On shoulders of giants: 70 years of science for conservation published in *Wildfowl*

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Abstract

This 70th annual issue of the Wildfowl & Wetlands Trust's scientific journal *Wildfowl*, which commenced life as the *First Annual Report of the Severn Wildfowl Trust* in 1948, provides a timely opportunity to review and celebrate the wealth of knowledge and pioneering research published in its pages over the decades. During this time it has disseminated the results of scientific studies undertaken globally on wildfowl and their wetland habitats, providing an invaluable source of information required to understand and conserve these species. In this retrospective editorial, we therefore review the heritage and evolution of the journal, its core role within the Wildfowl & Wetlands Trust (publisher of the journal), major papers published through its history, and recent advances in recognition of the journal in the 21st century.

Key words: heritage, impact factor, Peter Scott, publications, sound science, Wildfowl & Wetlands Trust.

Seventy-two years since it first appeared, in 1948, as the *First Annual Report of the Severn Wildfowl Trust*, this 70th standard issue of the Wildfowl & Wetlands Trust's scientific journal *Wildfowl* provides a timely opportunity to look back on the evolution of the journal and the wealth of knowledge and pioneering research published within its pages over the decades. Publication has been missed in only three years; for the benefit of those wishing to link volumes to publication date these were in 1950, 1956 and 2004, for reasons lost in the mists of time. It was founded at a stage when the range of peer-reviewed scientific publications was more limited than it is now, but *Wildfowl* quickly found a niche as a major scientific journal, initially specialising in wildfowl and more recently broadening its remit to include other waterbirds and their wetland habitats, with papers submitted from across the globe. Even with the advent of new titles in recent years, it is currently one of only 28 ornithological journals included in the Web of Science "Core Collection" and, although some titles such as *Ibis*, *The Auk* and *The Condor* date back to the dawn of ornithological research in the late 19th and early 20th century, *Wildfowl* is mid-list in both age and eminence.

Here we provide a fond retrospective of the history and development of the journal.

In particular, this review of 70 years of *Wildfowl* focuses on how the journal relates to scientific studies undertaken at WWT, and the impacts made by some of its influential papers. It also considers changes in the scope and influence of the journal over the decades, and remembers the major contributions of the editors and authors, many of whom are of international renown. With uncertain times ahead, in a rapidly changing world, the future of the journal is also briefly considered.

Heritage and evolution of the journal

The first issue of the journal – *First Annual Report of the Severn Wildfowl Trust* – was very much a manifesto for the fledging Severn Wildfowl Trust (now WWT) inaugurated the previous year. The father of WWT's founder Peter Scott, the explorer Robert Falcon Scott ("Scott of the Antarctic"), saw scientific endeavour as the mainstay of his expeditions; indeed, much of the data from the RRS Discovery expedition in particular is still used as baseline for current glaciological and climatological change assessment/modelling. The importance of science was not lost on his son. The *Annual Reports* therefore included not only detailed information on the Report of Council, membership, finances and fund-raising activity, but gave the results from the research and monitoring programmes undertaken not only by the Trust's staff but by visiting scientists. It was a significant publication for that era, with Konrad Lorenz publishing a paper in *Fourth Annual Report* following his 6-week visit to Slimbridge, and by the mid-1950s researchers working more widely afield were also contributing their papers for publication. Progress reports on the Trust's scientific activity were included from the outset, with the *First Annual Report* giving detailed descriptions on the numbers of geese at the New Grounds (including three of the

