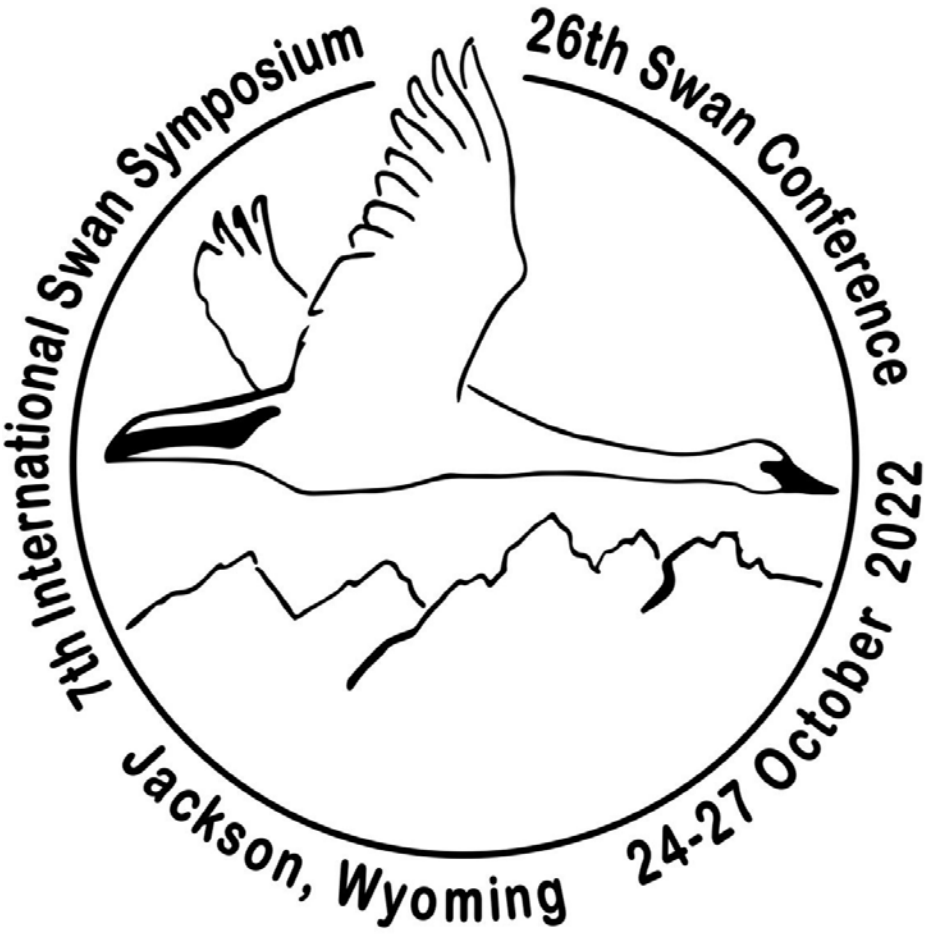

PROGRAM

Hosted by

The Trumpeter Swan Society

Ricketts Conservation Foundation

IUCN-SSC Swan Specialist Group

Snow King Resort, Jackson, Wyoming, USA

23 – 27 October 2022

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Snow King Resort, Jackson, Wyoming, USA

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Program

Time	Sunday 23 October
4:00-7:00pm	Arrival and check-in at Snow King/other accommodation
3:00-5:30pm	**REGISTRATION open – Snow King mezzanine area. Please leave posters on reception for display at the evening event.**
5:45pm	**Bus leave Snow King for EVENING RECEPTION**
6:00-10pm	**EVENING RECEPTION at National Museum of Wildlife Art, Jackson, Wyoming, with shuttle-service bus back to Snow King.** **6:30-7:00pm Welcome speeches** **7:00-8:30pm Food provided** **POSTERS on display** **CASH BAR**

Time			Monday 24 October
07:00-08:00			Breakfast buffet (**included in registration for those staying @ Snow King**) – **TIMBERLINE 3 (upstairs from main hall)**. **REGISTRATION OPEN**
MORNING SESSION – GRAND ROOM			
INTRODUCTORY PRESENTATIONS			**MODERATOR – GARY IVEY**
Time		**Authors**	**Title**
08:00-08:10		t.b.c.	Symposium Introduction/Welcome
08:10-08:30		Margaret Smith	History of The Trumpeter Swan Society
08:30-08:50		Eileen Rees	History and role of the IUCN-SSC Swan Specialist Group
POPULATION TRENDS			**MODERATOR – GARY IVEY**
Time		**Authors**	**Title**
08:50-09:10		Preben Clausen et al.	Moving northeast – an update of the numbers and distribution of wintering Whooper Swan *Cygnus cygnus* in continental Europe and western Asia: results of the January 2020 census.
09:10-09:30		Kane Brides et al.	The Icelandic Whooper Swan *Cygnus cygnus* population: current status and long-term (1986-2020) trends in its numbers and distribution
09:30-09:50		Yuriy Mikhailov et al.	Dynamics of the number and distribution of swans in the Neva Bay of the Gulf of Finland **(VIRTUAL)**

09:50-10:10		Gary Ivey	History and status of the Malheur National Wildlife Refuge Trumpeter Swan flock
10:10-10:40	**BREAK. Coffee/Tea (with snacks).** **REGISTRATION**		
POPULATION TRENDS			**MODERATOR – CRAIG ELY**
Time		**Authors**	**Title**
10:40-11:10		Radoslaw Wlodarczyk	Twenty-five years of Mute Swan population studies in central Poland.
11:10-11:30		Dave Olson	Status on the abundance levels and trends from the current Trumpeter Swan (*Cygnus buccinator*) survey of the Rocky Mountain Population, U.S. Breeding Segment
11:30-11:50		Eileen Rees et al.	Population estimates and trends in numbers for Bewick's Swan *Cygnus columbianus bewickii* wintering in the NW European and Caspian/Black Sea regions: results of the January 2020 census
11:50-12:10		Martin St. Louis et al.	Recent expansion of Rocky Mountain Population Trumpeter Swan winter range into Oregon
12:10-12:30		Mark Vrtiska & Michael Anderson	The North American Trumpeter Swan Survey – resurrection or R.I.P.?
12:30-14:00	**LUNCH (included!).** **POSTERS TO THE WALL**		
AFTERNOON SESSION – GRAND ROOM			
THREATS TO SWANS: LEAD POISONING			**MODERATOR – PREBEN CLAUSEN**
Time		**Authors**	**Title**
14:00-14:20		Martha Jordan	What the swans are telling us about lead poisoning
14:20-14:40		Kevin Wood et al.	Swans and lead angling weights: a perspective from Europe
14:40-15:00		Alysha Evans, Daniel Zimmerman et al.	A team effort: response, rehabilitation and release of Trumpeter Swan *Cygnus buccinator* and Tundra Swan *Cygnus columbianus* in western Washington State
15:00-15:20		Julia Newth et al.	Lead ammunition poisoning: A One Health issue with a simple solution
15:20-15:40		Mark Jankowski	Development of tools to site-specifically monitor exposure and effects of lead in Tundra Swans *Cygnus columbianus*
15:40-16:10	**BREAK. Tea/Coffee**		
BREEDING AND SURVIVAL			**MODERATOR – KEVIN WOOD**
Time		**Authors**	**Title**
16:10-16.30		Anna Buckardt et al.	A family affair: using GPS/GSM collars and auxiliary markers to quantify Trumpeter Swan cygnet survival and dispersal
16:30-16:50		Paige Miller et al.	Thermal ecology of Trumpeter Swan incubation
16:50-17.10		Diana Solovyeva et al.	Eastern Bewick's Swan *Cygnus columbianus bewickii* survival as related to marking technique **(VIRTUAL)**
17:10-18:10			**POSTER SESSION**

Time		Tuesday 25 October	
07:00-08:00			Breakfast buffet (**included with registration <u>for those staying at Snow King</u>**) – **TIMBERLINE 3 ROOM**
MORNING SESSION - GRAND ROOM			
HABITAT/LANDSCAPE USE			**MODERATOR – JULIA NEWTH**
Time		**Authors**	**Title**
08:30-08:50		Mark Vrtiska et al.	Trumpeter Swan fidelity and winter movements in the Nebraska Sandhills.
08:50-09:10		Sergei Kouzov et al.	Spring feeding of three species of swans in the eastern part of the Gulf of Finland **(VIRTUAL)**
09:10-09:30		Andrea Kristof et al.	Are they in it for the long haul? Tracking Rocky Mountain Trumpeter Swans in the Greater Yellowstone ecosystem and beyond
09:30-09:50		Kevin Wood et al.	Behavioural and energetic consequences of competition among three overwintering swan species
09:50-10.10		Cody Pitz et al.	Winter range and implications for management of Wyoming Trumpeter Swans (*Cygnus buccinator*)
10:10-10:40	**BREAK. Coffee/Tea (with snacks)**		
HABITAT/LANDSCAPE USE (cont.)			**MODERATOR – EILEEN REES**
Time		**Authors**	**Title**
10:40-11:00		Laura Kearns et al.	Successful reintroduction of Trumpeter Swans in Ohio: results of population surveys and movement studies
11:00-11:20		Preben Clausen et al.	The stable, the declining and the increasing: results from 50 years of swan censuses in Denmark 1967-2020 explained – an update
11:20-11:40		Dmitrijs Boiko & Leho Luigujõe	Distribution, size and habitat choice of the Whooper Swan Cygnus cygnus population breeding in Latvia and Estonia, 1973 – 2021
CONSQUENCES OF CLIMATE CHANGE: MIGRATION			**MODERATOR – EILEEN REES**
11:40-12:00		Hans Linssen et al.	What drives staying and leaving during autumn migration of Bewick's swans? **(VIRTUAL)**
12:00-12:20		Bart Nolet et al.	Social learning of migration in swans: parental guidance during first return migration **(VIRTUAL)**
12:20-12:40		Sergei Kouzov et al.	Influence of ice melting dates on the timing and bird number on spring migration stopovers of swans in the eastern part of the Gulf of Finland **(VIRTUAL)**
12:40-14:00	**LUNCH (included!).**		
AFTERNOON SESSION - GRAND ROOM			

THREATS TO SWANS: CONSERVATION AND OUTREACH			MODERATOR – CARL MITCHELL
Time		**Authors**	**Title**
14:00-14:20		Kerry Mackie et al.	Farming for Whooper Swans *Cygnus cygnus* – efficacy of a mitigation programme for a road development in Northern Ireland
14:20-14:40		Gregory Beabout	Following 5P with Aristotelian Eyes: from the observation of Trumpeter Swan behaviour to the quest for living well.
14:40-15:00		Tiffany Mayo & Kelly Schouten	Helping Trumpeter Swans one crayon at a time: developing activity books to inspire youth
15:00-15:30	**BREAK. Tea/Coffee**		
Time		**Authors**	**Title**
15:30-16.30		Julia Newth et al.	"The Flight of the Swans" (**FILM**)
16:30-17:00		Eileen Rees et al.	**WORKSHOP 1:** IUCN-SSC Swan Specialist Group into the future
17:00-19:00		Margaret Smith et al.	**WORKSHOP 2:** Interior Population Trumpeter Swan Management Plan meeting (CLOSED SESSION)

Time		**Wednesday 26 October**	
MID-CONFERENCE EXCURSION TO THE GRAND TETON NATIONAL PARK			
8.30 - 18.00		Plans are still in development, but this will likely be an all-day tour through Jackson Hole and the Grand Teton National Park. The scenery is stunning! Assuming decent weather (always suspect in late October in the Rocky Mountain "high-country") participants will see panoramic views of one of the most iconic landscapes in North America, and examples of most of the native ungulates, including bison, elk, moose, mule deer and prong-horned antelope. Trumpeter Swans can be seen within Jackson!	
13.00 – 17.00		Bill Long et al.	**WORKSHOP 3:** Swan rearing techniques (LOCATION: Valley Springs, Wyoming Wetlands Society Breeding Facility.)
18.00 – 19.30		Bewick's Swan Expert Group et al.	**WORKSHOP 4:** Bewick's Swan Action Plan Review: update/planning (LOCATION: TIMBERLAND 1 ROOM)

Time		**Thursday 27 October**	
07:00-08:00			Breakfast buffet (**included with registration for those staying at Snow King**) **- TIMBERLINE 3 ROOM**

MORNING SESSION - GRAND ROOM			
MOVEMENTS/DISTRIBUTION			**MODERATOR – DAVE OLSON**
08:30-08:50		David Wolfson	Interior Population Trumpeter Swan, *Cygnus buccinator,* annual movement and migration patterns
08:50-09:10		Sharon Poessel	Movements of the Rocky Mountain Population of Trumpeter Swans (*Cygnus buccinator*)
09:10-09:30		Carl Mitchell et al.	Historic distribution of Trumpeter (*Cygnus buccinator*) and Tundra (*Cygnus americanus*) in North America, 1587-1950
09:30-09:50		Todd Katzner	Origins of Trumpeter Swans (Cygnus buccinator) taken during hunting seasons in the northern Rocky Mountains
09:50-10:10		Timothy Poole	Trumpeter Swans in Manitoba: range expansion and movements at the northern edge of the Mississippi Flyway **(VIRTUAL)**
10:10-10.30		Lei Fang, Lei Cao et al.	Two distinct flyways with different population trends of Bewick's Swan *Cygnus columbianus bewickii* in East Asia **(VIRTUAL)**
10:30-11:00	**BREAK. Coffee/Tea (with snacks)**		
OUTCOME OF SITE MANAGEMENT/PROTECTION			**MODERATOR – EILEEN REES**
11:20-11:40		Lisa Vergin & Jutta Leyrer	Habitat use of Bewick's Swans (*Cygnus columbianus bewickii*) during the non-breeding season in Germany **(VIRTUAL)**
11:40-12:00		Rascha Nuijten et al.	Ecological network analysis in Bewick's swans in northwest Europe, and considerations for Nature 2000 legislation **(VIRTUAL)**
12:00-12:20		Andrea Soriano-Redondo, Stuart Bearhop et al.	Increased survival, but lower reproductive rates within protected areas promotes population growth in a long-lived migratory waterbird **(VIRTUAL)**
12:30-14:00	**LUNCH (not included)**		
POPULATION RESTORATION			**MODERATOR – SUSAN PATLA**
14:00-14:20		David Hoffman	Status of Trumpeter Swan restoration and the promotion of wetlands in Iowa
14:20-14:40		Dave Olson	Examining locations in both the core and expansion areas of the U.S. Breeding Segment of the Rocky Mountain Population of Trumpeter Swans for improved conservation strategies.
14:40-15:00		Taylor Finger	Trumpeter Swans and Wisconsin: reintroduction and current research **(VIRTUAL)**
15:00-15:20		Kyle Spragens	Status of Trumpeter Swan *Cygnus buccinator* and Tundra Swan *C. columbianus* populations and conservation challenges in Washington State.

