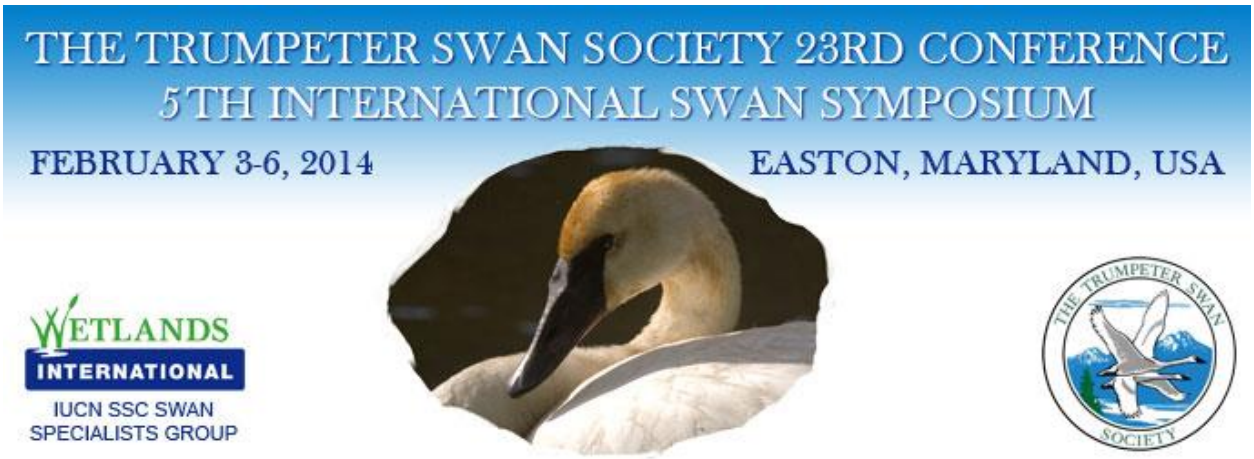

23rd Swan Conference and

5th International Swan Conference

Program schedule and Presentation Abstracts

The Trumpeter Swan Society

Wetlands International

Tidewater Inn

Easton, Maryland

February 3-6, 2014

TIME	PRESENTER	TITLE	LOCATION
SUNDAY 2nd FEBRUARY			
17:00-21:00 (5:00-9:00 p.m.)		**REGISTRATION** **WELCOME RECEPTION**	**Lobby** **Hunter's Tavern**
MONDAY 3rd FEBRUARY 2014			
07:30		**REGISTRATION**	**Lobby**
08:30 – 08:50	Gary Ivey, TTSS President	**WELCOME AND ANNOUNCEMENTS**	**Gold Room**
		POPULATION AND DISTRIBUTION **Moderator: Scott Petrie**	**Gold Room**
08:50 – 09:10	Cornely, Petrie & Hindman	*Status of swans breeding in North America*	
09:10 – 09:30	Handrigan, et al.	*Evaluation of Range Expansion of Trumpeter Swans re-introduced in SW Ontario*	
09:30 – 09:50	Garton & Shea	*Changing Viability of Greater Yellowstone Populations of Trumpeter Swans*	
09:50 – 10:10	Hawkings, et al.	*Early spring migration areas for Trumpeter Swans and other waterbirds in the Yukon Southern Lakes, Canada*	
10:10 – 10:30	Shirkey, et al.	*Mute and Tundra Swan Distribution and Abundance on Lake St. Clair and Western Lake Erie*	
10:30 – 10:50		**BREAK**	
10:50 – 11:50		**POPULATION AND DISTRIBUTION CONTINUED** **Moderator: Scott Petrie**	**Gold Room**
10:50 – 11:10	Beekman, et al.	*Long-term trends in the numbers and distribution of the NW European Bewick's Swan population: results of the international censuses*	
11:10-11:30	Vilina, et al.	*Populations trends in Black-necked Swans,* Cygnus melancorhyphus*, in three coastal wetland of Chile*	
11:30 – 11:50	Perrins & Wood	*The demography of the Mute Swan population on the River Thames*	
11:50 – 12:50		**LUNCH (ON YOUR OWN)**	
12:50 – 15:10		**POPULATION AND DISTRIBUTION CONTINUED** **Moderator: Chris Perrins**	**Gold Room**

12:50 – 13:10	Coleman, et al.	*Habitat utilisation and site occupancy in a long-term study of Mute Swans in the English Midlands*	
13:10 – 13:30	Nilsson	*Long-term trends in the population of breeding and wintering Whooper Swans in Sweden*	
13:30-13:50	Vilina, et al.	*Population trends in Coscoroba Swans,* Coscoroba coscoroba*, in a Mediterranean wetland of Central Chile*	
13:50 – 14:10	Boiko, et al.	*Breeding Whooper Swans in the Baltic States, 1973-2013*	
14:10 – 14:30	Morkūnas et al.	*Genetic diversity of Whooper Swans in Europe*	
14:30 – 14:50		**BREAK**	
14:50 – 15:10	Dau & Pearce	*Tundra swans of the lower Alaska Peninsula: a morphologically distinct North American population?*	
15:10 – 15:50		**BIRD COLLISIONS** **Moderator: Chris Perrins**	**Gold Room**
15:10 – 15:30	Rees, Griffin & Hughes	*Tracking Whooper Swan migration in relation to offshore and onshore wind farm sites*	
15:30 – 15:50	Ivey	*Model for mitigating mortality of cranes and swans from power line collisions*	
16:00 – 17:00		**POSTER SESSION**	**Gold Room**
17:00-18:15		**DINNER (ON YOUR OWN)**	
18:15 – 21:15		**WORKSHOP** **AVIAN INTERACTIONS WITH ELECTRIC POWERLINES**	**Gold Room**

TUESDAY, 4TH FEBRUARY 2014			
08:15 – 08:30		**OPENING ANNOUNCEMENTS**	**Gold Room**
08:30 – 10:50		**HABITAT AND DIET** **Moderator: Jan Beekman (pending)**	**Gold Room**
08:30 – 08:50	Snyder	*Aquatic Macrophyte Abundance and Distribution in Henry's Fork of the Snake River through Harriman State Park of Idaho, 1988 and 2011-2012*	
08:50 – 09:10	Weaver, Schummer & Petrie	*Temporal and geographic selection of agricultural and aquatic habitats by Eastern Population Tundra Swans during the nonbreeding period*	
09:10—09:30	Eryan Yang, Lizhi Zhou & Chunlin Li	*Wintering behaviour of Tundra Swans at the lakes in the YangtzeRiver Floodplain, Anhui Province*	
09:30 – 09:50	Van Krimpen, et al.	*Application of an individual-based model to predict non-linear responses of staging swans to changes in water level*	
09:50 – 10:10	Luigujoe, et al.	*Land use change and decline of Bewick's Swan staging population in West Estonia in last 20 years: reconstruction using Landsat TM sensor image*	
10:10 – 10:30	Morkūnas, Švažas & Morkūnė	*Whooper Swan population development and coexistence with native Mute Swans*	
10:30 – 10:50		**BREAK**	
		HABITAT AND DIET, continued **Moderator: Jan Beekman**	**Gold Room**
10:50 – 11:10	Nolet, Gyimesi & van Lith	*Lower foraging efficiency of juveniles constrains use of optimal habitat in swans*	
		MANAGEMENT **Moderator: Jan Beekman**	**Gold Room**
11:10 – 11:30	Newth, et al.	*Illegal shooting of migratory swans and an initiative to address the issue*	
11:30 – 11:50	Perrins	*The ecology and age structure of a highly pathogenic avian influenza virus outbreak in wild mute swans*	
11:50 – 12:50		**LUNCH (ON YOUR OWN)**	

		MANAGEMENT, continued **Moderator: Larry Gillette**	**Gold Room**
12:50 – 13:20	Araya & Dubovsky	*Assessing Temporal Distribution of Harvested Trumpeter Swans at Bear River Migratory Bird Refuge During the 1999-2005 Hunting Seasons*	
13:20 – 13:40	Ely, et al.	*Delineation of Eastern and Western Populations of Tundra Swans in North America: geographic boundaries and interchange*	
13:40 – 14:00	Matteson, et al.	*Wisconsin's Trumpeter Swan Recovery Program: A 25-Year Retrospective (1987-2012) on Techniques, Habitat Characteristics, Management, Threats, and Collaboration*	
14:00 – 14:20	Hindman, Harvey & Conley	*Spraying corn oil on Mute Swan eggs to prevent hatching*	
14:20 – 14:40		**BREAK**	
14:40 – 15:00	Luukkonen, Avers & Marks	*Mute swan population growth in Michigan in relation to management intensity*	
15:00 – 15:20	Avers & Luukkonen	*Using public engagement, outreach, and collaboration to support management of a rapidly increasing mute swan population in Michigan*	
15:20 – 15:40	Jordan	*Citizen science, grass roots efforts and their contributions to swan management*	
15:40 – 16:00	Hindman & Tjaden	*Citizan awareness and opinions about Chesapeake Bay Mute Swans*	
16:00 – 18:00		**WORKSHOP** **BEWICK'S SWAN ACTION PLAN IMPLEMENTATION**	**Gold Room**
18:00		**OYSTER FEED** **followed by DINNER (on your own)**	**Trumpeter Swan Antiques,**