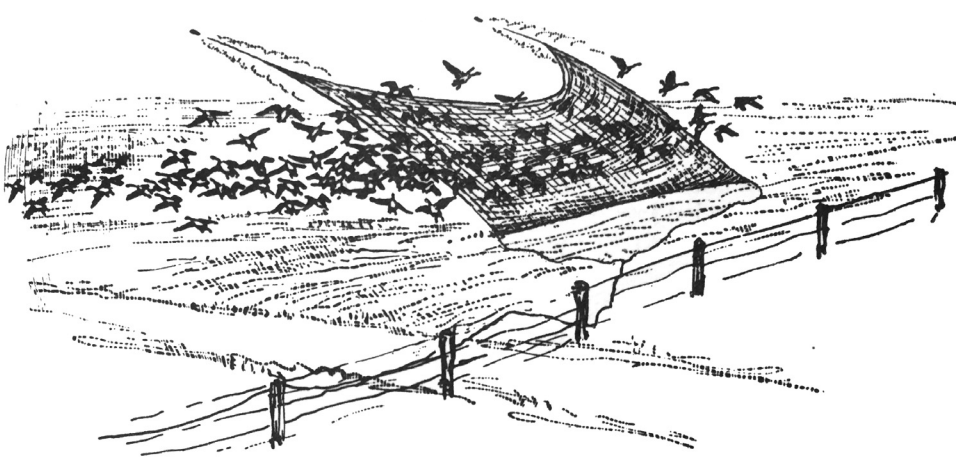

Figure 1. Line drawing of 32 European White-fronted Geese *Anser a. albifrons* being caught by rocket-net, in a flock of 1,300 at the New Grounds, Slimbridge during winter 1947/48. Illustration from the *Severn Wildfowl Trust Annual Report 1948*, drawn by Peter Scott.

rare Lesser White-fronted Goose *Anser erythropus*), rocket-netting geese for ringing (Fig. 1), deployment of the duck decoy for catching duck, and a stock-take of the waterfowl in the Trust's collection. Even in this inaugural issue, results of the ringing programmes were coming through, with some duck ringed in autumn 1947 (Fig. 2) reported shot in the same winter, mostly within Gloucestershire, but one immature male Northern Shoveler *Anas clypeata* was recovered on the Wexford Slobs, Ireland, and an immature male Eurasian Teal *A. crecca* was shot in France. Each issue was illustrated not only by Peter Scott paintings on the front cover but with his charming line drawings highlighting key points made or birds being described. Indeed, the *Second Annual Report of the Severn Wildfowl Trust* included, remarkably, the *Key to the Wildfowl of the World* – 47 pages of description and illustrations of all the world's wildfowl species – which was subsequently published as a separate book (Scott 1951).

The early years of the WWT were exciting and innovative times, evident in the rich flow of research papers and monitoring updates presented in the *Annual Reports* during the 1950s. Pioneering studies on the captive breeding (Lorenz 1952) and behaviour (McKinney 1959; Johnsgard 1960) of wildfowl, together with information on the initiation and development of ringing programmes (*e.g.* Scott *et al.* 1953; Cooch 1957), provided valuable information for the fields of animal husbandry, behavioural ecology and population dynamics used by the current and future generations of researchers. Frank McKinney, who became the foremost authority on dabbling duck behaviour, was author of the first Ph.D. study to be based at Slimbridge. His degree

Figure 2. Peter Scott working on the House pipe during refurbishment of the Berkeley New Decoy at Slimbridge in 1948, by Fox Photos.

was awarded in 1953 and his many students continued to publish in *Wildfowl* until the 1990s. In 1954, Eric Fabricius of the University of Helsinki and the Trust's Resident Biologist Hugh Boyd used an experimental approach to describe the "following" behaviour in ducklings; they found that positive acoustic stimuli are more effective than moving models in eliciting the following response, and the resultant paper in the *Sixth Annual Report* (Fabricius & Boyd 1954) continues to be a keynote publication, still cited > 60 years later. Importantly, Hugh Boyd instigated the regular sampling of age ratios among geese in wintering flocks, initially at Slimbridge (*e.g.* Boyd 1953, in the *Fifth Annual Report*), and shortly thereafter among wintering Iceland/Greenland Pink-footed Geese *Anser brachyrhynchus* at the population level, enabling facets of demography to be incorporated into population modelling (Boyd 1956; Boyd & Ogilvie 1969). By the end of the 1950s, such demographic assessment of the annual recruitment of young into wintering goose populations was an established feature of population level goose monitoring, work that continues to be undertaken by WWT staff and volunteer counters organised by WWT to the present day, now funded in partnership with the Joint Nature Conservation Committee and NatureScot (previously Scottish Natural Heritage). This, together with the information on survival rates coming through from the ring recovery programmes (*e.g.* Boyd 1958) and latterly supplemented by re-sightings of distinctive markers (such as leg bands and neck collars), has formed the basis for determining the demographic drivers underlying trends in numbers for the migratory goose populations wintering in the UK (*e.g.* Frederiksen *et al.* 2014).