15:20-15:40	**BREAK Tea/Coffee POSTERS RETRIEVED BY PRESENTERS**		
15:40-16:00		Susan Patla	Phases of range expansion: Trumpeter Swans in the Green River Basin of Wyoming
16:00-16:20		Evan Shields	Retrospective analysis of a declining Trumpeter Swan *Cygnus buccinator* population in Yellowstone National Park
16:20-16:40		Mike Anderson	Conservation priorities for Trumpeter Swans and the TTSS
16:40-17:00		Various	CLOSING REMARKS
17:30	**ROOM CLEARED TO PREPARE FOR BANQUET**		
????		**BANQUET** (included in full registration)	

ABSTRACTS

ORAL PRESENTATIONS

Session 1: Introductions

History of The Trumpeter Swan Society

JOHN CORNELY[1], MARGARET SMITH[2], DAVID WEAVER[3]

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Abstract

The Trumpeter Swan Society (TTSS) was founded in September 1968, at a meeting in Carver Park Reserve, Minnesota. The suggestion for a Trumpeter Society came from H. Albert Hochbaum of Delta Waterfowl Research Station in Manitoba. Fred E. King, the Chairman of the Hennepin County Park Reserve District Board of Commissioners was the driving force in establishing a Trumpeter Swan Restoration program in Minnesota. He became the first President of TTSS. The other founders of TTSS were from the Hennepin County Park Reserve District, the Wildlife Management Institute, and from Delta. The original purposes of TTSS were to: assist in perpetuating Trumpeter Swan as a living member of the wild birds of this world; promote research into the ecology of Trumpeter Swan; advance the science and art of Trumpeter management, both in captivity and in the wild; work for the restoration of Trumpeter Swan to their original breeding grounds; to be a focal point for assembling all possible data on Trumpeter Swan; provide a framework for the exchange of knowledge about Trumpeter Swan; and provide a common meeting ground for all who are active in or encourage research on, propagation of and restoration of Trumpeter Swan. After 54 years, TTSS is still involved in all of these areas. TTSS members have been actively involved in nearly every Trumpeter Swan restoration effort in North America. The Society has partnered with provincial, state, county, federal agencies, flyway councils; other conservation organizations; and private citizens to advance the restoration and conservation of Trumpeter Swans in assuring the vitality and welfare of wild Trumpeter Swan populations and their habitats throughout North America. TTSS continues to evolve and reprioritize, adapting our work to the contemporary circumstances of trumpeter swans and their habitats.

History and role of the IUCN-SSC Swan Specialist Group

EILEEN REES

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Abstract

Swan experts globally have long been aware of the importance of information exchange for advancing their research and conservation programmes. Thus, in association with the annual Executive Board Meeting of the International Waterfowl Research Bureau (IWRB; which developed into what is now Wetlands International), the first swan symposium was held at the Wildfowl Trust, Slimbridge, UK in December 1971, and several of the major papers were published in *Wildfowl.* The meeting was truly international – contributors included William W.H. Gunn (Canada); Professor W.J.L. Sladen and James G. King (USA), Dr Pelle Andersen-Harild (Denmark), Dr Sven Mathiasson (Sweden), and Dr Murray Williams (New Zealand) – as well as researchers from the UK. Bill Sladen presented his protocol for use of neck-collars on swan species in North America, which subsequently was expanded to Eurasia. Following this initial meeting it was decided to maintain lines of communication, and a second symposium was held – again in association with an annual meeting of the IWRB's Executive Board - at Sapporo, Japan, in 1980. The strong association with the IWRB led to what was a loosely configured network of swan specialists becoming more formally integrated into the IWRB Swan Research Group (coordinated by a Chair), and in due course into the Wetlands International Swan Specialist Group during the 1980s–1990s. The ethos of the Swan SG was primarily to maintain good communication among swan researchers/conservationists globally, whilst also providing information and advice in support of Wetlands International's programmes and projects. Specific actions/collaborations began to be undertaken under the auspices of the Swan SG, however, *e.g.* undertaking coordinated international swan censuses at 5-year intervals, which fed into the Waterbird Population Estimates. During the early 21st century, the Wetlands International Specialist Groups came under the umbrella of the IUCN Species Survival Commission (SSC), which is a science-based network of volunteer experts working together in > 160 Specialist Groups, Red List Authorities and Task Forces. The current structure and remit of the Swan SG is described, along with the involvement of the IUCN and Wetlands International in the Group's activities.

Session 2: Population Trends

Moving northeast – an update of the numbers and distribution of wintering Whooper Swan *Cygnus cygnus* in continental Europe and western Asia: results of the January 2020 census

PREBEN CLAUSEN[1], EILEEN REES[2,3], SONIA ROZENFELD[4], NIKOLAS PRIOR[5], LEIF NILSSON[6], WLODEK MEISSNER[7], PAUL SHIMMINGS[8], TOM LANGENDOEN[9], ALEKSI LEHIKOINEN[9], ALEXANDER SOLOKHA[9], KEES KOFFIJBERG[9], LAIMONAS SNIAUKSTA[9], ANTRA STĪPNIECE[9], LEHO LUIGUJÕE[9], SERGEI KULAGIN[9], ANNA BELOUSOVA[9], ELCHIN SULTANOV[9], CAROLINE MOUSSY[9], KOEN DEVOS[9], NICOLAS STREBEL[9], MICHAL BALÁŽ[9], ZUZANA MUSILOVÁ[9], NORBERT TEUFELBAUR[9], ELDAR RUSTAMOV[9], ANTHONY DAVID FOX[1]

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Abstract

Internationally coordinated mid-winter censuses of the Northwest Mainland Europe Whooper Swan population have been carried out across Europe at 5-year intervals since 1995. The counts comprehensive knowledge about trends in numbers, and to provide a robust estimate of total population size, given that the International Waterbird Censuses (IWCs) in several countries only cover a subset of relevant sites for Whooper Swans. The first coordinated total count of this population in 1995 found 59,000 swans, and the population increased three-fold over the next 20 years, when the 2015 census gave 138,500 birds. We present the results of the 2020 census, which found approx. 130,000 swans, hence a modest decline or stable population compared to 2015. Interestingly – the birds are moving northeast. The 2020 census gave the highest numbers ever in all countries around the Eastern Baltic from Finland to Poland, for which the total increased from *c*. 7,600 birds to 19,300 birds. Likewise, the Swedish population increased from 11,600 to 18,000 birds. Further west, numbers declined, especially in Germany and Denmark. The census for the first time extended to the Caspian and Black Sea regions to provide better information on the size and distribution for the two populations of Whooper Swans found in these regions. Assessment of their total numbers is still in the initial phase, as some countries have yet to submit their data, and we have to split data received over two flyway populations, but numbers so far sum up to *c*. 6,700 Whoopers for the Black Sea/East Mediterranean population, and *c.* 178,600 birds for the Caspian/West Siberian population. For the Northwest Mainland Europe Whooper Swan, we will also briefly look at changes in annual recruitment and habitat-use over the past 25 years.

The Icelandic Whooper Swan, *Cygnus cygnus*, population: current status and long-term (1986-2020) trends in its numbers and distribution

KANE BRIDES[1], KEVIN WOOD[1], COLETTE HALL[1], BRIAN BURKE[2], GRAHAM MCELWAINE[3], OLAFUR EINARSSON[4], NEIL CALBRADE[5], OISIN HILL[6], EILEEN REES[1,7],

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Abstract

The eighth international census of Whooper Swans, *Cygnus cygnus*, wintering in Britain, Ireland and Iceland (also including the Isle of Man and the Channel Islands) took place in January 2020, to update the estimates of the size, mid-winter distribution, habitat use and breeding success of the Icelandic Whooper Swan population. The total of 43,255 swans counted represented a 27.2% increase in numbers since the previous census in 2015. Overall, 36.8% of the population (15,927 birds) was recorded in England, 33.4% (14,467) in the Republic of Ireland, 11.7% (5,052) in Scotland, 10.7% (4,644) in Northern Ireland and 6.8% (2,923) in Iceland, with < 1% (242) in Wales, the Isle of Man and the Channel Islands combined. Despite numbers increasing in both the Republic of Ireland and Northern Ireland since 2015, the proportion of the total population in the Republic of Ireland was significantly lower in 2020 and no significant difference was detected for Northern Ireland, whereas proportions in England and Scotland were significantly higher in 2020 and lower in Iceland. Breeding success was not associated with temperatures on either the breeding or wintering grounds. It also showed no clear trend over time, suggesting that increased survival may be the demographic driver of the population growth.

History and status of the Malheur National Wildlife Refuge Trumpeter Swan flock

GARY IVEY

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Abstract

The trumpeter swan flock at Malheur National Wildlife Refuge (Malheur) in southeastern Oregon has a long history. Malheur was one of the original restoration programs for trumpeter swans which began in the 1930s. This flock began breeding in the 1950's and increased to peak numbers in the mid-1980s. The Malheur flock has experienced a significant declining trend. In 2022, only three adult trumpeters from the flock were known to be alive.

Dynamics of the number and distribution of swans in the Neva Bay of the Gulf of Finland

YURIY M. MIKHAILOV[1], SERGEY A. KOUZOV[2], KSENIIA A. KASKOV[1], OLGA A. BABKINA[1], ELMIRA M. ZAYNAGUTDINOVA[1]

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Abstract

The Neva Bay of the Gulf of Finland is one of the key migration stopover areas for birds moving along the Baltic Sea – White Sea flyway. The coastal shallow waters of the bay provide food resources for many species of waterfowl forming migratory stopovers. In our work, we studied the main spring migration sites of three species of swans (Mute Swan *Cygnus olor*, Bewick's Swan *Cygnus columbianus bewickii*, and Whooper Swan *Cygnus cygnus*) at the Neva Bay within the boundaries of St. Petersburg in 2018 – 2021. Particular attention was paid to the number of birds, distribution within the area, and anthropogenic impact on the stopovers. We conducted route counts of swans at 16 migration sites and visited traditional and new stopovers formed near the reclaimed coastline.

The maximum number of Bewick's Swan recorded in the 2018 – 2021 varied from 135 to 561 individuals per year. At the traditional sites, the maximum number of birds reached 315 individuals in 2020. At the reclaimed sites the maximum number of swans reached 246 individuals in 2020. In 2021, the maximum number of individuals decreased at the traditional sites (100 birds) and remained stable in reclaimed sites. The maximum number of Whooper Swan recorded in the 2018 – 2021 year varied from 106 to 366 individuals per year. At the traditional sites, the maximum number of birds reached 299 individuals in 2019. At the reclaimed sites the maximum number of swans reached 75 individuals in 2020. In 2021, the maximum number of individuals decreased at the traditional sites (we observed 51 birds only) and remained unchanged in reclaimed sites. Mute swan was observed nesting in Neva Bay first time in 2017, in the 2021 year we found five nests of this species. In the shallow waters of Neva Bay, the number of birds at migratory sites near reclaimed areas increased since 2018 and stayed stable in 2020 – 2021, which may be due to the formation of stable forage resources in these areas.