WEDNESDAY 5TH FEBRUARY 2013			
Early morning-14:00	***Final time to be announced***	**FIELD TRIP** **(registration required)**	**Depart from Lobby**
18:00 – 22:00		**BANQUET,** **PRESENTATION, AND AWARDS** **SILENT AUCTION**	**Chrystal Room Oxford Room**
THURSDAY 6TH FEBRUARY 2014			
08:15-08:30		**OPENING ANNOUNCEMENTS**	**Gold Room**
		BREEDING BIOLOGY **Moderator: Leif Nilsson**	**Gold Room**
08:30 – 08:50	Wlodarczyk	*Population of the Mute Swan in central Poland- fifteen years of study*	
08:50 – 09:10	Solovyeva	*Nest density and breeding biology of the Bewick's Swan Cygnus bewickii during dramatic increase in Chaun River Delta, east Russia*	
09:10 – 09:30	Einarsson, et al.	*Natal and breeding site fidelity for Whooper Swans in Iceland*	
09:30 – 09:50	Coleman	*Observations on Black Swans breeding in SE Queensland, Australia*	
09:50 – 10:10	Beekman, et al.	*Trends in long-term Bewick's Swan breeding success data, in relation to population development and climate change*	
10:10 – 10:30	Olson, Mitchell & Long	*Geographic variation in clutch size and egg weights from the Interior and Rocky Mountain Populations of trumpeter swans*	
10:30 – 10:50		**BREAK**	
		BREEDING BIOLOGY, continued **Moderator: Leif Nilsson**	**Gold Room**
10:50- 11:10	Quirk III	*Density and productivity comparisons between two distinctive populations of Trumpeter Swans in south-central Alaska*	
11:10 – 11:30	Lumsden	*Trumpeter Swan brood response to draw-down and changes in food abundance*	
		MIGRATION **Moderator: Leif Nilsson**	**Gold Room**

11:30 – 11:50	Nuijten, et al.	*The exception to the rule: retreating ice front makes Bewick's swans migrate slower in spring than in autumn*	
11:50 – 12:50	**LUNCH**	**ON YOUR OWN**	
		MIGRATION **Moderator: Bart Nolet**	**Gold Room**
12:50 – 13:10	Boiko, Morkūnas & Kampe-Persson	*Moult migration of non-breeding Whooper Swans Cygnus cygnus in the south-eastern Baltic region*	
13:10 – 13:30	Wieloch and Czyż	*The autumn migration of the Bewick's Swan Cygnus columbianus bewickii in Poland*	
13:30 – 13:50	Mineev & Mineev	*Seasonal migration of Bewick's Swans in European NE Russia*	
13:50 – 14:10	Glazov	*Autumn staging swans in the Pechora Delta region of arctic Russia*	
		THREATS **Moderator: Bart Nolet**	**Gold Room**
14:10 – 14:30	Newth, et al.	*The effects of lead exposure on the body condition and survival of Whooper Swans Cygnus cygnus wintering in the British Isles*	
14:30 – 14:50	Smith, et al.	*Lead Shot Poisoning of Swans within Whatcom County, Washington and Sumas Prairie, British Columbia: Sources, Management and Remediation*	
14:50 – 15:10		**BREAK**	
		THREATS, continued **Moderator: Bart Nolet**	**Gold Room**
15:10 – 15:30	Roller MaMing and Tong Zhang	*Swans killed by poison and analysis of poaching cases in China*	
15:30 – 15:50	Bolin, et al.	*Research identifying the causative agent of "Pink Feather Syndrome" in swans*	
15:50 – 16:50		**WORKSHOP 1** Future organisation of the Wetlands International/IUCN-SSC Swan Specialist Group (Eileen Rees, et al.)	**Gold Room**
16:50 – 19:30		**WORKSHOP 2** Estimating Population Viability by Applying Stochastic Growth Models to Annual Counts of Swan Populations (Oz Garton & Ruth Shea)	**Gold Room**

19:30		**DINNER (ON YOUR OWN)**	

ABSTRACTS

Monday, February 3rd

Population and Distribution

8:50

Status of swans breeding in North America

John E. Cornely[1], Scott A. Petrie[2] & Larry J. Hindman[3]

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[2] Long Point Waterfowl, Port Rowan, Ontario, Canada

[3] Maryland Department of Natural Resources, Cambridge, MD.

Abstract

The native Trumpeter (Cygnus buccinator) and Tundra (Cygnus columbianus) swans and the introduced Mute Swan (Cygnus olor) currently breed in North America. All three species are federally protected in Canada, but only Tundra and Trumpeter swans are protected by the federal government in the U.S. For management purposes, two populations of Tundra Swans have been designated. Swans in Western Population (WP) nest along the coastal Alaska and winter primarily in California, Utah, and the Pacific Northwest. The Eastern Population (EP) birds nest from the Seward Peninsula in Alaska to the northeast shore of Hudson Bay and Baffin Island in Canada. January survey data for the WP are available from 1949 to 2013. The most recent 3-year average was 80,600. but included an Incomplete survey. There is survey data for the EP for 1982 to 2013 with the most recent 3-year average of 105,500. Trumpeter Swans nest from central and southern Alaska east to Ontario in the north. Nesting occurs south through British Columbia to central Nevada eastward in the Greater Yellowstone region and then in South Dakota and Nebraska through the Midwestern States and as far as central New York State. A range-wide survey of Trumpeter Swans was first completed in 1968, repeated in 1975 and at five year intervals since. Three populations of Trumpeter Swans are recognized. From west to east they are the Pacific Coast (PCP), Rocky Mountain (RMP), and Interior (IP) populations. In 1968 a total of 3,722 Trumpeter Swans were counted. The total from the most recent survey conducted in 2010 was 46,225. Of this total, 26,790 were in the PCP, 9,626 were in the RMP, and 9,809 were in the IP. The Trumpeter Swan recovery and restoration is one of the most remarkable in North American conservation history. The Mute Swan, native to Eurasia, were transported into North America during the late 1800s. They subsequently escaped or were released and feral Mute Swans began nesting along the Atlantic Coast of the U.S., in the Pacific Northwest and the Great Lakes. Through the years the distribution expanded and numbers increased. There has not been a coordinated, systematic survey of Mute Swan numbers throughout North America. The Atlantic Flyway Council initiated a Mid-Summer Mute Swan survey in

1986. With one exception, the survey was completed every 3rd year. Numbers of Mute Swans counted in this survey increased from 6,309 in 1986 to 14,344 in 2002 and has declined to 9061 in 2011.

9:10

Evaluation of range expansion of Trumpeter Swans (*Cygnus buccinator*) re-introduced in south-western Ontario

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Abstract

Trumpeter swans (*Cygnus buccinator*) were extirpated from Ontario in 1886 due to hunting and habitat loss. From 1982-2006, 584 trumpeter swans were released in 42 different locations within southwestern Ontario by The Ontario Trumpeter Swan Restoration Group. Little is known about the population' breeding range but it is hypothesized to be regulated by the size of the swan population, and aggression towards conspecifics. If the population is failing to expand its range, there is potential for it to become a nuisance species. Sighting locations from 1982-2010 were used to infer the breeding range of the population using kernel-density estimates, and swan migration distances. The southwestern Ontario trumpeter swan breeding range was 4,817,905 ha as of 2010 and has been expanding throughout the study period. When the re-introduction program ended the breeding range rate of increase decreased. Migration distances have been decreasing over time and several swans are clustered around release sites. This study supports release-mediation (re-introduced swans were placed at low swan density areas), and supplemental feeding as major factors contributing to range expansion growth rates.

Key words: *Cygnus buccinator*, range expansion, density-dependence**.**

9:30

Changing Viability of Greater Yellowstone Populations of Trumpeter Swans

Edward O. Garton & Ruth E. Shea

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Abstract

Following discovery of the last remaining Trumpeter Swans (Cygnus buccinator) in Yellowstone National Park, adjacent portions of Idaho and Wyoming and Red Rocks Lakes, Montana in the early 1900s, all populations grew into the 1960s through protection from harvest, reduced habitat destruction and increased nutrition from supplemental winter feeding. Since that time, fluctuations of adult birds plus cygnets counted in September each year from 350 to 650 in the Greater Yellowstone region of Wyoming, Idaho and Montana have raised concerns about the long-term viability of the flocks composing this metapopulation of swans. We evaluated a suite of 26 stochastic population models of annual growth rates incorporating density dependence or lack thereof, cyclic patterns driven by life history or environmental factors, long-term changes in carrying capacity of lakes, marshes and wintering habitat and major changes associated with shifts in management direction. We identified the strongest predictive models for use in projecting long-term viability of individual swan populations and the combined metapopulation. These analyses indicated strong viability of populations within the region during the first half of the last century but raise serious concern about future long-term viability of individual populations based on patterns observed during the last 4 decades.

9:50

Early spring migration areas for Trumpeter Swans and other waterbirds in the Yukon southern lakes, Canada 1978-2013: characteristics, patterns of use, interpretation, and protection

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Abstract

The Southern Lakes region in the southern Yukon Territory, Canada, has three large and several smaller spring migration areas used by Trumpeter Swans as well as Tundra Swans and many other waterfowl and waterbirds. These sites are characterized by shallow open water wetlands with abundant submerged aquatic vegetation located at or near the outlets of large lakes, a situation which ensures open water and food at least a month in advance of general availability of other wetlands. Numbers of swans and other waterbirds have been monitored with generally increasing intensity at these sites since the mid-70s. Currently numbers of all waterbirds are counted daily from April 1 to May 15 at the most heavily used site. Other sites are covered by a combination of less-frequent ground counts and two aerial surveys per spring. At the peak of migration more than 3,000 Trumpeter Swans are present in these areas combined, and at least 30-70% of the Pacific Coast Population (PCP) is estimated to pass through this region enroute from wintering areas in south-coastal British Columbia and Washington state to breeding grounds in western Yukon and central Alaska. Individual marked Trumpeter Swans spent an average of 2-5 days at the M'Clintock Bay site. Use of these sites by Trumpeter Swans has increased over the past 30 years, but at a lower rate than the growth of the PCP. Fewer Tundra swans use these areas than in the past; an estimated 4-17% of the western population passes through the area. Three of the sites are highly accessible from the road system and have some residential and recreational development along the shoreline. The same three are located on lakes used as storage reservoirs for the Yukon Territory's main hydro-electric generating facility on the Yukon River in Whitehorse. Water levels in these lakes are currently altered from the natural regime, with the primary change being that maximum water levels are maintained from late summer (the natural peak in this glacier-dominated system) through freeze-up to provide maximum generating capacity during the cold winter months when natural flows are very low. It is unclear how and if this regime has influenced use of the areas by waterbirds in spring, as spring water levels appear to be very similar to those that existed in the natural system. Aerial photos of M'Clintock Bay taken on the same date for 27 years show

tremendous variation in ice cover, but no clear trend towards earlier of later springs. Two of the sites (Lewes Marsh and Tagish River) are designated as Special Management Areas in aboriginal land claims agreements signed in 1995. Both are likely to become Habitat Protection Areas under the Yukon Wildlife Act. The public profile of all these areas has been greatly enhanced by interpretive programs, especially the establishment of the Swan Haven interpretive centre at M'Clintock Bay in 1994. This centre, and the programs carried out there each April, comprise the flagship of Environment Yukon's wildlife viewing program, and Trumpeter Swan is the flagship species.