In 1961, the *Wildfowl Trust Annual Report* was divided into two parts; the scientific papers were separated from the account of the Trust's activities for its Members, but the science continued to be distributed to existing, and newly-recruited, WWT Fellows and Life Members. By 1968, when the name of the journal changed to *Wildfowl*, it was an established international publication, attracting papers from leading researchers of the day from both the UK and elsewhere interested in studying wildfowl and in the conservation of these species. The editor Prof. Geoffrey Matthews reported in his editorial that was much debate regarding the new title for the journal; it was no longer the Annual Report of the organisation but at the same time it was desirable that continuity from previous issues of the journal should not be lost. This precluded a complete change of title (*e.g. Anser* was suggested), and for a time *Wildfowl Trust Annual Review* was considered as there was an aim to increase the number of review articles. Other non-review papers would continue to be published, however, and there was a preference at the time for short, snappy, titles. Thus the decision was made simply to call our journal *Wildfowl*, with the numbering sequence of the volumes to be retained with the *Eighteenth Annual Report of the Wildfowl Trust* being succeeded by *Wildfowl* 19.

During the 1970s–1980s, *Wildfowl* grew from strength-to-strength, with many papers proving influential, as described in the "Main papers" section below. There was an increasing move towards investigating how

species ecology affects population trends and distribution, assessing their conservation status, informing good management practices for migratory waterbirds, and identifying ongoing threats to species at risk of extinction. The last most recently includes a paper in the current issue, which describes how chronic epizootics of avian botulism are affecting survival rates and population growth for the globally threatened Laysan Duck *Anas laysanensis* reintroduced to Midway and Kure Atoll in the Hawaiian Archipelago (Reynolds *et al.* 2020). Special Issues of the journal were added to the standard issue in some years, the first being the Proceedings of the Third International Swan Symposium published in 1991, but there has been a flurry of activity with Special Issues Nos. 2–5 published in the last decade. The latest edition, *Wildfowl* Special Issue No. 6, which provides current and novel information on the population trends, distribution and migration of waterbird populations in the East Asian flyway, is scheduled for publication later on this year.

Relevance to the Wildfowl & Wetlands Trust

From the outset the journal not only published papers on wide-ranging aspects of the wildfowl populations globally (with American and European authors in particular regularly sending their papers to the journal) but provided a platform for disseminating scientific research undertaken by the Wildfowl & Wetlands Trust. Providing the scientific basis for sound conservation was a founding principle of the organisation, and by 1957 there were six scientists on the team, headed by the Director of Research Prof Geoffrey Matthews. Many of the team – *e.g.* Hugh Boyd, George Atkinson-Willes, Janet Kear – became major international figures in the ornithological and conservation communities (see, for instance, Oglivie 2017; Rees 2005, 2008; Rees & Smart 2013). In a previous Anniversary Edition of *Wildfowl* (*Wildfowl* 47), published to celebrate 50 years since the establishment of the WWT, Dr Ian Newton noted in his valuable review of the Trust's scientific history that a Scientific Advisory Committee (SAC) was founded in 1954 to assess and advise on WWT's scientific programme (Newton 1996). It was chaired by Sir Arthur Landsborough Thomson, and two Nobel Prize laureates (Konrad Lorenz and Niko Tinbergen) served on the SAC during the 1950s; in 1960 the committee included at least five Fellows of the Royal Society including Sir Julian Huxley (Huxley 1993; Newton 1996). Internationally-renowned scientists continued to serve on the SAC until it was disbanded during the 1990s.

During the early years, research activity at WWT was unrestricted and permitted researchers the luxury of free thinking, with the result that any research topic deemed to be novel, ethical and of interest was considered worthwhile, as long as it contributed to the pool of human knowledge – what we might now call genuine "blue-sky" curiosity-driven research. Although behavioural studies were initially a main focus, perhaps influenced by the frequent visits of Konrad Lorenz to Slimbridge, WWT's involvement from the outset in wildfowl counts and in catching birds for

ringing quickly led to the organisation being at the forefront of migratory waterbird studies in Europe, particularly those to do with understanding the dynamics of such huntable populations, with the data generated being invaluable for describing and interpreting population trends and distribution. Scott's pioneering contribution to this is no better exemplified than by his expedition with Iceland's leading ornithologist Dr Finnur Guðmundsson and colleagues to catch and ring Pink-footed Geese in Iceland in 1951, described in detail in the *Fifth Annual Report* (Scott *et al.* 1953). Moreover, regular visits by American scientists and aviculturists saw a two-way transfer of monitoring, research and avicultural skills between the Old and New World until the late 1970s, to the benefit of the journal.

