards were watched heading out to sea to the SW at dusk. They were observed until they disappeared over the horizon, proving that these birds do sometimes migrate at night. Records of birds arriving off the sea at first light or just after sunrise also suggests that some raptors migrate at night.

The species involved

A total of 22 species and one distinct subspecies, Steppe Buzzard *Buteo buteo vulpinus*, were recorded during the survey (tables 1 and 2). The most abundant raptors recorded during the second phase of the study (2009–12, all sites) were Marsh Harrier (mean 2,052 per autumn, a significant number even compared with other major crossings in the Mediterranean), Honey-buzzard (mean 1,904), Lesser Kestrel *F. naumanni* (mean 212), Hobby (mean 190) and Common Kestrel *F. tinnunculus* (mean 167). The highest daily counts of a single species were of Honey-buzzard (including 700 on 19th September 2008, 650 on 21st September 2010 and 572 on 19th September 2010) and Marsh Harrier (including 555 on 18th September 2010 and 500 on 22nd September 2007). Although different species peak at

Table 1. Totals of each raptor species counted from Clapham Junction during autumn migration 2005–12.

Species	2005	2006	2007	2008	2009	2010	2011	2012	TOTALS
Honey-buzzard *Pernis apivorus*	395	390	699	810	412	2,616	950	1,937	8,209
Black Kite *Milvus migrans*	10	11	6	14	15	20	23	24	123
Red Kite *Milvus milvus*	0	0	0	0	0	1	1	2	4
Egyptian Vulture *Neophron percnopterus*	0	0	0	0	1	0	0	2	3
Short-toed Eagle *Circaetus gallicus*	1	1	0	3	0	4	6	2	17
Marsh Harrier *Circus aeruginosus*	394	667	1,359	572	430	2,227	1,446	1,748	8,843
Hen Harrier *Circus cyaneus*	0	0	1	0	0	0	0	0	1
Pallid Harrier *Circus macrourus*	1	0	2	0	1	0	4	4	12
Montagu's Harrier *Circus pygargus*	9	5	5	0	3	8	13	15	58
Pallid/Montagu's Harrier	0	0	2	0	1	0	2	0	5
unidentified ringtail harrier	1	1	1	4	0	5	0	0	12
Eurasian Sparrowhawk *Accipiter nisus*	8	3	6	18	1	12	12	17	77
Common Buzzard *Buteo buteo*	2	0	2	1	1	3	3	2	14
Steppe Buzzard *Buteo buteo vulpinus*	0	0	1	1	2	1	8	3	16
Lesser Spotted Eagle *Aquila pomarina*	1	0	1	9	2	1	14	1	29
Booted Eagle *Aquila pennata*	1	2	1	0	2	0	5	4	15
Osprey *Pandion haliaetus*	11	5	6	9	8	14	14	33	100
unidentified broad-winged sp.	5	5	5	2	1	9	4	1	32
Lesser Kestrel *Falco naumanni*	42	55	138	187	46	104	111	313	996
Common Kestrel *Falco tinnunculus*	53	12	64	68	6	68	84	87	442
Lesser/Common Kestrel	18	15	39	35	13	69	64	137	390
Red-footed Falcon *Falco vespertinus*	0	0	0	0	0	1	1	2	4
Merlin *Falco columbarius*	0	1	1	1	0	2	1	1	7
Hobby *Falco subbuteo*	75	68	145	97	52	168	134	150	889
Eleonora's Falcon *Falco eleonorae*	12	8	9	20	10	17	32	17	125
Saker Falcon *Falco cherrug*	0	0	1	0	1	0	1	2	5
Peregrine Falcon *Falco peregrinus*	1	1	0	1	5	5	15	14	42
unidentified falcon	3	0	6	2	1	16	11	3	42
TOTALS	1,043	1,250	2,500	1,854	1,014	5,371	2,959	4,521	20,512

Table 2. Totals of each raptor species counted during autumn migration 2009–12; all sites in the study area.

Species	2009	2010	2011	2012	TOTALS
Honey-buzzard *Pernis apivorus*	917	2,800	1,232	2,665	7,614
Black Kite *Milvus migrans*	22	24	27	40	113
Red Kite *Milvus milvus*	0	1	1	3	5
Egyptian Vulture *Neophron percnopterus*	1	0	0	2	3
Short-toed Eagle *Circaetus gallicus*	1	5	7	2	15
Marsh Harrier *Circus aeruginosus*	1,038	2,827	1,653	2,690	8,208
Hen Harrier *Circus cyaneus*	0	0	1	0	1
Pallid Harrier *Circus macrourus*	6	6	8	9	29
Montagu's Harrier *Circus pygargus*	5	12	14	34	65
Pallid/Montagu's Harrier	1	1	2	11	15
unidentified ringtail harrier	1	10	5	0	16
Eurasian Sparrowhawk *Accipiter nisus*	22	28	19	43	112
Common Buzzard *Buteo buteo*	5	3	3	2	13
Steppe Buzzard *Buteo buteo vulpinus*	2	3	10	5	20
Lesser Spotted Eagle *Aquila pomarina*	4	2	14	3	23
Booted Eagle *Aquila pennata*	2	0	5	4	11
Osprey *Pandion haliaetus*	22	45	30	49	146
unidentified broad-winged sp.	9	9	6	198	222
Lesser Kestrel *Falco naumanni*	119	175	163	390	847
Common Kestrel *Falco tinnunculus*	112	228	138	190	668
Lesser/Common Kestrel	39	92	70	248	449
Red-footed Falcon *Falco vespertinus*	3	3	1	3	10
Merlin *Falco columbarius*	2	5	3	1	11
Hobby *Falco subbuteo*	140	229	179	211	759
Eleonora's Falcon *Falco eleonorae*	12	24	47	34	117
Saker Falcon *Falco cherrug*	1	0	1	3	5
Peregrine Falcon *Falco peregrinus*	8	10	16	20	54
unidentified falcon	2	24	16	39	81
TOTALS	2,496	6,566	3,671	6,899	19,632

different times, the second half of September sees the greatest volume of passage (figs. 4–7).

Interesting observations during the survey years include an increase in Lesser Spotted Eagle *Aquila pomarina* records. This species was formerly very rare and there were several years without a single sighting (Fenech 2010), but a record flock of five was seen on 3rd October 2011, part of a record 14 that year. Eleonora's Falcons *F. eleonorae* also increased noticeably during 2009–11 (table 2), although numbers were lower in 2012, ironically a year when falcons in general, and Lesser Kestrels in particular, were abundant. The apparent increase in Peregrine Falcon *F. peregrinus* records is probably a spurious result affected by a local breeding pair.