10:10

Mute and Tundra Swan distribution and abundance on Lake St. Clair and western Lake Erie

Brendan Shirkey[1], David Luukkonen[2] & Scott R. Winterstein[3]

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[2]Avian Research Specialist Michigan Department of Natural Resources (luukkonend@michigan.gov)

[3]Wildlife Population Ecologist, Michigan State University (winterst@msu.edu)

Abstract

Lake St. Clair, the lower Detroit River, and western Lake Erie have traditionally been an important fall staging area for tundra swans (*Cygnus columbianus*), and recently the area has supported a growing population of non-native mute swans (*Cygnus olor*). Because of the region's importance to diving ducks, the Michigan Department of Natural Resources has been flying aerial surveys over Lake St. Clair since 1983, and beginning in Fall 2012 surveys were expanded to include all bird species during fall, winter, and spring months. This expansion allowed us to document swan distribution and abundance on Lake St. Clair and western Lake Erie using distance sampling theory and GIS mapping techniques.

We established a transect route of approximately 530 km with transects spaced 3.2 km apart. We also established 5 distance categories extending out from the line transect 0-50 m, 50-125 m, 125-225 m, 225-425 m, and >425 m. When a flock of swans was observed, we recorded flock size, the appropriate distance category based on the center of the flock, and a GPS waypoint. We often could not distinguish between mute and tundra swans during our surveys, however mute swans are largely resident in the area and based on survey date we could determine which surveys likely consisted of exclusively mute swans and which surveys included both mute and tundra swans. All distance data was then used to generate population estimates that accounted for imperfect detection probability, and all GPS data was used to create kernel density maps illustrating swan distribution.

The average detection probability for swans on our aerial surveys was 0.65. We found swan population estimates on survey dates that likely consisted of only resident mute swans averaged 957 birds, and our peak estimate occurred 12 December 2012 with 17,349 tundra and mute swans.

Furthermore, the average swan population estimate for Winter 2013 surveys (January-March) was 8,379 birds, indicating large numbers of tundra swans wintered in the lower Great Lakes region. Kernel density maps indicate that swan distributions were closely linked to shallow, near-shore areas and there is likely considerable overlap in mute and tundra swan distributions.

Growing mute swan populations in the lower Great Lakes could have significant impacts on tundra swans and dabbling ducks that use similar habitat. Mute swans have large dietary overlap with tundra swans and some other waterfowl species and they are highly aggressive often excluding native waterfowl from the highest quality habitat. As global climate change seems to be increasing the importance of Lake St. Clair and Lake Erie as a wintering area for tundra swans, the potential impacts of competition with mute swans could be significant and eventually limit the number of wintering tundra swans in the region.

10:50

Long-term trends in the numbers and distribution of the Northwest European Bewick's Swan population: results of the international censuses

Beekman, J., Koffijberg, K., Wahl, J., Hall, C., Devos, K., Pihl, S., Laubek, B., Luigujoe, L., Wieloch, M., Boland, H., Svarzas, S., Nilsson, L. Stipniece, A., Keller, V., Shimmings, P. & Rees, E.C.

Abstract

Coordinated international censuses of the Northwest European Bewick's Swan population have been undertaken in mid January at five year intervals since the mid 1980s, to determine trends in numbers, shifts in winter distribution and changes in habitat use over time across the swans' wintering range. The censuses also provide updated estimates of the total population size, for identifying sites of international importance (i.e. with ≥ 1% of the total population recorded) for Bewick's Swans, and thus for determining areas that should be protected for the species. The results of the censuses found that, following an increase in numbers from 16,000 birds in the mid-1980s to 26,748 in 1990 and a peak of 29,780 counted in 1995, numbers have since decline by c. 35% to c. 19,400 Bewick's Swans in the population by January 2010. This supported results of national trends indices for Bewick's Swans in the Netherlands, Britain and Ireland which indicated that, following an increase during the 1980s and early 1990s, numbers have since declined. There was some evidence for short-stopping (*i.e*. with swans being more likely to winter in the eastern part of their range), with a higher proportion of the population recorded in Germany in more recent years (2005 and 2010) than previously, and a corresponding decrease in the numbers recorded in the Netherlands and Ireland, but the proportion of birds wintering in Britain (mostly in southeast England) was maintained. The extent to which this is attributable to mid-January weather conditions in census years is assessed. Following indications over the years 1995–2005 that the Northwest European Bewick's Swan population was in decline, a Bewick's Swan Species Action Plan has been developed to address this conservation issue, and this was adopted by the African-Eurasian Waterbird Agreement (AEWA) of the Convention on Migratory Species (the "Bonn Convention" in May 2012 for implementation hereafter.

11:10

Population trends for Black-necked Swan, *Cygnus melancorhyphus* at three coastal wetlands in Chile

Yerko A. Vilina[1,2]; Hernán Cofré[3]; Javiera Meza3; Leslie Ramirez; [1] Yanina Meza[1]

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[3]Instituto de Biología, Universidad Católica de Valparaíso, Chile.

[4]Corporación Nacional Forestal, Viña del Mar, V Región, Chile.

Abstract

The connectivity degree among the wetlands of Chile is unknown due to there having been no major effort in the marking of aquatic birds. We analysed the populations of the Black-necked Swan since 1990 to 2013 in three coastal wetlands of southern and central Chile. The "Río Cruces wetland" in southern Chile is an important site where this species concentrates and breeding itself; yet its population strongly decreased due to the installing of a pulp mill factory.

The "Torca lagoon" is located in central south of the country, and it is one of the areas of concentration for the Black-necked Swan; yet only some few couples breeding and El Yali wetland is a concentration area for swans and its breeding in this place is associated to the El Niño- Southern Oscillation (ENSO). The statistical analysis allows to postulate that during dry years the swans that abandon "El Yali wetland" congregate here and that in rainy years leave the "Torca lagoon" and congregate and breeding in El Yali wetland. Thus, both wetlands form a source-sink system.

Our study does not allow to establish where did the thousands of Swans that left the Rio Cruces wetland went, when the macrophyte, *Egeria densa* declined due to the polllution in its waters. It is possible that they dispersed in several wetlands of the coast and central valley of Chile.

Acknowledgements: To Corporacion Nacional Forestal (CONAF, Chile) for allowing us to have the information gathered by their studies about this species.

11:30

The demography of the Mute Swan population on the River Thames

Christopher Perrins & Matthew Wood

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Abstract

The river Thames is a lowland English river, passing trough areas of high human population. Records have been kept of the breeding success on most of the lower sections of the river for over 250 years.

Since 1991 workers form the Edward Grey Institute have been accompanying the "Swan-Uppers" who make an annual census of the swans on the Thames from London to Whitchurch or (more recently) Abingdon.

The study area does not comprise a closed population; most of the birds coming into the breeding population were raised outside it and few of the birds raised on the Thames are found breeding there.

Nevertheless, most of the birds that settle to breed in the study area remain there for the rest of their lives – though they may not be found during the annual visit. A large number of birds breed only once, but a few birds have survived to reach the age of 20. The average annual survival rate of breeders is a round 75%. Factors affecting the balance of numbers are discussed.

12:50

Habitat utilisation and site occupancy in a long-term study of the Mute Swan *Cygnus olor* in the English Midlands

J.T.Coleman[1]*, A.E. Coleman[2], P.A.Coleman[2], C.D.T.Minton[3]

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Abstract

Over a forty year period the habitat selection, site occupancy and productivity of the paired population of Mute Swans within a 1440 square kilometre area of the English Midlands was analysed. The analysis included 3213 individual swan pairs of which 85% were recorded as breeding pairs. The paired population varied between 53 and 103 pairs per annum between 1961 and 1985 and then showed a period of significant increase in numbers, rising to 162 pairs by 1997. Between 1997 and 2000 the paired population then showed a sustained decrease, with the paired population reducing to 98 by the year 2000. Numbers of non breeding pairs remained remarkably constant throughout the study period.

Of the habitat types used by breeding swans, canals and rivers represented linear habitats and Gravel pits, ponds/lakes and sealed reservoirs represented non linear habitats. Pools and lakes were the most commonly used habitats, accounting for 37.4% of all utilised habitats. This was closely followed by Streams and rivers accounting for a further 27.5% of all the habitats used. The remaining 35.1% was comprised of territories on canals, gravel pits and sealed reservoirs, accounting for 15.4%, 14.7% and 5.1% respectively.

Site occupancy was highest for pools and lakes, rivers and gravel pits with mean site occupancy being 8.8, 8.9 and 9.7 years respectively. One pool was occupied for 37 of the available 40 years of the study, compared to a maximum occupancy of 29 years for one river location and 31 years for one gravel pit location. Reservoirs and canals demonstrated a lower mean occupancy for territories with values of 7.3 and 5.8 years respectively.