Twenty-five years of Mute Swan population studies in central Poland

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Abstract

The Mute Swan *Cygnus olor* breeding population in central Poland (extending over 8,800 km^2) became established in the 1960s and stabilized 70-100 pairs over the next 30 years. Swans from the local breeding population occupy habitats characterized by a varying degree of anthropogenic pressure, but most pairs nest at artificial reservoirs, mainly fishponds. Regular monitoring of the breeding population started in 1996, with each pair visited three times during breeding season. We collected data on clutch and eggs size, hatching and breeding success. Moreover, we tried to ring most of adults and cygnets. The intensive ringing effort produced a relatively high percentage of marked individuals within our study population. A large proportion of birds were observed as breeders only during 1 or 2 seasons (0.48 of males; 0.45 of females). The average lifetime number of reproductive episodes was 3.87 ± 0.34 and 4.00 ± 0.39 for males and females, respectively. At the population level, there was an initial increase in reproductive success (1–5 years), followed by a plateau (5–8 years), and then by a decrease in older age classes. We found significant variation in reproductive success among different age classes, which was explained by the negative quadratic trend. We confirmed that age-related differences in breeding performance at the population level could be explained by the selection hypothesis. Analysis of territory occupancy showed that long-term occupancy was positively correlated with the timing of breeding. In contrast, we found no relationship between territory occupancy and reproductive output (hatching and fledging success) or adult body condition. Finally, we observed the impact of atypical weather conditions related to climate change on the breeding performance of Mute Swans in central Poland.

Status on the abundance levels and trends from the current Trumpeter Swan (*Cygnus buccinator*) survey of the Rocky Mountain Population, U.S. breeding segment

DAVID OLSON

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Abstract

Annually in September the Rocky Mountain Population, U.S. Breeding Segment, there is a fall survey of Trumpeter Swans. It is conducted by several administrative entities and provides an accurate count of the number of trumpeter swans that summer in the U.S. Observers counted 923 swans (white birds and cygnets) in the U.S. Breeding Segment of the Rocky Mountain Population of Trumpeter Swans during fall of 2021, which was a 5.1% decrease from last year's count (970). The number of white birds in the Greater Yellowstone Area (437) was a 32.5% decrease from last year's count of 579. The total number of cygnets increased 3.3%, from 88 in 2020 to 91 in 2021. Cygnet count stayed the same from 2020 for Montana (27) and increased 20.5% for Wyoming, while Idaho decreased 35.3%. Palmer Drought Indices for areas within the Greater Yellowstone area show drier conditions for 2021 as compared to the area for 2020.

Population estimates and trends in numbers for Bewick's Swan *Cygnus columbianus bewickii* wintering in the NW European and Caspian/Black Sea regions: results of the January 2020 census.

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Abstract

Internationally coordinated mid-winter censuses of the NW European Bewick's Swan population have been carried out across Europe at 5-year intervals since the mid-1980s, to support assessment of trends in numbers determined by the international waterbird censuses (IWCs), and to provide a robust estimate of total population size. Following an increase in numbers to a peak of 29,000 birds in January 1995, the population declined by 38% to 18,100 in 2010 before increasing slightly to 20,100 swans in 2015. The January 2020 census therefore aimed to determine whether the indication that the population had stabilised was upheld, or if the decline was continuing. The census was also extended to the Caspian and Black Sea regions to provide better information on the size and distribution for the Caspian population of Bewick's Swans (historically thought to have wintered mainly on the Caspian Sea) in the 21st century. Preliminary results indicate that the NW European population has undergone a further decline and is now below levels recorded when the censuses commenced. The Caspian population, estimated at c. 1,500 birds at the turn of the century, appears to be stable or increasing in numbers, with >1,500 recorded to date and counts for some countries still to come in. Shifts in site and habitat use over time are described, and the counts used to identify new sites of national and international importance for the species. The results will also provide valuable information for the 10-year review of the International Single Species Action Plan (ISSAP) for Bewick's Swans in NW Europe.

Recent expansion of Rocky Mountain Population Trumpeter Swan winter range into Oregon

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Abstract

The Oregon Department of Fish and Wildlife, The Trumpeter Swan Society, The Pacific Flyway Council, and the U.S. Fish and Wildlife Service have been working to restore trumpeter swan (*Cygnus buccinator*) breeding and wintering populations in southcentral Oregon for nearly 35 years. Winter surveys initiated in 2012 at Summer Lake Wildlife Area and Malheur National Wildlife Refuge have documented a rapid increase in migrant and wintering trumpeter swans in southcentral Oregon, an apparent expansion of the Rocky Mountain Population's wintering range. Translocation of trumpeter swans to Summer Lake Wildlife Area during the Pacific Flyway range redistribution project in the early 1990's may have played a major role in facilitating this range expansion. Recent marking efforts involving GPS/GSM transmitters and conventional neck bands confirmed swans wintering at Summer Lake Wildlife Area migrate to breeding areas used by the Canadian breeding segment of the Rocky Mountain Population. This paper describes actions, efforts and observations suspected to be of importance to the apparent winter range expansion of Rocky Mountain Population trumpeter swans into Oregon.

The North American Trumpeter Swan Survey – resurrection or R.I.P.?

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Abstract

Measuring population status against specific objectives or assessing conservation or management actions are the primary reasons for conducting population surveys. The Trumpeter Swan Society acknowledges that surveys are needed to reliably assess trumpeter swan (TRUS) population status, trends, and distribution. The North American Trumpeter Swan Survey (NATSS), the only range-wide survey specifically designed for trumpeter swans (TRUS), was initiated in 1968 and occurred every 5 years from 1975 until 2015. The NATSS was not conducted in 2020 due to restrictions associated with the COVID-19 pandemic and lack of agency support. Our objectives were to examine trends and review the pros and cons of the NATSS; conduct a cursory comparison of trends in other counts or indices and consider if other counts or indices might reasonably "replace" NATSS; and provide some recommendations toward future monitoring of TRUS populations. The NATSS appeared to reflect changes in flocks and populations across geographic areas of management interest. However, limitations included its periodic nature, different protocols (e.g., chronology, cruise vs. sampling) for different flocks and populations, changing methodology between periods, changing survey area, and no estimation of detection probabilities. Comparisons with three other range-wide indices of TRUS populations: the Mid-Winter Waterfowl Survey, Breeding Bird Survey, and Christmas Bird Count reflected similar general patterns of flocks or populations. However, application of these indices to specific TRUS flocks or populations is problematic and may be insufficient for desired population status assessments. We believe that a more rigorous assessment of TRUS monitoring options is needed, and that a reliable, repeatable approach to tracking TRUS population trends is an essential element of TRUS management plans. Designing such surveys should begin with determining specific objectives for use of the data. A robust survey design is recommended, and consideration of surveying priority flocks or populations may be prudent.

Session 3: Threats to Swans: Lead Poisoning

What the swans are telling us about lead poisoning

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Abstract

Lead exposure in Trumpeter and Tundra Swans wintering in northwest Washington through ingestion of spent lead shot pellets and, to a lesser extent, fishing sinkers is well documented. However, documenting the source and geographic location of these exposure sites has proven to be elusive. Additionally, as the population of Trumpeter Swan has continued to increase and expand their winter range distribution in western Washington, so has the incidence of problematic encounters across a landscape unfamiliar with the presence of these swans. We present an evolving timeline and examples of swans in western Washington, against the backdrop of changing habitats, high dependency upon private agricultural lands, other private properties, and evolving problematic issues in accommodating the annual requirements for what is now more than 18,000 wintering swans. Using Trumpeter and Tundra Swans has proven valuable as a narrative species for community outreach and education as well as building partnerships between agencies and NGOs in seeking solutions to these iconic conservation species.

Swans and lead angling weights: a perspective from Europe

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Abstract

Lead is a potent neurotoxin that is poisonous to all life; the World Health Organisation states that there is no safe level of exposure to lead. Despite its toxicity, lead is still commonly used in some recreational activities, such as the lead weights ("sinkers") used in angling. Swans foraging for grit to aid digestion may ingest discarded lead weights, resulting in lead poisoning. In this presentation, we draw on the experiences gained in Europe to provide an overview of the impacts of lead poisoning associated with angling weights on swans, as well as efforts to mitigate these impacts through regulations on the use of lead by anglers. Impacts of lead angling weights on the survival and breeding success of Mute Swans (*Cygnus olor*) have been reported. Lead poisoning can be a major cause of mortality, limiting population size; In the United Kingdom in the 1980s, lead poisoning accounted for c.4000 deaths of Mute Swans, at a time when the national population was <19,000 individuals. Since the 1980s, full or partial bans on lead angling weights have been implemented in several European countries, including Denmark, Sweden, and the United Kingdom. There have also been attempts to introduce voluntary reductions on lead use by anglers, backed by campaigns to highlight the environmental impacts of lead. We discuss the effectiveness of these voluntary and legislated bans. The effectiveness of legal restrictions on lead is demonstrated by the situation in the United Kingdom; the Mute Swan population size more than doubled following lead regulations in 1987, with the proportion of swans found to have died from lead poisoning falling from 0.34 to 0.06 after regulation. There are currently ongoing consultations on the introductions of total bans on the use of lead in angling across the European Union.

A team effort: response, rehabilitation and release of Trumpeter Swan *Cygnus buccinator* and Tundra Swan *Cygnus columbianus* in western Washington State

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Abstract

Western Washington is a traditional wintering area for Trumpeter and Tundra swans in the Pacific Flyway. Since the 1990s, chronic sources of sickness, injury, and mortality have been caused by lead poisoning through ingestion of spent lead shot pellets, power line collisions, and to a lesser degree avian disease, illegal shooting, and fishing tackle. Beginning in 2006, efforts were undertaken to minimize lead exposure at Judson Lake, Whatcom County. Washington, and to document and monitor other potentially problematic areas. The wintering population of Trumpeter Swan in Washington has grown to more than 17,000 swans. The number of lead-affected swans is low compared to their current population level, though the number reported annually has remained similar over time, with increased issues during milder temperature winters. Swans have continued to expand their winter range into other western Washington counties as their population has increased, despite limitations in preferred habitat and numerous sources of disturbance. Swans are now reported annually from these new locations with unanticipated sources and emerging management needs. In 2016, attempts to improve the probability of rehabilitation efforts of sick and injured swans was bolstered by improved coordination between the Swan Response Team in this region and the use of a lead analyser to more rapidly assess candidate status. The Swan Response Team has taken strides to make the response with the following objectives: 1) to assume individual sick or injured swans have an opportunity for rehabilitation given the proper diagnosis by a trained veterinarian, and 2) the removal of lead-affected swans from the landscape lessens the potential of secondary lead exposure to other wildlife scavengers. Finally, we provide insights and evolving issues from these efforts, including summary of fifty rehabilitated swans released in western Washington.

Lead ammunition poisoning: a One Health issue with a simple solution

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Abstract

Lead ammunition poisoning is a global One Health issue that causes multiple negative health impacts, affecting wildlife, domestic animals and people. Lead ammunition contaminates soils and waterways - over 90,000 tonnes of lead gunshot pellets are irretrievably released into the European environment every year, creating an ever-increasing toxic legacy. Migratory swans and other waterbirds become poisoned when they ingest lead shot directly, mistaking them for food or grit ordinarily selected to aid digestion, while predators and scavengers are exposed to ammunition fragments in the flesh of hunted animals. One million waterbirds alone die every year in Europe and lead ammunition poisoning has been found to suppress multiple bird of prey populations in Europe. Lead poisoning accounts for a quarter of migratory swan deaths in the UK and causes a range of sub-lethal impacts including reduced body condition. For people eating game meat shot with lead, the fragments and particles of lead risks the health of people, particularly children and pregnant women, primarily due to lead's neurotoxic effects. If the multiple negative health impacts associated with lead ammunition are to be mitigated, a transition to the non-toxic alternatives is needed. Wide recognition of the risks of lead ammunition to our wildlife, environment and health have led to its partial phasing out and replacement with non-toxic alternatives in various settings. This has been driven by multilateral environmental agreements (such as AEWA, CMS and IUCN), national legislation (with Denmark and the Netherlands completely phasing out the use of lead ammunition many years ago), and most recently, through EU REACH which led to a ban on the use of lead shot in EU wetlands, signed into law in January 2021 (a transition period is currently underway). Without the full restriction of lead ammunition for all shooting and ammunition types, species and people remain at risk from poisoning. Here, we outline the risks of lead ammunition to health, describe lessons learned from the ban on lead shot in wetlands campaign and explain a new EU REACH process in motion which could see the end of lead ammunition use in the EU.

Development of tools to site-specifically monitor exposure and effects of lead in tundra swans (*Cygnus columbianus*)

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Abstract

Lead (Pb) is a contaminant of concern at the Bunker Hill Superfund Site in Idaho, USA, and many other locations globally. Releases of Pb from Bunker Hill mining operations resulted in the contamination of 7,000 ha of wetland habitat that is utilized by tundra swans during their northward migration. Feeding in the contaminated wetlands, tundra swans experience some of the highest Pb exposures due to sediment ingestion as they forage for rooted plants such as Wapato (*Sagittaria latifolia*). Swans can be exposed throughout their life cycle, greatly complicating our ability to monitor the effect of site remediation activities on these migratory birds. Remediation activities include the conversion of agricultural lands to uncontaminated wetlands and water level management practices to reduce the time waterfowl spend in contaminated wetlands. To better track remedy effectiveness, we initiated a study that aims to disentangle distal from proximal Pb exposures to help determine the most appropriate long-term monitoring approaches to deploy at Bunker Hill. In the spring of 2022 at three wetlands with variable Pb contamination, we obtained fecal and blood samples from 17 swans. We also collected dispersed feces, wetlands, sediment, and sediment porewater samples near feeding areas. Samples were examined for Pb concentration, species, and stable isotope composition. DNA in fecal samples is being used to identify diet versus Pb correlations. Colored collars (n=14) or GSM collars (n=3) were placed on the birds to understand how swans interact with wetlands across the site. Swan mortalities were higher than previous years during the 2022 migratory season (~366 observed mortalities) and we documented three mortalities within two weeks of swan capture. To date, one swan has been necropsied and found to have 10 mg/kg Pb in its liver, a lethal concentration. This presentation will provide an update of this on-going study.