At least four second-calendar-year Honey-buzzards were observed (and photographed) in autumn, which presumably means that juvenile birds must have returned to Europe after their first winter, unlike most first-year birds, which remain in Africa (Forsman 1999). A good number of Marsh Harriers still roost in trees (see Sammut 2005), though disturbance has become an issue and on many occasions birds did not land before it was completely dark. On a few occasions they were observed to roost in trees outside the usual known areas. A small number of dark-morph male Marsh Harriers were also

Natalino Fenech

143. Adult Hobby *Falco subbuteo*, Buskett, Malta, September 2012.

recorded during the survey, mostly in late September.

Conclusions

Results show that raptor migration through Malta is on a considerably larger scale than has been reported previously (and we reiterate that the numbers presented here are just from one part of the main island, and in the afternoons only) and needs further study. Our aim is to expand the study area to achieve a more inclusive picture through co-ordinated surveys and collaboration, ideally with watchpoints throughout the islands.

Acknowledgments

Special thanks go to the late John Azzopardi, who initiated the project with MS; also to Joseph Grech and Chris Cachia Zammit, who were active observers throughout the project, and Emanuel Curmi for his immense contribution, especially during the second phase of the study, both in the field and during various discussions on migration patterns. Thanks are also due to AquiLarus Study Group, Dominic Frendo, Marvic Sammut, Ryan Sciberras, Richard Cachia Zammit and his family, Nicholas Flores Martin, Ray Testa and all those who took an active part at some point during the surveys.

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Obituaries

Geoffrey Vernon Townsend Matthews, who died in January 2013 aged 89, was the first Research Director of the Wildfowl Trust (now Wildfowl & Wetlands Trust). He was appointed in 1955, when the Trust began to receive regular funding from the (then) Nature Conservancy to monitor Britain's wildfowl, principally through the National Wildfowl Count scheme (later WeBS), species censuses and ringing, as well as by more ecological and biological studies. I joined the small research unit in October 1960. Noted colleagues at that time were George Atkinson-Willes, Hugh Boyd, Janet Kear and Peter Olney, and a few years later, Myrfyn Owen. Geoffrey skilfully oversaw our work, at the same time encouraging research into behavioural studies of the unrivalled collection of captive wildfowl at Slimbridge (and later at other WWT centres), and also forging important research links with the Universities of Bristol and Cardiff.

Geoffrey studied natural sciences at Cambridge University and, following service in World War II, completed his PhD on bird navigation in 1950. This subject remained an abiding interest and his research into it continued through the 1960s and 1970s using the Mallard *Anas platyrhynchos* as a study species. Work in North America in the 1950s had shown that, when released far from home, Mallards show a strong tendency to fly off in a set direction, but Geoffrey was one of the first to put studies of avian orientation onto a scientific footing. Over several years, hundreds of Mallards, mainly caught in the duck decoys at Slimbridge and Peakirk, Northamptonshire, were released singly, usually on old airfields giving good all-round visibility. The vast majority disappeared from sight to the northwest. A small torch battery and bulb, taped to the bird's leg, even enabled released birds to be followed after dark. The time of day or night, the sun, moon or stars had no effect on this strange phenomenon, which Geoffrey termed 'nonsense' orientation.

WWT archives

144. Geoffrey Matthews (left), celebrating a successful Bewick's Swan *Cygnus columbianus* catch at WWT Slimbridge in January 1979, with the eminent Russian ornithologist Prof. Vladimir Flint. (The bird which Vladimir is holding, ringed 'FR' and named 'Flint' in his honour, was last sighted at Oosterwolde, Gelderland, the Netherlands, on 24th December 1991.)

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Despite many theories as to why birds (not only Mallards) have a standard escape direction, none have justified a change in name. It doesn't in fact last long, just a few miles. Thereafter, the birds disperse either home or randomly.

Geoffrey quickly established himself as a considerable force in the field of wildfowl conservation, both nationally and internationally. At a national level, he helped to change many conservationists' attitudes towards wildfowlers by insisting that co-operation not confrontation was the way forward. He also ensured that the Wildfowl Trust's influence was paramount in the Nature Conservancy's establishment of a countrywide network of wildfowl reserves, by the provision of accurate, up-to-date information. Another achievement was his critical input to the banning of wildfowl shooting in hard weather. Following complaints about heavy shooting of wildfowl during spells of severe weather in early 1979, particularly in the (unfrozen) southwest of England, where large numbers of wildfowl had moved from frozen areas farther north, a committee was convened by the Department of the Environment with a remit to prevent a recurrence. The question was: If there were to be hard-weather shooting bans, how would they be triggered? The sometimes acrimonious debate was ended when Geoffrey analysed weather data from a network of meteorological stations around the country whose temperature readings could be used for the purpose. If a majority of them reported freezing conditions for more than 13 days, then a ban would be triggered automatically. This universally accepted mechanism is still in place today.

Geoffrey became British Delegate to the International Wildfowl Research Bureau (IWRB, founded before the war) in 1956 and quickly realised that co-operation between countries was as important as that within them, given the migratory nature of so many of the wildfowl. He became Honorary Director of IWRB (now Wetlands International) in 1969. Its headquarters (at that time just two staff) moved to Slimbridge, which became a focus for further major developments, including expansion from a mainly European organisation to include the Americas, Australasia and Africa. What was seen by Geoffrey and others to be lacking was an international convention on the conservation of wildfowl and their habitats – wetlands that have some of the richest biodiversity on the planet. Much intense effort led to a meeting at Ramsar, in Iran, in 1971, at which the 'Convention on Wetlands of International Importance especially as Waterfowl Habitat' (the Ramsar Convention) came into being. There are now over 160 member states that have designated over 2,000 wetlands covering more than 200 million ha. This designation has been used in many countries both to prevent deterioration and destruction of wetlands and to enhance them. Such major progress in international co-operation can never be the work of one man, but without Geoffrey's determination and even, on occasions, bloody-mindedness, the Ramsar Convention and all that has stemmed from it would not have happened as soon as it did nor have been as effective as it has.