The habitats with higher occupancy rates also generally had higher productivity rates with pools and lakes, rivers and gravel pits hatching on average 3.0, 3.4 and 2.9 cygnets respectively, per breeding pair. Reservoirs, which were the least selected sites with lower than average occupancy were also generally poor sites for productivity with an average of only 1.81 cygnets per breeding attempt. Canals although poorly utilised and with low occupancy levels had the highest mean cygnets hatched per breeding attempt with 3.63 cygnets per attempt. This result may be a reflection of disturbance on

canals, limiting the available territories, despite them being good breeding habitats. Numbers of cygnets reared followed a similar pattern.

Mean cygnets produced per breeding attempt increased significantly over the study period for Pools and lakes, and rivers whereas the mean cygnets per breeding attempt remained constant in gravel pits and canals. Reservoirs had a variable productivity rate with mean cygnets hatched per breeding attempt being highly variable between years.

13:10

Long-term trends in the population of breeding and wintering Whooper Swans, *Cygnus Cygnus,* in Sweden

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Abstract

During the first decades of the last century the Whooper Swan was considered as a rare breeding species in Sweden with a population that was estimated to be in the order of about 20 pairs being restricted to some isolated large mires in the northernmost part of the country. During the 1960s some spreading of the species was reported and breeding was also reported from southern Sweden, but the first large-scale survey of the species was not undertaken until 1972-75, when the main breeding areas of northern Sweden (provinces of Västerbotten and Norrbotten) were covered and the population in this part of the country was estimated to be around 310 pairs. A new survey of this part of the country in 1997 showed the population to be around 2700 pairs. New aerial surveys in parts of northern Sweden in 2008 and 2009 showed an increase from 1997 but the rate of increase was lower. National estimates for the country were 5400 (2010), 3780 (1997) and 490 (1985). Sweden is also an important winter area for the species. During the first country-wide surveys in 1971-73 the population was close to 2000 increasing to more than 9000 at the country-wide survey in 2005 (the last country-wide survey in 2010 had much lower totals due to a cold winter). The IWC showed a significantly increasing trend since the start in 1967 but the counts in later years do not reflect the development of the wintering population correctly as more and more Whooper Swans are now feeding in the fields together with geese and are not covered fully by the IWC.

13:30

Populations trends for Coscoroba Swans *Coscoroba coscoroba* at a Mediterranean wetland in central Chile

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Abstract

This study accounts the colonization process in the Mediterranean wetlands at Central Chile by the Coscoroba Swan, this species it was confined to the wetlands of southern of the country; at Magellan region. During our study about waterbird populations on the "El Yali wetland" (33º 47' S, 71º 23' W), the most important wetland for aquatic birds of Central Chile, and a Ramsar site of the Mediterranean region of Chile, in the winter of 1989 we saw for the first time five adults of Coscoroba Swan, far to the north of the country. Since then the population has been growing exponentially, but most recently the population has been increasing more slowly. From 1989 to 2013, the population increased a maximum of 353 adults. On this wetland, this swan occurs all year-round, and breeds successfully every winter-summer. After colonizing the "El Yali wetland", the Coscoroba Swan has colonized several other wetlands in this region; rapidly expanding its distribution in this region of Chile and some of them also has recently begun to breed. Although its abundance in the wetland is not directly related to rainfall; the number of the breeding pairs depends on the level of flooding of the lagoons.

13:50

Breeding Whooper Swans, *Cygnus cygnus,* in the Baltic States, 1973-2013

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Abstract

In Continental Europe, intense year-round persecution through hunting, trapping and egg collection had a major adverse impact on Whooper Swans *Cygnus cygnus* during the centuries up to the early 20th century. National breeding populations were exterminated or pushed close to extinction in many countries, except in Russia. Legal protection of the Whooper Swan halted and reversed the decline, and numbers of breeding pairs have increased since the 1950s. When the Whooper Swan ceased to breed in the Baltic States is not known. After a nesting record in Lithuania in 1965 the Whooper Swan has nested annually in the Baltic States since 1973.

In Latvia, the number of pairs having a nest increased from one in 1973 to 320 in 2013. The first pair of Whooper Swans nested in the western part of the country, and this area has remained a stronghold for the species within Latvia, supporting 87% of 278 sites where breeding was confirmed during the years 2000–2013, with 58% of pairs found in the districts of Liepaja, Talsi and Kuldiga. Most breeding sites were associated with small water-bodies, 75% at artificial ponds and 21% in beaver dams. Few nests were found in lakes, bogs and gravel pits. The Latvian breeding population is still increasing though slower than earlier. The breeding range was extended by one county in 2012 and two counties in 2013. The mean annual increase in the number of nesting pairs was 8.8% during the years 2004–2013.

In Lithuania, where the Whooper Swan is more widely dispersed than in Latvia, the species has bred annually since 1973 and increased to an estimated 120–150 pairs in 2013. The highest breeding densities are associated with a high forest-cover, location of fish-ponds and less urbanised areas in the north-west, south-central and eastern parts of the country. Of 129 confirmed breeding sites, 66% were in fish-ponds, 12% in man-made dams, gravel pits and ditches, and 22% in peat bogs, swamps, lakes, flooded meadows and rivers. The fish-pond complexes offer breeding swans low water levels, good feeding conditions, including access to food provided for the fishes, and low disturbance levels. The mean annual increase in the number of pairs was 27.3% during the years 2008–2013.

Data about breeding Whooper Swans in Estonia are scanty. After a first breeding attempt in 1979 the breeding population increased to 150–200 pairs in 2013. The choice of breeding habitat in Estonia differs markedly from that in Latvia and Lithuania. Of the 39 first known breeding sites, 43% were in bogs, 31% at eutrophic or dyseutrophic lakes and 26% at coastal water-bodies.

Strong indications of breeding competition between Mute and Whooper Swan have been observed in the Baltic States. Annually, Whooper Swans start to breed at 3–5 Lithuanian sites where earlier the Mute Swan was breeding, and several water-bodies in western Latvia where earlier the Mute Swan was breeding are now used by nesting Whooper Swans.

14:10

The population genetic structure of Whooper Swans, *Cygnus cygnus,* in Europe

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The breeding range of the Whooper Swan *(Cygnus cygnus)* has expanded in Europe during the last decades. The breeding population has markedly increased in Sweden, Finland, Germany, Poland and in the Baltic States. To indicate genetic origin of increasing population, the partial mitochondrial DNA analysis was made. Blood or feathers samples were collected for genetic analysis from individuals were not from the same family of known origin in Lithuania (20 samples), Latvia (18), Iceland/United Kingdom (7), Poland (5) and Germany (4). 19 blood or feather samples were collected from birds of unknown origin: 8 birds were spring migrants sampled in Lithuania**,** 10 individuals were sampled during the moulting period in Lithuania (6), Latvia (1) and in the Pechora River delta in northern Russia (3), also 1 wintering bird was sampled in Lithuania. Partial mitochondrial D-loop sequences of approximately 417 bp in length were determined for 73 analyzed Whooper Swans. On the basis of the un-rooted statistical parsimony network two different haplogroups “A” and “B” with 19 different haplotypes were identified. The most frequent haplotype was found in all Whooper Swans sampled in the Continental Europe but not in birds breeding in Iceland. The highest diversity of haplotypes (11) was found in Whooper Swans breeding in Lithuania. Among them 3 haplotypes were unique, also Latvia and Poland had by one unique haplotypes. A unique haplotypes was defined in 2 individuals breeding in Iceland and sampled in the UK, while 3 other haplotypes found in birds of Icelandic origin were also identified in breeders from Germany, Latvia and Lithuania in the breeding sites located close to the seashore. High diversity of 7

different haplotypes were found in migratory birds of unknown origin sampled in Lithuania. In few individuals sampled in Northern Russia one of the most frequent haplotypes characteristic of birds sampled in the Continental Europe was found, also the haplotype defined in certain birds breeding in Lithuania. The current population genetic structure of Whooper Swans sampled in different regions of Europe indicate a possible historic isolation of two different populations. A broad-scale distribution of haplotypes indicates that previously isolated populations currently form one panmictic population with clear signs of the previous reproductive isolation. The same wintering grounds used by the Icelandic population and populations from the Northern Europe increase the genetic exchange between Whooper Swans of different origin. A more detailed study of the population genetic structure of Whooper Swans breeding in the core area of their distribution range is necessary for analysis of phylogenetic relationships between different populations of this species in Europe.

14:50

Tundra swans of the lower Alaska Peninsula: a morphologically distinct North American population?

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Abstract

Tundra Swans (*Cynus columbianus*) nesting along the lower Alaska Peninsula breed farthest south and winter farthest north and exhibit a unique largely non-migratory behavior distinguishing them from all other breeding populations in North America. In this paper, we used multivariate analyses of morphological characteristics and extent of bill coloration to examine if these measures could distinguish the largely resident lower Alaska Peninsula population of approximately 600 individuals from Tundra Swans breeding on the upper Alaska Peninsula, Yukon Delta, Seward Peninsula/Kotzebue Sound and Arctic Coastal Plain. We used a combination of measures from breeding and molting individuals. Measurements from Lower Alaska Peninsula Tundra Swans were also compared to populations wintering in the Atlantic and Pacific flyways. Results provide evidence that adult Tundra Swans from the lower Alaska Peninsula population averaged larger than those from other Alaska breeding populations in most (females) or all (males) morphological measures. However, discriminant function analysis did not provide clear resolution of breeding populations for either male or female data. The lowest amount of bill coloration was observed among Tundra Swans on the Alaska Peninsula compared to all other groups. Hunting is currently closed for lower Alaska Peninsula swans due to its non-migratory behavior and low recruitment. The inter-population differences in morphology we describe will further support management strategies aimed at protecting this unique population.