Session 4: Breeding and Survival

A family affair: using GPS/GSM collars and auxiliary markers to quantify Trumpeter Swan cygnet survival and dispersal

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Abstract

Trumpeter Swan (*Cygnus buccinator*) populations continue to expand across the Midwest as a result of successful reintroduction efforts. Nesting and fledging success, and even adult survival have been monitored through time, yet questions remain regarding cygnet over-winter survival and dispersal. The Iowa Department of Natural Resources (DNR) piloted a method in order to more closely follow Trumpeter Swan cygnets from fledging to dispersal and to inform population management decisions. During August and September of 2020, the Iowa DNR captured and banded flightless cygnets and adults from 12 Trumpeter Swan families across Iowa. We deployed GPS/GSM collars on one adult or cygnet Trumpeter Swans per family group and green neck collars with unique alphanumeric codes on as many remaining cygnets as we could capture from each family group. We resighted family groups bi-weekly from mid-September 2020 to early March 2021 using the latest location data from GPS/GSM collars to determine resighting search areas. We evaluated observed detection histories using a Cormack-Jolly-Seber model to estimate apparent over-winter survival and resight probability of marked cygnets. Resighting of marked individuals also revealed patterns of spring dispersal timing. Based on our findings, cygnet over-winter survival is not likely limiting the growth of Iowa's Trumpeter Swan population.

Thermal ecology of Trumpeter Swan incubation

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Abstract

Trumpeter Swans, North America's largest waterfowl, breed at high latitudes where they construct unusually large nest mounds, incubating from the top of the mound while fully exposed to the external environment and experiencing daily ambient temperature fluctuations of 25 °C or more as well as substantial exposure to solar radiation, high winds, rain, and snow. We asked how incubating swans accommodate thermal flux. We measured swan incubation dynamics at Red Rock Lakes National Wildlife Refuge in southwestern Montana, USA, a federally protected high-elevation marsh complex where the last breeding population of Trumpeter Swans in the contiguous United States persisted during the early 20th century, a period of near extinction. Using around-the-clock digital video imaging, environmental monitoring devices, and thermal recording devices placed within clutches and within and upon nest mounds, we modeled thermal dynamics in relation to swan incubation behavior. Swans maintained a mean egg temperature of 35.7 ± 0.27 °C during active incubation. Linear mixed models of thermal covariates evaluated using AICc values and model weights (ω) revealed an interactive association between nest attendance and: (1) ambient temperature deviation from ideal egg temperature; (2) solar radiation; and (3) vapor density. Deviations above and below ideal egg temperature, elevated solar radiation, and declining vapor density were interactively associated with swan presence on the nest. Egg temperature *per se* was associated with ambient temperature (positive) and vapor density (positive). Nest mound temperature was positively associated with ambient temperature, solar radiation, and vapor density. The nest mound acted as a thermal mass, moderating thermal flux. Nest success depended on swans shielding eggs from excessive daytime warming and desiccation and contact incubation when ambient temperature was below ideal egg temperature.

Eastern Bewick's Swan *Cygnus columbianus bewickii* survival as related to marking technique

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Abstract

West Pacific Bewick's Swan flyway population reached over 50,000 individuals in winter and had peak nesting densities in 2008-2013. Recently this population is regulated via reduced breeding propensity; declining clutch size and low nest success resulted from the behaviour of nesting pairs. Annual survival of adult birds and juvenile survival has never been investigated in the flyway population. Recent tracking techniques involves devices mount as neck collars what might effect swan survival. Colour neck collars are of wide use for individual marking of swans making swans attractive for shooters. We estimated survival rate of the following groups of Bewick's swans marked in the Chaun Delta, Chukotka, Russia, adult brood rearing birds, adult non-breeders, and juvenile birds from hatch to fledge, juvenile birds during their first migration and later on. A total of 279 Bewick's swans were marked individually in 2016-2021. We use swan recaptures during wintering in Japan and during summers in the Chaun Delta. Survival and recapture probabilities were calculated using Cormack-Jolly-Seber models in MARK software. We estimate survival of the birds equipped with GPS/GSM white neck collars separately to the birds with red neck collars and compare it to the birds with just leg bands. Last method is considered as non-invasive and survival of birds with leg bands is considered as natural.

Session 5: Habitat/Landscape Use

Trumpeter Swan fidelity and winter movements in the Nebraska Sandhills

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Abstract

Few data exist regarding the ecology of the High Plains Flock of trumpeter swans (hereinafter swans) located primarily in the Nebraska Sandhills. Conservation and management planning for swans depends on better understanding of swan ecology. Thus, our objectives were to examine the fidelity, winter movements and home ranges of swans in the Nebraska Sandhills, 2014-2020. Specifically, we wanted to determine fidelity of swans to wintering areas, number of different wintering areas used, and home range along wintering sites. We captured and fitted solar-powered GPS transmitters via neck collars to swans during the summer moulting period. Transmitters were set to provide 5 locations/day from 1 November to 31 March. We used movement patterns and weather data to determine movement from breeding and post-breeding areas to wintering areas. All swans remained in Nebraska during winter except one swan that migrated to Kansas and Oklahoma during one winter. New areas used by swans were identified and numerous swans used field feeding as a foraging strategy. Swan fidelity was 0.64 to the same wintering areas over our study period. Swans used 2.2 different wintering complexes, and 1.5 wintering sites within complexes. Median home range size at wintering areas was 512 km^2 (99% UD; 90% UD: 133 km^2) and ranged from 15.3 km^2 to 45,737 km^2 (90% UD: 7.2-11,253). Interestingly, during warm periods and near end of wintering period, swans would make forays back to or near their breeding/capture areas. Swan movements in the Nebraska Sandhills indicated that they are willing to move between areas, but tend to show fidelity to wintering areas. Changes in wintering habitat may alter patterns of fidelity, but swans may be able to adapt and move to alternative areas. Rivers, creeks, and other areas in Nebraska are important to the High Plains Flock.

Spring feeding of three species of swans in the eastern part of the Gulf of Finland

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Abstract

A total of 87 Mute Swan (*Cygnus olor*) faecal samples, 77 Bewick's Swan (*Cygnus bewickii*) samples and 72 Whooper Swan (*Cygnus cygnus*) samples were analyzed. The materials were collected in 2014-2019, during observations of spring migration sites on the southern shore of the eastern part of the Gulf of Finland (from the Neva Bay to the Kurgalsky Peninsula). The Mute Swan diet consisted mostly of soft plant food, particularly green macroalgae, and there was also a significant proportion of diatoms found in the droppings. Other groups of macroalgae, stems of pondweeds and thin root papillae of aquatic vascular plants were present in small quantities. In contrast, diatoms were found in an extremely small proportion of the faecal samples collected for the other swan species. The diet of these species consisted mainly of coarse forage, such as rhizomes, and seedlings of *Phragmites australis* and *Bolboschoenus maritimus*, as well as sedges and *Juncus sp*. The remains of thick reed rhizomes were found only in the Whooper Swan samples, whereas the remains of reed seedlings were more common in the Bewick's Swans' faeces. Seasonal variation in the diet was described. Following arrival at the end of February to the first half of March, all species feed on the remains of *Cladophora sp*. from the previous summer, which overwintered on the bottom in the form of algae mats. From late March to the first half of April, reed root papillae and diatoms appear in the Mute Swan diet, and the Whooper and Bewick's Swans feed on rhizomes and seedlings of reeds and other semi-submerged plants. Young growth of *Stuckenia pectinata*, *Zannichellia palustris* and other submerged vegetation are consumed by all species, mainly in the second half of April — early May.

Are they in it for the long haul? Tracking Rocky Mountain Trumpeter Swans in the Greater Yellowstone ecosystem and beyond

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Abstract

The tristate area of Idaho, Montana, and Wyoming supports the U.S. segment of the Rocky Mountain Trumpeter swan population. This subpopulation is considered distinct from the Canadian segment based upon the birds' year-round occupation of the Greater Yellowstone Ecosystem and correspondingly short migrations. However, little data on spatial ecology has been collected on this subpopulation outside of the summer season or across annual cycles. Therefore, we deployed a total of ten Ornitela OrniTrack-N62 GPS-GSM tracking collars to molting swans across four National Wildlife Refuges in eastern Idaho and southwest Montana in 2019 and 2020 to document important migratory and wintering habitats and interannual variation in habitat use. We have identified wintering habitats used including some initial quantification of field feeding, a behavior that is novel to the otherwise wetland-obligate species. Whereas some individuals conduct their annual life cycle within a 30 mile radius, others travel hundreds or thousands of miles between their winter and summer habitats. Finally, we have observed some significant interannual variation in summer habitat with some individuals venturing into Canada. All of these data are critical for understanding the population trends, distribution, and dynamics of the U.S. segment of swans and how they relate to the larger Rocky Mountain Trumpeter swan population. These are also vital to understanding outcomes of previous translocation efforts, future conservation needs, and this populations' resilience to climate change.

Behavioural and energetic consequences of competition among three overwintering swan species

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Abstract

Winter numbers of the northwest European population of Bewick's Swans (*Cygnus columbianus bewickii*) declined recently by c. 40%, whilst numbers of two sympatric and ecologically-similar congeners, the Mute Swan (*Cygnus olor*) and Whooper Swan (*Cygnus cygnus*) increased. It is unclear whether these opposing population trends have a causal relationship, as Mute and Whooper Swans are larger and competitively-dominant to Bewick's Swans when foraging. If so, effects of interspecific competition should be detectable as measurable impacts on behaviour and energetics. We studied the diurnal behaviour and energetics of 1083 focal adults and cygnets of the three swan species on their winter grounds in eastern England, to determine whether individual Bewick's Swans altered the time spent on key behaviours when sharing feeding habitat with other swan species, and any consequences for their energy expenditure and net energy gain. Mixed-effects models indicated that sharing feeding habitat with higher densities of Mute and Whooper Swans increased the likelihood of engaging in aggression for cygnet Bewick's Swans, but not for adults. Higher levels of interspecific competition decreased the time spent by Bewick's Swan cygnets on foraging, whilst adults showed the opposite pattern. When among low densities of conspecifics (<c.200 individuals/km2), individual Bewick's Swans spent more time on vigilance in the presence of higher densities of Mute and Whooper Swans, whilst individuals within higher density Bewick's Swan flocks showed the opposite pattern. Crucially, we found no evidence that greater numbers of interspecific competitors affected the net energy gain of either adult or cygnet Bewick's Swans. It is unlikely therefore that interspecific competition at arable sites in winter has contributed to the observed decline in Bewick's Swan numbers. Further research is needed, however, to test for competition in other parts of the flyway, including migratory stopover sites and breeding areas.

Winter range and implications for management of Wyoming Trumpeter Swans (*Cygnus buccinator*)

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Abstract

As the Rocky Mountain Population (RMP) of Trumpeter Swans (*Cygnus buccinator)* continues to expand their breeding range in Wyoming, understanding winter habitat can help inform management decisions. Using GPS collar data collected over two winters from five swans captured in pioneering summer range of Western Wyoming, we find that roughly 20 miles of the Green River surrounding Seedskadee National Wildlife Refuge is critical for winter range. Such a heavy reliance on this relatively small section of river for the southern end of the RMP carries consequence for future conservation efforts. With impacts of climate change including continued drought in the region, winter river flows on the Green River have become more variable. This may have negative impacts on the quality of habitat as lower flows could lead to more access to lead pellets on the river bottom, less open water, or limited access to forage. The next steps of this project are to look at winter river flows and regional snowpack and look for correlation with local population changes. Learning from the winter habitat use of these swans can help inform future efforts for habitat and water management, and captive reared swan releases in the region.

Successful reintroduction of Trumpeter Swans in Ohio: results of population surveys and movement studies

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Abstract

Trumpeter Swans were reintroduced in Ohio beginning in 1996. After active reintroductions from 1996-2003, the population reached its reintroduction goal of 15 nesting pairs. Since 2003, the number of breeding pairs in the population has continued to grow at an average annual rate of 14.2%. Successful breeding pairs has averaged 2.24 cygnets per year, and large non-breeding flocks of immature swans (50-200 individuals) can be seen in the summer in several areas throughout the state. The population has expanded from the initial 7 counties of reintroduction to 24 counties as of 2021. In cooperation with the University of Minnesota's regional study of Interior Population Trumpeter Swan movements, 20 adult swans, both breeding and non-breeding, were collared with GPS/GSM transmitters in 2020 and 2021. Compared to swans marked in other states and provinces, migratory movements of swans in Ohio were minimal. The furthest a swan travelled from its capture location was approximately 220 km (135 miles) as of March 15, 2022, but the majority of marked swans have remained within 30 km (20 miles) of their capture site. One hypothesis to explain these relatively short movement patterns is that swans in Ohio are at the southern periphery of their current breeding distribution and experience mild winter conditions, although it is not known whether there is any genetic influence on migration distance. Large wetland complexes are limited in the state, and many of the swans marked at these sites have remained near (within 30 km) their capture locations. Interestingly, marked swans that have moved further from capture sites have often made use of quarry lakes and farm/residential ponds as they presumably seek to locate foraging areas during non-breeding periods. In regions where large wetland complexes may be a limiting factor, such human-created aquatic habitats provide important stop-over and roosting habitat for swans.