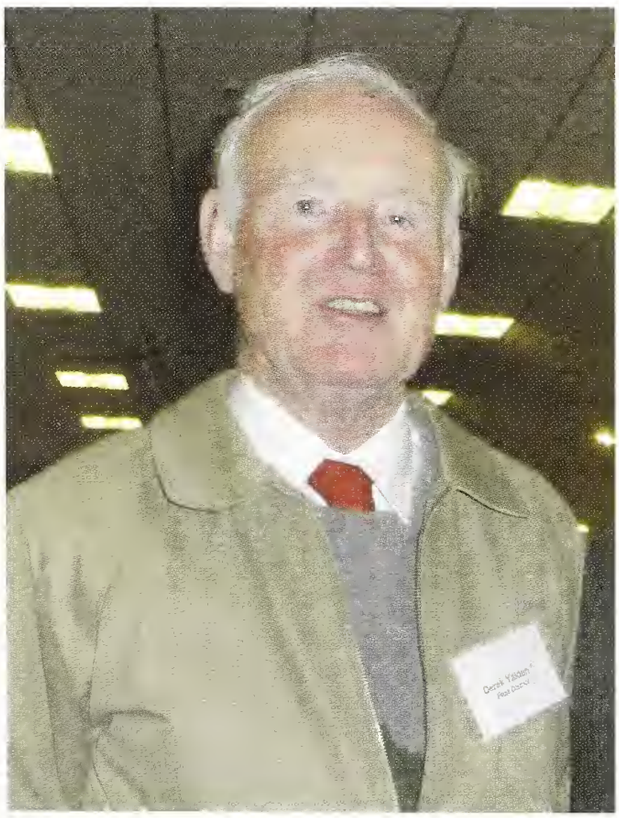
Geoffrey was a prolific author, of his major monograph (*Bird Navigation*, Cambridge University Press, 1955, 2nd edition 1968), over 150 papers, and chapters in over 40 multi-authored books. His first scientific contribution – a note on the Common Cuckoo *Cuculus canorus* – was published in *BB* in 1947 (*Brit. Birds* 40: 313). He was awarded the OBE in 1986, and was appointed an Officer of the Order of the Golden Ark in 1987 by Prince Bernhard of the Netherlands, both awards being for his services to conservation. He also received medals from the BOU and RSPB. On a personal level, I remember him as a constant source of encouragement and stimulation of my own research. We jointly edited *Wildfowl* for several years and co-authored papers, and I stood for hours on many a bleak airfield, releasing Mallards from a carrying basket while Geoffrey followed them out of sight. He was a fine administrator and the catalyst for great progress in wildfowl conservation. He also recognised (and enjoyed) the often very basic steps needed in carrying out research.

Malcolm Ogilvie

Derek William Yalden (1940–2013)

It is hard to think of a more complete zoologist and natural historian than Derek Yalden, who died on 5th February 2013. His expertise and enthusiasm inspired generations of students at the University of Manchester, where he taught for 40 years, while his many books and scientific publications have had a far wider reach. Although he regarded himself firstly as a mammologist (he was president of the Mammal Society from 1997), Derek made a tremendous contribution to ornithology far in excess of many who profess birds to be their primary passion. His studies on European Golden Plovers *Pluvialis apricaria* and Common Sandpipers *Actitis hypoleucos* in particular are rare exemplars of the importance of detailed, long-term and meticulous monitoring, the value of which was neatly described in his 2003 paper in *Wader Study Group Bulletin* 100: 212–215.

Derek was born in Surrey in 1940 and enjoyed a childhood exploring the natural history of the area. After obtaining a first-class Zoology degree at University College London in 1962, he studied carpal bones in mammals for his PhD at Royal Holloway College before joining the University of Manchester in 1965, firstly as an assistant lecturer, and then as a senior lecturer, where he soon familiarised himself with the local wildlife. He recounted one or two late-night encounters with police investigating what a tall gentleman wearing a thick pair of gloves was doing wandering the parks of Manchester at night – looking for Hedgehogs *Erinaceus europaeus* of course!



Dawn Balmer

145. Derek Yalden at the BTO conference in December 2010.

Soon this interest expanded to the Peak District, about which he wrote: 'When I moved to Manchester from Surrey, I knew nothing of the fauna of the Peak District, but was rather surprised that no-one else knew very much either, or perhaps more accurately, little of what they knew was written down.' Forty years of dedicated research and investigation followed, which generated many scientific papers on Golden Plovers and Common Sandpipers, and also publications on Black *Lagopus tetrix* and Red Grouse *L. lagopus*, Merlin *Falco columbarius*, Common Kestrel *F. tinnunculus* and owls, as well as upland birds in general. His 1974 paper on the status of Golden Plovers and Dunlin *Calidris alpina* in the Peak District, published in *The Naturalist* 930: 81–91, was in many ways ahead of its time. It was based on extensive surveys of the Dark Peak that Derek undertook himself, with the results mapped in relation to other factors, long before GIS techniques were available. He published extensively on all aspects of the fauna and flora of the Peak District, with papers on such wide-ranging taxa as the Labrador tea plant *Rhododendron groenlandicum*, newts and wallabies! A final paper by Derek documenting the extinction of the feral wallaby population in the Peak District was published in *British Wildlife* just days after his death.

His incredibly wide expertise made being with Derek in the field a delight, as virtually nothing escaped his eye, or his knowledge. He was not just an incredibly successful scientist and gifted naturalist, however, but also a passionate conservationist. He and his wife Pat published key papers on the subject of recreational disturbance of wildlife in the Peak District; work that helped guide the National Trust to pave the Pennine Way long-distance footpath on their High Peak Estate, thus reducing the impact of walkers on both

the surrounding vegetation and the breeding birds, such as Golden Plovers. With John Tallis and Penny Anderson, he also undertook long-term studies on the erosion and restoration of moorland vegetation in the Peak District, which helped to steer the subsequent work of Moors for the Future, restoring eroded parts of the Dark Peak that Derek loved so well.

In total, Derek published over 200 scientific papers as well as a wide range of books. His work on mammals included *Mammals of the British Isles* (2008) and the *History of British Mammals* (1999), as well as a catalogue of the mammals of Ethiopia, where he undertook a number of expeditions, and indeed had two species, Grassland Forest Treefrog *Leptopelis yaldeni* and Yalden's Desmomys *Desmomys yaldeni*, named in his honour. He also edited *Mammal Review* for 22 years. *The History of British Birds* (2009), which he authored with Umberto Albarella, is the most complete account of the subject, and emphasises another area of Derek's expertise, that of zooarchaeology. His incredible bone collection, collated over a lifetime, was an invaluable teaching tool to help undergraduate students (and student demonstrators!) to grapple with the wonderful subject of zoology. Here again, Derek published widely, from papers on Archaeopteryx and the excavation of archaeological sites in the Peak District, to using place-names to assess the historical distribution of birds.

It is difficult to do Derek justice in so few words. I cannot recall another modern-day zoologist who has had such a far-ranging impact on so many fields of study. Ornithology, mammology and zooarchaeology have each lost a great enthusiast and gentleman, and the Peak District a great expert and advocate. Many of us have also lost a great friend. I will always treasure memories of happy hours spent with Derek in the field and at the university, as we worked to understand Golden Plover ecology together, and will be forever grateful for his infectious enthusiasm and humour that inspired me as a young postgraduate student and beyond. He will be sorely missed by all who knew him, for he was unique. He leaves behind his beloved wife Pat, who was an unending source of support to his amazing career.

James Pearce-Higgins

Notes

White-tailed Laurel Pigeon copulating with a plastic decoy

The White-tailed Laurel Pigeon *Columba junoniae* is one of the two endemic pigeons of the Canary Islands. The species is currently restricted to Tenerife and the western islands of La Gomera, El Hierro and La Palma. However, fossil and historical evidence indicate that its past distribution included the whole archipelago (Hernández & Martín 2003).