15:10

Tracking migratory swans and geese in relation to offshore wind farm sites

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Abstract

Satellite-tracking Whooper Swan migration between the UK and Iceland was undertaken in 2009 and 2010 to provide data on their migration routes and flight heights in relation to current and proposed offshore wind farm sites. Wind farms are of concern for swans because their large size makes them less manoeuvrable than other birds, increasing the risk of collisions with turbines. Forty solar-powered GPS satellite tags were fitted to swans at wintering sites of international importance for the species in 2009, 10 to swans caught in Iceland in summer 2009, and 5 were redeployed in Britain in 2010. Twenty-five swans tracked from sites in western Britain in 2009 all migrated along the west coast and 95% departed the country over the Outer Hebrides, whereas 15 tracked from SE England were more likely to migrate along the east coast, with 73% passing over the Firth of Forth and 60% continuing via the Moray Firth to depart from north Scotland. Median flight height was 40 m overland and 12–100 m over water; altitude data recorded by the tags was accurate to ±22 m. Almost half of the swans tracked over the East Irish Sea in spring 2009 crossed the footprints of existing or proposed inshore wind farm sites, and 6 of 7 tracked in spring 2010 crossed at least 1 of 5 operational or potential coastal wind farms. Conversely, all swans tracked from SE England passed either across the land or within the inner areas of the Wash, avoiding overlap with wind farms off the East Anglia coast. Migration patterns are described in relation to flight distances, time of day and weather conditions.

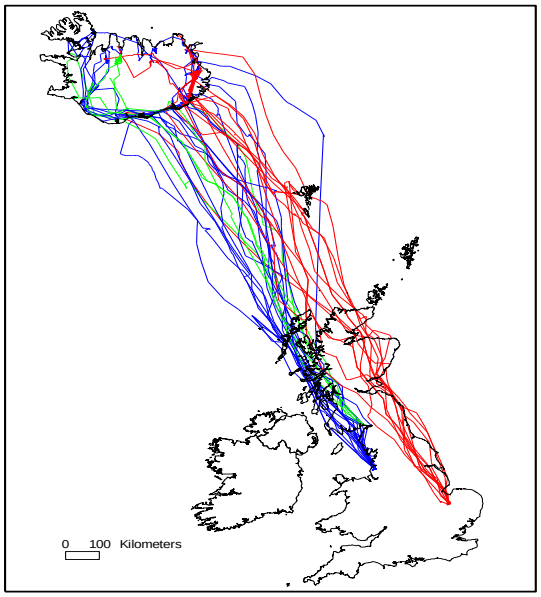

Figure 1. Whooper Swan tracks between Britain and Iceland

15:30

A model for mitigating mortality of cranes and swans from power line collisions

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Abstract

Mortality from power line collisions are a serious issue for large birds such as swans and cranes. I will discuss an example of a model to mitigate take of greater sandhill cranes from proposed power lines that should result in no net mortality. Such a model could be applied to mitigate the placement of new power lines in areas where collision risk is high for similar species such as swans. The model requires knowledge of local population numbers to estimate "take" and define the impacts of such take in population scales. It uses the best available estimates of expected mortality rates from unmarked lines (deaths per crossings), and estimated efficacy of line markers to reduce mortality (generally less than 80%) to estimate expected annual mortality with new, marked lines. Since marking lines does not compensate for 100% of mortality, the remaining mortality can be mitigated by marking additional lines where expected losses are calculated using the same methods.

Tuesday February 4th

08:30

Aquatic macrophyte abundance and distribution in Henry's Fork of the Snake River through Harriman State Park of Idaho, 1988 and 2011–2012

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Abstract

One of the most important wintering and feeding areas for the Rocky Mountain Population of Trumpeter Swans (*Cygnus buccinator* Richardson) is the 12-mile stretch of Henry's Fork of the Snake River through Harriman State Park of Idaho, USA. Here, aquatic macrophyte cover was quantified in 1988 along 68 random-placed transects to determine Trumpeter Swan winter foraging patterns. These same transects were resampled in 2011-2012 to determine any differences in macrophyte abundance and distribution since the 1988 sampling period. In 1988, sampling was conducted from late August to early November; in 2011-2012 sampling occurred in September. Between 1988 and 2011 the amount of bare, unvegetated river substrate at the beginning (upstream area) of the swan wintering area increased 14.50%, and 58.53%, depending on the river section sampled. Moreover, percent cover of Watermilfoil (*Myriophyllum* spp.) declined 36.33% in these same upstream areas. Overall, significant changes in the macrophyte abundance and distribution occurred in the upstream reaches of the wintering ground compared to the downstream reaches at the end of the wintering area.

Aquatic macrophyte distribution and abundance along Henry's Fork of the Snake River through Harriman State Park of Idaho, USA, is dependent upon interacting physical, chemical, and biological factors. As such, changes to these physical, chemical, and biological resources (and their interrelated effects) are causative factors affecting the composition of this unique macrophyte community and, thus, for wintering Trumpeter Swans. Since 1988, increased sedimentation, low winter flows (that dewater the river channel, increase winter frazil and anchor ice formation and subsequently disrupt the physical substrate and remove macrophytes), loss of important nutrients, and waterfowl herbivory have been hypothesized as factors (both anthropogenic and ecological) behind these significant changes. Continued sampling along these transects, combined with experimental treatments, is needed to better understand long-term macrophyte community variation over time, that interactive factors that affect it, and its ability to withstand/respond to these anthropogenic and natural stressors.

08:50

Temporal and geographic selection of agricultural and aquatic habitats by Eastern Population Tundra Swans, *Cygnus columbianus columbianus* during the nonbreeding period

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Abstract

During the 1900s Tundra Swans (TUSWs) and other grainivorous waterfowl began exploiting waste agricultural grains where seasonally available. Shifting from a purely aquatic diet to including agricultural foods was accompanied by changes in migration routes, earlier arrival on spring stopover sites and increased fat stores for many populations of waterfowl. Furthermore, consumption of agricultural grains was correlated with range expansions and dramatic population increases in several species of large-bodied, Arctic nesting waterfowl (e.g., snow geese). However, changes in agricultural practices and continued advancements in harvest efficiency may be reducing availability of waste grain for foraging waterfowl. Therefore, it is important to understand seasonal selection of agricultural and aquatic habitats and to identify the driving forces behind habitat selection by waterfowl.

To explore seasonal selection of agricultural and aquatic habitats, we used satellite telemetry data from 63 Eastern Population (EP) TUSWs during the nonbreeding period (September – June). We explored if selection of terrestrial and aquatic habitats by EP TUSWs was most influenced throughout the annual cycle by season-specific nutritional requirements, food availability or habitat accessibility.

We designed the following competing models; 1) REGION (Atlantic Coast, Great Lakes or Prairies), 2) LATITUDE & LONGITUDE, 3) SEASON (autumn, winter, spring), and 4) STUDY DATE. Support for REGION suggests that discrete regional differences influence habitat selection in TUSWs, whereas LATITUDE & LONGITUDE suggests a continuous gradient of change as TUSWs move throughout nonbreeding period. Support for SEASON suggests that changes in habitat selection are driven by changing physiological needs of TUSWs and these shifts occur at discrete times such as initiation of migration. STUDY DATE also suggests habitat selection influenced by timing of physiological needs, but that these needs scale to time rather than discrete seasonal endpoints. Because weather may influence habitat accessibility, we included indices of snow and ice cover as covariates to account for their

influence on habitat selection. Candidate model sets were tested with Akaike's Information Criterion (AIC) to determine weight of evidence among competing EP TUSW habitat selection models.

Habitat selection varied seasonally and geographically and was likely influenced by changes in nutritional requirements and habitat and food availability. TUSWs selected open water and agriculture in winter, and selected open water during migration, especially in the autumn, whereas wetlands were weakly selected during migration. There was a 2-fold increase in use of agriculture from autumn to spring. Selection for agriculture and wetlands changed continuously with latitude and longitude, whereas selection for open water changed discretely between the Atlantic Coast, Great Lakes and Prairies. EP TUSW habitat management should focus on protecting wetlands and open water habitats, while ensuring adequate availability of waste agricultural grains, especially during winter and spring.

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09:10

Wintering behaviour of Tundra Swans, *Cygnus columbianus,* at the lakes in the Yangtze River Floodplain, Anhui Province, China

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Abstract

Tundra Swan (*Cygnus columbianus*) is a large migratory waterbird, which breeds in the East Siberian tundra regions in Northeast Asia and migrates southward to China and Japan for wintering. In China, the Lakes in the Yangtze River floodplain in Anhui Province are their important wintering areas. Their population is still in decline due to wetlands loss and degradation in recent years. It is important for the conservation of this wintering population to understand the wintering ecology and adaptation to the environment. In this study, we observed the daily activity rhythm, behaviour time budget of wintering Tundra Swans and their behaviours response to environment change. We expect to provide a theoretical basis for the protection of Tundra Swans in the wintering areas.

We spent 50 days observing wintering Tundra Swans at Shengjin Lake from November 2011 to March 2012 and got the daily activity patterns, population and distribution in the winter period. From December 2012 to February 2013, we spent 40 days observing at Huangpi Lake and analyzed the daily activity rhythm, behaviour time budget and behaviour response to environmental change.

