Swan News

Issue no. 16

November 2021

Newsletter of the Wetlands International / IUCN SSC Swan Specialist Group

IUCN

SSC Species Survival Commission

SWAN SPECIALIST GROUP

Wetlands INTERNATIONAL

About the Swan Specialist Group

The Wetlands International / IUCN SSC Swan Specialist Group (SSG) is a global network of over 300 swan specialists from 38 countries who undertake monitoring, research, conservation and management of swan populations.

The SSG strives to facilitate effective communication between members and others with an interest in swan management and conservation world-wide, in order to improve national and international links for cooperative research, to identify gaps in knowledge and to provide a forum for addressing swan conservation issues.

Swan Specialist Group Committee and coordinators

Chair: Eileen Rees (**ReesEileenC@gmail.com**)

Newsletter Editor: Carl D. Mitchell (**mitch@silverstar.com**)

Membership Secretary: Kane Brides (**kane.brides@wwt.org.uk**)

Website: Julia Newth (**julia.newth@wwt.org.uk**)

Regional Coordinator (North America): Jeff Snyder (**SnyderJ@wou.edu**)

Bewick's Swan (Eastern Population): Diana Solovyeva (**Diana_Solovyova@mail.ru**)

Bewick's Swan (NW European Population): Wim Tijsen (**wimtijsen@ziggo.nl**)

Black Swan: Jon Coleman (**janetandjon@hotmail.com**)

Black-necked Swan and Coscoroba Swan: Yerko Vilina (**yvilina@santotomas.cl)**

Mute Swan (Central European Population): Radoslaw Wlodarczyk (**radoslaw.wlodarczyk@biol.uni.lodz.pl**)

Trumpeter Swan: John E. Cornely (**johncornely@msn.com**)

Tundra Swan: Craig Ely (**craigoely@gmail.com**)

Whooper Swan (Eastern Population): Ma Ming (**maming@ms.xjb.ac.cn**)

Whooper Swan (Mainland Europe Population): Preben Clausen (**pc@bios.au.dk**)

Whooper Swan (Icelandic Population): Olafur Einarsson (**olafur.einarsson@gmail.com**)

This issue of Swan News was edited by Carl D. Mitchell (USFWS, retired).
Typesetting and layout by Ellen Matthews (EM Typesetting).
Cover photograph: Trumpeter Swan landing, by Margaret Smith.

Citation: Mitchell, C.D. (ed). 2021. *Swan News issue no 16 / November 2021*. Newsletter of the Wetlands International / IUCN SSC Swan Specialist Group. 48pp.

Contents

Editorial 4
Announcement 5
7th International Swan Symposium & 26th Trumpeter Swan Society Swan Conference 5
Research projects and updates 6
Tracking swans in the East Asian flyway 6
A post-reintroduction assessment of the Interior Population of Trumpeter Swans 9
Movements and demography of Trumpeter Swans in the northern US Rocky Mountains 11
International Swan Census reports major numbers in the Volga Delta 12
Colour marking of Bewick's Swans on the West Pacific Flyway 14
Bewick's Swans on the NW European tundra during the global lockdown: "Swan Champions" project update 15
The Big Brood Count 2020! 17
Papers 18
Bewick's Swans wintering 2019/2020 in Schleswig-Holstein/northern Germany 18
Dietary habits of the Black-necked Swan *Cygnus melancoryphus* in a Ramsar wetland of southern Chile 21
New tools for old problems: using webcams to study swan aggression 22
Ecological consequences of Whooper Swans feeding in below-average water levels at Lake Izunuma-Uchinuma, Miyagi Prefecture, Japan 25
News Items 27
Utah's swan hunt 27
Biden administration revokes the "MBTA Rule" introduced by the Trump government 30
EU countries choose health over poison in historic vote to ban lead shot in wetlands 30
Florida city sells swans after Queen's gift leads to overpopulation 31
In Memoriam 33
Colin J. Pennycuick 33
Richard A. Malecki 35
Recent Swan Literature 36
Contributors 47

Editorial

Welcome to the 16th issue of the Swan Specialist Newsletter (*Swan News* 16), for 2020/21. For those readers who are unfamiliar with the Newsletter, it is one of the methods used by the Wetlands International / International Union for Conservation of Nature (IUCN) Swan Specialist Group (SSG) to keep its members, and other interested readers, informed about swan research, management and conservation around the planet. It allows readers to find out who is doing what, where, why and how. It provides insights, ideas, and contacts for those working on similar topics. In addition to the annual Newsletter, please also visit the SSG website at https://swansg.org for news, announcements, project updates and other information. If you have information on any projects you are working on, news you would like to share or know of forthcoming events of interest to the swan community, please do send it to the website coordinator for uploading to the website.

Obviously the global coronavirus pandemic in 2020, continuing into 2021, has made it a very challenging time for everyone, everywhere. Covid 19 considerations affect our very lives and living conditions, and force difficult decisions about fieldwork, research, teaching and every other activity. (This is the first year in 45 years that I have not personally conducted any field work.) As biologists we understand, perhaps better than most, the seriousness of the pandemic, and the importance of human behaviour in minimising its impacts. I hope that all of you, your family and friends, have escaped serious consequences, and that you all remain healthy throughout the remainder of the pandemic. Be smart, and stay safe.

With that in mind, we were very fortunate that many SSG members were able to continue their studies, and also found time to contribute to this Newsletter. We have a collection of Research Project updates, Papers, News and Recent Literature. Unfortunately we also have notices of Colin Pennycuick and Richard Malecki having passed away.

As always, the Newsletter would not be possible without your contributions, and the assistance of many friends and colleagues. My unbounded gratitude to Eileen Rees, who as always has been instrumental in ensuring that this Newsletter actually gets published. I also received very significant assistance from Martina Shannon, Ashley Stolp and Jeff Snyder, all of Western Oregon University. My sincere thanks to you to all.

Please remember to send me any updates, papers or other contributions for Swan News No. 17, at any time. We are always happy to receive any contributions from anyone. In addition please plan to give a presentation at the combined **7th International Swan Symposium & 26th Trumpeter Swan Society Swan Conference in October 2022.** Further details are provided in the Announcement below. Please also send me any constructive feedback, positive or negative. The only way to know if the Newsletter is meeting its objectives is to hear from the readers.

Best wishes to you all. Stay healthy, and enjoy the rest of the Newsletter.

Carl D. Mitchell

Announcement

7th International Swan Symposium & 26th Trumpeter Swan Society Swan Conference to be held at the Snow King Resort in Jackson, Wyoming, USA 24 – 27 October 2022

Following previous international symposia of the Wetlands International/IUCN-SSC Swan Specialist Group – held at Slimbridge (UK, 1971), Sapporo (Japan, 1980), Oxford (UK, 1989), Virginia (USA 2001), Easton, Maryland (USA 2014), and Tartu (Estonia, 2018) – we are delighted to announce that a joint 7th International Swan Symposium and 26th Trumpeter Swan Society Swan Conference will be held at the **Snow King Resort, Jackson, Wyoming on 24 – 27 October 2022**. This symposium is hosted by The Trumpeter Swan Society and the Ricketts Conservation Foundation, in partnership with the IUCN-SSC Swan Specialist Group.

The programme is still in development, but will include a 1-day mid-conference excursion. Delegates are also able to visit the National Parks independently before and after the conference, with further information on options to be provided later on this year.

Further information regarding registration and the submission of abstracts will be given in the **Second Announcement, in mid-December 2021**, which will be circulated by email. Details, including registration information, will also be provided on The Trumpeter Swan Society website (www.trumpeterswansociety.org) at that time.

Meanwhile please note the following dates in your diaries:

Second Announcement: **15 December 2021**
Call for abstracts: **15 December 2021**
Deadline for abstract submissions: **15 March 2022**
Confirmation of oral and poster presentations: **15 May 2022**
Deadline for early bird registration: **31 July 2022**
Deadline for final registration: **12 September 2022**
7th International Swan Symposium and 26th Trumpeter Swan Society Conference (all-day meetings with mid-conference excursion): **24–27 October 2022 inclusive**

We are already looking forward to seeing you in October 2022!

The Organising Committee

Research projects and updates

Tracking swans in the East Asian flyway

Lei Cao, Anthony D. Fox & Eileen C. Rees

The migration routes and main sites used by migratory waterbirds have been studied in Europe and North America since the mid-20th century, leading to the identification of discrete populations which form the basis for internationally coordinated conservation and management of these species. Until recently, however, there was a lack of comparable information about migratory Anatidae populations in Far East Asia, despite long-term monitoring programmes and some knowledge of migration routes based on Japanese satellite tracking (Cao *et al.* 2020). Tracking of 10 large-bodied Anatidae therefore was undertaken as a collaborative programme involving *inter alia* Chinese, Japanese, Korean, Mongolian and Russian researchers from 2014 onwards, and the results published in as a Special Issue of the Wildfowl journal in November 2020. The papers combined the new telemetry data with winter counts and expert knowledge, to update maps of the extent of breeding and wintering areas, and to define the flyways that connect them. Critical stopover sites were also described, to provide a basis for their more effective future conservation.

Three swan species native to East Asia – Whooper Swans *Cygnus cygnus*, Bewick's Swan *C. columbianus bewickii* and Mute Swan *C. olor* – were all included in the study, and the results provided valuable novel information on their distribution and movements. Bewick's Swan tracking data described two distinctive flyways for birds in the East Asia population: (1) the East Asian continental flyway, with birds breeding from Yamal Peninsula to the Svyatoy Nos Cape wintering in China, and (2) the West Pacific flyway, taken by swans which swans bred between the Indigirka River and Chaun Delta, which wintered in Japan (Fig. 1, from Fang *et al.* 2020). There was marked between-year variation in population-level Bewick's Swan count data recorded during the 21st century, reflecting incomplete

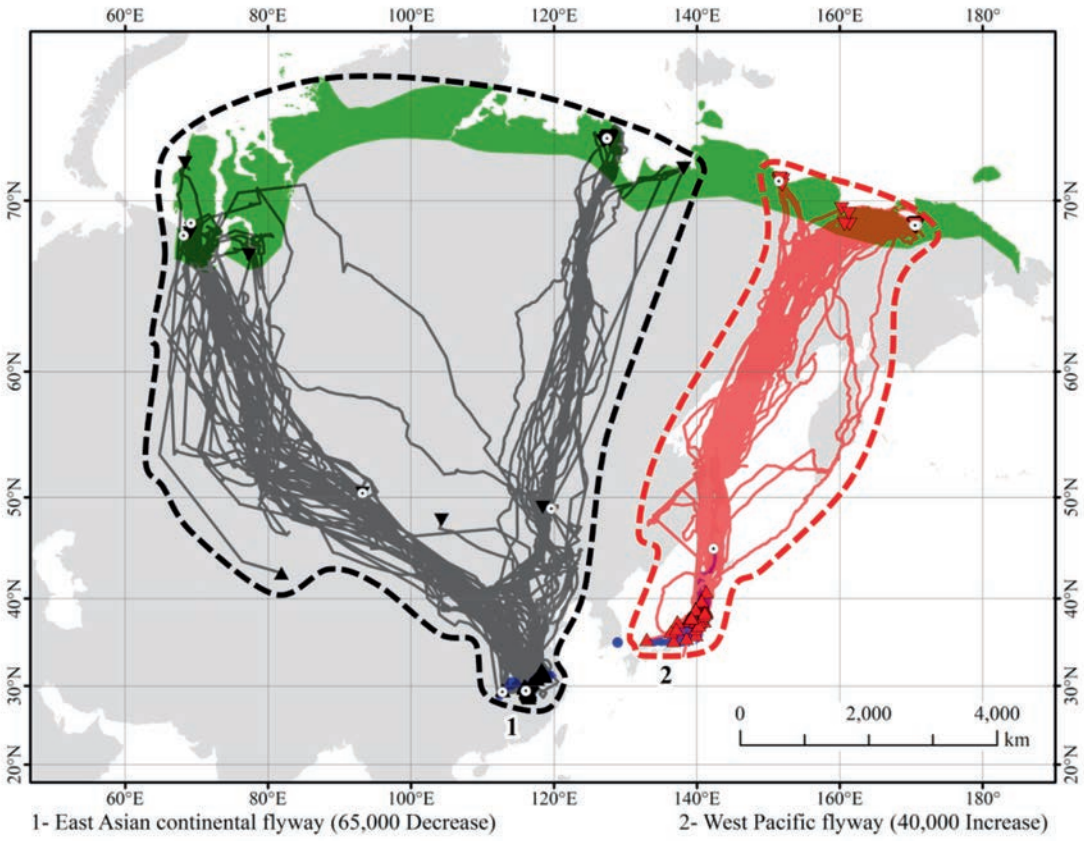


Figure 1. Migration routes for Bewick's Swan tracked along the East Asian continental flyway (black dashed line), and (2) the West Pacific flyway (red dashed line) in East Asia (from Fang *et al.* 2020).

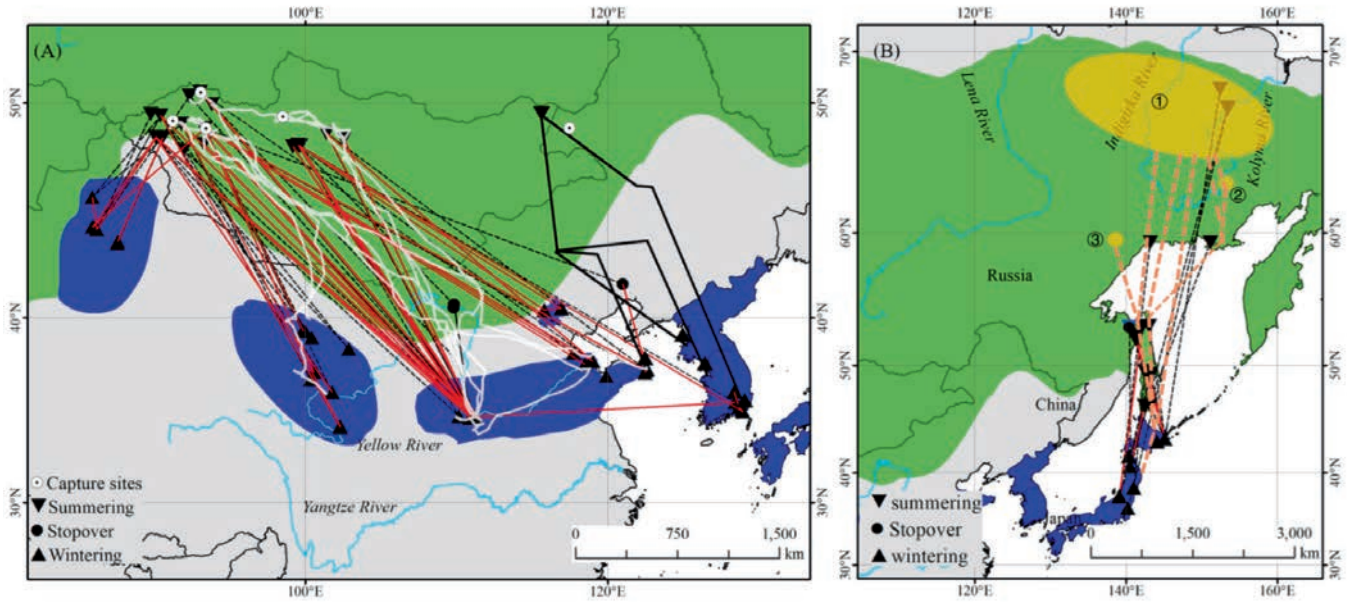


Figure 2. Migrations recorded for individual Whooper Swans in East Asia: (A) birds summered in Mongolia and wintered in China/South Korea; (B) birds summered in Far East Russia and wintered in Japan (from Ao *et al.* 2020). White solid lines = individuals from the Chinese-wintering population; black solid lines = individuals from the South Korean-wintering population, all of which summered in Mongolia (Ao *et al.* 2020). Orange dotted lines = representative (synthesised) migration routes, and orange shaded areas = representative summering/stopover/wintering areas for 47 tracked birds that summered in Russia and wintered in Japan (from Shimada *et al.* 2014).

coverage in some years. Numbers in the East Asia population were however most recently put at *c.* 65,000 birds following extensive wintering survey coverage in 2019–2020, compared to *c.* 81,000 in the early 2000s when coverage was less extensive, indicative of a population decline during the past two decades (Fang *et al.* 2020).

Whooper Swan tracking focussed on birds which spend the summer in western Mongolia and results indicated that the swans' summer distribution extended further than had previously been recorded, with three new wintering areas (in Xinjiang, Qinghai-Gansu and Beijing) identified for the species in China (Ao *et al.* 2020). The East Asian Whooper Swan population was estimated to number 57,690 individuals, generating a new 1% threshold of 577 birds for determining sites of international importance for the species in the region, with eight located in China, six in South Korea and 14 in Japan. Migration duration, stopover duration, the number of stopover sites and migration legs were significantly greater in spring than in autumn, whilst migration speed was slower in spring than in autumn. Assessment of the habitats frequented found seasonal variation in the proportion of time that the swans spent on arable crops, pasture, wetlands and open water (Ao *et al.* 2020).

The Mute Swan study was less comprehensive, but telemetry data and resightings of birds fitted with neck-collars confirmed that the species winters along the coast of eastern China and on the Korean Peninsula, and spends the summer along the Selenga River (Russia), central Mongolia and in Inner Mongolia (China). It is widespread but relatively scarce and scattered in East Asia, and although Mute Swans wintering in Korean Peninsula apparently originate from summering areas in Inner Mongolia and the Amur Region, further study is required before potential flyways can be confirmed (Meng *et al.* 2020). The sedentary introduced Mute Swan population in Japan does however appear to be isolated from those elsewhere.

Further information on these studies, and also on other species included in this initiative, are available online through the journal's website at http://wildfowl.wwt.org.uk.

References

Ao, P., Wang, X., Meng, F., Batbayar, N., Moriguchi, S., Shimada, T., Koyama, K., Park, J.-Y., Kim, H., Ma, M., Sun, Y., Wu, J., Zhao, Y., Wang, W., Zhang, L., Wang, X., Natsagdorj, T., Davaasuren, B., Damba, I., Rees, E.C., Cao, L. & Fox, A.D. 2020a. Migration routes and conservation status of the Whooper Swan Cygnus cygnus in East Asia. *Wildfowl* (Special Issue No. 6): 43–72.

Cao, L., Deng, X., Meng, F. & Fox, A.D. 2020. Defining flyways, discerning population trends and assessing conservation challenges of key Far East Asian Anatidae species: an introduction *Wildfowl* (Special Issue No. 6): 1–12.

Fang, L., Zhang, J., Zhao, Q., Solovyeva, D., Vangeluwe, D., Rozenfeld, S.B., Lameris, T., Xu, Z., Bysykatova, I., Batbayar, N., KoNishi, K., Moon, O.-K., He, B., Koyama, K., Moriguchi, S., Shimada, T., Park, J.-Y., Kim, H., Liu, G., Hu, B., Gao, Ruan, L., D., Natsagdorj, T., Davaasuren, B.,

Whooper catching in Mongolia (photo: Otgonbayar Tsend/WSCC of Mongolia).

Antonov, A., Mylnikova, A., Stepanov, A., Kirtaev, G., Zamyatin, D., Kazantzidis, S., Sekijima, T., Damba, I., Lee, H., Zhang, B., Xie, Y., Rees, E.C., Cao, L. & Fox, A.D. 2020. Two distinctive flyways with different population trends of Bewick's Swan *Cygnus columbianus bewickii* in East Asia. *Wildfowl* (Special Issue No. 6): 13–42.

Meng, F., Chen, L. Fang, L., Zhang, B., Li, C., Zhao, G., Batbayar, N., Natsagorj, T., Damba, I., Liu, S., Woods, K., Cao, L. & Fox, A.D. 2020. The migratory Mute Swan *Cygnus olor* population in East Asia. *Wildfowl* (Special Issue No. 6): 73–96.

Shimada, T., Yamaguchi, N.M., Hijikata, N., Hiraoka, E., Hupp, J.W., Flint, P.L., Tokita, K.-I., Fujita, G., Uchida, K. & Sato, F. 2014. Satellite tracking of migrating Whooper Swans *Cygnus cygnus* wintering in Japan. *Ornithological Science* 13: 67–75.

Whooper Swans in the Baltic (by Ben Cherry)

A post-reintroduction assessment of the Interior Population of Trumpeter Swans

David W. Wolfson & Randall T. Knapik

Trumpeter Swans *Cygnus buccinator* were widespread throughout North America prior to colonisation of the continent by Europeans during the 19th century. By the first half of the 20th century, however, a combination of commercial and subsistence hunting, and also habitat loss, had reduced the species to just a few thousand birds in the Pacific Coast Population. More recently, the Interior Population of Trumpeter Swans has increased dramatically, in both population size and distribution, following the development of re-introduction and conservation programmes in the 1960s and 1970s.