As time progressed, key aspects of the WWT's work continued to appear in *Wildfowl*. Progress reports on the wildfowl counts, ringing, goose research and swan studies were included until the early 1990s, along with the avicultural records. Latterly these were augmented by new initiatives being developed by the organisation, such as *e.g.* in *Wildfowl* 43 (in 1992), surveys to assess the status of the Scaly-sided Merganser *Mergus squamatus* in East Asia (Hughes & Bocharnikov 1992), the trialling of the attachment of radio-transmitters to captive White-winged Wood Duck *Cairina scutulata* (Green *et al.* 1994), and on the movement towards the use of non-toxic (lead-free) gunshot in the UK (Owen 1992). The last followed a paper in the previous issue by Dr Debbie Pain (who later became Director of Conservation at WWT) on the ingestion of lead shot by duck on the Evros Delta, Greece (Pain & Handrinos 1991), and the current issue continues this work (30 years on) with the focus now on ensuring that non-toxic gunshot is used over wetlands throughout the European Union (Green & Pain 2020). Meanwhile, WWT's work on long-term surveillance of waterbird health included a series of papers on the results of *post mortem* analysis not only of birds from its collections (which provided advice on animal husbandry for zoos elsewhere), but also on the causes of death for birds found in the wild. The annual progress reports culminated in 50-year reviews of these activities in *Wildfowl* 47, but full papers by or involving WWT staff, including inaugural publications by WWT's students commencing their careers, continue to be published on a regular basis (*e.g.* Brides *et al.* 2017; Frew *et al.* 2018; Sanders & Rees 2018; Wood *et al.* 2019).

In June 1989, the organisation changed its name to the Wildfowl & Wetlands Trust and, although the journal had always welcomed submissions covering a broad range of topics, this was clarified in the notice to contributors at the time in specifying that the journals aims to: "…*disseminate original material on the ecology, biology and conservation of wildfowl and ecologically associated birds (such as waders, rails and flamingos), and on their wetland habitats.*" This continues to be the remit (albeit that the call for papers now includes research and review articles related to habitat management and policy development), resulting in recent papers ranging from a review of the evidence on the effects of harvest on waterbird populations in North America (Cooch *et al.* 2014), to assessment of protected areas

in Madagascar (Razafindrajao *et al.* 2017) and biodiversity outcomes from the restoration of lakes, shallow wetlands and seasonally-flooded grassland from arable farmland in the Skjern River Valley, Denmark (Bregnballe *et al.* 2019). Whilst taxonomically the Anatidae continue to be main species covered, papers on flamingos, storks and waders appear periodically (*e.g.* on Curlew *Numenius arquata* and Spotted Crake *Porzana porzana* in recent issues), and two of the "top 50" cited papers were from Prof. Peter Evans' Bar-tailed Godwit *Limosa lapponica* studies (Smith & Evans 1973; Evans & Smith 1975).

Back in the 1950s, co-editors Peter Scott and Hugh Boyd (Fig. 3) would consider the "thickness" of the journal to determine whether they needed to put pen to paper, and there was a period in the early 2000s when *Wildfowl*'s Editorial Board members were similarly called upon to drum up quality manuscripts from among their students and other contacts, but this has not been required for quite some time.

In 2013, the full back catalogue of the journal was scanned and the papers made searchable by WWT volunteer Christine Orchard (an immense task expertly undertaken!), and digital copies were made freely available online through the *Wildfowl* webpage developed by WWT's Robin Jones at http://wildfowl.wwt.org.uk/. Although papers published in *Wildfowl* since the late 1970s have been included in the Web of Science (WoS) "All Databases" section for a

Figure 3. Hugh Boyd and Geoffrey Matthews (both renowned Editors of *Wildfowl*) loading rockets (converted shells) with cordite as the first stage in rocket-netting geese, by Philippa Scott.

number of years, it was not until 2016 (following requests to review the status of the journal) that it was added to the WoS "Core Collection". Then in 2019, following assessment of three issues, the journal was awarded an impact factor (IF), a metric often used to indicate the relative importance of a journal within its field. The combination of lack of page charges to authors, open access publication and the IF has been of benefit to the journal, resulting in a clear increase in submission rates, with academics in particular under some pressure from their institutes to submit their papers to journals in the "Core Collection", to enhance their standing in the scientific community.