In relation to a project aimed at restoring part of the former laurel forest on Gran Canaria, the island's local government (el Cabildo) initiated a reintroduction programme for the White-tailed Laurel Pigeon during 2007. When attempting to capture some juveniles on La Palma, plastic pigeon decoys, about one-third larger than real pigeons, were used for attracting the birds to the traps. Three elaborate models were used that represented pigeons in flight, feeding and standing postures. Initially, fieldwork was carried out from early morning to about midday in Barranco de La Galga (Puntallana).

At the beginning of the project, the standing pigeon decoy was found lying on its side every morning, something that we initially attributed to the effect of wind or rats. On 28th July 2007, however, we remained longer than normal in the hide. At 13.30 hrs, a male approached the decoy and commenced a courtship display (cooing, bowing, and tail-dragging) before finally jumping on the

Aurelio Martín

146. White-tailed Laurel Pigeon *Columba junoniae* copulating with a plastic decoy, La Palma, Canary Islands, July 2007.

decoy's back, where the mating display ended with copulation. This behaviour was repeated four times in about an hour and a half. During the following days, repeated courtship and copulation occurred every afternoon (plate 146). On one occasion, a male accompanied by a female also proceeded to court and copulate with the decoy. From 31st July, we confirmed that at least two different males were showing this behaviour and on 3rd August two were present together, and took turns to copulate with the decoy. This behaviour was observed until mid August.

Throughout this period only the standing decoy was selected for copulation, probably as a result of its greater resemblance to the female solicitation posture. In September 2010, this decoy was used again in an attempt to minimise the aggressive behaviour of a male towards the female of a captive pair. After the decoy was introduced, the female made frequent and violent attacks on the plastic pigeon, flapping her wings on the body and furiously pecking at the neck, while the male did not interact with the decoy but aggression between the live birds ceased abruptly. However, in the case of a solitary captive male, the feeding decoy induced copulation and also aggressive behaviour.

Copulation with dummies or inanimate objects appears to be quite rare in birds, but has been reported for several species (Pellatt & Birkhead 1994; Saint Jalme *et al.* 1994; Grønstøl *et al.* 1999). The technique is useful for studies of sperm numbers and ejaculate quality and also for artificial insemination in relation to the breeding of endangered species in captivity.

Acknowledgments

We thank David Tavío and Rafael Pedro for their help during fieldwork and Keith Emmerson for improving our English. The Cabildo de Gran Canaria provided financial support for the reintroduction programme.

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Letters

Water Rails in Britain

In the recent APEP report (Musgrove *et al.* 2013), I was surprised to see the estimate of 1,100 territories for the breeding population of Water Rails *Rallus aquaticus* in Great Britain. Although it was clearly stated that assessing the numbers of this notoriously skulking species is difficult, I feel that a better estimate might have been made, given the published data available.

Most previous estimates of the British Water Rail population have been associated with the national breeding atlases, the most recently published being of 450–900 pairs (Gibbons *et al.* 1993). That figure was based on 2–4 pairs per 10-km square for the 215 squares where breeding evidence was recorded. Initially, I assumed that the 1,100-pairs estimate was a simple revamp of those figures, but further reading made it clear that the figure used was derived from the Rare Breeding Birds Panel (RBBP). The RBBP Secretary, Mark Holling, explained: 'The population estimate in the APEP paper was derived from data submitted to RBBP in 2006–10, a five-year mean of the maximum number of territories reported (1,092 territories in Holling *et al.* 2012, rounded to 1,100).'

An estimate of the Scottish Water Rail population published in *The Birds of Scotland* (Forrester *et al.* 2007) appears to have been overlooked. This noted that 'recent studies in Scotland taken together suggest 800 territories'; and then presented an estimate for the whole of Scotland, based on known territories and extrapolated to unsurveyed areas, of at least 1,250–1,400 pairs.

More recently, even that estimate for the Scottish population seems low. Tape-luring for Water Rails, the main driver for the changes in our knowledge of numbers, has continued to be popular with some workers; this, together with the extra survey effort associated with Bird Atlas 2007–11, has given a clearer picture of the size of the Scottish population.

Tape-luring is pretty straightforward; an outline of the technique was given by Gilbert *et al.* (1998) and Jenkins & Ormerod (2002), while its efficacy was reviewed by Brambilla

Table 1. Maximum counts from sites holding Water Rails in Scotland; data from published sources and local bird reports.

Recording area	Territories	No. sites	Date	Source
Angus & Dundee	32	8	2008	SBR
Argyll	149	30	2007	ap Rheinalt *et al.* (2007)
Ayrshire	101	38	2007	SBR
Borders	261	75	2011	South-east Scotland Bird Atlas (in prep.)
Caithness	7	3	2007	SBR
Clyde	216	74	2006	SBR/BoS
Clyde Is	2	2	2007	SBR
Dumfries & Galloway	41	21	2008	SBR
Fife	47	25	2007	SBR
Highland	53	17	2007	SBR
Lothian	27	18	2011	South-east Scotland Bird Atlas (in prep.)
NE Scotland (inc. Moray & Nairn)	175	?	2011	Francis & Cook (2011)
Orkney	27	17	2008	SBR
Outer Hebrides	4	2	2002	SBR
Perth & Kinross	7	14	2006	SBR
Tay Reedbeds*	126	1	1991	SBR/BoS
Shetland	7	6	2008	SBR
Upper Forth	7	6	2008	SBR
Scotland	**1,289**	**357**		

Key SBR: Scottish Bird Report website; BoS: *The Birds of Scotland*; * Tay Reedbeds, the largest area of reeds in Britain, is rarely fully surveyed, hence the use of the 1991 count.

& Jenkins (2009). In most cases it is necessary only to circumnavigate the edge of a moss or marsh, without wading in. Typically, I repeat a 60-second recording 2–3 times, moving on if there is no response. Birds respond to even quiet recordings from 60–70 m or more, 'kekking' or 'sharming' in response. The results can be recorded as singles or pairs, as pairs will often duet in reply. It is not unusual to get birds replying at your feet, invisible among marshy vegetation. I then move another 50–60 m along the wetland margin before repeating the process. Density depends on the habitat quality, but territories can be as little as 50–100 m apart along the wetland margin. In my recording area of Borders, most mosses and marshes are relatively small, so easy to cover. Nevertheless, I suspect that I miss some birds located deeper into larger wetlands, hundreds of metres across. It is worth noting nil results, to record which sites have been surveyed, and it is worth repeating surveys in later years as numbers can change. A blank year at a waterbody may be followed by several in another breeding season, and vice versa. I was horrified to find a marsh where I had estimated 23 territories in 1999 with no birds in the very dry spring of 2011. Water Rail is a species covered by the RBBP and as well as recording numbers at each site visited, it is also valuable to report nil returns (see www.rbbp.org.uk/downloads/rbbp-recording-standards.pdf).

Surveys are best performed in the early spring, from late March to late April, to provide the best detection rate but, simply to establish presence or absence, I was happy to gather data whenever possible from mid April (many migrants, presumably Icelandic birds, are still present at wintering sites in Scotland in March) to August. This may mean that some of my counts are underestimates. Moreover, although surveying in the early morning is ideal, birds appear to respond at virtually any time of day, which is useful if covering many sites in a single day of fieldwork.