Although Trumpeter Swans currently breed throughout most of the western Great Lakes region, there is relatively little recent information about their ecology beyond estimates of population size, trends and distribution, hindering conservation decision-making. We are therefore marking a sample of Interior Population Trumpeter Swans with GPS-GSM transmitters, in the first range-wide assessment of their movements post reintroduction. Transmitters record high-resolution, high frequency location and related data, and transmit those data through cellular phone networks, which will allow us to:

- Evaluate year-round swan movements, including determining the locations where swans spend the winter, and the timing and duration of their movements.
- Determine whether and where Trumpeter Swans make moult migrations.
- Evaluate the Trumpeter Swans' year-round habitat use and selection patterns.
- Estimate annual survival rates for Trumpeter Swans, if sample sizes are adequate and their fates (*i.e.*, mortality events) can be determined.

After initial project onset, additional funding sources and partner collaborations allowed us to expand the scope of the project to include the following research objectives:

- Quantify extent of gene flow among Interior Population Trumpeter Swans, their overall genetic diversity, and genetic differentiation from source populations.
- Evaluate the association between migratory behaviour and genetic divergence of different groups of Trumpeter Swans.
- Quantify concentrations of lead in Interior Population Trumpeter Swans and assess potential sub-lethal effects of lead exposure on migration and annual movements.

Trumpeter Swan with USFWS leg-ring and GSM neck-band (photo: David Wolfson)

Increasing the scope of the project will allow us to integrate movement (GPS telemetry), physiological (lead concentrations), and genetic information to provide a more holistic evaluation of the Interior Population in addition to a comprehensive assessment of migration patterns and annual movements. Fieldwork began in the summer of 2019 and will continue through 2021. We GPS-banded and collected genetic samples from 96 swans in Minnesota, Michigan, Manitoba, Iowa, Wisconsin and Ohio as of 2020. Seventeen additional bands will be deployed in

Arkansas, Iowa, Wisconsin and Ohio during 2021, to bring the overall total to 113 marked swans. Preliminary results from the 19 swans marked in 2019 suggest that most swans do not engage in long-distance migration and that there may be a relationship between latitude and the extent of southern migration during the winter. Location data will be archived and is available to the public via a website that summarizes Trumpeter Swan movements and habitat use (https://trumpeterswan.netlify.app).

We thank the following project collaborators: Minnesota Cooperative Fish and Wildlife Research Unit, University of Minnesota, U.S. Fish and Wildlife Service, Minnesota Department of Natural Resources, Three Rivers Park District, The Trumpeter Swan Society, Michigan Department of Natural Resources, USDA Wildlife Services, Wisconsin Department of Natural Resources, Great Lakes Indian Fish and Wildlife Commission, Iowa Department of Natural Resources, Ohio Department of Natural Resources, Nebraska Game and Parks Commission, Canadian Wildlife Service and the Manitoba Wildlife and Fisheries Branch.

Trumpeter Swan in flight. (photo: Brett Blocker).

Trumpeter Swan in triumph display (by Margaret Smith)

Movements and demography of Trumpeter Swans in the northern US Rocky Mountains

Todd E. Katzner

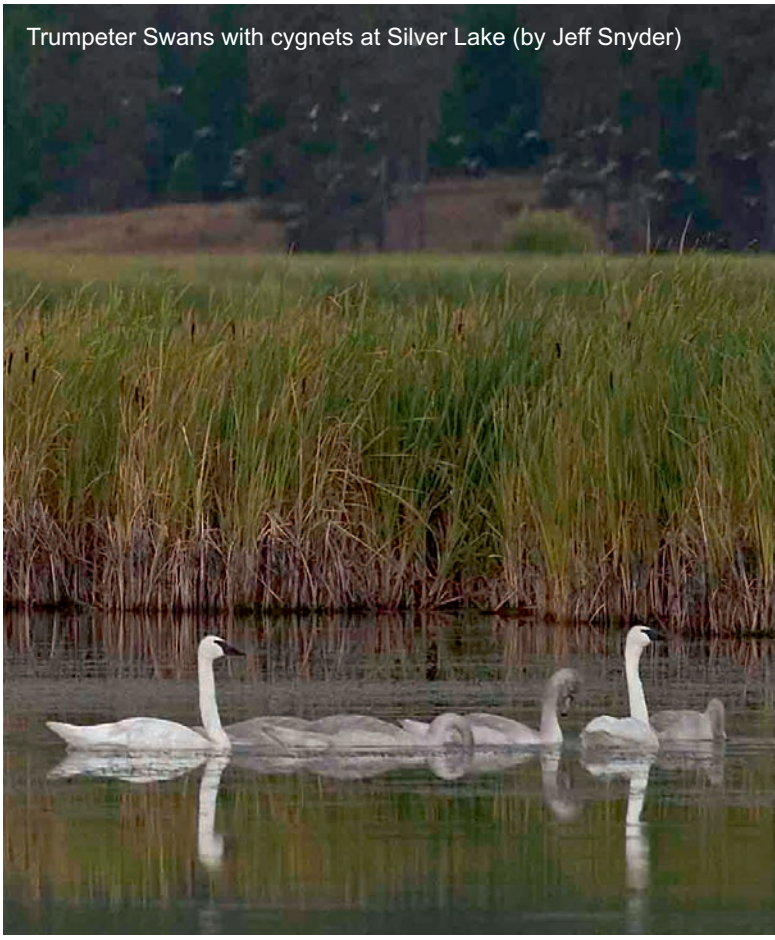
Populations of Trumpeter Swans *Cygnus buccinator* have fluctuated dramatically over the past century. Today, numbers of this species are fairly high, although recovery of swans has been inconsistent across their range. In particular, recovery of populations of swans in and around the Greater Yellowstone Ecosystem (GYE) has lagged behind that in other areas. This lag has resulted in the birds becoming of conservation concern in the region, particularly given that the take by hunters of swans near the GYE (where swans may migrate or winter) is not assessed. It is therefore important to obtain not only a better understanding of the movements and demography of swans in the GYE region, but also of the number of swans taken during the hunting season each year. This project aims to address those needs.

The study proposes to use two tools to study Trumpeter Swan movements, as a first step within a framework with the overall aim of understanding the potential demographic consequences of anthropogenic stressors on their populations. Our research will be structured as follows:

Firstly, to describe the swans' movements, we will use modern wildlife tracking tools in order to follow individual birds, especially those from the GYE area. Research will focus especially on understanding migratory pathways and the degree of migratory connectivity. We seek to collaborate with a number of ongoing projects in the GYE area in each of which a small number of swans has been tracked. By aggregating these data, and then using additional funds to deploy units in regions from which swans have not been tracked, we aim to build a collaborative effort to delineate the migratory strategies of this small population.

Additionally, we will analyse the stable hydrogen isotope ratios in feathers from swans taken during the hunting season, to identify the origins of each bird. Although geolocation via hydrogen isotopes is not as precise as that recorded by GPS telemetry, this technique has an advantage in that it can be performed retrospectively (*i.e.*, it can provide origin information for a dead animal) and, because it is much cheaper than telemetry, it can gain data from many more individuals. Furthermore, sample collection for these analyses can be done by anyone capable of plucking a swan feather. As such, we propose to work with states to request that a few feathers from each swan taken be sent to us in self-addressed, stamped, envelopes that we hope to provide when hunters are sent their licenses. Isotope data will also be combined with the telemetry data to refine the precision of isotope-derived geolocation.

Understanding both the lagging population recovery and the potential impacts of hunting on GYE Trumpeter Swans requires population modelling. Our team has recently developed a conceptual framework to integrate isotope- and telemetry-derived movement data with population models to improve use of models for understanding the population-level consequences of anthropogenic stressors. We propose to apply this framework to describe the consequences of hunting and other stressors on swans, to provide guidance on population management, and to answer questions about allowable take.



Trumpeter Swans with cygnets at Silver Lake (by Jeff Snyder)

Whoopers Swans seen in flight, during the aerial survey of the north Caspian region in February 2020. (photo: Sonia Rozenfeld).

International Swan Census reports major numbers in the Volga Delta

Sonia Rozenfeld & Tom Langendoen

In February 2020 a major survey was undertaken in the Volga Delta, Russia, aiming to assess the numbers of different swan species in the region. This survey was organised under the quintennial International Swan Census and contributes significantly towards our understanding of the swan populations around the Caspian Sea. The team flew over 1,500 km in the Volga Delta and surrounding lakes, surveying a total area of 725.5km^2. Photos of swans in groups were taken to allow more accurate counting, identification and age determination.

In total the counters reported 225,532 swans (19,318 juveniles) and it was possible to identify *c*. 42% to species level. Of these, by far the most common were the Whooper Swans (78.8%) with substantial numbers of Mute Swans (20.9%) and far fewer Bewick's Swans (0.3%). Thanks to simultaneous counting efforts in other countries and Russian regions, it is clear that by far the largest concentrations of swans around the Caspian Sea are wintering in the Volga Delta. This may be exacerbated by increasingly warmer winters in the region. During the winter of 2019/2020, the shallow waters of the Volga Delta froze for only a short period in November and again briefly towards the end of February. Surveys like this one are increasingly important to understand how waterbirds are responding to the rapidly changing climate dynamics around the Caspian Sea, which provides important information for conservation efforts.

Acknowledgements

We are very grateful to the survey team, notably to Alexander Dmitriev, Michael Ivanov (Association RGG) and Maxim Perkovsky (Astrakhansky State Reserve) for their efforts in collecting and reporting these results. Our thanks also go to the management of the Astrakhansky State Reserve, especially to

K.V. Litvinov and A.V. Nikitin for organising the logistics of the survey, to pilots S.V. Kuznetsov and G.A. Pliguzov, to technician N.V. Zapaschenko, and to the Director of the reserve Nikolay Tzimliansky. We thank A.V. Belousova, Y.V. Bykov and G.D. Dzhamirzoev for reporting their data from the winter swan counts made elsewhere in the Caspian Sea. In addition to the efforts of the local organisers, the survey was supported financially by the WWT and the EU LIFE programme.

Whooper Swan family seen during the aerial survey of the north Caspian region, February 2020. (photo: Sonia Rozenfeld).

The International Swan Censuses (ISC) have been organised and coordinated by the Wetlands International/IUCN-SSC Swan Specialist Group at 5-year intervals since the mid-1980s. Data recorded during the 2020 ISC are now being collated from the national count coordinators, with the results due to be published in peer-reviewed papers and also on the Swan Specialist Group website (http://www.swansg.org) during 2022.

Whooper Swan landing on snow-covered lake in Finland (by Juha Soininen-WWT)

Colour marking of Bewick's Swans on the West Pacific Flyway

Diana Solovyeva

Two different marking methods are being used to estimate the survival of adult and juvenile Bewick's Swans *Cygnus columbianus bewickii* on the West Pacific Flyway. Here, in the easternmost part of their breeding range, the swans nest on tundra habitat between the Indigirka River in the West (150° E) and Koluchin Bay in the East (175° W), and migrate to wintering sites primarily in Japan (Fang *et al*. 2020). A total of 234 swans were caught and marked on the Chaun River delta, Chukotka, Russia (68° N, 170° E) in summers 2016–2020: 155 adults, 64 cygnets and 15 birds not aged (Figures 1a,b). Twenty-three of the offspring were equipped with Ornitela GPS/GSM trackers (white neck-bands) and red leg-rings, and 36 were colour-marked just with red leg-rings.

Figures 1a,b. Bewick's Swans caught for banding in Chuckotka, Russia. (photo: Daria Barykina).

Of the adults, 118 birds were fitted with trackers and red leg-rings, 23 birds were marked with red neck-bands, and 26 birds were marked with red leg-rings only.

Of the 181 birds marked in 2016–2019, 81 have been resighted to date, and we encourage Japanese colleagues and birding clubs to continue reporting marked swans in future winters. Survival and resighting probabilities will be estimated for different age groups and different types of marker. To avoid bias resulting from the fate of tracked individuals being ascertained more frequently, only visual observations at either wintering grounds (Japan) or breeding grounds (Chaun River delta) will be used for estimating the demographic rates.

Plastic trackers started to fall off swans in their third year. Some birds therefore can now be identified only by their leg-rings, and we expect that re-sightings of these individuals might be underestimated compared to swans with their red or white neck-bands (with trackers) still in place. We therefore request that Japanese bird-watchers pay special attention to the legs of swans, to increase the number of reports of birds with leg-rings only.

Acknowledgements

GPS/GSM trackers were provided through a partnership with Research Centre for Eco-Environmental Sciences, Chinese Academy of Sciences (Prof. Cao Lei), and the colour plastic leg-rings and neck-bands were kindly donated by US Geological Service (Drs. Craig Ely and Sarah Sonstagen).

References

Fang, L., Zhang, J., Zhao, Q., Solovyeva, D. Vangeluwe, D., Rozenfeld, S.B., Lameris, T., Xu, Z., Bysykatova, I., Batbayar, N., Konishi, K., Moon, O.-K., He, B., Koyama, K., Moriguchi, S., Shimada, T., Park, J.-Y., Kim, H., Liu, G., Hu, B., Gao, D., Ruan, L., Natsagdorj, T., Davaasuren, B., Antonov, A., Mylnikova, A., Stepanov, A., Kirtaev, G., Zamyatin, D., Kazantzidis, S., Sekijima, T., Damba, I., Lee, H., Zhang, B., Xie, Y., Rees, E.C., Cao, L. & A.D. Fox, A.D. 2020. Two distinctive flyways with different population trends of Bewick's Swan *Cygnus columbianus bewickii* in East Asia. *Wildfowl* (Special Issue No. 6): 13–42.

Bewick's Swans on the NW European tundra during the global lockdown: "Swan Champions" project update

Julia Newth

The Russian is arctic one of the world's last great wilderness landscapes. During the dark winter months the sun rarely rises, temperatures fall to -40°C and the tundra is covered with ice and snow. With the snow melt in May and early June, however, the tundra is revealed in all its glory, with its myriad of pools and waterway networks brimming with aquatic vegetation and insects, which sustain millions of waterbirds during the breeding season, making it one of the richest habitats on earth. Many migratory wildfowl, including Bewick's Swans, therefore make long flights to spend the summer in these remote areas, until they're driven south again by the arrival of the arctic winter.

Poster of huntable species of wildfowl, which is being displayed at key locations in the Nenetskiy Okrug. (photo: the Department of Natural Resources, Nar'Yan-Mar, Russia).

Whilst since early 2020 people many parts of the world have been focussed on addressing the global Covid-19 pandemic, and extreme weather conditions in some areas, the birds continue to follow their annual migratory and breeding cycles. Threats also continue to be the same, with predators such as the Arctic Fox posing a danger particularly to newly-hatched cygnets, and illegal hunting continuing to be a problem for the species. The collaborative "Swan Champions Project" being undertaken by conservationists in Russia and the UK, with a view to reducing illegal hunting of the species in this region, therefore continued unabated, despite greater challenges in communicating under lockdown restrictions. A key part of the project is the dissemination information to hunters on the ecology and protected status of Bewick's Swans in NW European Russia, where the birds spend much of the year. Thousands of leaflets were again distributed to hunters, to provide a visual guide of the protected and huntable birds in the area, information about penalties incurred for breaking the law, a map of the no hunting zones, plus instructions on how to report ring sightings. Posters were also put up at key locations such as hunting huts, airports and community centres. A successful 2-week tour of the Travelling Swan Exhibition took place in February 2020, reaching four remote communities in the Nenets Autonomous Okrug region, and with 40 nature talks and 15 master classes conducted before the pandemic set in.

Swan Champion Co-ordinator Andrey Vokuev checks the leaflet distributed to hunters. (photo: Jury Tyulyubaev).

More recently, "virtual" meetings of the Swan Champions have continued online, and the initiative extended to Arkhangelsk, which is an important staging area for the swans particularly in spring but also during the autumn migration. Plans are afoot to develop a visual guide that can be downloaded onto phones.

Work is also underway to create a 1 hour film, using footage from a film crew who visited the region and spent time talking to communities to understand their relationship with the swans and their importance in local culture and folklore. The film, scheduled for completion this winter, will be circulated in the Russian arctic and more widely once conditions allow. Overall, the “Swan Champion Project” not only brings together key influencers (scientists, hunters, indigenous leaders, young people, teachers and local businesses), to convey the message that Bewick’s Swans are protected and should not be hunted, but we feel could be a powerful model for rolling out to other areas across the flyway where hunting is an issue.

Andrey Vokuev in his mask delivering the leaflets and posters to the Department of Natural Resources. (photo: Andrey Vokuev).

Children in Nes’ learning about swans and wetlands. (photo: Nenetskiy Nature Reserve (Zapovednik), Nar’Yan Mar, Russia).

Tundra hut in the Nenetskiy Zapovednik. (photo: Ben Sadd).

The Big Brood Count 2020!

Results of the international age and brood assessment for Bewick's Swans in winter 2020/21

Wim Tijsen & Kees Koffijberg

In the weekend of 12/13 December 2020 the Swan Specialist Group held a coordinated age count of Bewick's Swans *Cygnus columbianus bewickii* across Europe, to determine how many cygnets had hatched and migrated successfully during the year. In total, 9,197 Bewick's Swans were aged, similar to the numbers included in the December 2019 age count, when over 9,000 birds were checked to calculate the proportion of juveniles and brood sizes in the wintering flocks (Fig. 1). The average percentage of cygnets recorded was 6.6% and 8.3% in 2019 and 2020 respectively. Sample sizes were really good in both years, with *c*. 50% of the population checked in these two winters. The mean brood size in 2020 was 1.86, almost the same as in 2019.

The Northwest European population of Bewick's Swans has been declining since the mid-1990s. To try to understand the reasons for this decrease, it is important to know what the population structure might be, and to analyse the consequences of any changes over time. We therefore hold coordinated age counts in the swans' main wintering areas each year, to assess annual breeding success for the population as a whole. More countries along the flyway have become involved in recent winters, as climate change has brought warmer weather conditions, resulting in the birds remaining further east (Nuijten *et al.* 2020). Traditionally important wintering areas such as the UK and the Netherlands therefore are of lesser importance nowadays, whereas increasing numbers of Bewick's Swans remain in Poland into mid-winter, where previously many of the waterbodies used as feeding and/or roosting sites became frozen in December. Germany has taken the lead when it comes to wintering numbers in recent years, and long-held norms are changing rapidly, for instance with the swans no longer migrating to Britain, and particularly to Ireland, in the numbers that they used to.

References

Nuijten, R.J.M., Wood K.A., Haitjema T., Rees E.C., Nolet B.A. 2020. Concurrent shifts in wintering distribution and phenology in migratory swans: Individual and generational effects. Glob Change Biol. 26:4263– 4275.

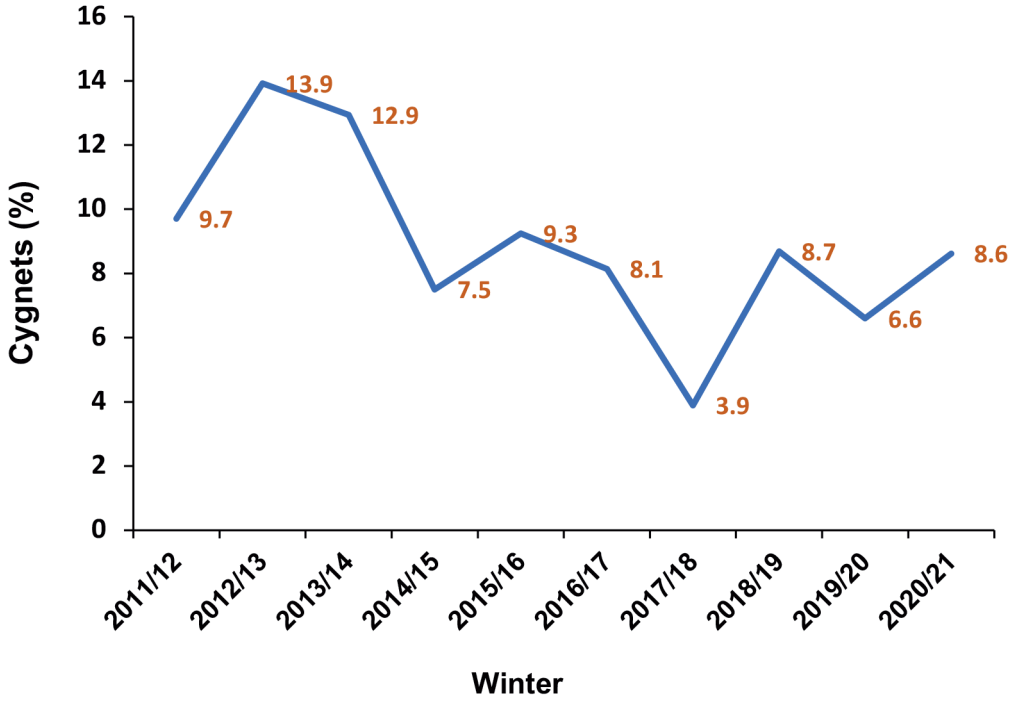


Figure 1. Percentage of cygnets recorded in the Northwest European Bewick's Swan population in early winter, 2011–2020.