Based on the observation of daily rhythm about wintering Tundra Swans, foraging and resting behaviours showed highly significant negative correlation (Huangpi Lake: R=-0.89, P=0.000; Shengjin Lake: R=-0.80, P=0.000) in 10 hours. The daily rhythms in two lakes were different, but both of them had the morning and evening peak foraging. Adults and juveniles showed similar activity rhythm. In time activity budget, foraging and resting were mainly wintering behaviours. Foraging behaviour of juveniles was higher than adults, while resting and alert were slightly lower at Huangpi Lake. Foraging, resting and alert in juveniles were slightly lower in adults at Shengjin Lake. Comparing the behaviours of wintering Tundra Swans in different months and found that foraging and alert were decreased firstly and then increased with the conduct of the wintering period, while resting behaviour was contrary in whole winter at Huangpi Lake. In six behaviours, resting was significant difference (χ^2=11.30, df=3, P=0.010) and alert as well as locomotion were highly significant difference (Alert: χ^2=11.30, df=3, P=0.010; Locomotion: $F_{3,167}$=11.30, P=0.010) in four months at Huangpi Lake. Foraging, resting, alert and maintenance were significant difference (Foraging: χ^2=72.21, df=3, P=0.000; Resting: χ^2=99.71, df=3, P=0.000; Alert: χ^2=77.09, df=3, P=0.000; Maintenance: χ^2=22.32, df=3, P=0.000) and locomotion and social behaviour were highly significant difference (Locomotion: χ^2=11.06, df=3, P=0.011; Social behaviour: χ^2=8.62, df=3, P=0.035) in four months at Shengjin Lake.

Water depth and temperature affected wintering behaviour of Tundra Swans. In the influence of water level on behaviours, resting, alert, maintenance, and social behaviour showed highly significant difference (Resting: χ^2=20.20, *df*=7, *P*=0.005; Alert: χ^2=48.15, *df*=7, *P*=0.000; Maintenance: χ^2=27.10, *df*=7, *P*=0.000; Social behaviour: χ^2=26.28, *df*=7, *P*=0.000) with water depth. Water level on foraging behaviour manifested in feeding intensity and feeding efficiency. The foraging intensity increased with the rise of water depth and they were highly significant difference (Adult: χ^2=21.41, *df*=4, *P*=0.000; Juvenile: χ^2=20.04, *df*=4, *P*=0.000) with water depths and no significant difference (*P*>0.05) in each water depth between adults and juveniles. Foraging efficiency also increased with the rise of water depth but the change was not obviously. The major impact of temperature on wintering Tundra Swans was that foraging behaviour presented a rising trend and resting presents a significant downward trend with increasing temperature. Vigilance, maintenance and locomotion were decreased with increasing temperature and social behaviour was not obviously. Alert, maintenance and locomotion were highly significant different (Alert: $F_{3,31}$=7.78, *P*=0.001; Maintenance: $F_{3,31}$=10.68, *P*=0.000; Locomotion: $F_{3,31}$=3.01, *P*=0.045) in four temperature rank.

Key words: Tundra Swan; wintering behaviour; feeding efficiency; Huangpi Lake; Shengjin Lake

09:30

Application of an individual-based model to predict non-linear responses of staging swans to changes in water level

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Abstract

Predicting the impact on the environment, for instance a given wetland and its components, of a proposed development is notoriously difficult, especially when future conditions fall outside the current range of conditions. In the past decade, individual-based approaches have been developed and applied to predict the impact of environmental changes on wintering and staging coastal bird populations. How many birds make use of a wintering or staging site is mostly determined by food supply. However, the carrying capacity of a site can often not simply be calculated by dividing the amount of food by the consumption of a single individual, because many factors influence food availability and consumption rates, and the ecological relationships are often non-linear. We used an individual-based modelling

framework (MORPH) to analyse how different environmental factors affect the number of migratory Bewick's swans staging at a shallow freshwater lake (Lauwersmeer, the Netherlands) in autumn. Apart from resource density, water depth and sediment type were the most important factors explaining the current number of swan-days (i.e., swans × days), while interference competition and interspecific competition did not improve model predictions. By running the most parsimonious predictive model, we found strong non-linear responses of swan usage to changes in water level. Such non-linear responses should be taken into account when evaluating wetland management options.

09:50

Land use change and decline of Bewick's Swan staging population in West Estonia in last 20 years: reconstruction using Landsat TM sensor image

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Recent decline of the spring migrating Bewick's Swan *Cygnus columiabus bewickii* (BS) in Estonia affected first of all birds, which staged in farmlands. Polders and wet fields were regularly used by feeding BS in spring. Due to collapse of soviet type of farming, such fields were rapidly abandoned, used for real estate development or most often crops were replaced by grasslands.

Land use change was studied in Pärnu County, which is a key spring staging area for BS (harbouring up to ½ of East-Atlantic flyway population). The network of farmland plots around Audru (large polder and wet fields) has been used by 10-17 thousand BS in spring of 1990s, but numbers declined about 3 times in late 2000s. In this period up to 4000 farmland BS shifted to Pärnu Bay (with natural pondweed bed).

To explain dramatic decline of BS numbers, the land use on all known migratory swan stopover sites (1992-2007) in Pärnu County was reconstructed using Landsat TM sensor images. Images from the end of May/beginning of June were preferred. For the period 1990-1999 image from 1992-06-03 and for the period 2000-2010 image from 2007-05-29 were available. Classification was performed with object-oriented methodology, using eCognition 3.0 software. The final analyze on general land use of feeding swans in year 1992 and 2007, is based on 5 complex classes: crops, grasslands, unmanaged fields, forested grasslands/real estate and water/ponds (mainly artificial golf course ponds created in early 2000s).

The cumulative reduction of arable lands and increase of land abandonment is main reason for decline of the Bewick's Swan numbers in the area (Table). But 3 three-fold decline of farmland staging population of BS could not be explained by general land use change only. We state, that it is rather caused by rapid crash of old style farming in core area for swans - narrow coastal belt (10 km from sea) with network of wet grasslands and crops (!) around Audru polder.

Table. Land use changes in 1992/2007 in Audru region, West Estonia.

No.	Land use class	1992		2007	
		No of pixels	Size (ha)	No of pixels	Size (ha)
0	water	19	1,71	97	8,73
1	forested grassland	0	0	4959	446,31
2	unmanaged grassland	530	47,7	1856	167,04
3	grassland	16647	1498,23	11650	1048,5
4	crops	8245	742,05	6879	619,11
Total		25441	2289,69	25441	2289,69

10:10

The expansion of the Whooper Swan, *Cygnus cygnus,* population and its coexistence with the Mute Swan, *Cygnus olor,* population in Lithuania

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The Whooper Swan (*Cygnus cygnus)* and Mute Swan (*Cygnus olor)* are closely related swan species. They were formerly allopatric throughout their breeding ranges, however during recent decades a sympatric distribution had become an important characteristic of these species in Lithuania.

The Lithuanian population of Mute Swans is estimated at about 1000 breeding pairs and the number of breeding Whooper Swans has increased from 1 pair in 1997 to about 130-150 pairs in 2013. Both swan species share the same habitats during breeding and non-breeding periods in Lithuania. Both swan species prefer to breed in shallow eutrophic lakes with sufficient amounts of submerged water vegetation and reed beds. A rapid expansion of the

Whooper Swan population has led to increased species interactions such as the competition for preferred breeding habitats. During the last years breeding Whooper Swans have gradually replaced Mute Swans in many preferred habitats in the country and particularly in fishponds.

This research was conducted in artificial fishpond complexes where both swan species share similar habitats. Several factors of habitat choice of swans were evaluated to find the most important factors for selecting breeding habitats in conflict areas. Analyzed factors included the size of the breeding pond, amount of open water and reed beds within the breeding pond, distances between nests/territories, from forested areas, human settlements, human disturbance sources and tolerance levels to human disturbance.

It was defined that breeding Whooper Swans prefer smaller fishponds with larger reed bed areas than Mute Swans. The most significant factor affecting the differences in the habitat choice of Whooper and Mute Swan was the tolerance to human disturbance. The Whooper Swan is less tolerant to human disturbance, choosing most remote sites for nesting. Also, the Whooper Swan is less tolerant to other adjacent swans than the Mute Swan. Intolerance to human disturbance prevents a more rapid expansion of Whooper Swans. Mute Swans are more tolerant to human disturbance and breed close to people in urban and suburban environments. The Whooper Swan attempts to avoid any contacts with people during the breeding period though certain Whooper Swans were found breeding close to urban habitats.

10:50

Lower foraging efficiency of juveniles constrains use of optimal habitat in swans

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Abstract

After reproducing successfully, birds with extended parental care form family groups. Despite being the dominant social unit, such family groups have been reported to switch to suboptimal habitat earlier than adults without offspring, with potential negative carry-over effects for the next reproductive season. Here we test a proposed mechanism for this earlier habitat switch, namely a low foraging efficiency of the juveniles. Such a test is best performed under controlled conditions, because in the field families may occupy food patches of a different quality than singles or pairs without young. We studied this in Bewick's swans that trample for food buried in the sediment. We found that gross intake

rate of juveniles was down to 60% of that of adults, depending on the burial depth of the food. Trampling (or "treadling") effort did not differ between age classes, but differences in intake rate were related to body size, suggesting that larger or heavier birds were trampling more efficiently. Corresponding giving-up densities in the field were calculated to be c. 60% higher for juveniles than for adults. Our findings are in accordance with the hypothesis that the lower foraging efficiency of juveniles is the main mechanism behind the segregation of birds with and without offspring.

11:10

Illegal shooting of migratory swans and an initiative to address the issue

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Abstract

The migratory whooper swans (*Cygnus cygnus*) and Bewick's swans (*Cygnus columbianus bewickii*) have been protected by national and international legislation throughout their migratory ranges since the mid 20th century, yet illegal shooting of both species still occurs. X-rays taken of wild caught swans at several sites in the UK were inspected to determine: (1) the incidence of embedded pellets in live birds, (2) inter-specific differences in the level of illegal shooting, and (3) trends in the prevalence of shot-in pellets between the 1970s and the 2000s. A significantly higher proportion of Bewick's swans (31.2%) contained shot-in pellets than whooper swans (13.6%). The likelihood of a bird having been shot increased with its age for both species. The proportion of Bewick's swans with embedded shot was higher during the 1970s and 1980s than in the 1990s and 2000s but the incidence remains high, with 22.7% of Bewick's swans X-rayed in the 21st century containing shot. The prevalence of whooper swans with embedded shot did not change significantly over time (14.9% with pellets in the 1980s compared with 13.2% with pellets in the 2000s).