Major papers published in the journal

Inclusion of *Wildfowl* in Web of Science has the advantage of assessing how individual papers are perceived and used, by noting the extent to which they are cited by other authors. It, of course, takes a number of years to accrue numerous citations, so perhaps it is not surprising that the fifteen or so key papers in the journal with > 100 citations to date (and counting) are those from the 1960s and 1970s, topped by Finn Salomonsen's epic and classic review of moult migration (Salomonsen 1968), N.W. Owens' study of the effects of human disturbance on Dark-bellied Brent Geese *Branta bernicla bernicla* (Owens 1977), David Lack's seminal work on the evolution of egg and clutch sizes in waterfowl (Lack 1967) and a pioneering study of daily food (and thus energy) intake by geese in the wild (Ebbinge *et al.* 1975). Papers by Dr Myrfyn Owen – for many years the widely respected Director of Research at WWT (but sadly lost to science on stepping up to become Director General of the organisation) – were particularly well-rated, as were his numerous publications elsewhere; he authored four of the 50 top-ranked papers appearing in *Wildfowl*, including several on the management of grasslands for geese wintering at WWT Slimbridge). Janet Kear's early review of the history of potato-eating by wildfowl in Britain also continues to be an important reference to this day (Kear 1963). Whilst many of these papers are from the 20th century, reflecting the years since they first appeared, it's good to see that several of the more recent publications are also being cited. For instance, the current list of *Wildfowl* papers with > 50 citations includes a number from the last 10–12 years, *e.g.* on Bar-headed Goose migration routes in East Asia (Takekawa *et al.* 2009) and identification of wetlands of international importance within Algeria, for classifying as Important Bird Areas (IBAs) and as Ramsar sites (Samraoui & Samraoui 2008). Others are also receiving much attention, such as Fox *et al.* (2016) and Brides *et al.* (2017) – both on Common Pochard *Aythya ferina* declines across Europe – and most recently outputs from the *Sixth International Swan Symposium*, which appeared as *Wildfowl* Special Issue No. 5 in 2019.

Into the future

When the first issue of the journal was published, the world was emerging from the ravages of the WWII and the hard times that followed. Seventy years on, we are again facing troubled times in a rapidly changing world. The consequences of climate change are becoming increasingly apparent through

dramatic variation in our weather systems globally, the rate of species extinctions is increasing and the human population has been hit by the Covid-19 global pandemic. WWT also is changing, and has indicated an intention to concentrate principally on wetlands in future. Both then and now, however, international cooperation is crucial for addressing the conservation of animal populations, many of which move across political boundaries. With the development of rapid communication systems, it is now much easier for scientists from different parts of the world to exchange information. This is in marked contrast to the situation in the mid-20th century, when little was known in the West about the conditions encountered by migratory birds at their summer haunts in the Russian Arctic, or by populations following different migration routes in East Asia, especially those occurring in China. While *Wildfowl* in the last 20 years has been fortunate to be able to publish significant material from Russia and China, as well as many other states across the Northern Hemisphere, there still remains work in progress to encourage contributions from other, less well represented parts of globe where waterbird populations are just as much in jeopardy. As such, despite the huge challenges ahead, international exchange of knowledge and research expertise should accelerate assessment and prioritisation of conservation needs, assisting governments and NGOs to put management plans in place to minimise extinction risk, maximise species biodiversity, and maintain and enhance ecosystems.

In similar vein, *Wildfowl* has recently joined an initiative instigated by Prof. Bill Sutherland and the Conservation Evidence group (www.conservationevidence.com), in which about 40 conservation journals (now including *Wildfowl*) request that authors take care to build on previous knowledge in their studies and publications, by ensuring that their literature review puts the new work fully and accurately into context (Sutherland *et al.* 2020). Early issues of the journal included papers which were rich in data, thus providing a valuable information resource, thought this later diminished somewhat, probably to minimise publication costs over the decades. In these days of electronic publication, however, base-line data can be archived online relatively easily and, in accordance with other journals, Supporting Materials have been made available through the journal's website since *Wildfowl* 65 in 2015.