Papers

Bewick's Swans wintering 2019/2020 in Schleswig-Holstein/ northern Germany

Hans-Joachim Augst

Schleswig-Holstein has held up to a third of the Northwest European population of Bewick's Swans *Cygnus columbianus bewickii*, which has declined in numbers at the population level (Beekman *et al.* 2019). The Ornithological Working Group of Schleswig-Holstein and Hamburg therefore has initiated an intensive monitoring programme for Bewick's Swans wintering and staging in the region. This has described increasing mid-winter numbers and longer duration of stay by the swans in winters 2016/2017 and 2017/2018, with the birds also arriving earlier in spring from wintering sites in more western parts of Europe (Augst *et al.* 2019).

In winter 2019/2020, a further 10 censuses were made of Bewick's Swans in Schleswig-Holstein, by up to 37 observers (Table 1). Here in Schleswig-Holstein we have a lot of Bewick's Swans occurring over a wide area, but only few people to count them. Nine counting units where the swans regularly feed cover nearly 10% of the land area of Schleswig-Holstein, but there are large areas between the counting units not completely coverable by observers.

For me, as the coordinator of the censuses, it therefore was very helpful to receive information from Peter de Vries of the Netherlands Institute of Ecology (NIOO) on the locations of some swans fitted with GPS-bands, just before four censuses when swans were moving into the area. For example, the individual marked with a white GPS-collar 230E was in an area not planned for coverage during the census, so I was able to ask the observer to extend the survey to this new area. She did so, and found white 230E (Fig. 1) together with other Bewick's Swans.

Similarly helpful were the GPS-positions from the Wildfowl & Wetlands Trust (WWT) tracking website, which enabled us to find new roost sites for the swans named "Hope", "Elroy", and "Leho", and thus clarify the feeding areas for a number of Bewick's Swans which roost at night in the brackish Beltringharder Koog on the North Sea coast. They flew up to 39 km from their roost, to spend the day within the planned counting units.

Bewick's Swans numbers from mid-December 2019 to mid-February 2020 were higher than ever at

Table 1. Census data and results. SH = numbers of Bewick's Swans counted in Schleswig-Holstein; Cygnets = percentage of cygnets among Bewick's Swans aged in the wintering flocks; Feeding habitat = percentage of birds on the two most important habitats for the species; Sighting of marked birds = numbers of individuals with leg-rings and/or neck-collars seen in the region at the time of the census.

Census	SH	Cygnets	Feeding habitat		Sighting of marked birds	Observers	
			Grassland	Maize			
No.	Date	No.	%	%	%	No.	No.
1.	16/11/2019	177	5.5	13	79	4	27
2.	14/12/2019	**1,633**	6.2	12	64	4	35
3.	11/01/2020	**3,686**	5.9	49	33	7	37
4.	15/02/2020	**5,976**	5.5	91	8	27	36
5.	22/02/2020	6,274	5.5	93	3	34	31
6.	29/02/2020	6,720	5.7	95	3	40	35
7.	07/03/2020	6,031	6.1	98	0	38	33
8.	14/03/2020	1,461	9.7	99	0	8	31
9.	21/03/2020	568	11.3	100	0	6	19
10.	28/03/2020	299	14.7	100	0	2	5

Figure 1. Bewick's Swan "white 230E" with leg-ring and neck-band (including a GPS transmitter) at Goldenbeck, just outside a scheduled counting unit, in a flooded depression on cropland on 22/02/2020 (photo: Katrin Fabricius).

Figure 2. An adult and cygnet Bewick's Swan at Meggerkoog on 17/03/2020. Cygnets become whiter (less grey) as the winter progresses, though the yellow part of the beak is still lighter that that of adult birds (photo: Hans-Joachim Augst).

comparable times in Schleswig-Holstein (**in bold font** in Table 1, including the international census on 11 January 2020), because of their earlier arrival (Augst *et al.* 2019). The maximum count during winter 2019/20 was of 6,720 birds on 29 February 2020, the fifth highest peak count for the region since 1992. Peak numbers in the previous two years however were considerably higher, at 8,364 and 7,851 swans in 2017/2018 and 2018/2019 respectively.

The percentage of cygnets recorded in the wintering flocks was nearly constant up until the end of February 2020, before rising in March (Fig. 2). This percentage is far below the level required to offset annual mortality rates (Wood *et al.* 2016).

As in previous years, Bewick's Swans in the study area fed mainly on maize stubble in autumn and early winter. Then, from mid-January until their departure in spring, their main food was grass swards (Fig. 3). Winter cereals and oilseed rape are not often selected (and therefore not mentioned in Table 1) in this part of the swans' wintering range.

Some changes in the swans' use of roost sites were noted during 2019/20. Heavy rainfall in January and February flooded small (1,000 – 5,000 m²) and shallow (≤ 0,5 m) depressions in grasslands and croplands, resulting in many swans using these new areas of floodwater to roost at night (Fig. 4). The number of roost sites available therefore increased, but the number of swans using their traditional roosts (peat bogs, lakes, ponds and dammed rivers) declined, at least whilst the floodwater persisted.

Figure 3. Bewick's Swans feeding on grassland in Meggerkoog during 17/03/2020. This is the centre of the "Eider-Treene-Sorge-Lowland", designated as a Special Protected Area under the EU Birds Directive (photo: Hans-Joachim Augst).

Figure 4. Bewick's Swan roost site in an flooded grassland depression during rain on 29/02/2020 (photo: Hans-Joachim Augst).

Overall, with the eastward shift in the Northwest European population of Bewick's Swans in recent years (Beekman *et al.* 2019), associated with warmer winters (Nuijten *et al.* 2020), this study provides valuable information on the swans' use of sites in an area of increasing importance for the species.

References

Augst, H.-J., Hälterlein, B. & Fabricius, K. 2019. From stopover to wintering: Bewick's Swans *Cygnus columbianus bewickii* in Schleswig-Holstein, northern Germany in winters 2016/2017 and 2017/2018. *Wildfowl* (Special Issue No. 5): 139–163.

Beekman, J., Koffijberg, K., Hornman, M., Wahl, J., Kowallik, C., Hall, C, Devos, K., Clausen, P., Laubek, B., Luigujõe, L., Wieloch, M., Boland, H., Švažas, S., Nilsson, L., Stīpniece, A., Keller, V., Degen, A., Shimmings, P., Larsen, B-H., Portolou, D., Langendoen, T., Wood, K. & Rees, E.C. 2019. Long-term population trends and shifts in distribution of Bewick's Swans wintering in northwest Europe. *Wildfowl* (Special Issue No. 5): 73–102.

Nuijten, R.J.M., Wood, K.A., Haitjema, T., Rees, E.C. & Nolet, B.A. 2020. Concurrent shifts in wintering distribution and phenology in migratory swans: individual and generational effects. *Global Climate Change* 26: 4263–4275

Wood, K.A., Newth, J.L., Hilton, G.M., Nolet, B.A. & Rees, E.C. 2016. Inter-annual variability and long-term trends in breeding success in a declining population of migratory swans. *Journal of Avian Biology* 47: 597–609.

Bewicks Swans at the Eider Treene Sorge Lowlands, Schleswig-Holstein (by Hans-Joachim Augst)

Dietary habits of the Black-necked Swan *Cygnus melancoryphus* in a Ramsar wetland of southern Chile

Carlos Velásquez & Eduardo Jaramillo

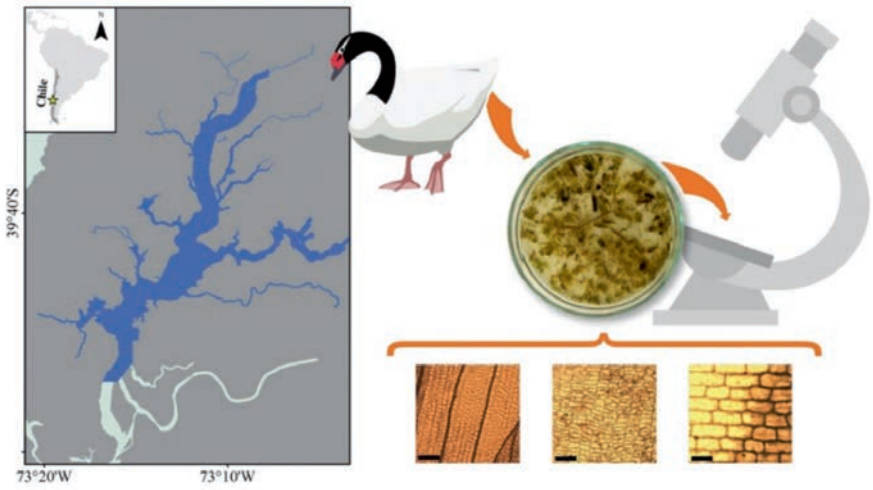


Figure 1. Location of the Río Cruces study area in Chile, and cell structure for vegetation from swan faeces inspected under a microscope.

The Black-necked Swan *Cygnus melancoryphus* is an aquatic herbivorous bird, native of the southern tip of South America. Faeces collected from 152 swans during six dates between 2012 and 2017 at the Río Cruces wetland, a Ramsar site in south-central Chile (ca. 39˚S; Fig. 1), were examined under the microscope (micro-histological analysis), to test the hypothesis that the swans' consumption of food is related to macrophyte cover within the wetland.

Results of the faecal analyses showed that dietary items were composed of six macrophyte species representing four life forms. However, remains of just the submerged *Egeria densa* and *Potamogeton pusillus*, as well as those of the floating *Potamogeton lucens*, were always present in the examined faeces. The pattern of macrophyte occurrence in the swans' faeces correlated positively with the spatial cover of those macrophytes, inferred from analysis of remote sensing data. Since the swans consume macrophytes in accordance with their abundance, it is argued that food items consumed by Black-necked Swans can be used as proxy to monitor spatio-temporal variability in the cover of those plants along coastal wetlands, where *C. melancoryphus* used to live as a permanent resident. Moreover, the close relationship found in this study between the swans' food and macrophyte cover highlights the need to preserve shallow-bottomed lakes, since these provide the habitat where most of aquatic macrophytes – the primary food source for swans in Chilean wetlands – flourish.

The full paper (Velásquez *et al.* 2019) is available online, and can be read on the PLOS ONE website at https://doi.org/10.1371/journal.pone.0226331

References

Velásquez C, Jaramillo E, Camus P, Labra F, San Martín C (2019) Dietary habits of the black-necked swan *Cygnus melancoryphus* (Birds: Anatidae) and variability of the aquatic macrophyte cover in the Río Cruces wetland, southern Chile. *PLOS ONE* 14(12): e0226331. https://doi.org/10.1371/journal.pone.0226331

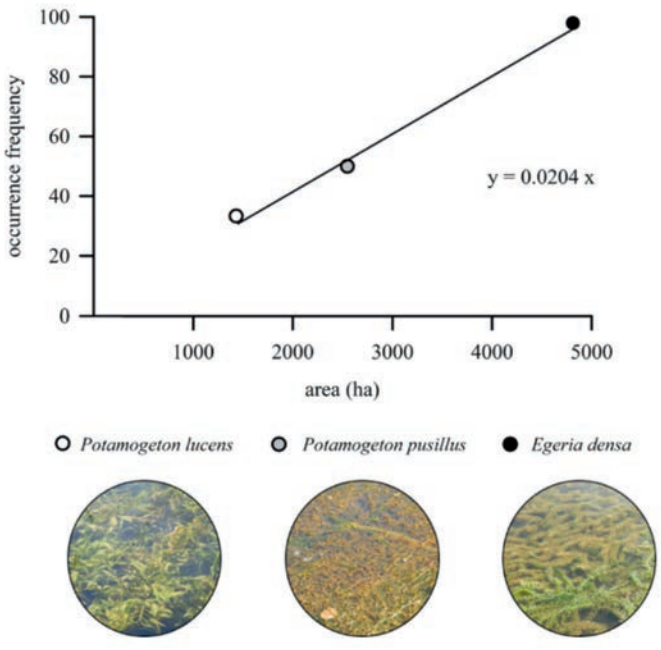


Figure 2. Frequency of occurrence of different plant species in the swans' faeces, in relation to the area of macrophyte cover at the site.

Figure 1. Bewick's Swans engaged in an aggressive interaction at a wintering site in southwest England. (photo: Graham Hann/WWT).

New tools for old problems: using webcams to study swan aggression

Kevin A. Wood, Phoebe Ham, Jake Scales, Eleanor Wyeth & Paul E. Rose

Studies of waterbird assemblages have often documented aggression by swans towards other waterbirds, including other swans (Johnsgard 1965; Tingay 1974; Figure 1). These aggressive behaviours have led to conservation and management issues related to the potential impacts of swans on other waterbirds; for example, in parts of the Russian Arctic, concerns of local hunters regarding the impacts of swans on other waterbirds have been identified as a motivation for the illegal persecution of Bewick's Swans *Cygnus columbianus bewickii* (Newth *et al.* in press). Yet, there is surprisingly little field data available to tell us which species swans interact aggressively with and how frequently such interactions occur. We recently published a paper that cast new light on aggression amongst swans and waterbirds (Wood *et al.* 2020).

To provide this much-needed evidence, we used the live-streaming webcams at WWT Slimbridge (SW England) and WWT Caerlaverock (SW Scotland) to undertake behavioural observations of aggression to/from swans and other waterbirds in winters 2018/2019 and 2019/2020 (Figure 2). Both Bewick's Swans and Mute Swans *Cygnus olor* were present at Slimbridge, while Mute Swans and Whooper Swans *Cygnus cygnus* occurred at Caerlaverock. We used all occurrence sampling to identify all of the aggressive interactions between conspecific or heterospecific individuals, and 10-minute focal observations to record the total time spent by swans specifically on aggressive interactions with other swans. Our aim was to compare whether the proportion of intraspecific aggressive interactions of each species differed from parity (*i.e.* 0.5, which would have indicated equal numbers of intraspecific and interspecific interactions). We also used zero-inflated generalized linear mixed effects models (ZIGLMMs) to assess between-individual variation in the total time spent by swans on aggressive interactions with other swans.

The data from our webcam observations at the two wintering sites showed that all three swan species were most frequently aggressive towards, and received most aggression from, their conspecifics (Figure 3). Indeed, for 13 out of the 14 focal waterbird species that we were able to collect data on, the majority of aggressive behavioural interactions were given by, and received from, conspecifics. The proportion of aggressive interactions directed by swans towards their conspecifics ranged from 0.589 among Bewick's Swans up to 0.801 among Whooper Swans. Similarly, the proportion of aggressive interactions received by swans from their conspecifics ranged from 0.623 for Whooper Swans up to 0.912 among Mute Swans. Our focal observations showed that Whooper Swans and Bewick's Swans spent approximately 2.3% and 0.2% of their total time-activity budgets, respectively, on aggression with other swans. The time spent in aggressive interactions with other swans was best-explained by the number of other swans present for Whooper Swans, and an interactive effect of time of day and winter of observation for Bewick's Swans.

Figure 2. A screenshot showing an example of the live-streaming webcam footage used in our study.

While the majority of swan aggression was directed towards, and received from, other swans, we also observed some aggression by the three swan species towards 9 of the 11 smaller waterbird species: Canada Geese *Branta canadensis*, Common Moorhen *Gallinula chloropus*, Eurasian Coot *Fulica atra*, Eurasian Teal *Anas crecca*, Greylag Geese *Anser anser*, gull species *Larus* spp., Northern Mallard *Anas platyrhynchos*, Northern Pintail *Anas acuta*, and Tufted Duck *Aythya fuligula*. All of these species, with the sole exception of the gulls, were also recorded giving aggression towards at least one of the swan species.

Our study illustrates how detailed behavioural investigations can help to improve our understanding of the prevalence of aggressive interactions within and between species. Whilst swans do exhibit some aggression towards smaller waterbirds, the majority of aggression by swans is directed towards other swans. Similarly, previous research on Mute Swans by Włodarczyk and Minias (2015) also found that the majority of aggressive behaviours were directed towards conspecifics. Aggression focused on conspecifics likely reflects greater overlap in resource use, and hence higher potential for competition, between individuals of the same species.

Aside from our findings regarding swan behaviour, more generally our study provides an example of how

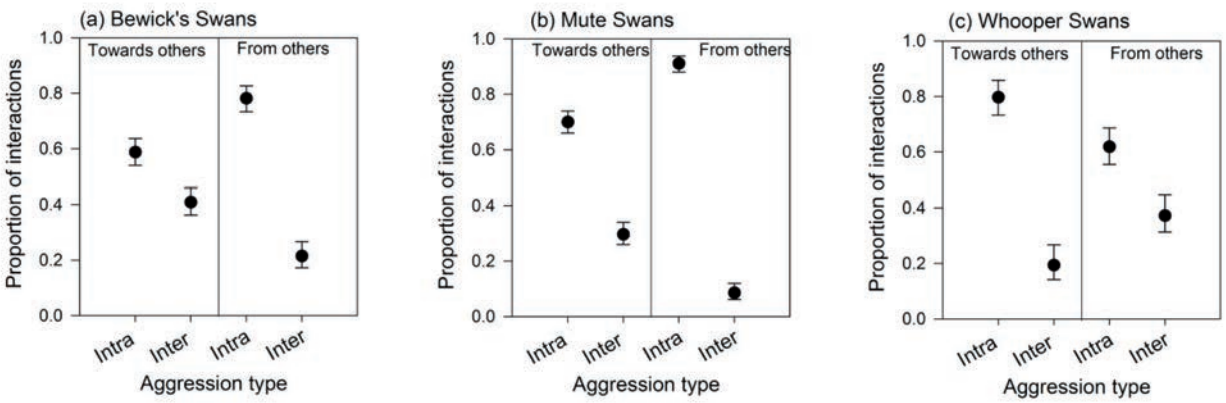


Figure 3. The proportions (± 95% binomial CIs) of intraspecific and interspecific aggressive interactions, directed towards or received from, other individuals.

behaviour can be studied using data collected remotely via live-streaming webcams. Such remote data collection offers several advantages to swan researchers, including less disturbance to the birds (once the camera has been installed), lower environmental costs (*i.e.* carbon footprint) due to not having to undertake visits to study sites, greater accessibility of research to scientists who cannot physically travel to study sites (either due to logistical difficulties or disability), and the facilitation of citizen science programmes. Given these advantages, we expect that remote data collection methods will become increasingly popular with researchers, especially with Covid-19 currently limiting opportunities to visit study sites in person.

References

Johnsgard, P.A. (1965). Handbook of waterfowl behavior. New York, USA, Cornell University Press.

Newth, J.L., McDonald, R.A., Wood, K.A., Rees, E.C., Semenov, I., Chistyakov, A., Mikhaylova, G., Bearhop, S., Cromie, R.L., Belousova, A., Glazov, P. & Nuno, A. (in press). Predicting intention to hunt protected wildlife: a case study of Bewick's swans in the European Russian Arctic. *Oryx*.

Tingay, A. (1974). Aggression in the Black Swan. *Emu*, 74, 35–38.

Włodarczyk, R. & Minias, P. (2015). Division of parental duties confirms a need for bi-parental care in a precocial bird, the Mute Swan *Cygnus olor*. *Animal Biology*, 65, 163–176.

Wood, K.A., Ham, P., Scales, J., Wyeth, E. & Rose, P.E. (2020). Aggressive behavioural interactions between swans *Cygnus* spp. and other waterbirds during winter: a webcam-based study. *Avian Research*, 11, 30.

Bewick's Swans in flight (by James Lees, WWT)

Ecological consequences of Whooper Swans feeding in below-average water levels at Lake Izunuma-Uchinuma, Miyagi Prefecture, Japan

Tetsuo Shimada

Waterfowl can cause substantial reductions in the standing crop of vegetation, which may have ecological consequences. Using data on water levels, Whooper Swan *Cygnus cygnus* distribution, lotus coverage and dissolved oxygen, we derived the relationship between waterfowl density and ecological conditions. The water level in Lake Izunuma-Uchinuma, northern Japan, in the winter of 2016/17 was 26cm lower than average to control reed community. The highest recorded number of Whooper Swans in the lake from November to February came to 6,461 individuals, more than double that of usual years. Analysis of images from monitoring cameras showed that swans were mainly distributed along the shoreline (Fig. 1, 2). Where the water depth was shallow enough, the swans dug into the lake bottom in the shallow water, feeding on lotus roots (Fig. 3). The density of Whooper Swans in 2016/17 significantly increased than that in 2015/16 in sections 1 to 3 close to the shoreline (Fig. 2 bottom). Area of open water of 2016/17 in subsequent summer was more than 80% in sections 1 to 3 (Fig. 1, Fig. 2 top). Lotus vegetation disappeared from areas where the water depth was 0.74m or less, although lotus had occurred in these areas in normal winters when the water depth was an average of 1.0m. As a result of foraging by swans, 64.4ha of lotus vegetation were eliminated, leaving

Figure 1. Aerial views of Lake Izunuma-Uchinuma, taken from a plane by monitoring cameras operated by the Ministry of the Environment. Numbers indicate the study site sections.