The stable, the declining and the increasing: results from 50 years of swan censuses in Denmark 1967-2020 explained – an update

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Abstract

At the 6th International Swan Symposium in Tartu, Estonia, the senior author gave a lecture entitled: *The stable, the declining and the increasing: results from 50 years of swan censuses in Denmark 1967-2016 explained.* Here we update the story with 6 wintering seasons added. Nationally coordinated censuses of all three Western Palearctic species of swans have been conducted on a regular basis in Denmark since 1967. Over the fifty-five years since, numbers, distribution and habitat use of these swan populations have changed tremendously. The Mute Swan *Cygnus olor* has been the most numerous and widespread species, with a relatively stable wintering population of c. 50,000 birds, albeit with a peak of 70,000 birds in the early 1990s. The moulting population of Mute Swans has increased from 37,000 birds in the first 1968-census to a highest ever number of 69,400 in summer 2018. But for Mute Swans we have seen major changes in the overall distribution, with declining populations in fjords and lagoons subject to eutrophication-driven reductions in submerged macrophytes, the principal food resource for the swans. This has been most prominent in wetlands in the northwestern parts of the country, which also used to be the principal autumn- and spring-staging sites for Bewick's Swans *Cygnus columbianus bewickii*, whose numbers therefore have declined. But thanks to restoration efforts, there are now signs of recovery of vegetation – and some return of the swans. The remaining Bewick's feed on agricultural lands together with expanding numbers of Whooper Swans *Cygnus cygnus*, for which we have seen an increase from c. 7,000 in the late 1960's to almost 64,000 in 2016, but new data suggest the Whooper population is levelling off.

Distribution, size and habitat choice of the Whooper Swan, *Cygnus cygnus*, population breeding in Latvia and Estonia, 1973 – 2021

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Abstract

Whooper Swan nests were first found in Latvia in 1973 and in Estonia in 1979. By 1975, the swans had three nesting places in Latvia, all at fishponds in the western part of the country. Since the 1970s, the species has bred annually and increased markedly in both countries, with the population estimated at 900-1200 breeding pairs in 2021: 600-800 in Latvia and 300-400 in Estonia. The western part of Latvia has remained a stronghold for the species, hosting 68.8 % of the 362 Latvian sites where breeding was confirmed during the years 2018–2021. In Estonia, on the other hand, the breeding sites are more widely distributed across the country. Almost all Latvian breeding sites are either at man-made ponds and fishponds (70%) or beaver dams and small swamps (14%); the other important breeding habitats being drainage ditches, lakes and rivers. In Estonia, conversely, Whooper Swans prefer to breed in bogs (43%), dystrophic lakes and ponds (31%), or coastal lakes (20%), with only 6% nesting on fishponds. There is thus a clear latitudinal difference in the choice of breeding habitats: in Estonia, the Whooper Swans preferred bogs, lakes and coastal waters, while the vast majority of all pairs in Latvia were found in ponds and fish-pond complexes and wetlands associated with beaver dams. There is an increasing trend in the number of breeding pairs in both countries.

Session 6: Consequences of Climate Change: Migration

What drives staying and leaving during autumn migration of Bewick's swans?

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Abstract

Migration has large effects on the fitness of migratory birds, and it must be carefully timed to make optimal use of biotic and abiotic conditions encountered across the yearly geographic range. The phenology of migration is constituted by individual decisions regarding when to leave an area and when and where to stop next. While this decision-making process has been studied in spring migration, little attention has been paid to autumn migration. Different decision mechanisms likely apply in autumn because the prospect of breeding, which in spring defines a clear spatiotemporal opportunity window, is absent. Here, we study what drives individuals' decisions to stay or leave stopovers in autumn-migrating Western Palearctic Bewick's swans along their migration route. Bewick's swans have shortened their autumn migration distance with more than 350 km in the last five decades, thereby shifting their average wintering distribution substantially in north-eastern direction. This shift coincided with a shift in the winterly 5 °C isotherm, suggesting a population-level adaptation to climate change-induced warmer winters, and within-winter flexibility towards temperature conditions. We use the GPS tracking data of 57 individuals, spanning six autumn seasons in total, to determine individual stopover sites. Using logistic regression, we examine to what extent the daily decision to stay at or leave a stopover site is driven by temperature and wind conditions, as compared to a fixed migratory timing schedule. We hypothesize that swans are responsive to environmental conditions along their autumn migration route, generally staying in an area as long as temperatures allow. We expect this responsiveness to be stronger further towards the wintering area. The study will yield insight in the mechanisms driving autumn migration phenology at the individual level, and it will enable to better understand the currently observed Bewick's swan range shift in a changing climate.

Social learning of migration in swans: parental guidance during first return migration

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Abstract

In birds migrating in family groups, like swans, young birds have been shown to learn their migratory route and timing of more experienced birds like their parents. In a previous study, based on ring re-sightings, Bewick's swans were found to have advanced spring departure due to a generational effect, whereas individuals were found to be consistent in their timing over their lifetime. Based on direct observations at stopovers, it is thought that first-year Bewick's swans depart on spring migration with their parents and remain with them until at least halfway their first return migration to the breeding grounds. This suggests that the abovementioned generational effect is due to selective (dis)appearance of phenotypes in the population rather than resulting from young birds behaving differently than their parents. In order to study this further, we equipped adult females and their cygnet(s) with GPS collars. In the first four parent-offspring couples that we followed on spring migration, the families only separated at 64^{o} N or beyond, confirming the existing premise. In spring 2022, however, a number of tagged (and untagged) first-year Bewick's swans initially stayed behind in the wintering range after the adults had left on spring migration. All tagged juveniles left in the direction of the breeding grounds weeks after their parents and probably without guidance of adults. This suggests that migration is to some degree innate, as opposed to learnt from parents.

Influence of ice melting dates on the timing and bird number on spring migration stopovers of swans in the eastern part of the Gulf of Finland

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Abstract

The eastern part of the Gulf of Finland is used as staging areas by swans during spring migration. Numbers present were monitored from 2009 to 2020, in February to the first half of May, at an interval of 5-7 days. The observation route passed along the southern coast of the Gulf of Finland from St. Petersburg up to the border with Estonia. The two areas with the largest numbers of birds were at Neva Bay (up to 500-550 swans in a single count, in 2012) and the shallow waters around the Kurgalsky Peninsula (up to 1,933 birds in a single count, in 2016). On the rest of the coast, birds were either absent or occurred in small groups of 10-20 swans. Early arriving species - the Whooper Swan and the Mute Swan - showed the strongest positive correlation between the timing of their appearance at migration sites and the date of ice melt on the gulf. The number of all swan species recorded was largest in the years with the earliest ice melting at sites near the Kurgalsky Peninsula. However, this pattern was not observed in the Neva Bay. Variation in the number of birds at the migration stopovers was the greatest for the Bewick's Swan (by up to 12 times in different years) than for the other two species (up to 3-6 times). We assume that if the ice melt is late on the gulf, then the swans can fly over the Kurgalsky Peninsula without stopping to reach the next staging areas - towards the Neva Bay, or even further to Lake Ladoga in an extremely late spring. Thus, the slow onset of spring may reduce the number of stops made by the swans during their spring migration.

Session 7: Threats to Swans: Conservation and outreach

Farming for Whooper Swans, *Cygnus cygnus* – efficacy of a mitigation programme for a road development in Northern Ireland.

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Abstract

Infrastructure development and the associated encroachment of urbanisation over natural or rural landscapes is a global phenomenon, the ecological impact of which is rarely perceived to be positive. Although legal frameworks may exist to protect features or species of importance, the baseline information collected for assessment may have limitations when predicting long-term change, notwithstanding the potential cumulative effect of successive development episodes. As part of planning consent, a PhD study was funded by the Department for Infrastructure (N. Ireland) to study the response to the Toome road development on Whooper Swans, *Cygnus cygnus,* a feature species of the adjacent "Lough Neagh" Special Protection Area (SPA). The sensitivity of this locality has brought together multiple agencies in a bid not only to mitigate for the direct impact of the development to swans but to also build additional capacity through the enhancement of foraging opportunity. By improving livestock management and with a variety of field-improvement prescriptions, swan abundance has now surpassed historic levels. This holistic approach endeavours to optimise mitigation at multiple levels while minimising mortality risk through line collision. With this positive outcome, the road development at Toome may become recognised as an exemplar of best practice for future development in areas of high conservation importance.

Following 5P with Aristotelian Eyes: from the observation of Trumpeter Swan behaviour to the quest for living well.

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Abstract

In *The Cambridge Companion to Aristotle's Biology* (2021), Cynthia Freeland makes the following observation: after Darwin, we typically account for the perceptions and behaviours of animals by appealing to evolutionary advantage; in contrast, Aristotle, in his biological writings, framed issues in a quite different manner by focusing on capacities that "equip animals to fulfill their natural ends" (159) in order to understand what it means for animals "to live and to live well" (170). For centuries, Aristotle's treatises on animals formed the basis of the study of the natural world – until the ancient Greek framework was replaced by Newtonian and Darwinian science. Aristotle certainly was no modern scientist: his approach was that of a naturalist, and his goal was to understand nature, especially animals, in terms of their parts, lives, activities, and traits. His observations of swans are of particular interest. In recent decades, there is revived interest in Aristotle's animal inquiries. Old approaches and insights are raising a question new in our context: what might be learned by observing swans through Aristotelian eyes? As a professor of philosophy who has spent a career in St. Louis (near the confluence of the Missouri and Mississippi Rivers during decades when the population of Trumpeter Swans have had great growth), I took up this question by tracking "5P" (a trumpeter swan collared in Iron County Wisconsin on July 22, 2021) during the winter months of 2021-22. In this paper, I explain what it means to observe Trumpeter Swans with Aristotelian eyes. Then, I consider two questions: What does it mean for 5P to live well? What does it mean for us to live well as observers of Trumpeter Swans?

Helping Trumpeter Swans one crayon at a time: developing activity books to inspire youth

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Abstract

The Trumpeter Swan Society (TTSS) is a non-profit organization founded in 1968 whose mission is assuring the vitality and welfare of wild trumpeter swans. An additional focus of TTSS is to be a leader in educational resources for wetland and trumpeter swan conservation, with these resources being readily available to the public on the TTSS website at no cost. In 2020, plans were started to create two educational activity/coloring books spotlighting trumpeter swans and their habitat. The objective of these books is to connect young people to the natural world and inspire them to take action to protect it. Each book is developed for a specific age group and aligns with Next Generation Science Standards (NGSS). The target audience for the books is children ranging from 5-11 years old with the flexibility to meet the needs of parents, teachers, and educators at zoos, nature centers and other conservation-minded facilities. A wide range of topics are covered including natural history, habitat, threats, research, and STEM (Science, Technology, Engineering, Math) careers. The books are designed to be interactive and engage children with activities, coloring opportunities, and QR codes that lead to videos and additional information. Developing the content was a collaborative effort with help from TTSS board members, Zoo education specialists and the graphics team at Peppermint Narwhal Creative. The books will complement the already vast collection of resources of TTSS by offering the youngest members access to information at their level of understanding.

Flight of the Swans

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Abstract

The *Flight of the Swans* film has been created with people living in the Russian Arctic to raise awareness of the plight of the rapidly declining NW European Bewick's swan. The hour-long film tells an emotive story of the swans' lives and their incredible journey as they migrate from their breeding grounds in the Russian Arctic to the winter homes in the UK, with a focus on the challenges they face and the communities they interact with along the way. Sacha Dench joins the swans on migration, flying by paramotor for more than 7,000 km, and offering a unique, never seen before, birds-eye view of their journey. The film features many local faces and voices, highlights the pride and joy people have in sharing the Arctic tundra with these birds, their deep cultural connections with this fragile arctic landscape, and why they are driving changes to help save these endangered birds as part of an international collaboration of people all along their migratory path. This film is one of several influencing tools being developed by the Swan Champions, an Arctic community of passionate individuals who are engaging scientists, hunters and young people in initiatives to protect endangered birds from illegal hunting. WWT is supporting the work of the Swan Champions. The film will tour the key areas in Russia used by the Bewick's swans.

Session 8: Movements/Distribution

Interior Population Trumpeter Swan, *Cygnus buccinator,* annual movement and migration patterns

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Abstract

The Interior Population (IP) of trumpeter swans (*Cygnus buccinator*) was established through re-introduction efforts throughout the Upper Midwest beginning in the late 1960s. Across much of their current breeding distribution, IP trumpeter swans have transitioned from a rare to a common component of the regional waterfowl community. However, unlike many other waterfowl species, little is known about migration patterns and seasonal distributions of IP trumpeter swans. Our objective is to provide a quantitative description of year-round swan movements, including the proportion of swans that migrate, spatial extent of migration, duration of time away from breeding territories during the non-breeding period, and the timing of fall departure and spring arrival. We deployed 113 GPS-GSM collars on swans primarily throughout the IP breeding range, in 6 states and 1 Canadian province, between July 2019 and December 2021. Preliminary results suggest that the IP displays partial migration, in which some individuals migrate each year while others remain resident on their breeding grounds, but not necessarily on breeding territories. We observed a spectrum of migration strategies that varied with latitude, from obligate migrants that breed furthest north (e.g., Manitoba), to a zone of facultative migrants that breed at middle latitudes (e.g., much of Minnesota), to obligate residents at breeding sites furthest south (e.g., Ohio). Anthropogenic sources of open water (lake aerators, power plants, gravel quarries) provided additional sites for swans to overwinter. Breeding individuals were more likely than non-breeders to overwinter near their breeding territory or undertake a short-distance migration, but there was substantial individual variability in movement patterns and breeding latitude had a much stronger relationship with migration distance than breeding status. Results from this study will facilitate a cohesive understanding of IP annual movements and seasonal distributions, thus informing flyway-level policy decisions and conservation actions.