Systematic use of tape-lures almost always increases the number of Water Rails recorded. Some 50 pairs at 26 sites were estimated in Lothian & Borders during the local tetrad atlas survey during 1988–94 (Murray *et al.* 1998). In Borders alone, this rose to 175 territories at 47 sites by 2006–07 (the estimate used in *The Birds of Scotland*) and to 261 territories at 75 sites by 2012. Some local sites still lack a survey visit, so numbers should increase further. Similarly, in Northeast Scotland Francis & Cook (2011) updated earlier estimates of c. 95 pairs in 2006–07 to 175 territories in 2011. Without the use of tape-lures, Water Rails are grossly underrecorded, and many local bird reports (dependent on casual records only, without the use of tape-luring) thus provide little insight into the true numbers present. It seems likely that casual, rather than systematic, observations lie at the heart of the very low national estimate of Water Rails by APEP.

Table 1 shows the April–August numbers published in Scottish local bird reports (using the Scottish Bird Report tool on the SOC website www.the-soc.org.uk/sbr.php); with one exception, the maximum number since 2000 is shown.

Table 1 shows that Scotland holds something in the order of 1,300 'known' Water Rail territories, well in excess of the APEP estimate for the whole of Britain. Since many are likely to be lurking unreported across much of the country, an estimate of 1,800–2,000 territories for Scotland alone might not be unreasonable.

Preliminary maps available from the BTO

Table 2. Water Rail numbers in the best-surveyed recording areas in Scotland, based on the number of occupied 10-km squares in Bird Atlas 2007–11.

Recording area	Territories	10-km squares 2008–11	Territories/ 10-km square
Argyll	149	13	11.5
Ayrshire	101	12	8.4
Borders	261	24	10.9
NE Scotland (inc. Moray & Nairn)	175	29	6
Clyde	216	17	12.7
Total/mean	902	95	9.5

for Bird Atlas 2007–11 suggest that Water Rails were recorded from 682 10-km squares in Great Britain during 2008–11. Using the density figure employed in the *1988–91 Breeding Atlas*, this would raise the GB population to 1,320–2,640 territories for 2008–11.

In Scotland, Water Rails were reported from almost 200 10-km squares in 2008–11, about 30% of all squares in mainland Britain. Using data from table 1 gives a 'density' of 6.5 territories per occupied 10-km square. However, in the best-surveyed recording areas of Argyll, Ayrshire, Borders, Clyde and Moray & Nairn/NE Scotland, this figure rises to 9.5 territories per occupied 10-km square (table 2). Using these values produces a range of 4,430–6,480 territories for Great Britain, with 1,530–2,230 territories in Ireland.

While dedicated national surveys are valuable in assessing population levels for many species, more use might be made of the good data available within local bird reports for others. Hopefully this note will prompt more observers to get out in the field and use tapelures to record this enigmatic species. While some enjoy the discovery of a rarity, I find surveying for Water Rails just as exciting. You never know what to expect and there can be a real thrill at the moment when you hear a reply from across a marsh but also the satisfaction that what you're doing is helping to unravel a local and national mystery.

Acknowledgments

I would like to thank Dawn Balmer, Mark Holling and David Jardine for comments on the text and the BTO for allowing use of the unpublished totals from Bird Atlas 2007–11.

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Editorial comment Andy Musgrove, lead author of the APEP report, has commented: 'Ray has clearly identified one of the most difficult species to source estimates for. We flagged the RBBP-derived Water Rail breeding numbers as a known underestimate and, indeed, failed to come up with a winter estimate at all. I acknowledge that we overlooked the figures in *The Birds of Scotland* for this species – we tended to refer to that source in those cases where the whole GB/UK population was in Scotland, for which it provided a robust national estimate. In general, we shied away from producing entirely new estimates ourselves by collation of information from county bird reports (unfortunately, the Panel just doesn't have the resources to take that approach), but Ray's figures and approach certainly seem perfectly sensible. If Ray, or one of his colleagues, can continue to look at Water Rails in this level of detail for a few more years, and publish the results in *BB*, I'm sure that the authors of APEP4 will be delighted to be able to cite them! And there might be a few more Baillon's Crakes *Porzana pusilla* discovered along the way…'.

Population estimates of birds in Great Britain and the UK

Like many readers, no doubt, I was hugely impressed by the sheer amount of work that lay behind the UK/GB population estimates set out in the recent APEP report (Musgrove *et al.* 2013). One statistic that caught my eye points either to an inconsistency or to an interesting and little-known phenomenon, however.

The summer estimate for UK Moorhens

Gallinula chloropus suggests that there are 270,000 territories. If each territory represents a pair, and each pair raises a single surviving young (which for Moorhens seems a rather conservative estimate), this suggests an early autumn population of over 800,000. The winter estimate, however, is only 330,000. Since *BWP* suggests that, if anything, the UK is a net importer of Moorhens (which are perhaps much more migratory than we might realise) in the winter, this suggests either large winter mortality or that a great chunk of the UK population does after all move south in winter.

My suspicion is that the winter estimate is too low (and less clearly that the summer estimate is too high), and that (as the authors suggest) the Wetland Bird Survey (WeBS) is not the best way of measuring the winter population of what is often a ditch/pond/field bird, except in the harshest weather. Nonetheless, when there *is* a big freeze, where do all these birds go – or is winter mortality even higher than we currently believe?

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Editorial comment Andy Musgrove commented: 'While *The Migration Atlas* shows that there is a small degree of movement in and out of the UK, most Moorhens are highly sedentary and I agree that at least one of the APEP estimates is probably some way off the mark. I also agree that the winter estimate was harder to generate than the breeding one, and was judged less reliable. However, it was not based solely on WeBS counts; the full details of its derivation were published in "Overwinter population estimates of British waterbirds" (Musgrove *et al.*, *Brit. Birds* 104: 364–397).'

Breeding Baillon's Crakes in Britain

With reference to the fascinating story in Ausden *et al.* (2013) about the discovery of breeding Baillon's Crakes *Porzana pusilla* in Britain, I should like to point out that the late Peter Grant reckoned with this possibility in the 1970s. Considering the availability of (seemingly) suitable habitat, he strongly believed that breeding had been overlooked in Britain. Knowing my experience with this intriguing species in the Netherlands, Peter invited me to write a note for *BB* on discovering breeding Baillon's Crakes (Oreel 1981), hoping that this would assist British birdwatchers.

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I was interested to read the recent article on the breeding by Baillon's Crakes in Britain in 2012 (Ausden *et al.* 2012). It struck me that there is a curious parallel to events in the mid-nineteenth century, in terms of British workers benefiting from experience gained in the Netherlands.