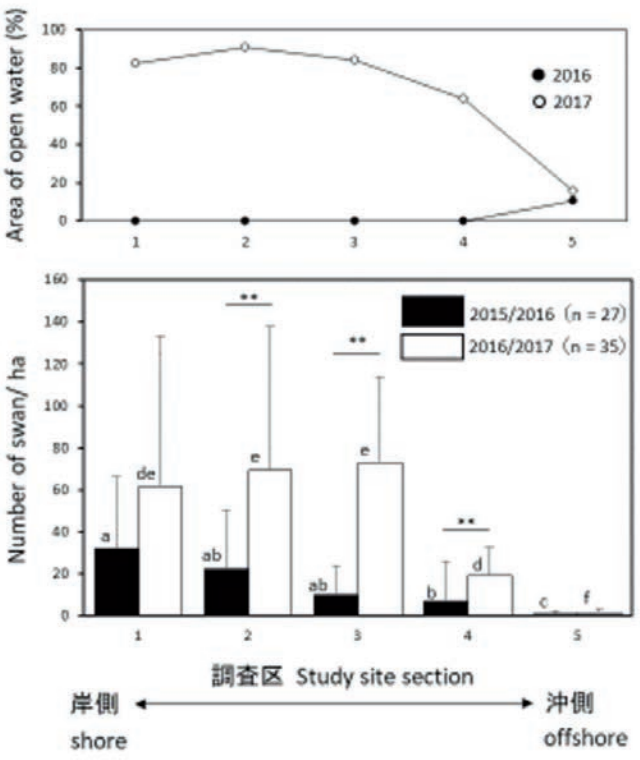


Figure 2. Numbers of Whooper Swans counted at Lake Izunuma in winters 2015/16 and 2016/17. Values from 1–5 on the x-axis indicate sections of the study site; the y-axis gives the average number of swans observed in each section; n = the number of observations.

Figure 3. Group of Whooper Swans at the shoreline of Lake Izunuma (top). Arrows indicate the feeding behaviour of the swans. A Whooper Swan eating a lotus root (bottom). (photos: Hiromi Kano).

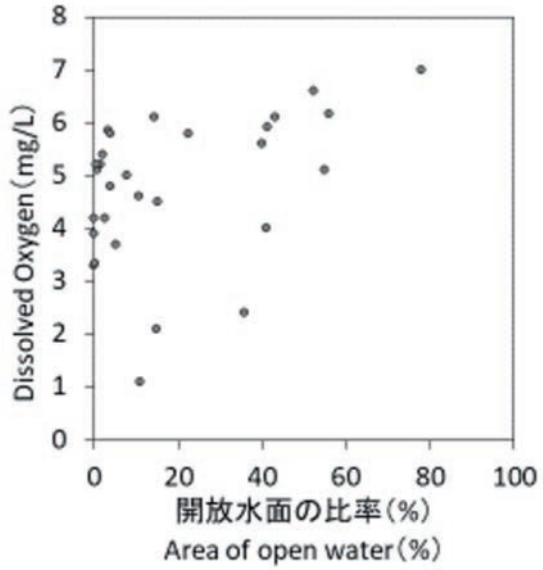


Figure 4. Correlation of the ratio of open water with the concentration of dissolved oxygen in Lake Izunuma, in September 2017.

open water. The dissolved oxygen of the lake water increased in the new open-water areas created by swans, probably due to enhanced water circulation (Fig. 4, 5). Foraging activity of swans affected the

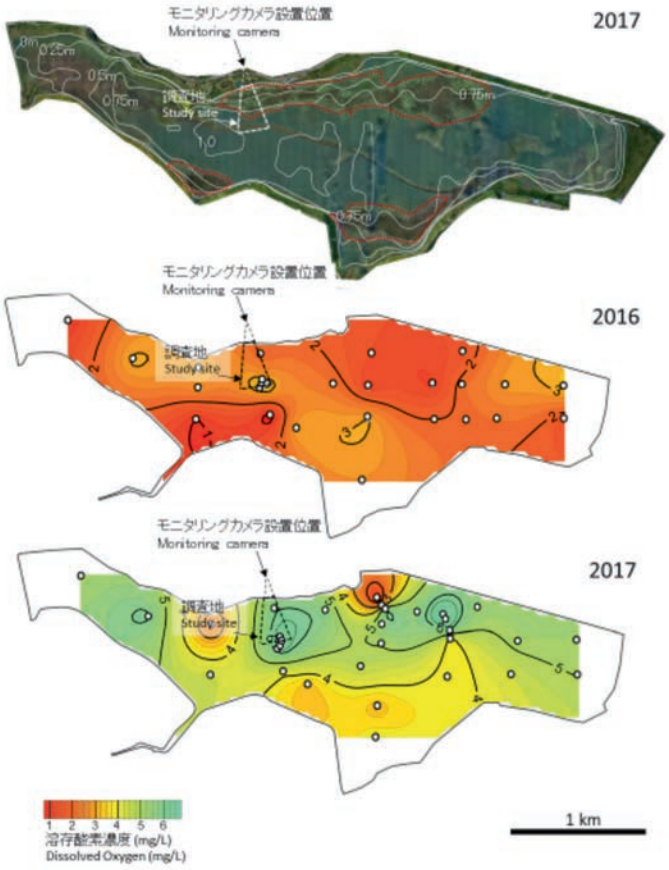


Figure 5. Ortho image of Lake Izunuma in September 2017 (top) and distribution maps of dissolved oxygen concentration in September 2016 (middle) and 2017 (bottom). The blue-green area in the centre of the lake represents lotus vegetation, and the black area represents open water. White lines and adjacent numbers indicate water depth. The thick dashed line in the centre indicates the area covered by the monitoring camera. The three areas surrounded by red dotted lines indicate the areas where lotus vegetation disappeared in 2017, leaving open water. Open circles indicate sampling points for measuring dissolved oxygen.

extent of lotus vegetation, causing a change in the water quality of the lake.

References

Yasufumi Fujimoto, Tetsuo Shimada, Kimihito Inoue, Yusuke Takahashi and Hiroki Hayami. 2020. Below-average water level in Lake Izunuma-Uchinuma in Miyagi Pref, Japan, in the water of 2016/17 induced whooper swan feeding activity, leading to reduced coverage of lotus vegetation and increased dissolved oxygen in the water. *Japanese Journal of Conservation Ecology* 25: 99–108. (In Japanese with English summary).

News Items

Utah's Swan Hunt (News Release and Article)

Todd Sanders

(*The News Release is included to put the article that follows in perspective. Please note that these date from late 2019. They do underscore the debate about swan hunting in the US. Ed.*)

UTAH DIVISION OF WILDLIFE RESOURCES NEWS RELEASE, 6th December 2019:

"**Utah's swan hunt closes early after harvest limit for Trumpeter Swans met**".

Salt Lake City — The swan hunting season was closed in Utah two days early, after the federal quota of 20 Trumpeter Swans was met on Dec. 6.

Starting on Saturday 7th December 2019, hunters were prohibited from killing any swan in Utah.

The 2019 swan hunting season opened on 5th October 5 and was scheduled to run until 8th December, but the season was closed after the twentieth Trumpeter Swan was harvested. Previously, the limit for Trumpeter Swan harvest in Utah was set at 10 swans, but that number was increased to 20 this year. "There was a higher number of Trumpeter Swans harvested this year because there were more migrating through Utah than in previous years," Utah Division of Wildlife Resources migratory game bird program coordinator Blair Stringham said. "We also increased the number of swan permits in Utah from 2,000 to 2,700 this year, which meant more hunters were targeting swans than in past years."

Utah's swan hunt requires a permit, which is only available through a hunt drawing. Hunters with a permit can legally take one Trumpeter or Tundra Swan; however, hunters are discouraged from harvesting Trumpeter Swans. Utah is one of only nine states in the U.S. that allows hunting for swans. Due to the low population size of Trumpeter Swans in the Greater Yellowstone area, the U.S. Fish and Wildlife Service sets an annual harvest quota for the number of Trumpeter Swans that can be harvested in Utah.

"There was a really high harvest of Trumpeter Swans this year, and while all the permit holders may not have harvested a swan, we appreciate their understanding in helping to protect the Trumpeter Swan population," Stringham said.

Hunters who harvested any species of swan are required to check in the bird at a DWR office or the Bear River Migratory Bird Refuge office within 72 hours of harvest.

Hunters who didn't harvest a swan before the season was closed will not be refunded the permit fee or have their preference points reinstated.

(The article below is based on a 2019 letter from Todd Sanders, U.S. Fish and Wildlife Service, in response to the News Release above. It has been edited by permission of Todd Sanders, and reviewed for accuracy by Todd Sanders The Editor of SSG News No. 16 is responsible for any errors that remain. Ed.)

I am surprised by the unusual take of Trumpeter Swans in Utah in 2019. But this take is within conservatively calculated limits for sustainability and within limits to achieve objectives for both Tundra and

Trumpeter Swans. We manage take at the population level, but I understand that nobody wants to lose a project or range expansion Trumpeter Swan.

We can reflect on the 20 Trumpeter Swans taken in Utah in 2019 from at least three perspectives. First, was this within calculated limits (and regulations) to balance objectives for sustainable Tundra and Trumpeter Swan management? Second, was the take of 20 Trumpeter Swans an anomaly? And third, can we further evaluate the potential impact of taking as many as 30 Trumpeter Swans a year?

Limits and Regulation

The take of up to 20 Trumpeter Swans in Utah was consistent with the conservatively calculated acceptable limits and regulations. However, take at this level can result in an early closed season to guard against any additional take.

The swan season in Utah closed Saturday, Dec 7th, two days before the scheduled end of the season (Sunday) because the 20-bird Trumpeter Swan quota was reached Friday afternoon. Hunters in Utah were notified via e-mail and informed via press release (see above) consistent with the FWS-UT 2019 Memorandum of Agreement (MOA) on the subject.

The relevant part of the MOA says: "Utah must ensure adequate provisions are in place to result in a prompt (within 48 hours) season closure should the annual Trumpeter Swan harvest quota in Utah be reached." Utah effectively closed the season on Friday late afternoon the day the quota was reached.

The quota system worked as expected, and Utah was effective at meeting the intent of the regulations and MOA. The regulations and system in place effectively closed the swan season before take exceeded a conservative level calculated to be sustainable and consistent with the management objectives for both Tundra and Trumpeter Swans. No Trumpeter Swans are known to have been taken after the early season closure.


Trumpeter Swan coming in to land (by Margaret Smith)

Anomaly

The Trumpeter Swan season has not closed prematurely in any state in the Pacific Flyway prior to this year and since the season was established in 1995 (during 24 years). So the 2019 season was a first in this regard. The average number of Trumpeter Swans harvested per year in Utah during 1995 through 2018 was 2.3 (range 0–7) swans. Since 1997, the maximum number of Trumpeter Swans reported harvested in Utah was 5 per year. The quota is based on reported harvested swans, and the quota was adjusted downward in 2000 during the experimental season period from 15 to 10 swans to account for crippling loss (*c.* 16%) and possibly failure to report.

In Utah, the Trumpeter Swan quota was increased from 10 to 20 swans in 2019, based on a white paper assessment to rebalance swan management objectives and account for changes in swan abundance that have occurred since the regulations were initially established in 1995. Also, the number of swan hunting permits was restored from 2,000 back to 2,750, and there was a slight increase in the swan hunting area, mostly for boundary clarification.

The unusual number of Trumpeter Swans harvested this year was attributed to unusual weather, migration and numbers of Trumpeter Swans in Utah, and may also be related to the increased number of permits. I don't believe that any or many Trumpeter Swans were harvested in the new hunt area (based on the last report I have from Utah). This year was clearly an anomaly for Trumpeter Swan harvest, and appears to be unrelated to season framework changes to a large extent.

Although within limits (20 birds annually in Utah), it is my strong hope that Trumpeter Swan harvest will return to more normal levels and the season would not close prematurely. The quota is intended to prevent take above conservative limits. Ideally, the Trumpeter Swan harvest would remain low, and the quota would only become a factor in those rare and unusual years, as in 2019. Time will tell if the average Trumpeter Swan harvest of 2.3 swans in Utah during 1995–2018

inclusive will increase and approach anything near 20 swans per year.

The white paper demonstrated that the 20 Trumpeter Swans per year in Utah is sustainable, consistent with swan management objectives, and conservative because: 1) it assumed this harvest level is achieved each year, 2) available Trumpeter Swan abundance estimates under represent total Trumpeter Swan abundance, 3) a recovery factor of 0.5 was incorporated which effectively cuts the maximum allowable harvest in half in the interest of taking a conservative approach in managing harvest of a species of concern, and 4) it assumed that all Trumpeter Swan harvest is from the US-breeding segment of the Rocky Mountain Population (RMP), which is more likely to be 6% or about two Trumpeter Swans per year.

We do have annual crippling and reporting information from hunters. We know that the average reported crippling rate in Utah since 1995 is 16% and that reporting rates have averaged at 93% since 2001 in Utah. Failure to report is a violation and has future license and financial penalties. Contacts with those that failed to report indicated these are persons that opted not to hunt. All this is taken into account when we report hunter activity and harvest. We don't know about unreported take, but all indications are this is near zero, and failure to report is against the law; Utah enforces this regulation by FWS-UT MOA. There is no evidence of unreported take in Utah from hunter surveys or law enforcement activity, so we assume that unreported take is low and inconsequential.

Impacts

Although the annual take of up to 20 Trumpeter Swans was determined to be sustainable and consistent with swan management objectives at the population level, we certainly don't want to undo or impede any Trumpeter Swan restoration progress or rebuilding of essential migratory patterns.

I think the number of Trumpeter Swans in Utah was in the thousands during winter 2019, whereas usually hundreds or maybe *c.* 1,000 birds occur. Reports from hunters and agency personnel were of unusual numbers of Trumpeter Swans during this winter, with many saying that they were commonly seen. Normally, Trumpeter Swans are relatively rare compared to Tundra Swans, which peak at *c.* 32,000 individuals in Utah during mid-November. Most Trumpeter Swans are to the north of the open swan hunting region, in the Logan and Bear River area. We do know that there were no reports of marked Trumpeter Swans (apparent project birds) harvested in Utah, at least in 2019.

The State of Utah counted swans weekly during the winter, from 1993 until at least 2017, but as the counts were by aerial survey unfortunately species identification was not possible. A ground count would be ineffective at assessing total Trumpeter Swan numbers in Utah, given their distribution, the geographic area, and turnover as the birds pass through the State. Swans start arriving in Utah in mid-October and most/all depart by late November or December. There may however be additional data available via eBird or the Christmas Bird Count.

I think the central question is: what is the origin of Trumpeter Swans taken in the Pacific Flyway? We currently assume all birds harvested are from the US-breeding segment of the RMP, but this may be only 6% of the Trumpeter Swan harvest given the relative size of each population segment in the RMP. It would be beneficial to test this idea. I am currently working on a proposal and trying to secure funding to conduct a genetic, or more likely isotope, analysis of samples from harvested swans to ascertain their origin. (*See Project Update by T. Katzner, Ed.*). I am not sure how else we can conclusively evaluate the impact of mortality on migratory routes.

There may be some funds available for this special project in late January, so that is my target. We do have some tissue samples from harvested Trumpeter Swans in Nevada and Utah, and I think that everybody would be willing to collect samples if we have a plan to use them.

Post script

Since this letter, the U.S. Fish and Wildlife Service has established an interagency agreement with the U.S. Geological Survey to evaluate Trumpeter Swan (Rocky Mountain Population) demography and movements in 2020 and 2021. The study is a cooperative effort with the states in the Pacific Flyway, The Trumpeter Swan Society, Wyoming Wetlands Society, and other organisations and individuals in the swan management community. Also, the 2020 swan hunting season in Utah was closed 16 days early, after the federal quota of 20 Trumpeter Swans was met on 27th November. This was the second consecutive year that the swan hunt had to be closed early. The season in Utah is planned to run from 2nd October through to 12th December in 2021.

Biden administration revokes the "MBTA Rule" introduced by the Trump government

In February 2021, The IUCN-SSC Swan Specialist Group joined other conservation agencies and non-government organisations in writing to the Acting Secretary for the US Department of the Interior, to express concern about the "MBTA Rule", whereby former President Trump's administration aimed to redefine the scope of the Migratory Bird Treaty Act (MBTA) so that it protected birds only if a business or individual *intentionally* injures or kills birds protected by the MBTA. We were particularly concerned that the proposed change has the potential to reduce very significantly the effectiveness of the MBTA for conserving migratory birds in North America (noting that Trumpeter Swans recovered from near-extinction following protection under the MBTA), and that it would also affect relationships with treaty partners.

We are now pleased to report that the representations were successful, and that the U.S. Fish and Wildlife Service has published a *final rule revoking the 7th January 2021 regulation*. The Service has thus returned to implementing the MBTA as prohibiting incidental take and applying enforcement discretion, consistent with long-standing agency practice prior to 2017.

The most recent information, as provided on the U.S. Fish and Wildlife Service website (*https://www.fws.gov/regulations/mbta/*) is as follows:

"*On October 4, 2021, the Service published a final rule revoking the January 7, 2021, regulation that limited the scope of the MBTA. With this final and formal revocation of the January 7 rule, the Service returns to implementing the MBTA as prohibiting incidental take and applying enforcement discretion, consistent with judicial precedent and long-standing agency practice prior to 2017. This final rule goes into effect on December 3, 2021.*

The Service also published the final economic documents, the Final Regulatory Flexibility Analysis and Final Revised Regulatory Impact Analysis, following public comments.

In addition, the Service published a Final Record of Decision in compliance with the National Environmental Policy Act. The Record of Decision now states that the Service will implement Alternative B, the Environmentally Preferred Alternative, revoking the January 7 regulation and beginning a new process to promulgate a regulation that defines the scope of the MBTA's prohibitions to include actions that incidentally take migratory birds.

The Service also issued a Director's Order to provide instruction to Service employees, including expectations for conducting Service activities and prioritizing our law enforcement activities. This Director's Order goes into effect on December 3, 2021.

In addition, the Service simultaneously published an Advanced Notice of Proposed Rulemaking (ANPR) announcing the intent to solicit public comments and information as we consider developing proposed regulations to authorize the incidental take of migratory birds."

EU countries choose health over poison in historic vote to ban lead shot in wetlands

A huge leap towards ending the suffering of millions of waterbirds from lead poisoning has been taken following a momentous vote to ban lead shot in and around wetlands.

The vote was made by EU Committee REACH, set up to specifically deal with chemical hazards. A total of 18 countries, which made up 90% of the votes, voted in support of the ban for a greener, healthier future for the environment, wildlife and people.

This is a result that conservation charities have campaigned long and hard for, by developing a substantial body of evidence to alert hunters, policymakers and the public to the deadly effects of lead, and working tirelessly for international policy change. Dr Julia Newth of the Wildfowl & Wetlands Trust (WWT) said:

"*The toxic legacy of lead is profound - more than 20,000 tonnes of mainly lead shot lands in the very*

places where migratory waterbirds of the European flyways feed and breed every year, claiming the lives of a million waterbirds and causing ill health in three million more. Human health is put at risk when game meat shot with lead is consumed and hunters have been living with the uncomfortable perception that they are poisoners. This historic vote has shown that in a modern society it is no longer acceptable for a minority of people to continue to release poisons which kill our collective natural heritage and impact our health through the food that we eat."

Campaigner and Research Fellow at WWT, Dr Ruth Cromie, added: "*It remains to be seen how the UK government will respond but this is the beginning of the end of lead ammunition and the start of a healthier, greener future for Europe's wildlife and people. After decades of pollution and suffering, lead ammunition may finally be consigned to history*."

Support for the proposed ban was broad and came from many parts of civil society - hunters, scientists, EU Ministers, conservation NGOs and the wider public.

The proposal will now go to the European Parliament for ratification before becoming law within the EU.

(Source: https://www.wwt.org.uk/our-work/projects/tackling-lead-ammunition-poisoning/).

Florida city sells swans after Queen's gift leads to overpopulation

October 2020

A Florida city is selling dozens of its beloved swans to the public, after birds donated by Queen Elizabeth II in 1957 led to overpopulation. The swans have lived in Lakeland, Florida, since at least 1923, according to the city, but by 1953 had all been eaten by alligators or fallen prey to dogs. A Lakeland woman who was living in England at the time wrote to the Queen to ask for a gift of swans. The given pair bred, and now 36 Mute Swans are being sold. "It'll be hard to say goodbye," Parks and Recreation Supervisor Steve Platt – who is known as "The Swanfather" – told the Lakeland Ledger newspaper.

Photograph: Mute Swans being rounded up by Steve Platt, "The Swanfather", for their 'wellness check'.

The swans all live around Lake Morton in Lakeland, a city of 112,000 people about 35 miles east of Tampa. The city, which has a swan as its symbol, did a "wellness check" on their entire flock prior to the sale. It is charging $400 per swan and buyers, who were chosen via a raffle, were contacted on Friday to arrange for pick up.