Movements of the Rocky Mountain Population of Trumpeter Swans (*Cygnus buccinator*)

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Abstract

Trumpeter swans (*Cygnus buccinator*) are a species of conservation concern throughout much of their North American distribution. Although current numbers of trumpeter swans are relatively high, recovery has been inconsistent across their range. Specifically, recovery of the United States breeding segment of the Rocky Mountain Population (RMP), especially those found in and around the Greater Yellowstone Ecosystem, has not been as successful as that of the Canadian breeding segment of this population. Thus, a better understanding of the movements and habitat use of RMP trumpeter swans can inform management decisions. We outfitted 62 trumpeter swans with GPS collars in Wyoming, Montana, Idaho, and Oregon between 2019 and 2021, the majority of which were captured in summer. Preliminary evidence suggests that, of 56 swans for which we obtained data, six made long-distance migratory movements to Canada in spring and returned to the United States in fall. The other 50 swans remained within the United States and either made local movements or shorter migratory movements. The next steps in this project are to continue collecting GPS data from the swans currently being monitored, to capture and collar additional swans in 2022, and to analyze the data on swan movements and habitats used. Our analyses will focus on understanding the migratory pathways of RMP trumpeter swans and the degree of migratory connectivity. Our results will contribute to understanding both the slow recovery of this population and the potential consequences of anthropogenic stressors on RMP trumpeter swans.

Historic distribution of Trumpeter (*Cygnus buccinator*) and Tundra (*Cygnus americanus*) in North America, 1587-1950.

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Abstract

Avian distributions are of interest to biogeographers, ornithologists and managers. There is some controversy over the historic distribution of trumpeter swans (*Cygnus buccinator*) in North America. We examined the literature and searched museum databases to document the historic (i.e. pre-range expansion efforts) distribution of both native swans in North America between 1560 and 1950. We identified historical observer records of Trumpeter Swans breeding in 18 of 50 United States, 9/10 Canadian Provinces; wintering in 27/50 states, 2/10 Provinces and 1/31 Mexican State; and migration in 27/50 US, 8/10 Provinces and 1/31 Mexican state. For Tundra Swans we documented breeding in 6/50 US states, 7/10 Provinces; wintering in 35/50 US states, 1 Canadian Province and 2/31 Mexican states; and migration in 40/50 US states, 9/10 Canadian Provinces and 2/31 Mexican States. Such records will always be incomplete because new sources are constantly becoming available. However, these data provide some guidelines for conducting such research, expand current species distribution maps, and provide some important new records.

Origins of Trumpeter Swans (*Cygnus buccinator*) taken during hunting seasons in the northern Rocky Mountains

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Abstract

Trumpeter swans (*Cygnus buccinator*) are a species of conservation concern throughout much of their North American distribution. In the western part of their range, the Rocky Mountain Population is, in general, thought to be fairly stable. This is particularly true for the fairly large Canadian segment of the population. However, there is substantial concern for the much smaller US segment, particularly those in the Greater Yellowstone Ecosystem. To provide information on movements of swans that can inform management, we conducted stable hydrogen isotope analyses on feathers to identify origins of swans captured, that moulted feathers, that died naturally, or that were taken during hunting seasons in the western United States. Research partners collected 3,223 swan feathers for isotopic analysis. Of these, we analyzed 143 feathers from 99 individuals, 57 of which were adults. Preliminary analyses of these data show the majority of the swans were long-distance migrants from the Canadian segment of the population. However, a few birds appeared to have originated within the US segment of the population. Next steps in this study are to refine the isotopic transfer function to improve accuracy of origin assessment and to update these preliminary results with additional data from the 2021/2022 hunting season. With these data, we will be able to identify what proportion of birds taken during legal hunting seasons are from Canadian vs US segments of the population.

Trumpeter Swans in Manitoba: range expansion and movements at the northern edge of the Mississippi Flyway

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Abstract

The Trumpeter Swan (*Cygnus buccinator)* remains designated as Endangered under the *Manitoba Endangered Species and Ecosystems Act.* Attempts to reintroduce the species at the Delta Marsh Waterfowl Research Centre between 1959 and 1974 proved unsuccessful. Instead, the Trumpeter Swan in Manitoba expanded naturally from successful reintroductions in the United States and Canada. Sightings in Manitoba increased throughout the 1980's and 1990's, although breeding was only confirmed post-2000. Confirmed breeding was documented in ten 10 km^2 Atlas squares during the Manitoba Breeding Bird Atlas (2010-2014), primarily in Riding Mountain National Park, a boreal escarpment in western Manitoba, and in the boreal hardwood transition and boreal softwood shield in eastern Manitoba. Even without the highly coordinated efforts of the Manitoba Breeding Bird Atlas, evidence from various sources suggest ongoing range and population expansion in the years since it ended. We will provide an updated map of occupancy per 10 km^2 to demonstrate the rapid rate of change, including confirmed breeding in the prairie potholes region. In 2020, Manitoba Fish and Wildlife partnered with the Canadian Wildlife Service, University of Minnesota and the Minnesota Cooperative Research Unit to deploy ten GPS-GSM transmitters on adult Trumpeter Swans in southern Manitoba. Early results indicate that Manitoba birds migrate further south than birds tagged elsewhere in the Mississippi Flyway. We propose questions about the future of trumpeter swans populations and management in Manitoba.

Two distinct flyways with different population trends of Bewick's Swan *Cygnus columbianus bewickii* in East Asia

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Abstract

Two of the most fundamental ecological questions about any species relate to where they occur and in what abundance. Here, we combine GPS telemetry data, survey data and expert knowledge for the first time to define two distinct flyways (the East Asian Continental and West Pacific flyways), migration routes and abundance for the Eastern population of Bewick's Swan *Cygnus columbianus bewickii*. The Eastern population is the largest flyway population, supporting *c*. 77% of Bewick's Swan numbers globally. GPS telemetry data showed that birds breeding in the Russian arctic from the Yamal Peninsula to *c.* 140°E (including the Lena and Yana Deltas), winter in the middle and lower reaches of the Yangtze River in China (which we label the "East Asian Continental flyway"). Bewick's Swans breeding from the Indigirka River east to the Koluchin Bay winter in Japan, mostly in Niigata, Yamagata and Ishikawa Prefectures (the "West Pacific flyway"). There was no overlap in migration routes used by tagged individuals from the two flyways. Counts of Bewick's Swans in the East Asian Continental flyway during the 21st century have shown wide between-year variations, reflecting incomplete coverage in earlier years. Bewick's Swans in this flyway currently numbers *c.* 65,000 birds based on extensive wintering survey coverage, compared to *c.* 81,000 in the early 2000s, based on less complete coverage. Chinese-wintering swans now concentrate mainly (*c.* 80%) at Poyang Lake in Jiangxi Province and Hubei Lakes (mostly in Longgan Lake), compared to a more widespread distribution both within Poyang and throughout the Auhui Lakes in 2004 and 2005. In contrast, Bewick's Swans of the West Pacific flyway now numbers *c.* 40,000, compared to just 542 in 1970. This population has shown no significant overall change since 2004, when it numbered *c.* 45,000 birds. Small numbers within this population probably also winter in South Korea. These results provide our first basic understanding of the winter distribution of Chinese- and Japanese-wintering Bewick's Swans in relation to their breeding areas, confirming the need to coordinate future research and monitoring in the two flyways, as well as the need for more information on swans wintering in South Korea.

Session 9: Outcome of Site Management/Protection

Habitat use of Bewick's Swans (*Cygnus columbianus bewickii*) during the non-breeding season in Germany

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Abstract

Over the past decades, Germany has become increasingly important for the NW European population of Bewick's Swans (*Cygnus columbianus bewickii*) during their migration and wintering season. Despite the ongoing overall decline of this population, numbers are increasing in Germany and thousands of swans migrate there to spend the winter and to fill their energy stores for subsequent migration. In Germany, Bewick's Swans mainly forage on seminatural wet grasslands and arable fields during the day in order to feed on carbohydrate-rich crops and protein-rich grass, while at night they fly to safe roosting places on water. The connectivity between those habitats within an area is thought to play a crucial role in the selection of wintering and staging sites for Bewick's Swans. In 2021, we started a new project in order to get a better understanding about habitat requirements of Bewick's Swans in Northern Germany, and to develop suitable conservation measures for this species. To study the connectivity of foraging and night roosting sites, we deployed GMS-GPS transmitters on Bewick's Swans to follow the individuals' daily movements during the winter and when preparing for migration. We calculated home ranges by using kernel densities and compared those for swans at different stages of their migration and for different ages classes. Here, we present results of the first season in 2021/2022 in which we tracked the swans and collected the data.

Ecological network analysis in Bewick's swans in northwest Europe, and considerations for Nature 2000 legislation

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Abstract

The Bewick's swan *Cygnus columbianus bewickii* is an obligate migratory species, which breeds across the Russian arctic. One of the three populations described for the species winters in northwest Europe, where it is included as a target species in the EU Natura 2000 legislation. Since the second half of the 20th century, large changes in water quality management, agricultural practice, climatic conditions and policy have occurred, and the swans' use of sites and habitats consequently have shifted over time. This may have consequences for their use of Natura 2000 protected areas and efforts for their conservation in general. Here we present a network analysis of key wintering sites based on bird observations and ring-resighting data of Bewick's swans in western Europe in winters 1990/91-2019/20. Based on identified network nodes, we found that the importance of the nodes changed over time, in interaction with habitat and longitude. Network nodes in the eastern parts of the winter range gained importance, and network nodes with grassland lost importance over time. Furthermore, we found that the movements between agricultural nodes have increased in recent years. Evaluating the network nodes for their protected status revealed that six increasingly used sites are not protected by the Natura 2000 network. This raises the question as to whether the rigid Natura 2000 legislation is effective in protecting species such as the Bewick's swan that respond dynamically to a changing environment. We envision that a reflection on the assignment criteria for Natura 2000 sites is expedient, and that a more dynamic form of nature conservation is needed to protect Europe's biodiversity in this time of rapid global environmental change.

Increased survival, but lower reproductive rates within protected areas promotes population growth in a long-lived migratory waterbird

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Abstract

Protected areas aim to halt declines in biodiversity. However, the extent to which they achieve this is often difficult to estimate, particularly for long-lived animals. Here we assess the value of nature reserves (NRs) used during the wintering period of a migratory waterbird, the Whooper swan (Cygnus cygnus). Using a 30-year dataset, we found that swans had a lower breeding probability when wintering inside NRs than outside but better survival for all age classes, generating a 30-fold higher annual growth rate within NRs. By combining these demographic rates with estimates of movement (into and out of NRs) into population projections, we show that the NRs will have doubled the population of swans wintering in the UK by 2030. These results highlight the major effect that spatial management can have on species conservation, even when the areas protected are relatively small and only used during short periods of the life-cycle.

Session 10: Population Restoration

Status of Trumpeter Swan restoration and the promotion of wetlands in Iowa

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Abstract

In 1993, the Iowa Department of Natural Resources (IDNR), working cooperatively with public and private partners, developed a plan to restore Trumpeter Swans to their former breeding range. The primary goal is to restore a self-sustaining, migratory Trumpeter Swan population. The secondary goal is to use the swans to "trumpet" the positive values of wetlands, including water quality improvement, flood reduction, and groundwater recharge in addition to wildlife habitat. A total of 1,237 cygnets have been released from 1995 - 2021. Swans from 132 sources and partnerships from 26 different states have been used for re-introduction in Iowa. Sources include private propagators, zoos and other state swan restoration programs. Public support for the program was higher than anticipated; private donations have exceeded $500,000 with 1,000+ volunteer hours tallied. The first nesting attempt by free-flying swans in Iowa since 1883 was documented in 1998. In 2020, 120 Trumpeter Swan nest attempts were documented in 37 Iowa counties. Through 2021, a total of 939 nest attempts have been recorded in Iowa, with additional nesting attempts by Iowa swans in MN, WI, Manitoba, Ontario, IL and MO. The Iowa population was estimated at 339 Trumpeter Swans in 2015. Mortality rates are higher than anticipated and slowed trumpeter swan restoration efforts. Mortalities include lead poisoning, power line collisions, shootings, disease and flooding. Iowa also hosts many wintering Trumpeter Swans, a total of 3,164 trumpeters were tallied during the mid-winter waterfowl survey in January 2021. Marked swans from Iowa have been reported in 17 states and 3 Canadian provinces. An experimental release of 49 swans was conducted in Arkansas with the cooperation of Arkansas Game and Fish Commission in 2008-2010. Two swans returned north to central MN and two to Iowa. Methods to encourage migration have included the experimental fall releases of cygnets at traditional fall staging areas. Early indications have shown positive results. This popular public restoration program has experienced successes in species restoration, promotion of wetland values, and the restoration of wetlands. Sustainable numbers of trumpeter swans are now found in several counties in Iowa. Subsequently, IDNR involvement is being reduced with a transition of responsibilities to several public and private partners. These are mainly county conservation board staff and naturalists. Current efforts include drafting a trumpeter swan management plan, environmental education and the promotion of wetland habitat. The following aspects have been considered throughout the process of updating Iowa's Trumpeter Swan Management plan: Iowa's Trumpeter Swan population status and trends, the amount of suitable breeding habitat in Iowa, the current status of swan education and outreach in Iowa, Iowa DNR's Research Section and Wildlife Bureau goals, and the current state of Trumpeter Swan management across the Mississippi Flyway region. "*Trumpet the Cause for Habitat*" has been a significant part of the program. We believe it is important to engage, educate, connect, empower and ultimately instill an ownership of our natural resources with the public and that people will protect what they value.