In these days of "fake news", combined with political pressure on researchers to provide instantaneous results, it cannot be emphasised enough that sound science remains crucial for measuring and optimising the outcomes of conservation endeavours. Within this ferment, we trust that *Wildfowl* will continue to report on changes to the species and wetlands habitats, with a particular eye to addressing how change or loss in habitat may require management actions to sustain both species viability and human livelihoods affected by environmental change. As *Wildfowl* is a truly international journal, we also hope that it will continue to provide researchers and conservationists from different parts of the globe with a forum for publishing their work, which can be taken forward to inform national and international environmental policy in the years to come.

Acknowledgements

The 70 years of *Wildfowl* would not have been possible without the unstinting efforts of its previous Editors, in chronological order: Peter Scott (1948–1958), Hugh Boyd (1959–1966), Geoffrey Matthews (1968–1988), Janet Kear (1989–1996), Jeff Kirby (1997–1998) and Mark O'Connell (1999–2004), with Hugh Boyd also acting as co-editor (with Peter Scott) in 1953–1958 and Malcolm Ogilvie (with Geoffrey Matthews) in 1968–1986. Since the current Editor and Associate Editor took on their roles (in 2006 and 2010 respectively) we have been greatly supported by the eminent group of scientists serving on the Editorial Board: Jeff Black, Bruce Dugger, Andy Green and Matt Guillemain (with David Roshier and Mark O'Connell also making valued contributions in earlier years), who have unfailingly continued to handle papers and provide sound scientific advice. We're immensely grateful to them all, and also to the very large numbers of reviewers who kindly and selflessly provide expert opinion on papers submitted to the journal, thereby maintaining our scientific standards. Most recently, James Robinson and David Stroud made helpful comments on a draft of this paper.

Since the early 2000s, administrative tasks, particularly in dealing with distribution lists and requests for back issues, have been largely undertaken by Maggie Sage. With Maggie approaching retirement, we wish to pay particular thanks to her for looking after the journal so well over the years – a number of authors will no doubt recall her kindness in chasing up their copies of the journal lost in the post. In recent years we've also been much supported by the expertise of Ellen Matthews (EM Typesetting) in preparing the proofs and keeping the work on schedule, Paul Marshall for the cover design, and the staff at Henry Ling Ltd for printing and distributing the journal. Geoff Hilton kindly arranged peer-review of some of the incoming papers for *Wildfowl* Special Issue No. 6 when one of us (ER) was on furlough for 3 months during the Covid-19 lockdown in the UK in mid-2020, and this also helped to keep the work on schedule.

None of this would have been possible, however, without the many authors who have submitted their manuscripts to *Wildfowl* for more than half a century. We remain immensely grateful to them for selecting the journal to publish their work over the decades. Meanwhile, despite complications resulting from the current pandemic, there is no doubt that the authors and the publication team have done us proud in 2020, with both *Wildfowl* 70 and *Wildfowl* Special Issue No. 6 being impressive volumes, and we hope that you likewise find them of use and interest.

References

Boyd, H. 1953. Notes on field counts of age-group ratios and brood-size. *Wildfowl Trust Annual Report* 5: 14–19.

Boyd, H. 1956. Statistics of the British population of the pink-footed goose. *Journal of Animal Ecology* 25: 253–273.

Boyd, H. 1958. Survival of the Greenland White-fronted Goose. *Wildfowl Trust Annual Report* 9: 36.

Boyd, H. & Ogilvie, M.A. 1969. Changes in the British-wintering population of the Pink-

footed Goose from 1950 to 1975. *Wildfowl* 20: 33–46.

Bregnballe, T., Clausen, P. & Fox, A.D. 2019. Responses of autumn-staging ducks and Coot *Fulica atra* to the Skjern River Valley wetland restoration project. *Wildfowl* 69: 28–44.

Brides, K., Wood, K.A., Hearn, R.D. & Fijen, T.P. 2017. Changes in the sex ratio of the Common Pochard *Aythya ferina* in Europe and North Africa. *Wildfowl* 67: 100–112.