There have been other swan sales held previously, in 2014 and 2011. Anyone who lives near a fresh body of water is welcome to apply for the lottery, officials added. Proceeds of the sale will go towards their $10,000 (£7,700) annual feeding budget.

What is the history of the swans?

According to historians, a woman who was living in England while her husband was stationed there for the US Air Force, wrote to Buckingham Palace asking the Queen for a donation from her royal flock.

She agreed, as long as the Floridians raised the $300 to capture and safely import the breeding pair. While awaiting transport, a barge sank in London's Thames River, covering the pair in oil and delaying their journey. After they were cleaned off, they were successfully delivered to Lakeland on 9 February 1957. But within a week, the pair had gone missing, triggering a frantic helicopter search before they were safely rediscovered.

Photograph: In addition to the Mute Swans, Black Swans also reside at Lake Morton

Mute Swans in Britain are, by prerogative right, the property of the monarchy, but ownership rights may be granted to British subjects by the Crown. Such ownership was commonly granted to landowners up until the 16th century, but the only bodies still exercising their rights today are the Vintners' Company and the Dyers' Company in the City of London. One of the Queen's royal titles – in addition to Head of the Commonwealth, Defender of the Faith and Commander in Chief of the British Armed Forces – is Seigneur of the Swans.

(Source: https://www.bbc.com/news/world-us-canada-54572788).

Photograph: The city of Lakeland uses a swan as its official logo.

Rusty Whooper Swans in Schleswig-Holstein, German (by Hans-Joachim Augst)

In Memoriam

Colin James Pennycuick (1933–2019)

Colin Pennycuick, who died on 9 December 2019 at the age of 86 years, was a leading figure in avian biology whose passion for flying informed his pioneering research into avian flight for over five decades. His innovative studies, which famously included developing the use of wind tunnels for studying flight performance, led to him describing key principles underlying the mechanics of flight in bats and birds. He was also an expert on their navigation, with own enthusiasm for piloting light aircraft (pursued in his student days) providing him with fresh insights into the constraints encountered by the birds during their daily movements and longer distance migrations.

A keen birdwatcher since childhood, whilst still an undergraduate he joined a goose-ringing expedition to Spitsbergen. The results were published in Seventh Annual Report of the Wildfowl Trust (now the Wildfowl & Wetlands Trust; WWT). He moved on to Peterhouse, Cambridge for a PhD study on muscle physiology, and as a post-doctoral fellow at Cambridge he studied the navigation of the Common Pigeon *Columba livia*, before moving to become a lecturer in the Zoology Department at Bristol University. During his initial (1964–68) stint in Bristol, Colin used the university's first computer to design and build a wind tunnel, which he famously hung in a stairwell in the Zoology Building then trained Pigeons to fly within it. His observations led to his adapting the existing aerodynamic theory for helicopters to birds, using the results of his wind tunnel experiments to derive a quantitatively accurate mechanical model of bird flight, which was published in a landmark paper in the Journal of Experimental Biology. During this period, he also used the wind tunnel to estimate basic properties for birds in steady gliding flight, with information gained about wing lift and drag from the body and wings leading to his classic 'momentum jet' model of flapping flight mechanics, and to addressing the key point of how the mechanical power required to fly varies with airspeed. A second seminal paper on this theory appeared in Ibis in 1969, describing its significance for the flight of birds of different sizes and with varying migration ranges. Colin concluded at the time that there is an upper limit to the body mass at which birds are capable of flight and migration, with larger birds more limited by the amount of body fat which they can carry as fuel, which reduces their range, but they can economise by soaring.

In 1968 Colin moved to East Africa, where he was seconded to Nairobi University for 3 years and first acquired his own aircraft (a Piper Cruiser). There he used his wind tunnel to study gliding flight in the Egyptian Fruit Bat *Rousettus aegyptiacus*. This was followed by 2 years in the Serengeti National Park as Deputy Director of the research station, at which time he flew a powered glider with pelicans *Pelecanus* spp., storks *Ciconia* spp. and vultures *Gyps* spp. and discovered that soaring birds are able to travel across vast areas with little effort, using currents of rising air to gain height, then gliding to the base of the next thermal.

In preparation for his return to Bristol in 1973, he adapted his Piper Cruiser for long-distance flight and made a 'stepping-stone' migration back to the UK, calling in at Addis Ababa, Cairo and Crete *en route*. This time he remained in Bristol until 1983, using the Piper to track migrating cranes *Grus grus* in southern Sweden and also developing the 'ornithodolite', a portable instrument which recorded in real-time onto a

computer the azimuth, elevation and range of birds in flight. This he used in South Georgia to measure glide patterns for albatrosses *Diomedea* spp. and *Phoebetria* spp. to determine how the wind and waves of the Antarctic Ocean powered their flight thus shedding light on gust-soaring phenomena in the species.

In 1983 Colin moved to the US as the Maytag Chair of Ornithology at Miami University where he continued his studies of flight performance, using the ornithodolite to study Frigate Bird *Fregata* spp. flight and the wind tunnel to refine his flight mechanics model. Here he developed his 'Flight' software, which he made readily available to other researchers, and his book 'Bird Flight Performance, a Practical Calculation Manual' was published in 1989. He collaborated on several projects with the Patuxent Research Centre, including developing bird-borne transmitters that could send data via the Argos satellite system, and recording basic flight characteristics data for several falconry-trained raptors and wild Sage Grouse *Centrocercus urophasianus* to test the effects of radio-tagging on avian flight. On returning to Europe in 1992, he again made an inter-continental flight in his own aircraft, this time a Cessna 182, flying via Greenland and Iceland back to Bristol.

Following his return to the UK, several new projects commenced, with Colin making regular visits to Lund University (where a new wind tunnel was inaugurated by King Carl XVI of Sweden), and also collaborating with the Wildfowl & Wetlands Trust (WWT) in tracking Whooper Swan *Cygnus cygnus* migration between Britain and Iceland. This was of particular interest to Colin, because the species was deemed to be at the upper limits for making the long-distance overseas flight. His VW campervan became a familiar sight in Lund and at Whooper Swan catch sites in Iceland.

Always generous with his time, Colin mentored a number of undergraduate and PhD students who

went on to be highly successful in their fields. He also took trouble to ensure that the results of his somewhat technical research was made accessible and understandable to a wider audience, including joining the WWT/BBC/Nenetskiy State Nature Reserve expedition to ring Bewick's Swans *Cygnus columbianus bewickii* in the Russian arctic in 2003, an expedition which included tracking Bewick's Swans fitted with satellite tags for BBC Radio 4's 'Migration' programme.

Colin's was elected Fellow of the Royal Society in 1990 for his innovative work on the flight of birds and bats, and was made Honorary Companion of the Royal Aeronautical Society in 1994. In 1996 he was also awarded an honorary doctorate by Lund University. His publications, including the textbook *Modelling the Flying Bird* (2008) and his 'Flight' software models on the mechanics of flapping and gliding flight and long-distance migration, set out the principles of aeronautical engineering and how they may be adapted for exploring bird flight. These remain valuable tools for current and future generations of researchers, who continue studies to develop our understanding avian flight.

(Extracted from an obituary in Ibis 162: 607–608, which can be read in full at https*://onlinelibrary.wiley.com/doi/full/10.1111/ibi.12822*).

Whooper Swan landing on snow-covered lake in Finland (by Juha Soininen-WWT)

Richard A. Malecki (1947–2020)

Richard A. “Rich” Malecki, age 73, died on October 14 while fishing at his favourite spot, Elk Lake in Montrose, PA. Over the past year, he had been dealing with lymphoma, lung cancer and a failing heart. Rich was an avid outdoorsman, and he frequently told his wife that he really hoped that when he died it would be while doing something he enjoyed like hunting, fishing, cutting wood or driving his tractor. The woodshed was full, the tractor was in the shop, and he had yet to prepare for deer season or obtain his waterfowl license. If fate was going to intervene that day, fishing was the only option.

Born in Utica, NY, Rich held an Associates’ Degree in math and science from Mohawk Valley Community College, a Bachelor of Science in wildlife management from Cornell University, and a Master of Science in wildlife ecology and a Doctorate in wildlife science from the University of Missouri. Rich had an illustrious career as a wildlife biologist working for the USFWS (now USGS) New York Cooperative Fish and Wildlife Research Unit, retiring in 2017. He was stationed at Cornell University and held an appointment on the faculty. Rich specialised in conducting research programmes for waterfowl and wetlands. He made significant contributions to our knowledge about the biology and management of Canada Geese, Mallards, Tundra Swans and other assorted species. He loved working with graduate students and had a profound impact on the careers of many.

Rich overcame numerous health challenges during his lifetime, and firmly believed the only reason he lived as long as he did was because science and medical research always came up with innovative treatments just in the nick of time to keep him around. He survived Hodgkins lymphoma when in his early twenties because the doctor that was treating him suggested he try a recently developed treatment called chemotherapy. Rich wished to be cremated and have his ashes spread in a marsh that had fond memories for him and reflected his love of the outdoors.

Recent Literature

Amundson, C., Flint, P., Stehn, R., Platte, R., Wilson, H., Larned, W., & Fischer, J. 2019. Spatio-temporal population change of Arctic-breeding waterbirds on the Arctic Coastal Plain of Alaska. *Avian Conservation and Ecology* 14(1): 18. DOI:10.5751/ACE-01383-140118

Andrushenko, A. Y., & Zhukov, A. V. 2016. Masshtabno-zavisimye jeffekty v strukture jekologicheskoj nishi lebedja-shipuna Cygnus olor (Gmelin, 1803) v period zimovki v predelah zaliva Sivash [Scale-dependent effects in structure of the wintering ecological niche of the mute swan during wintering in the gulf of Sivash]. Biological Bulletin of Bogdan Chmelnitskiy Melitopol State Pedagogical University 6(3): 234–247. [In Russian.]

Ao, P., Wang, X., Meng, F., Batbayar, N., Moriguchi, S., Shimada, T., Koyama, K., Park, J., Ma, M., Sun, Y., Wu, J., Zhao, Y., Wang, W., Zhang, L.,Wang, X., Natsagdorj, T., Davaasuren, B., Damba, I., Rees, E.C., Cao, L., & Fox, A.D. 2020/In press. Migration routes and conservation status of Whooper Swans *Cygnus cygnus* in East Asia**.** *Wildfowl* (Special Issue No. 6): 43–72.

Arican, M., Parlak, K., & Yalçın, M. 2019. Angel wings syndrom in swans (*Cygnus cygnus* and *Cygnus atratus*): A retrospective study. *Kafkas Universitesi Veteriner Fakultesi Dergisi* DOI: 10.9775/kvfd.2019.21995.

Artemyev, A.V., Lapshin, N.V., & Simonov, S.A. 2019. Stopovers of swans (*Cygnus cygnus* and *C. bewickii*) (Anatidae, Aves) in the agricultural landscape of southern Karelia during the spring migration. *Biology Bulletin* 46(10): 52–57.

Augst, H., Halterlein, B., & Fabricius, K. 2019. From stopover to wintering: Bewick's Swans *Cygnus columbianus bewickii* in Schleswig-Holstein, northern Germany in winters 2016/2017 and 2017/2018. *Wildfowl (*Special Issue No. 5): 139–163.

Aulsebrook, Anne E.; Lesku, John A.; Mulder, Raoul A.; Goymann, Wolfgang; Vyssotski, Alexei L., & Jones, T.M. 2020. Streetlights Disrupt Night-Time Sleep in Urban Black Swans. Frontiers in Ecology and Evolution 8(131). DOI: 10.3389/fevo.2020.00131.

Autio, O., Heliölä, J., & Rinkineva-Kantola, L. 2020. Lintupellot rauhoitettujen lintulajien aiheuttamien satovahinkojen ennaltaehkäisevänä keinona. *Raportteja* 16.

Aznar, I., Bocca, V., Gibin, D., Monguidi, M., Richardson, J., & Stoicescu, A-V. 2019. Guidelines for reporting 2019 avian influenza data in accordance with SSD2 data model. *EFSA supporting publication* 2019:EN-1725. DOI: 10.2903/sp.efsa.2019.EN-1725.

Bao, T., Zhu, R.B., Wang, Q. Fang, Z.Y., Li, B.K., Gao, Y. S., & Xu, H. 2020. Spatial variability in greenhouse gas fluxes of a temperate freshwater marsh in China: Effects of soil moisture, animal activities and land use. *Applied Ecology and Environmental Research* 18(2): 2761–2780.

Bateman, B.L., Pidgeon, A.M., Radeloff, V.C., Vanderwal, J., Thogmartin, W.E., Vavrus, S.J., & Heglund, P.J. 2015. The pace of past climate change vs. potential bird distributions and land use in the United States. *Global Change Biology* DOI: 10.1111/gcb.13154.

Beekman, J., Koffijberg, K., Wahl, J., Kowallik, C., Hall, C., Devos, K., Clausen, P., Hornman, M., Laubek, B., Luigijõe, L., Wieloch, M., Boland, H., Švažas, S, Nilsson, L., Stīpniece, A., Keller, V., Gaudard, C., Degen, A., Shimmings, P., Larsen B.H., Portolov, D., Langendoen, T., Wood, K.A., & Rees, E.C. 2019. Long-term population trends & shifts in distribution of Bewick's Swans *Cygnus columbianus bewickii* wintering in northwest Europe. *Wildfowl* (Special Issue No. 5): 73–102.

Beerens, N., Heutink, R., Pritz-Verschuren, S., Germeraad, E., Bergervoet, S., Harders, F., Bossers, A., & Koch, G.

Bewicks Swan feather (by Hans Joachim Augst)

2019. Genetic relationship between poultry and wild bird viruses during the highly pathogenic avian influenza H5N6 epidemic in the Netherlands, 2017–2018. *Transboundary Emerging Diseases* 66: 1370–378.

Benzarti, E., Sarlet, M.I. Franssen, M., Cadar, D., Schmidt-Chanasit,J., Rivas, J.F., Linden, A., Desmecht, D., & Garigliany, M. 2019. Usutu Virus epizootic in Belgium in 2017 and 2018: evidence of virus endemization and ongoing introduction events. *Vector-Borne and Zoonotic Diseases* DOI: 10.1089/vbz.2019.2469.

Biler, L., & Altindag, A. 2020. Economic valuation of Balikdami Wetland (Eskisehir/Turkey). *Acta Biological Turcica* 33(3): 147–157.

Biljana, B., Vladimir, P., Ivana, V., Dejan, V., Nikola, V., Jasna, P., & Sanja, A. 2018. Morphological differences of pancreatic lesions in mute swans and hens naturally infected with highly pathogenic Avian Influenza Virus H5N8. *Acta Veterinaria 68*(2): 217–223.

Biroli, A., Van Doren, B., & Grabowska-Zhang, A. 2020. Drivers of avian species richness and community structure in urban courtyard gardens. *Journal of Urban Ecology* 6(1):juz026.

Biswas, S., Ramakrishna, C., & Maruthi, Y. 2020. Heavy metal residues in liver tissues of selected birds from aquatic and terrestrial environments Of Visakhapatnam, India. *International Journal of Scientific & Technology Research* 9(1): 299–305.

Bocharnikov, V.N., Gluschenko, Y.N., Korobov, D.V., & Korobova, I.N. 2015. Materials for the study of the spring migration of waterfowl (Anseriformes, Aves) on the Lake Khanka. *Achievements in the Life Sciences* 9: 87–94.

Boiko, D. & Wikelski, M. 2019. Moulting sites of Latvian Whooper Swan *Cygnus cygnus* cygnets fitted with GPS-GSM transmitters Boiko. *Wildfowl* (Special Issue No. 5): 229–241.

Bontas, B., Mirila, D., Gritcu, G., Nistor, I., & Ureche, D. 2020. High pollution with heavy metals NATURA 2000 Protected Area in Bacau County, Eastern Romania**.** *Revista de Chimie* 71(6): 154–169.

Borgsteede, F., Kavetska, K., & Zoun, P. 2006. Species of the nematode genus *Amidostomum* Railliet and Henry, 1909 in aquatic birds in the Netherlands. *Helminthologia* 43(2): 98–102.

Božić (Đurđević), B., Vućićević, I., Polaček, V., Vasković, N., Petrović, T., Marko Pajić, M., & Aleksić-Kovačevic, S. 2019. Comparative pathological findings in mute swans (*Cygnus olor*) naturally infected with highly pathogenic Avian influenza viruses H5N1 and H5N8 in Serbia. *Veterinaria Italiana* 55(1): 95–101.

Božić (Đurđević), B., Vučićević, I., Polaček, V., Vasković, N., Petrović T., Pajić, M., & Sanja Aleksić-Kovačević, S. 2019. Comparative pathological findings in Mute Swans (*Cygnus olor*) naturally infected with highly pathogenic Avian influenza viruses H5N1 and H5N8 in Serbia. *Veterinaria Italiana* 55(1): 95–101.

Brunton, D.F. & Bickerton, H.J. 2018. New records for Eastern Mosquito Fern (*Azolla cristata*, Salviniaceae) in Canada. *The Canadian Field Naturalist* 132: 150–359.

Buczyński, P., Tończyk, G., Bielecki, A., Cichocka, J., Kitowski, I., Grzywaczewski, G., Krawczyk, R., Nieoczym, M., Jablonska, A., Pakulnicka, J., & Buczynska, E. 2014. Occurrence of the medicinal leech (*Hirudo medicinalis*) in birds' nests. *Biologia* 69: 484–488.

Burton, N.H.K., Austin, G.E., Frost, T.M. & Pearce-Higgins, J.W. 2020. Impacts of climate change on UK's coastal and marine waterbirds. *MCCIP Science Review* 400–420.

Çakirlar, C., van den Hurk, Y., van der Jagt, I., van Amerongen, Y., Bakker, J., Breider, R., van Dijk, J., Esser, K., Groot, M., de Jong, T., & Kootker, L. 2019. Animals and people in the Netherlands' past: > 50 years of archaeozoology in the Netherlands. *Open Quaternary* 5(13): 1–30. doi.org/10.5334/oq.61

Carleton, R.E., McKenzie, S., Elsberry, E., & Klemm, C. 2019. Placement of a recycling container and informational signs reduces fishing line and tackle litter at a residential lake: a case study. *Urban Naturalist* 25: 1–11.

Chen, Q., Pugno, N.M., & Li, Z. 2020. The rotation toughening mechanism of barb-barbule joint in the barb delamination of feathers. *Acta Mechanica* 231: 1173–1186.

Clausen, K.K., Holm, T.E., Pedersen, C.L., Jacobsen, E.M., & Bregnballe, T. 2020. Sharing waters: the impact of recreational kayaking on moulting mute swans *Cygnus olor*. *Journal of Ornithology* DOI: 10.1007/s10336-020-01746-z.

Çobanoğlu, E.O. 2020. The avifauna of Lake Seyfe. *Turkish Journal of Agriculture – Food Science and Technology* 8(2): 484–494.

Csabai, Z., Csete, S., Fenyosi, L., Marjaine, Z., Mora, A., Parrag, T., Pernecker, B., Purger, D., Purger, J., & Sallai, Z. 2019. A Barcsi Ó-Dráva holtág élőhelyei és élővilág. *BioRes Pecs*.

Da-Silva, E.R. & Coelho, L.B.N. 2020. Sobre incursões da fauna silvestre a áreas urbanas durante a pandemia do novo coronavirus. *A Bruxa* 4(2): 1–13.

Davaasuren, B., Erdenechimeg, T. & Sukhbaatar, T. 2019. Annual report 2019. Mongolian bird ringing program. *Wildlife Science and Conservation of Mongolia*.

Densmore, C.L., Iwanowicz, D.D., McLaughlin, S.M., Ottinger, C.A., Spires, J.E., & Iwanowicz, L.R. 2019. Influenza A Virus Detected in Native Bivalves in Waterfowl Habitat of the Delmarva Peninsula, USA. *Microorganisms 7*(9): 334. DOI: 10.3390/microorganisms7090334

Detwiler, H. 2020. Checklist of the Birds of Yuma County. *Arizona Birds*.

Devos, K., T'jollyn, F., Desmet, P., Piesschaert, F., & Brosens, D. 2020. Watervogels – wintering waterbirds in Flanders, Belgium. *ZooKeys* 915: 127–135.

Dhaulakhandi, D.B., Ravi, A. K., Garg, L.C., & Ahluwalia, K.B. 2017. Complex disposition of an enigmatic pathogen: rare electron microscopic manifestations in nasal rhinosporidiosis. *Romanian Journal of Rhinology* 7(27): 169–180. DOI: 10.1515/rjr-2017-0019.

Dodovski, A., Popova, V., & Savić, V. 2019. Characterization of novel avian avulavirus 1 of class 1 isolated from a Mute Swan (*Cygnus olor*) in Macedonia in 2012. *Macedonia Veterinary Review* 42(2): 115–122.

Doser, J., Finley, A., Kasten, E., & Gage, S. 2019. Assessing soundscape disturbance through hierarchial models and acoustic indices: a case study on a shelterwood logged northern Michigan forest. *Ecological Indicators* 113: 106244.