Illegal shooting is of particular conservation concern for the Bewick's swan population because its numbers declined by 27% between 1995 and 2005 and national trends indicate that numbers have continued to decline since then. International collaboration is required for the successful reduction of shooting of migratory swans, as demonstrated for other hunted species, particularly as adherence to national and international legislation is likely to vary between countries. In response to these concerns, the multi-partner Illegal Shooting Project was established in 2011. In collaboration with members of the hunting and farming community, conservation groups and governmental and non-governmental agencies, the Project aims to reduce the illegal shooting of both species across their flyways by: (1) understanding the range of issues leading to the illegal shooting of these migratory swans and

identifying potential hotspots of shooting activity, to determine best practice for addressing the issue, (2) improving awareness of both species, the threat posed to them by shooting and legislation protecting the species within relevant communities, law enforcement bodies and authorities across the birds' respective flyways, in order to encourage greater engagement in addressing the issue, (3) encouraging 'ownership' of the issue by stakeholders across the flyways, and (4) encouraging greater enforcement of protective legislation across the flyways. Information gathered on perception of the levels of illegal shooting along the flyway is also described, together with the initiative to address the issue. Input on potential ways to reduce the illegal shooting of migratory swans would be welcome.

11:30

The ecology and age structure of a highly pathogenic avian influenza virus outbreak in wild mute swans

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Abstract not available

12:50

Assessing temporal distribution of harvested Trumpeter Swans at Bear River Migratory Bird Refuge during the 1999 – 2005 hunting seasons

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Abstract

In 1962, the U.S. Fish and Wildlife Service (Service) authorized the hunting of Tundra Swans (*Cygnus columbianus*) in portions of the Pacific Flyway. Because Tundra Swans often comingle with Trumpeter Swans (*C. buccinator)* in parts of their range, and it is difficult to differentiate the two species in the field, there was much concern that Trumpeter Swans could be accidentally shot during Tundra Swan hunting seasons. In 1995, the Service completed an Environmental Assessment on a proposed action to resolve conflicting management strategies for the Western Population (WP) of Tundra Swans and the less abundant Rocky Mountain Population (RMP) of Trumpeter Swans. An experimental general swan season was established from 1995-99 which restructured existing Tundra Swan regulations and allowed the take of a small number of RMP Trumpeter Swans. As part of the experiment, a monitoring and reporting system was required to collect information on harvested swans. In Utah, hunters that were successful in harvesting a swan were required to have their swan examined at designated locations where certain swan attributes, including bill length, were recorded to assist in identifying the species of

swan harvested. As a result of continuing concerns about the adequacy of hunter reporting, in 2002, a check station was established at the Bear River Migratory Bird Refuge (Refuge) and operated each day of the week during the swan hunting season from 0530h to 1900h. Operating the check station at this intensity was very expensive, approximately $22,000 for two months. Therefore, we analyzed available harvest records from the 1999-2003 hunt seasons to determine when the majority of swans were being checked. Harvest data revealed that only 65% (n=902) of the swans at the Refuge were checked Friday-Sunday; therefore, it was necessary that the check station continue to operate daily. However, analyses also indicated that 96% of swans were checked between 1400h and the end of the day (≥1800) Monday-Thursday and all day (0600 - >1800) Friday-Sunday. Therefore, we recommended staffing the check station during these hours and days to ensure the majority of swans were being checked. Subsequent analysis of harvest data collected for the 2004 and 2005 hunting seasons indicated that after reducing the number of hours of check station operation, the frequency at which swans were checked during those hours remained high at 98% (n=239) and 94% respectively (n=242). Overall, harvest information from Utah indicated that during 1999 - 2005 only 1-2 trumpeter swans were harvested during each season. Because of the expense associated with staffing the check station, combined with results that intensified efforts did not detect more swans compared to methods used prior to establishment of the check station, we recommended that the check station effort be discontinued but that hunters continue to have their swans checked at other designated locations as required.

Key words: *Cygnus buccinator*, *Cygnus columbianus*, trumpeter swan, tundra swan, swan hunting, swan harvest, Rocky Mountain Population, Bear River Migratory Bird Refuge.

13:20

Delineation of Eastern and Western Populations of Tundra Swans in North America: geographic boundaries and Interchange

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Abstract

We address the stability and nature of the well-recognized geographic delineation in North America between Eastern Population (EP) and Western Population (WP) Tundra Swans (*Cygnus columbianus*). Using information from movements of satellite-marked (PTT) birds and recoveries and observations based in part on a major neck-banding effort in Alaska, we reassess the population ranges initially described over 40 years ago. We used the cumulative movement vectors of 50 PTT birds from 5

different breeding areas in Alaska over a 4-year period to create a template for determining population affinities. We found little change in the migration patterns of Tundra Swans since the 1970's. EP swans breed from far northwestern Alaska, across the Arctic coastal plain and northern Canada, and migrate through central Canada (from central Saskatchewan eastward) through the Great Lakes region, and to the central East Coast. WP Tundra Swans breed in tundra habitats from the tip of the Alaska Peninsula northward along coastal western Alaska through the Selawik lowlands of northwest Alaska, and migrate to the western states, primarily wintering in central California. EP birds follow a very defined and narrow migration pathway across the United States during autumn and spring, whereas movements of WP Tundra Swans are more variable and dictated largely by breeding location. Sympatry of EP and WP Tundra Swans is largely confined to a small area in northwestern Alaska during summer. The autumn migration pathways of EP and WP Tundra swans abut in southwestern Saskatchewan, a region from where migrating WP birds turn west, and EP birds deviate abruptly eastward. None of the satellite-marked birds strayed from these established migration routes, however there were notable cross-boundary movements among leg-banded and neck-collared birds which we summarize. Climate-induced decreases in tundra breeding habitats and losses of wetlands on staging areas may lead to changes in the distribution of both these populations, but it is too early to predict the possible consequences on population interchange.

13:40

Wisconsin's Trumpeter Swan Recovery Program: A 25-Year retrospective (1987-2012) on techniques, habitat characteristics, management, threats, and collaboration

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Abstract

Wisconsin's Trumpeter Swan Recovery Program, initiated in 1987, employed 4 recovery techniques: cross-fostering (using feral Mute Swans as foster parents), decoy-rearing ("Alaskan" cygnets imprinted on life-size decoys manipulated in floating blinds at selected wetland sites), captive-rearing (rearing followed by release of 2 year-olds at selected wetland sites), and captive parent-rearing (removal and release of captive parent-raised yearlings at selected wetlands). Eggs collected in Alaska (n=385) during

1989-1997 and cygnets hatched (n=356) at the Milwaukee County Zoo comprised most releases; with cross-fostering abandoned as a recovery technique after 2 years. Wisconsin's Trumpeter Swan breeding population increased from 1 pair in 1987 to 216 pairs in 2012. Breeding habitat characteristics included: shallow (generally 1-2 m deep or less) waterfowl production areas and cranberry impoundments/flowages, with sedge and cattail marshes; shallow state wildlife areas, flowages, marshes, small farm ponds (<2 ac, 1 ha), and glacial potholes, with abundant submergents and emergents (*Elodea, Sagittaria, Potamogeton, Zizania*); backwater sloughs, beaver ponds, bogs, and hardwood swamps with small marshy islands/islets and abundant submergent foods; and lake bay marshes and lake edge marshes. Lead poisoning and shooting comprised over 50% of mortalities during the first 10 years of the program, with power line collisions representing a growing percentage of fatalities during the program's later years. Use of powerline diverters to prevent collisions has proved moderately successful. Similar to other mid-western USA Trumpeter Swan restoration initiatives, collaboration between the private and public sectors proved critical to program success.

14:00

Spraying corn oil on Mute Swan eggs to prevent hatching

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Abstract

During the 1980s and 1990s, non-native mute swans (*Cygnus olor*) increased dramatically in the Maryland portion of Chesapeake Bay. As a method to slow further population growth, we tested the effectiveness of coating eggs in incubation with 100% food-grade corn oil to prevent hatching. During April - June 1996 and 1997, we monitored hatching success and nest abandonment in 26 control and 28 treatment nests. Whereas all full-term control nests hatched at least one egg, with an overall hatching success of 82.8% (111/134 eggs in 22 nests), no eggs in treated nests (0/118 eggs in 19 nests) hatched ($\chi_1^2 = 40.0$, $P < 0.001$). Abandonment was the sole form of nest loss; there was no evidence that any active nest was predated. Abandonment of oiled nests did not differ from that of controls ($\chi_1^2 = 1.17$, $P > 0.2793$), nor did abandonment among treated nests differ from controls between those treated early (first half of incubation) ($\chi_1^2 = 0.83$, $P = 0.3613$) or late (last half of incubation) ($\chi_1^2 = 0.55$, $P = 0.4579$). Treated nests carried full-term were incubated on average an additional 16 $\pm$ 2.63 SE days beyond estimated hatching date. We were unaware of any renesting associated with egg treatment. We applied these experimental results to a large-scale, integrated control program aimed at reducing the feral mute swan population in Maryland. Over a 12-year period (2002-2013, excluding 2004) we treated 1,659 mute swan nests containing 9,438 eggs. We combined egg treatment with the culling of adult swans as part of our control program to reduce the swan population from 3,995 in 1999 to 87 in 2013. Egg treatment was especially effective in reducing the number of swans that required culling. Corn oil provides resource managers with an effective, nontoxic method of reducing mute swan hatching success. While egg oiling can reduce the production of cygnets, however, merely treating eggs does little to reduce the swan population. If managers desire to reduce a population of swans quickly (<5-10

years), an integrated strategy of treating swan nests and removing adult swans (i.e., reducing annual survival) by lethal means should be considered.