Cooch, E.G., Guillemain, M., Boomer, G.S., Lebreton, J.-D. & Nichols, J.D. 2014. The effects of harvest on waterfowl populations. *Wildfowl* (Special Issue No. 4): 220–276.

Cooch, F.G. 1957. Mass ringing of flightless Blue and Lesser Snow Geese in Canada's Eastern Arctic. *Wildfowl Trust Annual Report* 8: 58–67.

Evans, P.R. & Smith, P.C. 1975. Studies of shorebirds at Lindisfarne, Northumberland. 2. Fat and pectoral muscle as indicators of body condition in the Bar-tailed Godwit. *Wildfowl* 26: 64–74.

Fabricius, E. & Boyd, H. 1954. Experiments on the following-reactions of ducklings. *Wildfowl Trust Annual Report* 6: 84–89.

Fox, A.D., Caizergues, A., Banik, M.V., Devos, K., Dvorak, M., Ellermaa, M., Folliot, B., Green, A.J., Grüneberg, C., Guillemain, M., Håland, A., Hornman, M., Keller, V., Koshelev, A.I., Kostiushyn, V.A., Kozulin, A., Ławicki, Ł., Luigujõe, L., Müller, C., Musil, P., Musilová, Z., Nilsson, L., Mischenko, A., Pöysä, H., Ščiban, M., Sjeničić, J., Stīpniece, A., Švažas, S., Wahl, J. 2016. Recent changes in the abundance of Common Pochard *Aythya ferina* breeding in Europe. *Wildfowl* 66: 22–40.

Frederiksen, M., Hearn, R.D., Mitchell, C., Sigfússon, A., Swann, R.L. & Fox, A.D. 2004. The dynamics of hunted Icelandic goose populations: a reassessment of the evidence. *Journal of Applied Ecology* 41: 315–334.

Frew, R.T., Brides, K., Clare, T., MacLean, L., Rigby, D., Tomlinson, C.G. & Wood, K.A. 2018. Temporal changes in the sex ratio of the Common Pochard *Aythya ferina* compared to four other duck species at Martin Mere, Lancashire, UK. *Wildfowl* 68: 140–154.

Green, A.J., Webber, L.C. & Etheridge, A. 1992. Studies of the White-winged Wood Duck *Cairina scutulata* in captivity. *Wildfowl* 43: 200–210.

Green, R.E. & Pain, D.J. 2020. Additional mortality rate of wildfowl caused by ingestion of lead shotgun pellets: a re-analysis of data from a 70-year-old field experiment on wild Mallards *Anas platyrhynchos*. *Wildfowl* 70: 242–256.

Hughes, B. & Bocharnikov, V.N. 1992. Status of the Scaly-sided Merganser *Mergus squamatus* in the Far East of Russia. *Wildfowl* 43: 193–199.

Huxley, E. 1993. *Peter Scott: Painter and Naturalist*. Faber & Faber, London, UK.

Johnsgard, P.A. 1960. Comparative behaviour of the Anatidae and its evolutionary implications. *Wildfowl Trust Annual Report* 11: 31–45.

Kear, J. 1963. The history of potato-eating by wildfowl in Britain. *Wildfowl Trust Annual Report* 14: 54–65.

Lack, D. 1967. The significance of clutch-size in waterfowl. *Wildfowl* 18: 125–128.

Lorenz, K. 1952. The scientific value of a group collection of live animals. *Wildfowl Trust Annual Report* 4: 47–50.

McKinney, F. 1959. Waterfowl at Cold Bay, Alaska, with notes on the display of the Black Scoter. *Wildfowl Trust Annual Report* 10: 133–140.

Newton, I. 1996. Fifty years of scientific research by The Wildfowl & Wetlands Trust *Wildfowl* 47: 1–8.

Ogilvie, M.A. 2017. Hugh Boyd, CM (1925–2016). *Ibis* 159: 475–476.

Owen, M. 1992. Progress on lead-free shot in the UK, 1991. *Wildfowl* 43: 223–224.

Owens, N.W. 1977. Responses of wintering Brent Geese to human disturbance. *Wildfowl* 28: 5–14.