Breeding by Baillon's Crakes in England was documented or suspected several times in the mid-nineteenth century (Wolley & Newton 1902). Joseph Baker, a collector and taxidermist from Cambridge, learnt his skills in searching for this species when visiting the Netherlands in May–June 1855 and April–June 1856. At that time, Baillon's Crake was a common breeder in the Netherlands (Jansen & Vlek 2010), and Baker used his experience to good effect when he returned to the UK. He was involved with a nest discovered in east Norfolk on 6th June 1858 (there is some discrepancy in reports of the locality, which was claimed by another dealer to have been in Cambridgeshire), and this is generally taken to be the first confirmed breeding record for Britain. Fuller details can be found in Sealy (1859) and Wolley & Newton (1902); the eggs are retained in the University Museum of Zoology in Cambridge.

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Thrush arrivals on Holy Island in October 2012

I read with interest the recent account of the exceptional arrival of thrushes on Blakeney Point, Norfolk, and at Spurn, Yorkshire, on 22nd October 2012 (*Brit. Birds* 106: 114–117). On Holy Island, Northumberland, two huge influxes of thrushes were noted during October 2012, one on 12th and a second on 22nd–23rd.

The overnight weather forecast on 11th October looked very promising with rain and strong southeasterlies, gusting to gale force. I reached the Island soon after sunrise on 12th October and birds were already arriving in large numbers. From 09.00 to 10.30 hrs, I estimated that approximately 6,000 thrushes came in off the sea at The Snook, at the north end of the Island. Wave after wave of thrushes, like swarming flocks of locusts, just cleared the ground, with many birds flying around my feet as they poured in. Many were totally exhausted, crashing into isolated bushes at The Snook car park, after an arduous North Sea crossing. However, others passed straight over the island at height, perhaps having taken a slightly different track across the North Sea and avoided the worst conditions?

Simultaneously, Paul Massey witnessed a similar arrival in Holy Island village. Our estimated combined totals for the morning were 6,380 Redwings *Turdus iliacus*, 4,900 Blackbirds *T. merula*, 900 Fieldfares *T. pilaris*, 460 Song Thrushes *T. philomelos*, a few Mistle Thrushes *T. viscivorus* and 5–6 Ring Ouzels *T. torquatus*. Estimates for other species of note, among a good variety of common and scarce migrants, included 120 Goldcrests *Regulus regulus*, 27 Robins *Erithacus rubecula*, six Common Chiffchaffs *Phylloscopus collybita*, six Common Redstarts *Phoenicurus phoenicurus* and several Short-eared Owls *Asio flammeus*.

Ten days later, on 22nd October, after overnight southeasterlies and fog, a second major influx of thrushes occurred. Ian Kerr's estimates for the Island included 4,000–4,500 Redwings (of which more than 3,000 passed south over The Heugh to the mainland) and 2,000 Blackbirds. The following day I counted 660 Fieldfares on the island and Ian noted a further 2,000 passing southwest. In contrast to the arrival on 12th (and with the situation at Blakeney and Spurn), no new Ring Ouzels or Song Thrushes were recorded. Notable totals of other species included c. 300 Robins, 200 Bramblings *Fringilla montifringilla* and 70 Goldcrests.

Interestingly, and unlike the situation farther south, Northern Wheatears *Oenanthe oenanthe* were totally absent from Holy Island during both arrivals and Common Chiffchaff numbers were well below those recorded elsewhere. A conservative estimate of over 22,500 birds was recorded in both influxes without any systematic counting. In a historical context, the total of 4,900 Blackbirds on 12th October has been beaten only three times in Northumberland, with 10,000 on Holy Island on 28th October 2004 being the highest count (Frankis *et al.* 2006). The total of 6,380 Redwings on 12th October has been bettered only seven times, with the highest county total being 20,000+ on Holy Island on 10th October 1991 (Kerr 2007). Both influxes were truly memorable, with an equally impressive supporting cast of species.

Acknowledgments

I wish to thank Paul Massey and Ian Kerr for helpful comments on a first draft of this letter.

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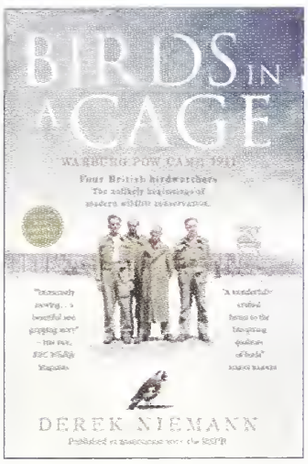
Reviews



Birds in a Cage

By Derek Niemann
Short Books, 2012
Hbk, 312pp
ISBN 978-1-78072-093-7 Subbuteo code M21587
£20.00 *BB* Bookshop price £18.00

John Barrett, John Buxton, Peter Conder and George Waterston were four of the most significant British ornithologists to be born in the 1910s. All wrote papers for *British Birds* at various times and each made his mark on bird study in a different way. By chance, they each joined a different regiment in the Second World War and, by tragic coincidence, all found themselves imprisoned at different places during that war, having been captured in Germany, Norway, France, and Greece respectively.

The war brought together so many people from different backgrounds, often in very challenging situations. Friendships were forged in the toughest of circumstances – not least in Prisoner of War camps across Germany. These four ornithologists were all moved between different prison camps in varying locations but all four were held at the same place between October 1941 and September 1942. That place was the Oflag VI-B camp for officers at Warburg in Germany – roughly halfway between Hanover and Cologne.

This book tells the story of their wartime service, but particularly the time they spent together. If anything, their interest in birds was strengthened by their enforced imprisonment. There were relatively few things that inmates could do, but each of them had noticed birds around the camp, and – despite the absence of binoculars – they had started to record what they saw. In particular they observed the spring migration of 1942, with a daily log being kept of every bird seen over a period of almost two months. In addition Buxton focused his attention on the Common Redstart *Phoenicurus phoenicurus*. Their interest in birds attracted the attention of security guards, who suspected them of plotting an escape plan. Not surprisingly, some of the inmates thought that they were an odd group – not least when they started to correspond with a German ornithologist. All but Barrett were later moved south to another camp in a wooded valley at Eichstätt, where Conder studied the Goldfinch *Carduelis carduelis* and Waterston focused on the Wryneck *Jynx torquilla*. The latter study totalled an astonishing 1,200 hours of observation for Waterston and his 'assistants'. Eventually, the men were split up before the war ended in 1945 and all returned home safely.

In their own ways, each of the four men went on to make their impression on the world of ornithology and bird conservation. John Buxton became a teacher and academic and wrote up his studies of the Common Redstart in a New Naturalist monograph (*The Redstart*, Collins, 1950); John Barrett became the warden of Dale Fort Field Centre in Pembrokeshire and wrote highly popular guides to seashore wildlife; Peter Conder became the warden at nearby Skokholm, eventually joining the RSPB staff in 1954 and becoming the Society's Director General; George Waterston, who founded Fair Isle Bird Observatory, also ended up on the RSPB staff and is widely accepted as the man who made sure that the Osprey *Pandion haliaetus* successfully reintroduced itself to Scotland in the 1950s.