Dwyer, J., Pandey, A., McHale, L., & Harness, R. 2019. Near-ultraviolet light reduced Sandhill Crane collisions with a power line by 98%. *The Condor* 20: 1–10. DOI: 10.1093/condor/duz008.

Elbers, J.R. & Gonzales, J. 2019. Quantification of visits of wild fauna to a commercial free-range layer farm in the Netherlands located in an avian influenza hot-spot area assessed by video-camera monitoring. *Transboundary and Emerging Diseases* DOI: 10.1111/tbed.13382.

Elmberg, J., Celine Arzel, C. Gunnarsson, G., Holopainen, S., Nummi, P., Pöysä, H., Sjöberg, K. 2019. Population change in breeding boreal waterbirds in a 25-year perspective: what characterises winners and losers? *Freshwater Biology* DOI: 10.1111/fwb.13411.

Ertan, K. 1996. The birds of Kocacay Delta. *Birds of Turkey* 12: 1–44.

Evgeny, V. 2020. The structure, territorial relationships and ecology of birds in high-mountain Daghestan. *Journal of Wildlife and Biodiversity* 4(1): 8–17.

Fallah Mehrabadi M.H., Tehrani F., Bahonar A., Shoushtari A., & Ghalyanchilangeroudi A. 2019. Risk assessment of the introduction and spread of highly pathogenic avian influenza viruses (H5-subtypes) via migratory birds in Iran. *Iranian Journal of Epidemiology* 14(4): 384–394.

Fang, L., Zhang, J., Zhao, Q., Solovyeva, D., Vangeluwe, D., Rozenfeld, S.B., Lameris, T., Xu, Z., Bysykatova, I., Batbayar, N., Konishi, K., Moon, O.-K., He, B., Koyama, K., Moriguchi, S., Shimada, T., Park, J., Kim, H., Liu, G., Hu, B., Gao, D., Ruan, L., Natsagdorj, T., Davaasuren, B., Antonov, A., Mylnikova, A., Stepanov, A., Kirtaev, G., Zamyatin, D., Kazantzidis, S., SekijiMa, T., Damba, I., Lee, H., Zhang, B., Xie, Y., Rees, E.C., Cao, L., & Fox, A.D. 2020/In press. Two distinct flyways with different population trends of Bewick's Swan *Cygnus columbianus bewickii* in East Asia. *Wildfowl* (Special Issue No. 6): 13–42.

Фёдоров В.А. 2018. О гнездовании лебедя-шипуна *Cygnus olor* в пределах Санкт-Петербурга. *Русский орнитологический журнал* 27(1570): 840–846.

Ferrer, M., Morandini, V., Baumbusch, R., Muriel, R., De Lucas, M., & Calabuig, C. 2020. Efficacy of different types of "bird flight diverter" in reducing bird mortality due to collision with transmission power lines. *Global Ecology and Conservation* 23: e01130.

Fiderer, C., Göttert, & T., Zeller, U. 2019. Spatial interrelations between raccoons (*Procyon lotor*), red foxes (*Vulpes vulpes*), and ground-nesting birds in a special protection area of Germany. *European Journal of Wildlife Research* 65(14). DOI: 10.1007/s10344-018-1249-z.

Flis, M. 2017. Ptasia grypa: groźna zoonoza przenoszona przez ptaki wolno żyjące – historia i stan obecny. *Ornis Polonica* 58: 35–43.

Gable, T.D., Windels, S.K., Homkes, A.T., Robertson, G., & Verveniotis, E.K. 2019. Trumpeter Swan Killed by Gray Wolf in Minnesota. *Northeastern Naturalist* 26(3): 27–30.

Gadzevich, D. V., Danilchenko, S. I., Yerofeyev, S. G., Pasunkina, M. A., Grinchenko, A. B., Irza, V. N., Volkov, M. S., & Varkentin, A. V. 2019. Epidemiological Monitoring of Avian Influenza in the Republic of Criteria. *Veterinary Science Today* (1): 34–38.

Gális, M. & Ševčík, M. 2019. Monitoring of effectiveness of bird flight diverters in preventing bird mortality from powerline collisions in Slovakia. *Raptor Journal* 13: 45–59.

Gális, M., & Ševčik, M. 2019. Monitoring of effectiveness of bird flight diverters in preventing bird mortality from powerline collisions in Slovakia. *Raptor Journal* 13: 45–59.

Gális, M., Naďo, L., Hapl, E., Šmídt, J., Deutschová, L., & Chavko, J. 2019. Comprehensive analysis of bird mortality along power distribution lines in Slovakia. *Raptor Journal* 13: 1–25. DOI: 10.2478/srj20190006.

Garrettson, P., Kruse, K., Moser, T., & Groves, D. 2020. Exploratory surveys of migratory birds breeding in the western and central Canadian Arctic 2005–2011. *Journal of Fish and Wildlife Management* 11(1): e1944-687X. DOI: 10.3996/092019-JFWM-082.

Gilbert, A.D., Jacques, C.N., Lancaster, J.D., Yetter, A.P. and Hagy, H.M. 2020. Disturbance Caused by Aerial Waterfowl Surveys During the Nonbreeding Season. *The Journal of Wildlife Management* 84: 1063–1071.

Gittings, T. 2018. Derryadd Wind Farm: Collision Risk Modelling. 1811-F1.

Goffette, Q., Germonpre, M., Lefevre, C., Brecko, J., Goemaere, E., & Rots, V. 2020. Bird bones from Trou de Chaleux and the human exploitation of birds during the late Magdalenian in Belgium. *Journal of Archaeological Science – Reports* 29: 102096. DOI: 10.1016/j.jasrep.2019.102096.

Goletić, T., Kustura, A., Gagić, A., Savić, V., Rešidbegović, E., Kavazović, A., Šatrović, E., Harder, T., Prašović, S., Beširović, H., & Alić, A. 2019. Molecular determinants of pathogenicity and host specificity of highly pathogenic H5N1 BiH isolates. *Acta Medica Saliniana* DOI: 10.5457/519.

Goodman, G.B., Klingensmith, M.C., Bush, S.E., & Clayton, D.H. 2020. The role of scratching in the control of ectoparasites on birds. *The Auk* 137: 1–9. DOI: 10.1093/auk/ukaa010.

Gower, C., Knetter, J. M., Olson, D., Olson, S., Sanders, T. A., Stringham, B., & Woolstenhulme, R. 2018. General Swan Hunting Framework in the Pacific Flyway: A Review. U. S. Fish and Wildlife Service, Washington D.C., USA.

Grade, T., Campbell, P., Cooley, T., Kneeland, M., Leslie, E., MacDonald, B., Melotti, J., Okoniewski, J., Parmley, E., Perry, C., Vogel, H., & Pokras, M. 2019. Lead poisoning from ingestion of fishing gear: A review. *Ambio* 48: 1023–1038.

Gyimesi, A., Van Lith, B., & Nolet,B. 2012. Commensal Foraging with Bewick's Swans *Cygnus bewickii* Doubles Instantaneous Intake Rate of Common Pochards *Aythya ferina*. *Ardea* 100(1): 55–62.

Hackett, P.M.W. 2020. The complexity of bird behavior – A facet theory approach. *Springer Nature Switzerland AG*. DOI: 10.1007/978-3-030-12192-1.

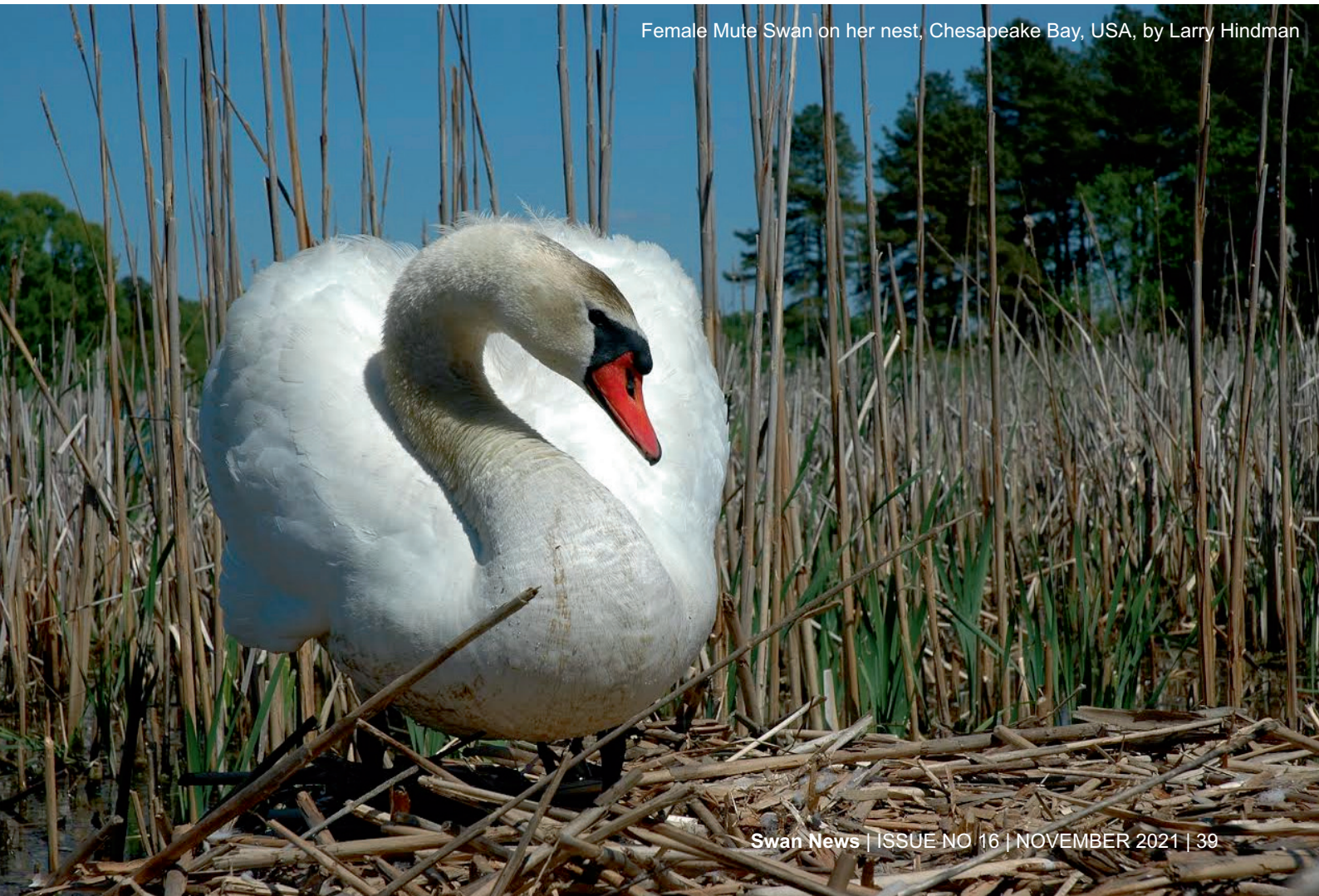
Haddadmarandi, M.R., Madani, S.A., Nili, H., & Ghorbani, A. 2019. Molecular survey of avian circoviruses in some non-psittacine birds and detection of a novel canary circovirus in a pigeon. *Iranian Journal of Veterinary Research, Shiraz University* 21:1: 70: 57–60.

Hagiwara, K., Nakaya, T., & Onuma, M. 2020. Characterization of Myxovirus resistance protein in birds showing different susceptibilities to highly pathogenic influenza virus. *The Journal of Veterinary Medicinal Science* 82(5): 619–625.

Hanžel, J., & Šere, D. 2012. Seznam ugotovljenih ptic Slovenije s pregledom redkih vrst / The list of birds of Slovenia with an overview of rare species, *Acrocephalus* 32(150–151): 143–203

Haraszthy, L. 2019. Cases of interspecific brood parasitism in Hungary. *Ornis Hungarica* 27(2): 115–141.

Harding, S., Greig, J., Mascarenhas, M., Young, I., Waddell, LA. 2019. La Crosse virus: a scoping review of the global evidence. *Epidemiology and Infection* 147(e66): 1–13.
Harmon, A., Littlewood, D.T.J., & Wood, C.L. 2019. Parasites lost: using natural history collections to track disease change across deep time. *Frontiers in Ecology and the Environment* 17(3): 157–166.
Harris RMB, Carter O, Gilfedder L, Porfirio LL, Lee G, & Bindoff NL. 2015. Noah's Ark Conservation Will Not Preserve Threatened Ecological Communities under Climate Change. *PLoS ONE* 10(4): 1–18.
Heaton, C.J., Gerbig, G.R., Sensius, L.D., Patel, V & Smith, T.C. 2020. *Staphylococcus aureus* epidemiology in wildlife: a systematic review. *Antibiotics* 9(89). DOI: 10.3390/antibiotics9020089.
Higman, P.J., H.D. Enander. D.A. Hyde, P.J. Badra, & K.M. Korroch. Prioritization schemes relevant to Great Lakes islands and invasive species. *USFWS Great Lakes Coastal Program Report number* 2019–18.
Hill, A., Gillings, S., Berriman, A., Brouwer, A., Breed, A.C., Snow, L., Ashton, A., Byrne, C., & Irvine, R.M. 2019. Quantifying the spatial risk of Avian Infuenza introduction into British poultry by wild birds. *Scientific Reports* 9(19973). DOI: 10.1038/s41598-019-56165-9.
Hill, S., Hansen, R., Watson, S., Coward, V., Russell, C., Cooper, J., Essen, S., Everest, H., Parag, K., Fiddaman, S., Reid, S., Lewis, N., Brookes, S., Smtith, A., Sheldon, B., Perrins, C., Brown, I., & Pybus, O. 2019. Comparative micro-epidemiology of pathogenic avian influenza virus outbreaks in a wild bird population. *Philosophical Transactions Royal Society B* 374: 20180259. DOI: 10.1098/rstb.2018.0259
Hintsanen, L. 2019. Lokkiyhdyskuntien vaikutus sorsalintujen pesimäsaaren valintaan Helsingin edustan merialueella.
Hise, C., Obermeyer, B., Ahlering, M., Wilkinson, J., & Fargione, J. 2020. Site wind right: Identifying low-impact wind development areas in the Central United States. *bioRxiv* 943613; DOI: 10.1101/2020.02.11.943613.
Hong, S. 2020. Relationship between Population of Wintering Whopper Swan (Cygnus cygnus) and bridge spacing in the Lower Nakdong River, Korea. *Korean Journal of Environment and Ecology* 34(3): 191–197.
Hunt, J., Derwin, J., Coveney, J., & Newton, S. 1989. Republic of Ireland. Important Bird Areas in Europe.
Hüppop, O. & Sommerfeld, M. 2020. Mitteilungen des Arbeitskreises Vogelschutzwarte Hamburg. *Vögel an Alster und Elbe*.
Hutson, J.M., Villaluenga, A., García-Moreno, A., Elaine Turner, E., & Gaudzinski-Windheuser, S. 2020. A zooarchaeological and taphonomic perspective of hominin behaviour from the Schöningen 13II-4 "Spear Horizon". *Tagungen* 37: 43–66.
Irwin, G. 2020. The archaeology of Māori Settlement and Pā on Pōnui Island, inner Hauraki Gulf, AD 1400–1800. *The Journal of the Polynesian Society* 129(1): 29–58.
Janaus, M. 2009. Waterbirds breeding on some territories of Riga Freeport in lower Daugava. Innovative and applied research in *Biology 77th International Scientific Conference of the University of Latvia* 19: 20–25.
Jarić, I., Courchamp, F., Correia, R.A., Crowley, S.L., Essl, F., Fischer, A., González-Moreno, P., Kalinkat, G., Lambin, X., Lenzner, B., Meinard, Y., Mill, A., Musseau, C., Novoa, A., Pergl, J., Pyšek, P., Pyšková, K., Robertson, P., Schmalensee, M.V., Shackleton, R.T., Stefansson, R.A.,



Female Mute Swan on her nest, Chesapeake Bay, USA, by Larry Hindman

Štajerová, K., Veríssimo, D., & Jeschke, J.M. 2020. The role of species charisma in biological invasions. *Frontiers in Ecology and the Environment* DOI: 10.1002/fee.2195.

Jashenko. J., Maltseva, E., & Ilina, V. 2019. The conservation of ecosystem and biological diversity in Alakol Biosphere Reserve (East Kazakhstan). *IOP Conference Series: Earth and Environmental Science*. DOI: 10.1088/1755-1315/298/1/012022.

Jenni, L., Ganz, K., Milanesi, P., & Winkler, R. 2020. Determinants and constraints of feather growth. *PLoS ONE* 15(4): e0231925. DOI: 10.1371/journal.pone.0231925.

Jia, Q., Zhang, Y., & Cao, L. 2019. Response of Anatidae abundance to environmental factors in the middle and lower Yangtze River floodplain, China. *Sustainability* 11(6814). DOI: 10.3390/su11236814.

Kanwal, S., Abbasi, N.A., Chaudhry, M.J.I., Ahmad, S.R., & Malik, R.N. 2020. Oxidative stress risk assessment through heavy metal and arsenic exposure in terrestrial and aquatic bird species of Pakistan. *Environmental Science and Pollution Research* 1–15. DOI: 10.1007/s11356-020-07649-z

Karamendin, K., Kydyrmanov, A., Kasymbekov, Y., Seidalina, A., Daulbayeva, K., Sayatov, M., & Fereidouni, S. 2020. Evolution of Avian orthoavulavirus 16 in wild avifauna of Central Asia. *Heliyon* 6(1): e03099.

Kashiwagi, A., Kasahara, S., Takahashi, M. & Azuma, N. 2019. Habitat use and flight paths of geese and swans at Lake Jusan a spring migration stopover site in Northern Japan before construction of a wind farm. *Japanese Journal of Ornithology* 68: 53–66.

Kruckenberg, H. & C. Kowallik, C. 2021. Rastbestände von Höcker-, Zwerg- und Singschwan Cygnus olor, C. columbianus, C. cygnus an der Unterems in den Jahren 1996/97 bis 2018/19. *Vogelkdl. Ber. Niedersachs.* 48: 55–74.

Khaleghizadeh, A. 2020. Atlas of Birds of Iran. Mohammad Kaboli, Mansour Aliabadian, Mohammad Tohidifar, Alireza Hashemi, Seyed Babak Musavi and Cees C. Roselaar (Eds). Iran Department of the Envrionment, Tehran. 617 pp. *Journal of Animal Diversity* 2(1): 100–103.

Knapik, R. 2019. Demographics and Movements of Mute Swans in Michigan, USA. Ph.D. Dissertation. Michigan State University, East Lansing, Michigan, USA.

Knapik, R., Luukkonen, D.R., & Winterstein, S.R. 2019. Density dependence in productivity of a North American Mute Swan *Cygnus olor* population. *Wildfowl* (Special Issue No. 5): 178–196.

Kolodinska-Brantestam, A., Boiko, D., Grauda, D., Krasòevska, N., & Rashal, I. 2015. Genetic diversity of Mute Swan population of the RIGA urban area. *Proceedings of the Latvian Academy of Sciences* Section B, 69(3): 696:135–139.

Korbecki, J., Gutowska, I., Chlubek, D., & Baranowska-Bosiacka, I. 2019. Lead (Pb) in the tissues of Anatidae, Ardeidae, Sternidae and Laridae of the Northern Hemisphere: a review of environmental studies. *Environmental Science and Pollution Research* 26: 12631–12647.

Koshelev, O.I., Koshelev, V.O., Fedushko, M.P., & Zhukov, O.V. 2019 The bird communities diversity and indicator groups of natural and anthropogenic landscapes of the south and south-east of Ukraine. *Agrology* 2(4): 229–240.

Коузов, С.А. 2020. Замечания к публикации К.Д.Мильто «Первая находка гнезда лебедя-шипуна Cygnus olor на южном берегу Невской губы между Петергофом и Стрельной». *Русский орнитологический журнал* 29(1942): 2965–2968.

Коузов, С. А. & Лосева, А. В. 2015. Находка гнезда лебедя-шипуна Cygnus olor на острове Малый Фискар в 2015 году. *Русский орнитологический журнал* 24(1197): 3551–3553.

Kouzov, S.A. & Loseva, A.V. 2016. Modern distribution, new breeding and moulting places of the mute swan (*Cygnus olor* Gmelin) in the Leningrad region in 2005–2015. *Вестник СПбГУ* 3(1): 116–136.

Kühn, S. & Van Franeker, J. A. 2020. Quantitative overview of marine debris ingested by marine megafauna. *Marine Pollution Bulletin* 151(2): 110858.

Kulaga, K., & Budka, M. 2019. Bird species detection by an observer and an autonomous sound recorder in two different environments: Forest and farmland. *PLoS ONE* 14(2): e0211970.

Lahelma, A. Strange swans and odd ducks: interpreting the ambiguous waterfowl imagery of Lake Onega. Lahelma, A., 2012. Strange swans and odd ducks. Interpreting the ambiguous waterfowl imagery of Lake Onega. *Visualising the Neolithic. Abstraction, figuration, performance, representation*, Oxford, 2: 15–33.