Examining locations in both the core and expansion areas of the U.S. Breeding Segment of the Rocky Mountain Population of Trumpeter Swans for improved conservation strategies.

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Abstract

The U.S. Breeding Segment of the Rocky Mountain Population of trumpeter swans has increased over the past 20 years. Increased numbers of trumpeter swans have occurred in both the Core Area, which is made up of 17 separate areas and the Expansion Area which consists of 15 separate areas. Swans in Montana's Core and Expansion ($P \leq 0.01$) areas have both increased overall for the last 21 years (5.6% and 14.9% respectively). Idaho's Core and Expansion areas showed no trends ($P = 0.66$ and $P = 0.53$ respectively). Wyoming's Core Area showed no trend ($P = 0.14$), while its Expansion Area had a significant ($P \leq 0.01$) increase of 8.2% over the past 22 years although the number of total birds has declined the past 5 years from a high of 199 in 2015. What is not known, is how each of the separate areas in the Core and Expansion areas contribute to the long-term trend. This paper will examine all areas and how they are contributing (both positive and negative) to growth trends so that conservation dollars and management projects can be allocated in a more strategic and beneficial manner.

Trumpeter Swans and Wisconsin: reintroduction and current research

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Abstract

Wisconsin initiated its Trumpeter Swan (*Cygnus buccinator)* reintroduction program in 1987 based on a recovery plan to establish at least 20 breeding and migratory pairs by the year 2000. From 1989 through 1997, WDNR staff collected a total of 353 Trumpeter Swan eggs in east-central and south-eastern Alaska; 92.5% (356) of these eggs hatched in incubators at the Milwaukee County Zoo. The Alaskan cygnets from this program were placed into the captive-rearing and decoy-rearing programs. Cygnets were allowed to fly free when they reached fledging age at about 15 weeks; and limited yearling birds (produced by captive pairs) were released at selected wetlands in central and northern Wisconsin. These swans were monitored by canoe, kayak, airboat, and airplane during 1989 through 2014 allowed WDNR staff to annually assess the distribution and number of nesting Trumpeter Swans across Wisconsin. Beginning in 2015 through aerial surveys across randomly assigned transects—each transect one-quarter mile wide by 30 miles long—the Wisconsin breeding population estimate increased as follows: 2015—4,695 (95% CI: ± 3,924); 2016— 5,069 (95% CI: ± 5,165); 2017—4,833 (95% CI: ± 2,371); 2018— 5,677 (95% CI: ± 4,287); 2019—6,106 (95% CI: ± 4,728); 2021—11,510 (95% CI: ± 4,958); no survey was conducted in 2020 due to the COVID 19 pandemic. Between 2019 and 2021, the University of Minnesota and the Minnesota Cooperative Research Unit partnered with Wisconsin Department of Natural Resources to capture and equip a subset of trumpeter swans in Wisconsin with GPS-GSM transmitters to monitor their movements, habitat use, and survival. The swans captured in Wisconsin will provide much needed information about their ecology, differential movements and habitat selection of cygnets versus adults, and will contribute to the large-scale, ongoing study of trumpeter swans across the Great Lakes Region. Since 2019, nine trumpeter swans have been captured and collared in Wisconsin (3 cygnets and 6 adults), obtaining more than >256,430 locations. Seven of the Nine GPS-GSM collars are still transmitting. Most Wisconsin marked swans wintered in either Illinois, Indiana, or Ohio with only two marked birds wintering in Wisconsin. Most individuals continue to return to the county they were captured in, but two individuals have made migratory movements into Canada (Lake Winnipeg, Manitoba and Northwestern Ontario).

Status of Trumpeter Swan *Cygnus buccinator* and Tundra Swan *C. columbianus* populations and conservation challenges in Washington State.

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Abstract

In North America, two native species are present, the smaller Tundra Swan (*Cygnus columbianus*) and the larger Trumpeter Swan (*C. buccinator*). Historical characterization of both species throughout Washington, prior to a period of landscape alteration to their native wetland habitats and exploitation of the species' themselves, were never conducted or lack context in the natural history record. However, Washington's geographic position in the Pacific Flyway offers a unique opportunity to observe both species during winter. Wetland loss in this region has been shown to exceed the national average, to the point where historical habitat types preferred by swans are no longer displayed on topographic maps. The lack of natural forage options, has placed a higher degree of dependence for both species upon farmlands, including dairy pastures, harvested agricultural crops, and cover crops. However, since the late-1980s significant changes have altered the availability and timing of these important alternative foraging areas, including: 1) the abundance and location of dairy farms, 2) shifts of crop types from grains, carrots, and peas to potatoes, dairy silage corn, and less waterfowl-beneficial crops, 3) strategies to improve nutrient retention and reduce soil erosion through the planting of cover crops, and 4) improvements to draining standing water prompted by flooding events in the 1990s. We present a status update on swans in Washington state. Additionally, we stress that future efforts to understand the relationship between these various influences on the abundance and distribution of both swan species would provide land managers and cooperative partnerships valuable information to address information gaps, anticipate future needs towards meeting seasonal requirements for both species, and craft appropriate conservation and management strategies in the North Puget Lowlands core region and across Washington.

Phases of range expansion: Trumpeter Swans in the Green River Basin of Wyoming

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Abstract

The Trumpeter Swan is one of Wyoming's rarest nesting avian species and a designated species of conservation concern. Prior to the 1990s, distribution of resident and migrant swans was limited to the northwest corner of the state. Dave Lockman, a state waterfowl biologist, identified the Green River basin as a potential expansion area in the 1980s. Wyoming Game and Fish Department implemented a range expansion project and began releasing captive-raised birds in 1992. Releases ceased after 2002 when the goal of 10 nesting pairs was reached. The expansion population continued to increase at a rapid rate and more than doubled the state's overall resident swan population, but number of adults/subadults in the expansion area peaked in 2015 (n=149) and then declined to over 50% by fall 2021. Examination of annual aerial survey data (2015-2021) suggests that lack of summer habitat for non-breeding subadults plus a decrease in swan productivity at established nest sites may be factors limiting population growth. Active management, restoration and conservation of shallow water wetland habitats will likely be needed to maintain a healthy resident swan population in Wyoming if regional drought conditions and warming trends continue.

Retrospective analysis of a declining trumpeter swan (*Cygnus buccinator*) population in Yellowstone National Park

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Abstract

The abundance and productivity of Yellowstone National Park's (YNP) resident trumpeter swan population declined from about the 1960's through 2010. Many hypotheses for the decline in YNP trumpeter swans exist, including human disturbance at nesting areas, changes in habitat quality, predation, and management of trumpeter swans outside of YNP. However, it is still unclear which may have contributed to swan decline or if the same mechanisms could be affecting current population trends. To improve knowledge and take advantage of long-term monitoring of trumpeter swans in YNP, a retrospective study was designed to evaluate the various competing hypotheses about possible factors associated with temporal and spatial variation in swan abundance and reproductive success in YNP for 1931-2019. Bayesian reversible jump Markov chain Monte Carlo analyses were conducted to evaluate the utility of covariates representing swan decline hypotheses for explaining variation in annual, territory-level patterns of where swans were Absent, Present, and Successful each year. Analyses of covariates that are useful to explain variation in territory statuses identified several interesting covariate relationships. Some support was found for covariates representing human disturbance and predation hypotheses, but because several covariates had values that trended through time and alternative interpretations could be made for the underlying causes of temporal trends, stronger inferences could not be made. Swan territories identified in this analysis as most likely to have swans Present and Successful may serve as a useful tool to help YNP staff manage important swan habitat or justify targeted management actions. Development of territory-specific information, such as utilizing satellite imagery to reconstruct hydrology metrics for individual lakes and wetlands, may be a promising direction for future work.

Strategic priorities for Trumpeter Swan conservation

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Abstract

Trumpeter Swan (TRUS) populations have grown substantially over recent decades, particularly the Interior population, but some nesting flocks (e.g., U.S. Rocky Mountain) have not. The conservation landscape for TRUS recovery continues to change as birds disperse, habitats are lost or degraded, and development expands. As restoration programs continue, the needs of TRUS evolve, and our conservation focus needs to change as well. The Trumpeter Swan Society recently identified three focus areas to help meet the needs of TRUS: **1) Population Status and Demography:** Well-designed periodic surveys are needed that allow managers to reliably assess TRUS population status, trends, and distribution. Comprehensive, range-wide surveys were last conducted in 2015 and suspended in 2020. In the past, methods and timing have been variable. Estimates of productivity and survival are also needed to inform decisions. **2) Habitat Needs – Quality and Quantity:** A better understanding is needed of habitat use by TRUS throughout their annual cycle. Tagged swans might allow for detailed seasonal analyses of how Trumpeters use habitats at local and regional scales. This could help inform managers about the quantity and quality of existing habitat and where swans might expand their distributions as populations grow. This would also provide early insights into potential for crop depredation, needed management, and additional field studies. Such information could also offer baseline perspective to help understand the impact of expected climate change on TRUS. **3) Telling the Swan Story – Engaging Stakeholders:** Stakeholders and the broader public need greater understanding and engagement in swan conservation. Elements should include celebration of successes (e.g., Interior population), ongoing conservation needs for struggling breeding flocks (e.g., U.S. segments of the Rocky Mountain Populations), threats to swans generally (e.g., lead, power lines), and engaging landowners and birders in tracking and celebrating the ongoing expansion of TRUS across their former range.

POSTER PRESENTATIONS

Nest attendance and other contributing factors to breeding success in captive vs. wild Trumpeter Swan (*Cygnus buccinator*) populations in the Greater Yellowstone Ecosystem

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Abstract

The tri-state (Idaho, Montana and Wyoming), or Greater Yellowstone Ecosystem (GYE) population of Trumpeter swans has rebound from near extirpation more slowly than other regions of the Rocky Mountain population (from about 70 in the 1930's to about 600 today), and there are several possible reasons for a lag in population growth. In this small, focused study we are looking at a segment of that population to determine if behavioural differences related to feeding and nest attendance during incubation, can be observed in wild nesting pairs versus pairs in a captive breeding program. The hypothesis proposed is that supplemental feed provided to captive birds, especially in winter and spring, allows the female to build up body reserves for use during the period of egg laying and incubation, when she spends most of her time on the nest. Consequently, the time a captive female must leave the nest to feed would be minimal compared to that of a wild female who did not receive supplemental feeding. Behavioural observations were collected over six breeding seasons in 2012, 2014 and 2018-21. In all, 16,280 observations were logged at 33 separate nests. Preliminary analysis shows a marked difference between the two groups in female nest attendance, captive swans being observed on the nest about 90% of the time vs. wild swans about 75% of the time. About 39% of the wild nests were successful in bringing at least one cygnet to fledgling age, while 73% of the captive swan pairs fledged at least one cygnet. Although this data supports nutritional status influencing nesting success, it is based on a small sample size, and other factors must also be considered. We are planning to continue to collect behavioural data during future nesting seasons in order to be able to better explore these interactions.

Management recommendations for nesting Trumpeter Swans

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Abstract

Trumpeter Swans underwent a severe population decline during Euro-American settlement of North America but have recovered from near extinction following nearly a century of intense management. Human intrusions at the nests of breeding Trumpeter Swans can cause temporary or permanent nest abandonment. Current understanding of the effects of human disturbance on Trumpeter Swans comes from studies of swan interactions with the general public. We studied the ecology and behaviour of Trumpeter Swans breeding in Idaho and Montana, USA from 2012-2022. We documented swan responses to investigator presence and activities. Here, we offer recommendations to managers and investigators on minimizing nest disturbance during investigations. We recommend that visits to swan nests be timed to minimize exposure of eggs to environmental thermal extremes including heat stressors. Nest visits should be timed to occur during thermally neutral periods during the day, as might occur during mid-morning and late afternoon. At these times, environmental temperature tends to be favourable and swans naturally engage in incubation recesses. Swans should not be disturbed at night, during precipitation, or under intense sunlight or heat conditions. Investigators should approach nests slowly and conspicuously, ideally pausing at a distance of 100-300 m while in view of swans, to give swans a chance to cover their eggs and depart quietly from nests. Investigators should always cover swan eggs with nest vegetation prior to leaving a nest. Disturbance recesses often cause parental swans to leave the nest rapidly without covering eggs, leaving eggs vulnerable to lethal solar heat gain. When possible, duration of nest visits should not exceed normal recess duration of approximately 50 min. Artificial nest structures placed in marshes to assist swans should include sufficient vegetation or other material to serve as a thermal mass that moderates nest temperature fluctuation as does a natural nest.