The great value of this book is that it brings together the story of what these men experienced. These are stories that have rarely been told, as each of them remained relatively tight-lipped about their experiences – even to close family. Peter Conder did write up some of his thoughts but never completed them, and John Buxton even wrote a book on the subject, which was rejected for publication. The strength of this book comes from the fact that you are drawn into their lives and it feels as if the men are in a room talking about what had happened. All four died a long time before Derek Niemann had the idea for this book, but despite having never met any of them, he has brought to life their different attitudes and experiences with great ease.

Keith Betton

Recent reports

Compiled by Barry Nightingale and Harry Hussey

This summary of unchecked reports covers the period from early February to early March 2013.

Headlines Another quiet period, but one punctuated by some long-awaited rarities, the most sought-after being a male Harlequin Duck in the Outer Hebrides. A Pied-billed Grebe in Somerset was more accessible and also in the southwest was a returning Pacific Diver in Cornwall and a rare English record of an American Herring Gull on Scilly. The list of long-staying passerines remained impressive, headlined by Pine Grosbeak in Shetland and the first Desert Wheatear to survive a Scottish winter.

Cackling Goose *Branta hutchinsii* Long-stayers: Islay (Argyll), to at least 1st March; Frampton Marsh (Lincolnshire), to 9th February; North Wootton (Norfolk), to 9th February; Balranald, North Uist (Outer Hebrides), to 10th March; and Lissadell (Co. Sligo), to 16th February. In addition: Mersehead (Dumfries & Galloway), 23rd February to 3rd March; Termoncarragh Lake (Co. Mayo), 20th February; and Raghly (Co. Sligo), two, 24th February. Red-breasted Goose *Branta ruficollis* Thorney Island, Langstone and Farlington Marshes (Sussex/Hampshire), long-stayer to 10th March.

American Wigeon *Anas americana* Long-stayers: Tullaghan (Co. Leitrim), to 24th February; Udale Bay (Highland), to 9th March; South Uist (Outer Hebrides), to 17th February; and Cahore (Co. Wexford), to 23rd February. New arrivals: South Ronaldsay (Orkney), 8th February; Fiskerton (Lincolnshire), 9th–27th February; Slimbridge (Gloucestershire), 15th–16th February; Bowling Green Marsh/Topsham (Devon), 16th February to 10th March; and Finstown (Orkney), 3rd–10th March. Baikal Teal *Anas formosa* Tacumshin (Co. Wexford), 8th–9th February. Black Duck *Anas rubripes* Long-stayers: Mizen Head (Co. Cork), two to 9th March; Strontian (Highland), to 10th February; and Sruhill Lough, Achill Island (Co. Mayo), to 10th February. Blue-winged Teal *Anas discors* Threave (Dumfries & Galloway), long-stayer to 1st March; North Bull (Co. Dublin), 14th–17th February.

Ferruginous Duck *Aythya nyroca* Long-stayers at Priory CP (Bedfordshire), to 2nd March, and Cockshoot Broad (Norfolk), to 10th February. Also: Blashford Lakes (Hampshire), 22nd–24th February; Ham Wall area, 27th February to 10th March, with another at Wimbleball Lake (both Somerset), 3rd March. Lesser Scaup *Aythya affinis* Long-stayers: Lough Gash (Co. Clare), to 2nd

Kit Day

147. Male Harlequin Duck *Histrionicus histrionicus*, Balranald, North Uist, Outer Hebrides, March 2013.

Gary Thoburn

148. Pied-billed Grebe *Podilymbus podiceps*, Ham Wall, Somerset, March 2013.

March; Colliford Lake to 19th February, then Siblyback Resr (both Cornwall), to 10th March; and Cardiff Bay (East Glamorgan), to 10th March. Burton Mere (Cheshire & Wirral), 3rd March, presumed same Shotwick (Flintshire), 4th–8th March. King Eider *Somateria spectabilis* St Combs (North-east Scotland), long-stayer to 25th February; Ballyvaughan (Co. Clare), 18th February; Bluemull Sound (Shetland), 1st March. Harlequin Duck *Histrionicus histrionicus* Balranald, 18th February to 10th March. Surf Scoter *Melanitta perspicillata* Long-stayers: Llandulas (Denbighshire), up to four to 3rd March; The Wig (Dumfries & Galloway), to 19th February; Largo Bay (Fife), to 5th March; Ballinskelligs to 24th February, and Brandon Bay (both Co. Kerry), to 21st February; North Uist, to 11th February; and Broadhaven (Pembrokeshire), to 5th March. New arrivals: Rerwick Head (Orkney), 9th February; Ballyvaughan, 18th February; Soleburn (Dumfries & Galloway), 26th February to 9th March.

Pacific Diver *Gavia pacifica* Mount's Bay (Cornwall), 12th–23rd February. White-billed Diver *Gavia adamsii* South Ronaldsay/Burray (Orkney), 9th February to 1st March; Lewis (Outer Hebrides), 18th February; Huna (Highland), 4th March; Uisaed Point (Argyll), 5th March.

Glossy Ibis *Plegadis falcinellus* Long-stayers at Marloes Mere (Pembrokeshire), to 9th March, and Warblington/Bickerley Common (Hampshire), to 10th March.

Pied-billed Grebe *Podilymbus podiceps* Ham Wall, 15th February to 10th March.

White-tailed Eagle *Haliaeetus albicilla* Various sites in northwest Norfolk, 16th February to 6th March. Northern Harrier *Circus cyaneus hudsonius* Tacumshin, long-stayer to 9th March. Gyr Falcon *Falco rusticolus* Long-stayer in Orkney, reported from Yesnaby 8th February, South Ronaldsay 26th and Newark Bay, 27th February.

American Coot *Fulica americana* Murloch (Co. Galway), long-stayer to 11th March.

American Golden Plover *Pluvialis dominica* Tacumshin, 1st March. Long-billed Dowitcher *Limnodromus scolopaceus* Long-stayers at Gann Estuary (Pembrokeshire), to 7th March, and Lady's Island Lake/Tacumshin (Co. Wexford), to 9th March. Lesser Yellowlegs *Tringa flavipes* Ernesettle Creek (Devon), long-stayer to 10th March.

Forster's Tern *Sterna forsteri* Galway Bay (Co. Galway), long-stayer to 17th February. Bonaparte's Gull *Chroicocephalus philadelphia* Long-stayers: Ogmore Estuary (East Glamorgan), to 9th March, and Eastbourne (Sussex), to 26th February. Also, Cardiff Bay, 24th February to 9th March; Skerries (Co. Dublin), 2nd–9th March. American Herring Gull *Larus smithsonianus* Baltimore (Co. Cork), long-stayer to 9th February; St Mary's (Scilly), 28th February.