Lameris, T.K., & Kleyheeg, E. 2017. Reduction in adverse effects of tracking devices on waterfowl requires better measuring and reporting. *Lameris and Kleyheeg Animal Biotelemetry* 5: 24.

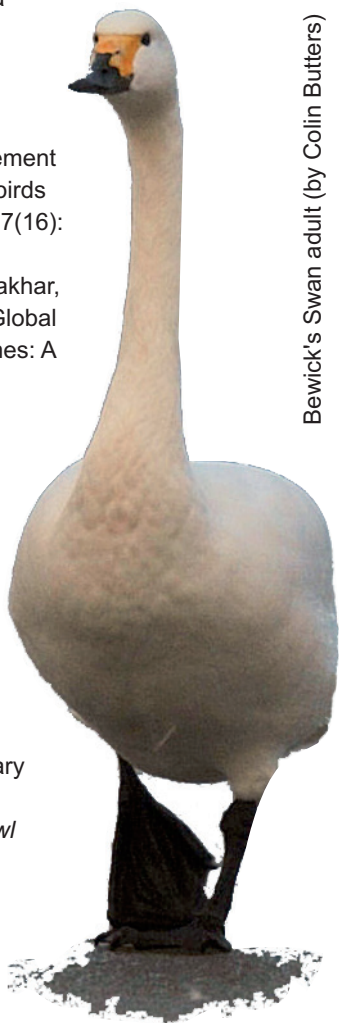
Lanszki, Z., Horvath, G., Bende, Z., & Lanszki, J. 2020. Differences in the diet and trophic niche of three sympatric carnivores in a marshland. *Mammal Research* 65: 93–104.

Laroulandie, V., Morin, E., Soulier, M., & Castel, J. 2020. Bird procurement by humans during the Middle and early Upper Paleolithic of Europe: New data for the Aurignacian of southwestern France. *Quaternary International* 543: 16–24.

Larson, D.M., Cordts, S.D., & Hansel-Welch, N. 2020. Shallow lake management enhanced habitat and attracted waterbirds during fall migration. *Hydrobiologia* 547(16): 3365–3379.

Lashaki, E., Teshnizi, S., Gholami, S., Fakhar, M., Brant, S., & Dodangeh, S. 2020. Global prevalence status of avian schistosomes: A systematic review with meta-analysis. *Parasite Epidemiology and Control* 9: e00142.

Laubek, B., Clausen, P., Nilsson, L., Wahl, J. , Wieloch, M., Meissner, W, Shimmings, P., Larsen, B.H., Hornman, M., Langendoen, T., Lehikoinen, A., Luigujõe, L., Stī pniece, A., Švažas, S., Sniauksta, L., Keller, V., Gaudard, C., Devos, K., Musilová, Z., Teufelbauer, N., Rees, E.C., & Fox, A. D. 2019. Whooper Swan *Cygnus cygnus* January population censuses for Northwest Mainland Europe, 1995–2015. *Wildfowl* (Special Issue 5): 103–122.



Bewick's Swan adult (by Colin Butters)

Ławicki, Ł., Staszewski, A., Racławski, B., Barcz, M., Jasiński, M., Kajzer, Z., Stańczak P., & Guentzel, S. 2020. Ocena liczebności populacji wybranych gatunków ptaków lęgowych obszaru Natura 2000 Puszcza Goleniowska. *Ornis Polonica* 61: 14–31.

Ławicki,L ., Wylegała, P., Wieloch, M., Sikora, A., Grygoruk, G., Dombrowski, A., Chmielewski, S., Lenkiewicz, W., & Włodarczyk, R. 2011. Liczebność i rozmieszczenie łabędzia czarnodziobego *Cygnus columbianus bewickii* w Polsce wiosną 2010 roku. *Ornis Polonica* 52: 196–210.

Leach, E.C., Daly, G., & Burwell, C.J. 2020. The avifauna of the Eungella Region, central coastal Queensland, Australia. *Proceedings of The Royal Society of Queensland* 125: 117–138.

Lee, H., Yeo, Y., Ahn, S., & Kim, J. 2020. Analysis of the anti-microbial susceptibility of *Clostridium* isolated on clinical specimens from captive wild animals in Seoul Zoo. *Korean Journal of Veterinary Service* 43(1): 31–37.

Lei, J., Jia, Y., Zuo, A., Zeng, Q., Shi, L., Zhou, Y., Zhang, H., Lu, C., Lei, G., & Wen, L. 2019. Bird Satellite Tracking Revealed Critical Protection Gaps in East Asian–Australasian Flyway. *International Journal of Environmental Research and Public Health* 16(7): 1147. DOI: 10.3390/ijerph16071147.

Lewis-Phillips, J., Brooks, S., Sayer, C., Derek, McCrea, R.S., Siriwardena, G., & Axmacher, J.C. 2019. Pond management enhances the local abundance and species richness of farmland bird communities. *Agriculture, Ecosystems & Environment* 273: 130–140. DOI: 10.1016/j.agee.2018.12.015.

Liu, Q., Yang, Z., Han, F., Shi, H., Wang, Z., & Chen, X. 2019. Ecological Environment Assessment in World Natural Heritage Site Based on Remote-Sensing Data. A Case Study from the Bayinbuluke. *Sustainability* 11(22): 6385. DOI :10.3390/su11226385.

Lowther, P. 2019. Host list of avian brood parasites 1 – Anatidae. Field Museum of Natural History, Chicago, Illinois, USA.

Makarewicz, C., & Pleuger, S. 2020. Herder-hunter-fishers and agricultural contacts. Zooarchaeological perspective on Pitted Ware animal exploitation strategies on Djursland. *The Pitted Ware Culture on Djursland: Supra-regional significance and contacts in the Middle Neolithic of southern Scandinavia*.

MaMing, Roller. 2020. Case analysis of illegal poaching on the waterfowl under highly pathogenic plague in China. *Preprints* 2020030260. DOI: 10.20944/preprints202003.0260.v.

Marchowski, D., & Neubauer, G. 2019. Kleptoparasitic strategies of Mallards towards conspecifics and Eurasian Coots. *Ardea* 107(1): 110–114.

Marchowski, D., Kaliciuk, J., & Ławicki, Ł. 2019. Avifauna of the SPA Natura 2000 Kamień Lagoon and Dziwna River – current status and changes in 1979–2018. *Ornis Polonica* 60:85–102.

Marchowski, D., Kaliciuk, J., & Lawicki, L. 2019. Awifauna obszaru Natura 2000 Zalew Kamienski i Dziwna – stan aktualny i zmiany w latach 1979–2018. *Ornis Polonica* 60: 85–102.

Matrozis, R. 2019. A 30-year (1988–2017) study of Mute Swans *Cygnus olor* in Riga, Latvia. *Wildfowl* (Special Issue No. 5): 164–177.

Mayer, M., Natusch, D., & Frank, S. 2019. Water body type and group size affect the flight initiation distance of European waterbirds. *PLoS ONE* 14(7): e0219845.

McCollin, D., Preece, R.C., Sparks, T.H. 2015. Pushing back the baseline: a novel approach to detect long-term changes in terrestrial faunal abundance using historical qualitative descriptions. *European Journal of Ecology* 1(1): 32–42.

Meissner, W., Binkowski, Ł.J., Barker, J., Hahn, A., & Trzeciak, M. 2020. Relationship between blood lead levels and physiological stress in mute swans (*Cygnus olor*) in municipal beaches of the southern Baltic. *Science of the Total Environment* 710(136292). DOI: 10.1016/j.scitotenv.2019.136292.

Meissner, W., Bzoma, S., Nagórski, P., Bela, G., Zięcik, P., Wybraniec, M., & Marczewski, A. 2011. Liczebność ptaków wodnych na Zatoce Gdańskiej w okresie od maja 2010 do kwietnia 2011. *Ornis Polonica* 52: 295–300.

Meng, F., Chen, L., Zhang, B., Li, C., Zhao, G., Batbayar, N., Natsagdorj, T., Damba, I., Liu, S., Wood, K.A., Cao, L. & Fox, A.D. 2020. The migratory Mute Swan *Cygnus olor* population in East Asia. *Wildfowl* (Special Issue No. 6): 73–96.

Michalski, M., Galecki, R., & Siedlecka, K. 2019. First report of *Sarconema eurycerca* (Filarioidea) in mute swan (*Cygnus olor*) in Poland – the case report. *Helminthologia* 56(1): 62–65.

Mikow, E., Gonzalez, D., McDavid, B., & Kostick, M. 2020. Harvest and Use of Wild Resources in Wales, 2017. *Alaska Department of Fish and Wildlife, Division of Subsistence* Technical Paper No. 457.

Mitchell, C. D., & Eichholz, M. W. 2020. Trumpeter Swan *(Cygnus buccinator*), version 1.0. In Birds of the World (P. G. Rodewald, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.truswa.01

Mohamed R. 2019. Histomorphological study on the tongue of the duck in the Caribbean with relation to feeding habit. Journal of Advanced Veterinary Animal Research 6(1): 74–81.

Mojžiš, M. & Kerestúr, D. 2019. Prvé hniezdenie labute spevavej (*Cygnus cygnus*) na Slovensku. [First breeding of the Whooper Swan (*Cygnus cygnus*) in Slovakia]. *Tichodroma* 31: 19–23.

Montràs-Janer, T., Knape, J., Nilsson, L., Tombre, I., Pärt, T., & Månsson, J. 2019. Relating national levels of crop damage to the abundance of large grazing birds: Implications for management. *Journal of Applied Ecology* 56: 2286–2297.

Montràs-Janer, T., Knape, J., Stossel, M., Nilsson, L, Tombre, I., Pärt, T., & Månsson, J. 2020. Spatio-temporal patterns of crop damage caused by geese, swans and cranes – implications for crop damage prevention. *Agriculture, Ecosystems and Environment* 300(9): 107001. DOI: 10.1016/j.agee.2020.107001.

Morales, A., Barbara Frei, B., Leung, C., Titman, R., Shannon Whelan, S., Benowitz-Fredericks, Z.M., & Elliott, K.H. 2020. Point-of-care blood analyzers measure the nutritional state of eighteen free living bird species. *Comparative Biochemistry and Physiology* Part A 240(110594).

Mulyanto, D., Iskandar, J., Gunawan, R., & Partasasmita, R. 2019. Ethnoornithology: Identification of bird names mentioned in *Kakawin Ramayana*, a 9th-century Javanese poem (Java, Indonesia). *Biodiversitas* 20(11): 3213–3222.

Musilová, Z., Musil, P., & Neužilová, Š. 2019. Mezinárodní sčítání vodních ptáků v Česku v lednu 2019 The International Waterbirds Census in Czechia in January. *Aythya* 7: 44–58.

Mykhailo, K. 2020. Characteristics of visible autumn migrations of waterfowl in national park "Prypiat-Stokhid" in 2012–2017. *Cherkasy University Bulletin: Biological Sciences Series* 7(1): 79–91.

Nergiz, H. 2019. Habitat utilization and winter time-activity budgets of the Whooper Swan *Cygnus Cygnus* (Linnaeus, 1758) population wintering at the Van Lake Basin, Turkey. *Applied Ecology and Environmental Research* 17(2): 2179–2185.

Newth, J., Wood, K., McDonald, R., Nuno, A., Semenov, I., Chistyakov, A., Mikhaylova, G., Bearhop, S., Belousova, A., Glazov, P., Cromie, R., & Rees, Eileen. 2019. Conservation implications of misidentification and killing of protected species. *Conservation Science and Practice* 1:e24. DOI:10.1111/csp2.24.

Niczyporuk, J., Kozdrun, W., Czekaj, H., Stys-Fijol, N., & Piekarska, K. 2020. Detection of fowl adenovirus D strains in wild birds in Poland by Loop-Mediated Isothermal Amplification (LAMP). *BMC Veterinary Research* 16: 58. DOI: 10.1186/s12917-020-2271-4.

Nikolov, S., Marinova, M.H., Murad, B. & Tsachev, I. 2019. A review of wild and synantropic birds recorded as reservoirs of avian influenza viruses in Bulgaria. *Bulgarian Journal of Veterinary Medicine* DOI: 10.15547/bjvm.2248.

Nuijten, R., Wood, K., Haitjema, T., Rees, E., & Nolet, B. 2020. Concurrent shifts in wintering distribution and phenology in migratory swans: Individual and generational effects. *Global Change Biology* 26: 4263–4275.

Nuijten, R.J.M., Gerrits, T., Shamoun-Baranes, J., & Nolet, B.A. 2020. Less is more: on-board lossy compression of accelerometer data increases biologging capacity. *Journal of Animal Ecology* 89: 237–247.

Nuijten, R.J.M., Vriend, S.J.G., Wood, K.A., Haitjema, T., Rees, E.C., Jongejans, E. & Nolet, B.A. 2020. Apparent breeding success drives long-term population dynamics of a migratory swan. *Journal Avian Biology* 2020: e02574. doi 10.1111/jav.02574

Nummi, P., Väänänen V.M., Peekarinen, A.J., Eronen, V., Mikkola-Roos, M., Nurmi, J., Rautiainen, A., & Rusanen, P. 2019. Alien predation in wetlands – Raccoon Dog and waterbird breeding success. *Baltic Forestry* 25: 2.

O'Leary III, D. Inouye, D., Dubayah, R., Huang, C., & Hurtt, G. 2020. Snowmelt velocity predicts vegetation green-wave velocity in mountainous ecological systems of North America. *International Journal Applied Earth Observatory Geoinformation* 89(102110).

Osborn, J., Hine, C.S., Yetter, A.P., & Fournier, A. 2020. Monitoring of key ecological attributes and indicators of waterbirds at the nature conservancy's Emiquon Preserve annual report 2019. Illinois Prairie Research Institute, University of Illinois at Urbana-Champaign, Illinois, USA.

Oyarzun-Ruiz, P., Munoz, P., Paredes, E., Valenzuela, G., & Ruiz, J. 2019. Gastrointestinal helminths and related histopathological lesions in black-necked swans *Cygnus melancoryphus* from the Carlos Anwandter Nature Sanctuary, Southern Chile. *Brazilian Journal of Veterinary Parasitology* 28(4): 613–624.

Parut, S., Rattanaporn, O., Witthawat, W., Nareerat, S., Paisin, L., & Ladawan, S. 2019. Occurrence of *Chlamydia* spp. in wild birds in Thailand. *Asian Pacific Journal of Tropical Medicine* 12: 2: 67–71.

Pau, N. 2013. Using Tiny "Nanotags" to Track Large Scale Bird Migrations. *The Wrack Line* 1–2.

Pavón-Jordán, D., Abdou, W., Azafzaf, H., Balaž, M., Bino, T., Borg, J.J., Božič, L., Butchart, S.H.M., Clausen, P., Sniauksta, L., Dakki, M., Devos, K., Domsa, C., Encarnaçao, V., Etayeb, K., Faragó, S., Fox, A.D., Frost, T., Gaudard, C., Georgiev, V., Goradze, I., Hornman, M., Keller, V., Kostiushyn, V., Langendoen, T., Ławicki, Ł., Ieronymidou, C., Lewis, L.J., Lorentsen, S.H., Luigujoe, L., Meissner, W., Mikuska, T., Molina, B., Musil, P., Musilova, Z., Nagy, S., Natykanets, V., Nilsson, L., Paquet, J.Y., Portolou, D., Ridzon, J., Santangeli, A., Sayoud, S., Šćiban, M., Stipniece, A., Teufelbauer, N., Topić, G., Uzunova, D., Vizi, A., Wahl, J., Yavuz, K.E., Zenatello, M., & Lehikoinen, A. 2020. Positive impacts of important bird and biodiversity areas on wintering waterbirds under changing temperatures throughout Europe and North Africa. *Biological Conservation* 246: 108549.

Pavón-Jordán, D., Abdou, W., Azafzaf, H., Balaž, M., Bino, T., Borg, J.J., Božič, L., Butchart, S.H.M., Clausen, P., Sniauksta, L., Dakki, M., Devos, K., Domsa, C., Encarnaçao, V., Etayeb, K., Faragó, S., Fox, A.D., Frost, T., Gaudard, C., Georgiev, V., Goradze, I., Hornman, M., Keller, V., Kostiushyn, V., Langendoen, T., Ławicki, Ł., Ieronymidou, C., Lewis, L.J., Lorentsen, S.H., Luigujoe, L., Meissner, W., Mikuska, T., Molina, B., Musil, P., Musilova, Z., Nagy, S., Natykanets, V., Nilsson, L., Paquet, J.Y., Portolou, D., Ridzon, J., Santangeli, A., Sayoud, S., Šćiban, M., Stipniece, A., Teufelbauer, N., Topić, G., Uzunova, D., Vizi, A., Wahl, J., Yavuz, K.E., Zenatello, M., & Lehikoinen, A. 2020. Corrigendum to "Positive impacts of important bird and biodiversity areas on wintering waterbirds under changing temperatures throughout Europe and North Africa". *Biological Conservation* 246: 108602.

Pavón-Jordán, D., Clausen, P., Dagys, M., Devos, K., Encarnaçao, V., Fox, A. D., Frost, T., Gaudard, C., Hornman, M., Keller, V., Langendoen, T., Ławicki, Ł., Lewis, L. J., Lorentsen, S., Luigujoe, L., Meissner, W., Molina, B., Musil, P., Musilova, Z., Nilsson, L., Paquet, J., Ridzon, J., Stipniece, A., Teufelbauer, N., Wahl, J., Zenatello, M., & Lehikoinen, A. 2019. Habitat- and species-mediated short- and long-term distributional changes in waterbird abundance linked to variation in European winter weather. *Diversity and Distributions 25*(2): 225–239.

Pearce-Higgins J.W. & Crick H.Q.P. 2019. One-third of English breeding bird species show evidence of population responses to climatic variables over 50 years. *Bird Study* 66: 159–172.

Pecsics, T., Laczi, M., Nagy, G., & Csörgő, T. 2017. The cranial morphometrics of the wildfowl (Anatidae). *Ornis Hungarica* 25: 44–57.

Percival, S. 2020. Report to Inform a Habitats Regulations Assessment. *Ecology Consulting*.

Pfeiffer, M. B., Blackwell, B. F., & DeVault, T. L. 2020. Collective effect of landfills and landscape composition on bird-aircraft collisions. *Human-Wildlife Interactions* 14(1): 43–54.

Pham, P.H., Leacy, A., Deng, L., Nagy, E., &. Susta, L. 2020. Isolation of Ontario aquatic bird bornavirus 1 and

Black-necked Swans on Chiloe Island, Chile (by Eileen Rees)

characterization of its replication in immortalized avian cell lines. *Virology Journal* 17(16). DOI: 10.1186/s12985-020-1286-6.

Pigniczki, C., Bakró-Nagy, Z., Bakacsi, G., Barkóczi, C., Nagy, T., Puskás, J., & Enyedi, R. 2019. Preliminary results on bird collision with overhead power lines in Hungary: a case study around Pusztaszer Landscape Protection Area. *Ornis Hungarica* 27: 221–238. DOI: 10.2478/orhu-2019-0012.

Poen, M., Venkatesh, D., Bestebroer, T., Vuong, O., Scheuer, R., Munnink, B., de Meulder, D., Richard, M., Kuiken, T., Koopmans, M., Kelder, L., Kim, Y., Lee, Y., Steensels, M., Lambrecht, B., Dan, A., Pohlmann, A., Beer, M., Savic, V., Brown, I., Fouchier, R., & Lewis, N. Co-circulation of genetically distinct highly pathogenic avian influenza A clade 2.3.4.4 (H5N6) viruses in wild waterfowl and poultry in Europe and East Asia, 2017–18. *Virus Evolution* 5(1): vez004. DOI:10.1093/ve/vez004.

Ramey, A. M., Reeves, A. B., Drexler, J. Z., Ackerman, J. T., De La Cruz, S., Lang, A. S., Leyson, C., Link, P., Prosser, D. J., Robertson, G. J., Wight, J., Youk, S., Spackman, E., Pantin-Jackwood, M., Poulson, R., L., & Stallknecht, D. E. 2020. Influenza A viruses remain infectious for more than seven months in northern wetlands of North America. *Proceedings Royal Society* 287.20201680. DOI: 10.1098/rspb.2020.1680

Rees, E.C. 2020. Colin James Pennycuick (1933–2019). *Ibis* 162: 607–609.

Rees, E.C. & Rozenfeld, S.B. 2020. *Cygnus columbianus* Tundra Swan. *In* V. Keller, S. Herrando, P. Voříšek, M. Franch, M. Kipson, P. Milanelsi, D. Martí, M. Anton, A. Klvaňová, M.V. Kalyakin, H.-G. Bauer & R.P.B. Foppen (eds.), *European Breeding Bird Atlas 2: Distribution, Abundance and Change*, pp. 105. European Bird Census Council & Lynx Edicions, Barcelona, Spain.