Egg size does not correlate with hatching success in Trumpeter Swans (*Cygnus buccinator*).

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Abstract

Swans in general may have highly variable rates of hatching success. During field studies of Trumpeter Swan breeding biology at Red Rock Lakes National Wildlife Refuge, Montana, USA, I collected data on egg length, width and weight. Of 57 eggs measured during 1989-90, 26 did not hatch. Failure to hatch could only be grossly estimated, and included predation, possible infertility and embryo death at various stages of development from < 1 week to ~ 30 days. There was no difference in egg size, weight or volume between years. There was also no difference in egg size, weight or volume between eggs that hatched and those that did not. High rates of egg failure can have significant effects on flock demographics. Predation rates should be independent of egg size, but other factors should be investigated using behavioural, physiological, environmental and genetic data.

Habitat requirements for the Rocky Mountain Population of Trumpeter Swans (*Cygnus buccinator*)

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Abstract

I compiled a short list of habitat requirements for the Rocky Mountain Population of Trumpeter Swans in order to inform students, managers and administrators who are not familiar with the primary literature on the subject. These habitat requirements are derived from multiple published and unpublished studies and reports by Trumpeter Swan research biologists, students, and managers over 50 years. This list is intended to inform and also direct individuals to original data sources, some of which are unknown and/or are not readily available. The list contains 43 largely quantifiable habitat requirements, and has been used to great effect for pre-release habitat analyses for at least one Trumpeter Swan restoration project in the Blackfeet Valley of Montana, USA. Other site-specific habitat attributes may be added to this list, but overall it provides a reliable first source for Trumpeter Swan (and probably other *Cygnus* sp.) habitat requirements.

Human activity and territoriality in the Mute Swan *Cygnus olor*: lesson from the lockdown period.

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Abstract

In spring 2020, human activity was strongly reduced because of pandemic-related restrictions. Traditional resting areas and tourist attractions in Poland were closed to the public between 24 March and 20 April. This period overlapped with time when Mute Swan breeding pairs establish their own territory borders. I compared two different locations with significant number of Mute Swan breeding pairs, which differed in the level of human activity (private fish pond complex vs. recreation dam reservoir). The Sarnów fish ponds are visited on the regular basis by workers (5–6 people). In contrast, the Sulejowski dam reservoir is a popular resting area for tourists, anglers and yacht owners, especially during weekends. Total reduction in human disturbance corresponded with a significant increase in the number of breeding pairs at recreation reservoir (years 2015-2019: 6-7; year 2020: 15). New pairs appeared in parts of the reservoir that were regularly used by anglers and tourists in the previous seasons. The number of breeding pairs at the fish ponds did not change significantly (years 2015-2019: 8-11; year 2020: 10). New pairs appeared later at the reservoir (median laying date for local population: years 2015-2019: 8-16.04; year 2020: 24.04.). The restrictions were canceled at the end of April and the number of people in May and June reached its annual level. Breeding success was very low at the reservoir, with majority of new pairs losing their broods. Mute Swan breeding success at the two sites in 2020 suggests human-related limitation of population size in these areas.

The influence of climate on reproductive parameters of the Mute swan population in the eastern part of the Gulf of Finland

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Abstract

We tested "the Living child-free hypothesis" (Solovyeva *et al*., 2019) using our Mute Swan nesting data, collected on the Kurgalsky Peninsula in 2005-2021. The number of swans varied from 17–102 pairs/year, depending on temperature in the wintering grounds and the timing of the ice melt. We observed both territorial pairs and colonial nesting. All nests (*n* = 858) were described and mapped. The total number of territorial pairs and their spatial distribution changed very little, while the number of colonial pairs varied greatly (> 10-fold). Population declines coincided with years of climatic pessimism. In colonies, the proportion of empty nests and abandoned clutches increased, and the size of clutches and the success of incubation decreased, both during the years of the greatest population declines and during the years of strong population growth. All reproductive parameters of territorial-nesting birds improved with population growth. Analysis of the breeding sites occupied by birds over many years (both for territorial and for colonial birds), and for territories and sites in colonies occupied for 1-3 years, found that all long breeders (both in colonies and outside colonies) have improved reproductive parameters at times of climatic maximum and population growth, and a decrease in overall reproductive indicators at population peaks due to a strong increase in the number of short breeders in colonies. Long breeders in their first year of breeding had reproductive parameters lower than in subsequent years. Thus, the observed "living child-free" effect may be due to massive breeding attempts of young birds in colonies during the years of population increases.

Spatial genomic structure in Tundra Swans: a circumpolar perspective for population delineation

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Abstract

For migratory species, management practices are often defined and implemented across large spatial scales. Regional management areas may, therefore, contain genetically divergent populations necessitating the need for assessments of population delineation using multiple methods. While population delineation has often relied on movement data and geography, genomic data is increasingly being used in conjunction with movement data to assess population structure and connectivity. In North America, Tundra Swans (*Cygnus columbianus*) are comprised of two well-recognized populations, the Arctic-nesting Eastern Population that winters along the east coast and the Western Population that nests exclusively in Alaska and winters in the west. In Europe and Asia, the Bewick's Swan (*C. bewickii*) is composed of four main populations (northwest European, Caspian, East Asian Continental, and west Pacific) that utilize different wintering areas. Although telemetry data shows a high degree of flyway fidelity, these studies cannot assess connectivity within and among flyways across broad temporal scales due to their short duration. Integrating both movement and genomic data can improve our ability to link both contemporary and historical effective dispersal and structure to population dynamics. To-date, there is very little known concerning the genetic composition of Tundra Swan populations. To fill this information gap, we use double-digest restriction site-associated DNA (ddRAD) sequence data to assess the distribution of nuclear genomic diversity of Tundra Swans between the North American Eastern and Western Populations and neighbouring populations in Eurasia (*i.e*. northwest Europe and west Pacific). Although not heavily hunted, this wetland-obligate species is considered highly vulnerable to environmental change, habitat loss, and lead poisoning, especially due to certain life history traits such as delayed reproduction. Given these conservation concerns, knowledge of the population delineation and dispersal between populations can is key to identifying and understanding the resilience of individual populations to further natural and human-induced stressors.

Swan deaths with avian influenza H5N6 recorded in Xinjiang, China

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Abstract

With the warmer winters associated with climate change, thousands of swans now remain in Northern Xinjiang during the winter months, where several outbreaks of avian influenza have also been recorded in swans in the region. Cooperative monitoring of avian influenza in waterbirds has been carried out in several Central Asian countries over the last 15 years, and 4 species of swans are known to be threatened by the disease. Cases have been recorded for Whooper Swans, Mute Swans, Tundra Swans and Black Swans. The largest mortality event occurring in early 2020, when the highly pathogenic H5N6 subtype of the virus killed at least 76 swans across 4–5 locations in the Xinjiang Uygur Autonomous Region, across an area of 700 x 300 $km^{2.}$ The region is occupied by about five million people (including in Yining County, Bole City, Manas County and Korla City) and, although this incident did not pose a direct threat to human life (*i.e.*, it did not spread to humans), it caused social panic and innocent poultry species were culled with the aim of reducing spread of the disease. According to the literature, various types of avian influenza have previously occurred in other provinces in China, and some variants (e.g. H5N1) have transmitted to people.

Birding with awareness: creating connections between user groups and waterfowl habitats.

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Abstract

Getting out to go bird watching and photography during the winter waterfowl season is very popular. The large flocks of snow geese (*Anser caerulescens*), Trumpeter (*Cygnus buccinator*) and Tundra Swans (*Cygnus columbianus*) arrive on agricultural lands and wetlands and attract tens of thousands of people to see them. It drives a huge ecotourism industry, especially in northwest Washington. Most observers look at the birds and rarely pay attention to the habitat/agriculture land that attracts the large flocks of swans and geese.

Birding With Awareness was created to educate the public about the relationship between the presence of swans and geese and waterfowl friendly agricultural lands and dairy farms. Birding in Shared Spaces was created to bring attention to our Washington Department of Fish and Wildlife public wildlife areas in Snohomish/King counties. Birders, hikers, sportsmen/women all share two things in common: They all rely on healthy natural lands and they all must be good stewards of these shared spaces This concept is being expanded with a public outreach effort to include other areas In Washington where people bird, including birding from public roads, parks, etc.

Included is information on Taking Action on how to stay safe on public lands and how to report wildlife issues including poaching or other illegal activities. The Northwest Swan Conservation Association is leading the effort through many local Audubon chapters, hunting organizations and more.

The Eurasian steppe as one of the migration stopovers of the Bewick's Swans (*Cygnus columbianus bewickii*).

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Abstract

The North Kazakhstan and adjacent Russian steppe are one of the largest Eurasian migration stopover sites for Bewick's Swan, a species of conservation concern in Russia. This area is at the intersection of two major flyways: the western, leading to the Caspian and the Aral seas, and the eastern, directed toward China. We analyzed GPS-recorded routes of 44 Bewick's Swan (34/10 from the western/eastern flyways, respectively) from 2015-2020 to delineate migration stopover sites in the Central-Eurasian steppe and evaluate their conservation status. The migration stopover sites in the western flyway are situated in vast wheat croplands in North Kazakhstan along the Kazakh-Russian border, around the Kak lake group and between the Ishim River and Naurzum Lakes. Along the eastern flyway the migration stopovers also lie in the large agricultural area between Chany and Kulunda lakes, in Russia. During spring migrations, the swans tend to use small lakes and ephemerally flooded depressions amidst the crops, while in fall migrations they gather around larger permanent lakes. Most of these stopover sites used by swans have no conservation status and are in fact unprotected, especially the largest sites across croplands in the northern Kazakhstan. Since human disturbance is an important factor negatively affecting swans, both roost and foraging sites need to be protected. Creating hunting-free zones in all stopover areas, and conferring protected status to key lakes used by swans would be the most appropriate way to ensure that swan migration persists in this part of Eurasia.

Stopping Trumpeter Swan collisions with power lines: a collaborative approach

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Abstract

This is the story of overhead, 3-phase power lines adjacent to a small pond just north of Sequim on Washington's Olympic Peninsula and our community's project to underground them. Burial of power lines is not unique, but how we accomplished it is, using an innovative community coalition that may be the first of its kind. The pond is a critical roost for Trumpeter Swans when they migrate to the Peninsula each fall to spend winter here. The threat to swans from these lines is well-known. The utility responsively placed diverters on the lines but collisions persisted. Over the course of several seasons from 2017-2020, observations and video collected by a dedicated OPAS volunteer documented the scope and number of swan injuries and deaths at the site. By Dec 2020 consensus among OPAS, the local public utility, and WDFW officials was that diverters were not the solution. The lines must be buried. Line burial usually falls under the sole purview of a local utility. However, given the costs, our rural public utility lacked funding to undertake it for wildlife protection. We needed a different approach. We developed an extraordinary collaboration among public agencies, private companies, individuals, and non-profits. OPAS conducted a GoFundMe campaign, yielding $65,000.00 from over 290 individuals and other non-profits, while the utility contributed partial construction funds, project design, and management. WDFW provided regulatory backing, and our county road department permitted use of an alternative, less-costly road crossing. The excavation contractor reduced their costs and coordinated with the irrigation district and landowners to offer no-cost easements, and other aid. Through the persistent efforts of a dedicated community working together, the project was successfully completed in just six months, within budget. No swan injuries or mortalities were observed adjacent to the pond this season. (We have an excellent array of photos and videos used in our funding campaign and documenting the project).

Breeding biology of the Black Swan, *Cygnus atratus,* on the Gold Coast, Queensland, Australia from 2007 to 2021

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Abstract

The breeding biology of the Black Swan *Cygnus atratus* was studied in sub-tropical Australia from 2007 to 2022, in a study area on the Gold Coast in southeast Queensland. The study aimed to identify factors influencing recruitment to the breeding population and evaluate the factors impacting reproductive success in this species. The number of pairs has increased since the study started rising from 20 pairs in 2007 to 61 pairs in 2021 with a maximum of 78 pairs recorded in 2020. The increase has occurred in both breeding and non-breeding pairs. The number of successful breeding attempts has also increased over time with 18 breeding attempts in 2007 rising to 52 in 2021. Almost 40% of pairs breed two or more times per calendar year with 3% of breeding pairs making 5 nesting attempts in a single year. Over time the number of cygnets hatched and reared per breeding attempt has also increased. Pairs have been recorded as hatching cygnets in every month of the year with a peak in hatching recorded in the Austral winter. In some years the breeding season extends over the whole year and in others may only occur over a three-month period. The reasons for these variations are unknown and require further investigation. Only 34% of cygnets banded entered the paired population and birds first pair from two and three years old and first breed in their third and fourth years. Recruits to the paired population are not significantly larger or smaller than their non-breeding counterparts but are significantly heavier.

Additional Posters:

LEHO LUIGUJÕE: **Numbers, distribution and trends of swans wintering in Estonia in the period 1993–2022.**

LEHO LUIGUJÕE**: Swan monitoring in Estonia.**

The Scientific Committee for the 7th International Swan Symposium and 26th Trumpeter Swan Society Conference:

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