Dark-breasted Barn Owl *Tyto alba guttata* Rodmell/Southease (Sussex), long-stayer to 16th February. Snowy Owl *Bubo scandiacus* Pettigo Plateau (Co. Donegal/Co. Fermanagh), 10th–15th February; Ben Macdui (North-east Scotland), 18th February to 4th March.

Penduline Tit *Remiz pendulinus* Stodmarsh (Kent), long-stayer to 6th March. Dungeness (Kent), two, intermittently, 8th February to 10th March; Grove Ferry (Kent), 8th February. Pallas's Leaf Warbler *Phylloscopus proregulus* Green Moor Lakes (Berkshire), long-stayer to 5th March. Rose-coloured Starling *Pastor roseus* Exminster (Devon), long-stayer to 10th March. Black-bellied Dipper *Cinclus c. cinclus* Thetford (Norfolk), long-stayer to 9th March. Desert Wheatear *Oenanthe deserti* Rattray Head (North-east Scotland), long-stayer to 10th March. Pine Grosbeak *Pinicola enucleator* North Collafirth (Shetland), long-stayer to 23rd February. Little Bunting *Emberiza pusilla* Longstone Hill (Somerset), 5th March.

Talking point

The amateur British ornithologist – amber-listed?

David Lack once said that the greatest pleasure he derived from his election as a Fellow of the Royal Society was that the work that underpinned it – the study of Robins *Erithacus rubecula* that he undertook while teaching at Dartington Hall – was carried out while he was an amateur.

Any student of the history of Britain's ornithology will be aware of the contribution made over a long period by people whose working lives were unrelated to birds. Many seminal studies were carried out in the twentieth century by people such as Edgar Chance (Common Cuckoos *Cuculus canorus*), Arthur Landsborough Thomson (migration) and Edward Armstrong (Wrens *Troglodytes troglodytes*), and up to the 1960s most of the papers published in ornithological journals were the result of work done by amateurs. Where it was the work of professionals it was almost always related to taxonomy and nomenclature since professional ornithology was largely confined to the curatorship of collections – usually, but not always, working in museums.

In the latter part of the twentieth century, ornithology, like other sciences, moved into a professional era. Much of this was due to the success of our new post-war conservation ethic and the subsequent firm financial base and leadership of the RSPB, first by Peter Conder and then by Ian Prestt. Once on a sounder footing, the RSPB could afford to employ the research scientists it needed, both Directors realising that they had to use science and research to underpin their conservation strategies. There was also a new interest in birds in academia, not least in their behaviour and in using them for models of more general studies. The number of professional ornithologists grew exponentially and Britain continued to be among the world leaders in the field. It is difficult to pinpoint the moment at which professional ornithology became the norm in this country but it probably happened sometime in the 1980s and early 1990s.

There is no suggestion here that this professionalisation is a bad thing. It has led to a proliferation of studies that have unravelled many surprising facts, such as extra-pair paternity; and, using ever-advancing technology, it has revealed in a matter of days secrets that, despite our efforts, remained hidden for hundreds of years such as Cuckoo migration strategies. It is difficult to see how all this new knowledge could have been achieved entirely by amateurs.

However, the professionalisation of ornithology has seen a significant decline in the publication of amateur studies. The two main British ornithological journals, *Ibis* and *Bird Study*, now publish studies almost entirely by professionals. Only *BB* continues to provide an outlet for the amateur and even here about half the papers are from professionals – and not always about British birds! So as far as most national publications are concerned, the amateur has been so marginalised by these advances as to be barely visible today.

In one field of study, however, amateurs remain very much in the vanguard – that of bird identification and, as a consequence, in the recording of rare birds and the status of bird species. Furthermore, the basis of the BTO's work continues to rely on its network of amateur birdwatchers and ringers who supply the raw material from which the organisation constructs its influential database of our avifauna.

Yet professionalism has prevailed in the BTO, too, and this is most obvious today in the changing nature of *Ringing and Migration*, which was set up to be the journal by which British amateur ringers and students of migration could publish their results. Yet '*R&M*' has undergone a gradual but inexorable shift towards professional ornithology and has departed almost entirely from the original concept of the journal, put together by Colin Bibby, the first editor. To the average BTO ringer, recently published studies of wing moult of Eastern Olivaceous Warblers *Iduna pallida* in the Sahara and the sexing of migrating Tengmalm's Owls *Aegolius funereus* are unlikely to raise much interest. This

Richard Porter

149. Wader counters on the Wash, in 1971; from left, Alan McGregor, John Andrews, Peter Conder, James Cadbury and Gareth Thomas. Is it the case that there was less of a distinction between professional and amateur ornithologists 40 years ago, when professionals were just as likely to get their wellies dirty in the cause of what we might today call 'citizen science'?

departure from the, albeit parochial, subject of 'our' birds and the move to modern science publishing standards cannot have been anything other than discouraging when it comes to persuading ringers and other amateurs to submit papers for publication to a journal for which historically they provided the funding – do they still?

Of course most editors would doubtless argue that they publish from the papers that they receive and they do not receive papers from amateurs. This may well be true. Yet the pattern of current publication will provide no encouragement for amateur ornithologists. Complex statistical analyses, in particular the current devotion to mathematical modelling, act as a significant deterrent (to readers as well as potential authors) since most amateurs are untrained in this arena.

So what is left for the amateur? An article in a local bird report perhaps, or a natural history magazine? A casual glance at such outlets reveals some very interesting papers and articles that almost always remain within a limited readership. Such articles deserve better, county bird reports often contain some examples of good basic ornithological research. Yet now they have no natural outlet for wider publication.

Within the Wicken Fen Group simple analyses of our collected data are frequently circulated by e-mail. For example, studies of the distribution and longevity of Cetti's Warblers *Cettia cetti*, survival of Blue Tits *Cyanistes caeruleus* and passage periods of Common Whitethroats *Sylvia communis* are all relatively recent topics. Other ringing groups do the same, some having their own websites (e.g. Rye Meads Ringing Group, www.rmrg.org.uk/pubs.htm). All this work, only a fraction of which is mentioned here, remains outside the mainstream of British ornithology.

We cannot turn the clock back and nor should we try; so how can we restore the amateur to a wider audience? A solution would be to provide a forum in which the amateur can publish their analyses, with proper scrutiny but without the rigours of strict scientific peer review. Within the army of surveyors, birdwatchers and ringers there must be many who would like to undertake further study of their data and to see it in the public domain. What is required is a universally available depository that is accessible both physically and intellectually, namely a website. To have credibility such a site needs to be managed by one of the present journals, or by an organisation such as the BTO or even the BOU; with material being uploaded via a moderator who might reasonably be expected to act as an editor of sorts. Ornithology, like astronomy, has always enjoyed a strong relationship between amateurs and professionals, it would be a shame to lose it altogether.

Would David Lack's studies of Robins be published today in the form in which he submitted them? If you think not, then surely something has gone wrong.

Peter Bircham

If you would like to write a Talking point column, please contact us at editor@britishbirds.co.uk

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