Rees, E.C., Cao, L., Clausen, P., Coleman, J.T., Cornely, J., Einarsson, O., Ely, C.R., Kingsford, R.T., Ma, M., Mitchell, C.D., Nagy, S., Shimada, T., Snyder, J., Solovyeva, D.V., Tijsen, W., Vilina, Y.A., Włodarczyk, R., & Brides, K. 2019. Conservation status of the world's swan populations, *Cygnus* sp. and *Coscoroba* sp.: a review of current trends and gaps in knowledge. *Wildfowl* (Special Issue No. 5): 35–72.

Robinson, B., Withrow, J., Richardson, R., Matsuoka, S., Gill, R., Johnson, A., Lovette, I., Johnson, J., DeGange, A., & Romano, M. 2020. Further Information on the Avifauna of St. Matthew and Hall Islands, Bering Sea, Alaska. *Western Birds* 51(2): 78–91. DOI: 10.21199/WB51.2.1.

Sadigova, A., Jafarova, S., & Abbasov, A. 2020. Ecological Groups of Birds of Greater Shor Lake of the Azerbaijan Republic. *Agricultural and Biological Sciences Journal* 6(2): 86–90.

Sánchez, A., Garcı́a-Galán, A., Garcı́a, E., Gómez-Martín, A., de la Fe, C., Corrales, J., & Contreras, A. 2020. EXPOSICIÓN OCUPACIONAL A LOS VIRUS INFLUENZA DE LAS AVES SILVESTRES**.** *Review Espana Salud Pública* 94(1): e1–e9.

Sesser, K.A., Iglecia, M., Reiter, M.E., Strum, K.M., Hickey, C.M., Kelsey, R., & Skalos, D.A. 2018. Waterbird response to variable-timing of drawdown in rice fields

fter winter-flooding. *PLos ONE* 13(10):e0204800. DOI: 10.1371/journal.pone.0204800.
Ширяева, М.О., & Коузов, С.А. 2019. Первый случай гнездования лебедя-шипуна *Cygnus olor* в Выборгском заливе на острове Стоглаз. *Русский орнитологический журнал* 28(1815): 4043–4047.
Shao, M. Q., Zhang, C. M., Dai, N. H., Nian-hua, X.U., Zhi, Y.J., & LU, P. 2018. Time budget and behavioral rhythm of wintering Tundra Swans in a lotus pond reclamation area around Poyang Lake. *Chinese Journal of Ecology* 37(3): 817–822.
Sikora, A. & Półtorak, W. 2019. Zmiany liczebności żurawia Grus grus i łęczaka Tringa glareola w rezerwacie Bielawa w latach 1983–2019 oraz wpływ działań ochronnych na awifaunę. *Ornis Polonica* 60: 285–299.
Sikora, A. 2011. Przydatność zdjęć lotniczych do wykrywania stanowisk lęgowych łabędzia niemego *Cygnus olor* na przykładzie Gdańska. *Ornis Polonica* 52: 219–224.
Škorpíková, V., Hlaváč, V., & Křápek, M. 2019. Bird mortality on medium voltage power lines in the Czech Republic. *Raptor Journal* 13: 27–44.
Skutāne, Elīza. 2020. Latvijā apgredzenoto ziemeļu gulbju *Cygnus cygnus* spalvu maiņas migrācija. Latvijas Universitāte. Bioloģijas fakultāte. http://dspace.lu.lv/dspace/handle/7/50695
Sˇmída J., Hapl, E., & Gális, M. 2019. Methodology of risk assessment for electricity distribution lines in Slovakia with regard to potential bird mortality due to collisions with power lines**.** *Raptor Journal* 13: 61–73.
Śmietanka, K., & Meissner, W. 2011. Grypa ptaków w populacjach wolno żyjących-wybrane aspekty epidemiologiczne ze szczególnym uwzględnieniem zakażeń wirusem H5N1. *Ornis Polonica* 52: 265–274.
Smith, O., Snyder, W., & Owen, J. 2020. Are we overestimating risk of enteric pathogen spillover from wild birds to humans? *Biological Reviews* 95: 652–679.
Smith, P.A., McKinnon, L., Meltofte, H., Lanctot, R.B., Fox, A.D., Leafloor, J.O., Soloviev, M., Franke, A., Falk, K, Golovatin, M., Sokolov, V., Sokolov, A., & Smith A.C. 2020. Status and trends of tundra birds across the circumpolar Arctic. *Ambio* 49: 732–748.
Solovyeva, D., Koyama, K., & Vartanyan, S. 2019. Living child-free: proposal for density-dependent regulation in Bewick's Swans *Cygnus columbianus bewickii. Wildfowl* (Special Issue No. 5*)*: 197–210.
Старіцин, С.О & Панько, В.В. 2019. Міграція лебедів в зимовий період на водоймищах Вінничини. *Вісник студентського наукового товариства ДонНУ імені Василя Стуса* 1(11): 147–149.
Stenschke, N., Degen, A., & Schonert, A. 2019. Moult migration of northwest mainland European Whooper Swans *Cygnus cygnus*. *Wildfowl* (Special Issue No. 5): 211–228.
Straub, J.N., Palumbo, M., Fleener, J., Glenzinski, B., Fowler, D., Kidd, G., Waterstradt, K., & Hygnstrom, S. 2020. Wisconsin Waterfowl Habitat Conservation Strategy, Wisconsin Department of Natural Resources, Madison, Wisconsin, USA.
Sullivan, K. Presence of an Absence: Yeats's Solitary Swan. *International Yeats Studies*. 4(1): 8: 91–98.
Szymańska-Czerwińska, M., Mitura, A., Niemczuk, K., Zaręba, K., Jodełko, A., Pluta, A., Scharf, S., Vitek, B., Aaziz, R., Vorimore, F., Laroucau, K., & Schnee, C. 2017. Dissemination and genetic diversity of chlamydial agents in Polish wildfowl: Isolation and molecular characterisation of avian *Chlamydia abortus* strains. *PLoS ONE* 12(3): e0174599.


Coscoroba Swans in Berlin Zoo (by Hans-Joachim Augst)

Talluto, D. 2019. Monitoring avian productivity and survivorship at Witty's Lagoon. Rocky Point Bird Observatory, Victoria, British Columbia, Canada.

Tkachenko, H., Kurhaluk, N., & Hetmanski, T. 2018. The *In Vitro* Hemolytic Activity of Erythrocytes From Free-living Mute Swan (*Cygnus olor)* Spread Out in Gdynia and Sopot Coasts. *Baltic Coast Zone* 22: 73–90.

Torralba-Burrial, A., Arias, A., & Herrero, M. 2020. Teacher training and biology students' perceptions on the introduction of alien species and seaports role. *Ediciones de la Universidad de Oviedo*.

Tucakov, M. 2005. Numbers and seasonal activity of the Mute Swan (*Cygnus olor*) on the Kolut Fishpond (NW Serbia). *Ring* 27: 2: 221–226.

Tumiel, T., Białomyzy, P., Grygoruk, G., Korniluk, M., Świętochowski, P., & Wereszczuk, M. 2020. Wybrane gatunki ptaków lęgowych OSO Bagienna Dolina Narwi w latach 2011 i 2012 oraz zmiany ich liczebności. *Ornis Polonica* 61: 1–13.

Turghan, M. A., MaMing, R., Weidong, L., Jie, D., & Guohua, X. 2021. An Updated Checklist of Bird Species in the Arjin Mountain Nature Reserve, China: Conservation Implications. *Pakistan Journal of Zoology* 1–9. DOI: 10.17582/journal.pjz/20181010091000.

Uelmen, J. A., Brokopp, C., & Patz, J. 2020. A 15 Year Evaluation of West Nile Virus in Wisconsin: Effects on Wildlife and Human Health. *International Journal of Environmental Research and Public Health* 17(5): 1767. DOI: 10.3390 /ijerph17051767.

Velasquez, C., Jaramillo, E., Camus, P., Labra, F., & San Martın, C. 2019. Dietary habits of the black- necked swan *Cygnus melancoryphus* (Birds: Anatidae) and variability of the aquatic macrophyte cover in the Rio Cruces wetland, southern Chile. *PLoS ONE* 14(12): e0226331.

Walser III, J.W., Kristjánsdóttir, S., Gröcke, D.R., Gowland, R.L., Jakob, T., Nowell, G.M., Ottley, C.J., & Montgomery, J. 2020. At the world's edge: Reconstructing diet and geographic origins in medieval Iceland using isotope and trace element analyses. *American Journal of Physical Anthropology* 171: 142–163.

Wang, B., Zheng, X., Zhang, H., Xiao, F., He, Z., & Yan, Q. 2020. Keystone taxa of water microbiome respond to environmental quality and predict water contamination. *Environmental Research* 187: 109666. DOI: 10.1016/j.envres.2020.109666.

Wang, K., Gazizova, A., Wang, Y., Zhang, K., Zhang, Y., Chang, Y., Cui, Y., Zhang Y., Zhang, S., & Zhang, L. 2019. First Detection of *Cryptosporidium* spp. in Migratory Whooper Swans (*Cygnus cygnus*) in China. *Microorganisms* 8(6): 1–8. DOI:10.3390/microorganisms8010006.

Wang, Y., Li, X., Sun, Q., Gong, P., Zhang, N., Zhang, X., Wang, X., Li, G., & Li, J. 2020. First case report of *Metorchis orientalis* from Black Swan. *International Journal for Parasitology: Parasites and Wildlife* 13: 7–12.

Wang, Y., Zhang, K., Zhang, Y. Wang, K., Gazizova, A., Wang, L., Cao, L., Zhang, Y., Huang, J., Cui, Y., Zhang, Y., & Zhang, L. 2020. First detection of *Enterocytozoon bieneusi* in whooper swans (*Cygnus cygnus*) in China. *Parasites Vectors* 13(5). DOI: 10.1186/s13071-020-3884-y.

Wang, Z., Yang, Z., Shi, H., Han, F., Liu, Q., Qi, J., & Lu, Y. 2020. Ecosystem Health Assessment of World Natural Heritage Sites Based on Remote Sensing and Field Sampling Verification: Bayanbulak as Case Study. *Sustainability* 12(7): 2610. DOI: 10.3390/su12072610.

Wartecki, A. & Piotr Rzymski, P. 2020. On the Coronaviruses and their associations with the aquatic environment and wastewater. *Water* 12: 1598: 1–27. DOI:10.3390/w12061598.

Warzecha, J., Agnieszka, F., Oczkowicz, M., & Bugno-Poniewierska, M. 2018. A Molecular Characteristic of the Anatidae Mitochondrial Control Region – A Review*. *Annals of Animal Science* 18(1): 3–15.

Wen-yun, H.E. , Shao, M.-Q., Zhi, Y.-J., Dai, N.-H., Lu, P. & Tu, X.-Y. 2019. Waterbird diversity in three reclamation regions of Poyang Lake. *Chinese Journal of Zoology* 38: 2765–2771.

Wilk, T., Bobrek. R., & Pępkowska-Król, A. 2019. Znaczenie zbiorników zaporowych polskiej części Karpat dla migrujących i zimujących ptaków wodno-błotnych. [The importance of dam reservoirs in the Polish Carpathians for migrating and wintering waterbirds] *Ornis Polonica* 60: 103–123.

Włodarczyk, R., & Minias, P. 2020. Age-related differences in reproductive success support the selection hypothesis in a Mute Swan population. *Journal of Ornithology* DOI: 10.1007/s10336-020-01803-7.

Wood, K., Brown, M., Cromie, R., Hilton, G., Mackenzie, C., Newth, J., Pain, D., Perrins, C., & Rees, E. 2019. Regulation of lead fishing weights results in mute swan population recovery. *Biological Conservation* 230: 67–74.

Wood, K., Newth, J., Brides, K., Burdekin, M., Harrison, A., Heaven, S., Kitchin, C., Marshall, L., Mitchell, C., Ponting, J., Scott, D., Smith, J., Tijsen, W., Hilton, G., & Rees, E. 2019. Are long-term trends in Bewick's Swan *Cygnus columbianus bewickii* numbers driven by changes in winter food resources? *Bird Conservation International* 29: 479–496.

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.

Wood, K.A., Hilton, G.M., Newth, J.L. & Rees, E.C. 2019. Seasonal variation in energy gain explains patterns of resource use by avian herbivores in an agricultural landscape: insights from a mechanistic model. *Ecological Modelling* 409: 108762.

Wood, K.A., Ham, P., Scales, J., Wyeth, E., & Rose, P.E. 2020. Aggressive behavioural interactions between swans (*Cygnus* spp.) and other waterbirds during winter: a webcam-based study. *Avian Research* 11(1): 1–16. DOI: 10.1186/s40657-020-00216-7

Worthy, T. H., & Nguyen, J. M. T. 2020. An annotated checklist of the fossil birds of Australia. *Transactions of the Royal Society of Australia* 144: 66–108.

Wylegała, P., Krąkowski, B., Batycki, A, & Cierplikowski, D. 2012. Zmiany liczebności lęgowych ptaków wodno-błotnych w Nadgoplu w latach 1988–2011. *Ornis Polonica* 53: 50–63.

Wylegała, P., Sikora, A., Janiszewski, T., Lenkiewicz, W., & Grygoruk, G. 2019. Występowanie, stan ochrony i propozycja monitoringu łabędzia czarnodziobego *Cygnus columbianus bewickii* w Polsce. *Ornis Polonica* 60: 245–268.

Black-necked Swans at Punta Arenas, Chile (by Eileen Rees)

Wylegała, P., Sikora, A., Janiszewski, T., Lenkiewicz, W., & Grygoruk, G. 2019. Występowanie, stan ochrony i propozycja monitoringu łabędzia czarnodziobego *Cygnus columbianus bewickii* w Polsce. *Ornis Polonica* 60: 245–268.

Xu, Y., Si, Y., Takekawa, J., Liu, Q., Prins, H. H. T., Yin, S., Prosser, D. J., Gong, P., & De Boer, W. F. 2019. A network approach to prioritize conservation efforts for migratory birds. *Conservation Biology* 34(2): 416–426.

Yoshino, T., Uemura, J., Endoh, D., Kaneko, M., Osa, Y., & Asakawa, M. 2009. Parasitic nematodes of anseriform birds in Hokkaido, Japan. *Helminthologia* 46(2): 117–122. DOI: 10.2478/s11687-009-0023-x.

Yang, L., Wang, W., Sun, P., Huang, S., Gao, R., Kong, D, Ru, W., Wronski, T. & Zhang, G. 2021. Extrinsic factors, endocrine mechanisms, and behavioral indicators of migratory restlessness in wintering whooper swans (*Cygnus cygnus*). *Scientific Reports* 11: 12636 . https://doi.org/10.1038/s41598-021-92031-3

Yu, C., Zhou, L., Mahtab, N., Fan, S., & Song, Y. 2020. Microhabitat variables explain patch switching by wintering Bewick's swans through giving-up net energy intake rates. *Environmental Science and Pollution Research* DOI: https://doi.org/10.1007/s11356-020-08343-w.

Yu, C., Zhou, L., Mahtab, N., Fan, S., Song, Y. 2019. The influence of food density, flock size, and disturbance on the functional response of Bewick's Swans (*Cygnus columbianus bewickii*) in wintering habitats. *Animals* 9(11): 946. DOI: 10.3390/ani9110946.

Yuniati, E., Ani, S., Batoro, J., & Purwanto, Y. 2020. Ethnozoology of the ritual and magic of the To Bada Ethnic Group in the Lore Lindu Biosphere Reserve, Central Sulawesi, Indonesia. *Biodiversitas* 21(6): 2645–2653. DOI: 10.13057/biodiv/d210636.

Zana, B., Erdélyi, K., Nagy, A., Mezei, E., Orsolya Nagy, O., Takács, M., Bakonyi, T., Forgách, P., Korbacska-Kutasi, O., Fehér, O., Malik, P., Ursu, K., Kertész, P., Kepner, A., Martina, M., Süli, T., Lanszki, Z., Tóth, G.E., Kuczmog, A., Somogyi, B., Jakab, F., & Kemenesi, G. 2020. Multi-approach investigation regarding the West Nile Virus situation in Hungary, 2018. *Viruses* 12: 123. DOI: 10.3390/v12010123.

Zawadzki, G., Zawadzka, D., Sołtys, A., Zawadzki, J. 2019. Abundance and distribution of the Mute Swan *Cygnus olor* in the Special Protection Area PLB200002 Augustów Forest. *Ornis Polonica* 60: 47–57.

Zaynagutdinova, E.M., Kouzov, S.A., Batova, P.R., Mikhailov, Y.M., & Kravchuk, A.V. 2019. Spring migration stopovers of swans *Cygnus* sp. in the Russian part of the Gulf of Finland. *Wildfowl* (Special Issue No. 5): 123–138.

Zhang, N., Li, Y. K., Shan, J. H., *et al.* 2019. Community structure, abundance and spatial distribution of waterbirds wintering in Poyang Lake wetlands. *Journal of Lake Sciences* 31(1): 183–194.

Zhou, Y. X., Li, Y. K., Shan, J. H., *et al.* 2018. The species diversity of waterbirds in the Five River catchment of Poyang Lake. *Journal of Jiangxi Normal University (Natural Science)* 42(6): 571–577.

Zhukov, A.V. & Andryushchenko, A.Y. 2017. Rol' rel'efa v organizacii jekologicheskoj nishi lebedja-shipuna (Cygnus olor (Gmelin, 1803)) na zimovke v Prisivash'e [Relief and ecological niche of mute swan (*Cygnus olor* (Gmelin, 1803)) wintering in Sivash]. *Acta Biologica Sibirica* 3(2): 20–45 (in Russian). DOI: 10.14258/abs.v3i2.2730

Zou, Y., Zhang, P., Zhang, S., Chen, X., Li, F., Deng, Z., Yang, S., Zhang, H., Li, F., & Xie, Y. 2019. Crucial sites and environmental variables for wintering migratory waterbird population distributions in the natural wetlands in East Dongting Lake, China. *Science of the Total Environment* 655: 147–157. DOI: 10.1016/j.scitotenv.2018.11.185.

Zurfluh, K., Albini, S., Mattmann, P., Kindle, P., Nuesch-Inderbinen, M., Stephan, R., & Vogler, B. 2019. Antimicrobial resistant and extended-spectrum β-lactamase producing *Escherichia coli* in common wild bird species in Switzerland. *Microbiology Open* 8:e845. DOI: 10.1002/mbo3.845.

Contributors

Hans-Joachim Augst
Ornithological Working Group of Schleswig-Holstein and Hamburg, Winnert, Germany

Lei Cao
Eco-Environmental Sciences, Chinese Academy of Sciences, Beijing, China.

Anthony D. Fox
Department of Ecoscience, Aarhus University, Kalø, Rønde, Denmark

Phoebe Ham
Centre for Research in Animal Behaviour, Psychology, University of Exeter, Devon, UK

Eduardo Jaramillo
Instituto de Ciencias de la Tierra, Facultad de Ciencias, Universidad Austral de Chile, Valdivia, Chile

Todd E. Katzner
Forest and Rangeland Ecosystem Science Centre, US Geological Survey, Boise, Idaho USA

Randall T. Knapik
Department of Fisheries and Wildlife, Michigan State University, East Lansing, Michigan, USA

Kees Koffijberg
SOVON Vogelonderzoek, Nijmegen, The Netherlands.

Tom Langendoen
P.O. Box 471, 6700 AL Wageningen, The Netherlands

Julia Newth
Wildfowl & Wetlands Trust, Slimbridge Wetland Centre, Slimbridge, Gloucestershire, UK

Eileen C. Rees
Department of Zoology, University of Cambridge, Downing Street, Cambridge, UK

Paul E. Rose
Wildfowl & Wetlands Trust, Slimbridge Wetland Centre, Slimbridge, Gloucestershire, UK and Centre for Research in Animal Behaviour, Psychology, University of Exeter, Devon, UK

Sonia B. Rozenfeld
Bird Ringing Centre, A.N. Severtsov Institute of Ecology and Evolution, Russian Academy of Sciences, Moscow, Russian Federation

Todd A. Sanders
U.S. Fish and Wildlife Service, Portland, Oregon, USA

Jake Scales
University Centre Sparsholt College, Sparsholt, Hampshire, UK

Tetsuo Shimada
Miyagi Prefectural Izunuma-Uchinuma Environmental Foundation, Kurihara-city, Miyagi, Japan

Diana Solovyeva
Institute of Biological Problems of the North FEB RAS, Magadan, Russia

Wim Tijsen
Landschap Noord-Holland, Heiloo, Netherlands

Carlos Velásquez
Instituto de Fomento Pesquero, Coquimbo, Chile

David Wolfson
Minnesota Cooperative Fish and Wildlife Research Unit, Department of Fisheries,

Wildlife and Conservation Biology
University of Minnesota, St. Paul, Minnesota, USA

Kevin A. Wood
Wildfowl & Wetlands Trust, Slimbridge Wetland Centre, Slimbridge, Gloucestershire, UK

Eleanor Wyeth
Centre for Research in Animal Behaviour, Psychology, University of Exeter, Devon, UK

Nesting Black Swan in Queenland, Australia (by Jon Coleman)

SWAN SPECIALIST GROUP