Pain, D.J. & Handrinos, G.I. 1990. The incidence of ingested lead shot in ducks of the Evros Delta, Greece. *Wildfowl* 41: 167–170.

Razafindrajao, F., Bamford, A.J., Young, H.G., Andrianarimisa, A., Bin Aboudou, A.I. & Lewis, R.E. 2017. Reassessing the conservation outlook for Madagascar's endemic Anatidae following the creation of new protected areas. *Wildfowl* 67: 72–86.

Rees, E.C. 2005. *In memoriam*: Janet Kear 1933–2004. *Auk* 122: 1293–1294.

Rees, E.C. 2008. Kear, Janet (1933–2004). *Oxford Dictionary of National Biography*. Oxford University Press, Oxford, UK. Available at http://www.oxforddnb.com/view/article/94353 (last accessed 9 October 2020).

Rees, E. & Smart, M. 2013. Geoffrey Matthews, OBE (1923–2013). *Ibis* 155: 701–703.

Reynolds, M.H., Hatfield, J.S., Courtot, K.N. & Vanderlip, C. 2020. Survival of Laysan Teal *Anas laysanensis* differs between island populations: role of chronic avian botulism. *Wildfowl* 70: 192–210.

Salomonsen, F. 1968. The moult migration. *Wildfowl* 19: 5–24.

Samraoui, B. & Samraoui, F. 2008. An ornithological survey of Algerian wetlands: Important Bird Areas, Ramsar sites and threatened species. *Wildfowl* 58: 71–96.

Sanders, J.D. & Rees, E.C. 2018. Arrival and departure patterns of Eurasian Curlew *Numenius a. arquata* wintering on the River Severn estuary, Gloucestershire, southwest England. *Wildfowl* 68: 155–171.

Scott, P. 1951. *Key to the Wildfowl of the World*. Severn Wildfowl Trust, Slimbridge, UK.

Scott, P., Fisher, J. & Guðmundsson, F. 1953. The Severn Wildfowl Trust expedition to central Iceland, 1951. *Wildfowl Trust Annual Report* 5: 78–115.

Smith, P.C. & Evans, P.R. 1973. Studies of shorebirds at Lindisfarne, Northumberland. 1. Feeding ecology and behaviour of the Bar-tailed Godwit. *Wildfowl* 24: 135–139.

Sutherland, W.J., Alvarez-Castañeda, S.T., Amano, T., Ambrosini, R., Atkinson, P., Baxter, J.M., Bond, A.L., Boon, P.J., Buchanan, K.L., Barlow, J., Bogliani, G., Bragg, O.M., Burgman, M., Cadotte, M.W., Calver, M., Cooke, S.J., Corlett, R.T., Devictor, V., Ewen, J.G., Fisher, M., Freeman, G., Game, E., Godley, B.J., Gortazar, C., Hartley, I.R., Hawksworth, D.L., Hobson, K.A., Lu, M.-L., Martín-López, B., Ma, K., Machado, A., Maes, D., Mangiacotti, M., McCafferty, D.J., Melfi, V., Molur, S., Moore, A.J., Murphy, S.D., Norris, D., van Oudenhoven, A.P.E., Powers, J., Rees, E.C., Schwartz, M.W., Storch, I. & Wordley, C. 2020. Ensuring that tests of conservation interventions build on existing literature. *Conservation Biology* 34: 781–783.

Takekawa, J.Y., Heath, S.R., Douglas, D.C., Perry, W.M., Javed, S., Newman, S.H., Suwal, R.N., Rahmani, A.R., Choudhury, B.C., Prosser, D.J., Yan, YB, Hou, Y., Batbayar, N., Natsagdorj, T., Bishop, C.M., Butler, P.J., Frappell, P.B., Milsom, W.K., Scott, G.R., Hawkes, L.A. & Wikelski, M. 2009. Geographic variation in Bar-headed Geese *Anser indicus*: connectivity of wintering areas and breeding grounds across a broad front. *Wildfowl* 59: 100–123.

Wood, K.A., Cao, L., Clausen, P., Ely, C.R., Luigujõe, L., Rees, E.C., Snyder, J., Solovyeva, D.V. & Włodarczyk, R. 2019. Current trends and future directions in swan research: insights from the 6th International Swan Symposium. *Wildfowl* (Special Issue No. 5): 1–34.