Key words: *Cygnus olor*, mute swan, swan control, egg oiling, egg asphyxiation, hatching success.

14:40

Mute swan population growth in Michigan in relation to management intensity

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Barbara A. Avers, Michigan Department of Natural Resources, 530 W. Allegan St., Lansing, MI

David Marks, USDA - APHIS - Wildlife Services, Okemos, MI 48864

Abstract

Mute swans (*Cygnus olor*) are not native to North America and distribution and abundance of this invasive species has increased significantly throughout the lower Great Lakes since their introduction in the mid-twentieth century. There is much concern about potential negative impacts of mute swans on native waterfowl, waterbirds, submerged aquatic vegetation, and wetland habitats. Given that the species is non-native, and projected ecological and social impacts could be large, the Mississippi Flyway Council and Michigan Department of Natural Resources (MDNR) established control policies and associated population reduction goals in the mid-1990s. Historic accounts of mute swan abundance based on complete counts going back to 1949 and more recent population estimates resulting from MDNR's spring waterfowl survey conducted since 1991 provide a record of population growth in Michigan. This long-term monitoring suggested that despite initiation of opportunistic control efforts going back to the 1980's and focused on public lands in southern Michigan, the mute swan population grew rapidly through 2010. The MDNR reviewed existing policies and control programs in 2010 in consultation with Federal agencies, local governmental units, animal welfare groups, waterfowl hunting groups, conservation organizations, and other stakeholders. Part of the evaluation included critical review of mute swan population dynamics and levels of control needed to meet a short-term goal of population stabilization and long-term population goal of no more than 2,000 mute swans in Michigan by 2030. Prior to 2010, less than 500 mute swans were taken annually. However based on simulated population growth in relation to differing levels of mortality, the amount of mute swan take was increased to approximately 2,700 by 2012. The growth rate of the Michigan mute swan population was higher during the period before expanded control (1949-2009: $\hat{\lambda} = 1.09$; 95% confidence interval: 0.08 – 0.10) compared to after expanded control was initiated (2010-2012: $\hat{\lambda} < 0.01$; 95% confidence interval: -0.05 – 0.05). Although early in the expanded control program these results suggest population growth has levelled off in Michigan. We recommend continued monitoring and expanded research to better understand the role of movements and density dependence in mute swan population dynamics and control.

15:00

Using public engagement, outreach, and collaboration to support management of a rapidly increasing mute swan population in Michigan

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David R. Luukkonen, Michigan Department of Natural Resources, Rose Lake Wildlife Research Center, 8562 E. Stoll Rd., East Lansing, MI, 48823

Abstract

Mute swans (*Cygnus olor*) are an exotic invasive species whose population has increased significantly throughout the lower Great Lakes since their introduction during the mid-twentieth century. Based on historic and simulated population growth, the Michigan mute swan population could exceed 24,000 birds in five years if active management activities were ceased. The negative impacts that mute swans have on native waterfowl, waterbirds, submerged aquatic vegetation, and wetland habitats are well documented. The Mississippi Flyway Council and Michigan Department of Natural Resources (MDNR) established control policies and associated population reduction goals in the mid-1990s in response to potential ecological and social impacts of this rapidly increasing invasive species.

In 2010, the MDNR engaged federal and state agencies, local governmental units, animal welfare groups, waterfowl hunting groups, conservation organizations, and other stakeholders during a review of existing policies and control programs. As part of this review, MDNR simulated dynamics of Michigan's mute swan population to guide short- and long-term mute swan management decisions and to evaluate alternative control strategies. In relation to projected future mute swan abundance, there are several management options to achieve population goals with differing social implications. Despite well documented negative impacts of mute swans, management efforts have been difficult to implement on a large scale because of social and political challenges. We suggest that a strong educational and outreach effort is necessary to sustain levels of mute swan take required to meet management goals; MDNR has developed an outreach plan using web-based and printed communication tools, as well as training professional staff to communicate effectively with the public about mute swan management. Natural resource managers from state and federal agencies in the Great Lakes region met in August 2013 to discuss mute swan management in a regional context and to identify potential for future collaboration.

15:20

Citizen science, grass roots efforts and their contributions to swan management

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Western Washington hosts the largest concentration of wintering Trumpeter Swans in North America and the population is returning to the state's east side. Agency budgets have been substantially shrinking and along with this their ability to devote adequate time and resources to swans related to conducting field oriented needs including swan surveys, respond to swans in distress and respond to the public's interest in these beautiful birds that grace their lives. Private citizens and non-government organizations are well suited to fill this gap. When local people care, habitat and species conservation happens. The Washington State Swan Stewards, the local arm of The Trumpeter Swan Society, has been active in this collaborative work for more than 30 years. Our partnerships and collaboration with the Washington Department of Fish and Wildlife and the U.S. Fish and Wildlife Service as well as many NGOs and citizens has provided valuable data and written documents and maps that have substantially improved information upon which swan management decisions are made. Funding is another partnership that happens to maximize dollars, leverage and lobby to get the funds needed to get larger projects done.

The process by which these collaborative or partnership efforts happen are discussed, including how citizen science projects and even random swan sightings can and do contribute substantially to the overall conservation of Trumpeter Swans and their habitats. Even with a small budget or all volunteer effort, much can be accomplished by getting citizens involved as well as local landowners, especially farmers. Grass roots efforts in our rural areas are key to understanding Trumpeter Swan biology and distribution. Google Maps and other internet tools have proven valuable in getting and keeping citizen involvement. The results of these efforts has produced updated maps and data that agency biologists have to provide better swan management. We serve as the clearing house for all things swan in Washington State. Whether it is biological, citizen interest, agency policy or political we offer an explanation of how this web of private-public collaboration can and does work to provide the best for swans in the Pacific Coast Population and Washington State.

15:40

Citizen awareness and options about Chesapeake Bay Mute Swans

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Abstract

Concerns surrounding the ecological impacts from increasing numbers of feral mute swans (*Cygnus olor*) have led some management agencies in the United States to implement control efforts directed at reducing populations of this invasive species. In February 2005, we conducted a telephone survey of 625 Maryland residents to determine their opinions and attitudes toward mute swans, options for controlling this non-native swan, and the importance of the health of Chesapeake Bay to help strengthen the state's mute swan management. Although most respondents were unaware of mute swans (72%) and the problems they caused, most respondents indicated they would support mute swan population control if provided evidence that this species was harmful to the Bay's ecosystem; they felt the health of Chesapeake Bay was more important than sustaining a nonnative swan population. Most respondents (83%) also thought the Maryland Department of Natural Resources (MDDNR) should regulate this species and most (86%) supported the agency controlling the mute swan population. A majority of respondents (64%) supported egg addling as a control method. Of those respondents that supported more aggressive control measures, 62% supported the use of lethal methods of control including hunting. About 72% of respondents were confident that the MDDNR would implement control methods that were both humane and effective in solving the overabundance of mute swans. Most respondents (90%) supported the allocation of resources to increase public awareness about mute swans and their impacts to the living resources in Chesapeake Bay. Our results provide useful information to wildlife professionals for management planning and communication when considering control of feral mute swan populations.

Key words: Mute swan, *Cygnus olor*, public opinion, attitudes, control, management, Maryland, Chesapeake Bay.

Thursday February 6th

08:30

Population of the Mute Swan in central Poland- fifteen years of study

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Abstract

The Mute Swan as a breeding bird appeared in Lodz region in the 70ties of XX century. Since the 80ties it became a common breeding wildfowl in that part of Poland. The extensive observations of local breeding population started in 1996 and are continued till present year. Regular field works that used birds' ringing and breeding data collection were introduced in 1998. The size of study area was ca. 8800 sq km. The main habitat occupied by swans were different waterbodies created by man such as fishponds, dam reservoirs and small ponds situated in villages. The only natural habitat used by breeding pairs are oxbow lakes and flooded river valleys during spring. The population consist mainly of fraction of non-breeders. This group (600-1600 birds) was located at 13 main moulting sites, each gathering more than 30 individuals. Annually up to 20 % of birds establish breeding territories. Number of breeding pairs fluctuated from 69 to 100 pairs, 80 % of them build nest and lay eggs. Number of breeding pairs was connected with weather conditions during preceding winter. Long periods of frosty days during winter resulted in breeding population reduction next spring. Regular ringing allowed to collect data about life history of ringed individuals. The rotation of breeders within the population was considerable, from 242 ringed breeding birds 54 % were observed only during 1-2 breeding seasons. The longest observed breeding period was 14 years for female and 10 years for male. The number of cygnets produced by each individual was positively related to number of breeding seasons. The majority of young birds was produced by the small fraction of breeders. The 75 % of all cygnets were produced by individuals that breed at least for three seasons (46 % of birds). The best breeding output was 64 cygnets produced during 14 years. 59 cases of partner change were detected in years 1996-2012. This behaviour was correlated with poor breeding success in previous season. Moreover, presence of a new partner often resulted in territory change. Breeding dispersal distance was short (3,5 km, n=42). A new territory was usually situated within the same fishpond complex and birds moved to the nearby pond but longest detected distance was 34,5 km. Wintering grounds of local population are situated in the southern part of Poland, 100-200 km from study area. Some pairs fly further distances, even up to 500-700 km to Hungary or Croatia. There is a small fraction of birds that stay as close to their own breeding territory as possible. Presence of river that does not freeze even in severe winters promote lack of winter migration. However pairs that occupy territory whole year round are scarce and can be found only in urban areas.

08:50

Nest density and breeding biology of the Bewick's Swan, *Cygnus bewickii,* during dramatic increase in Chaun River Delta, east Russia

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The breeding success of Bewick's Swans *Cygnus bewickii* nesting on Ayopechan Island in the Chaun River delta, Chukotka, northeast Russia was recorded from 2002–2013 inclusive, which coincided with a marked increase in the number of Bewick's Swans in the Eastern Eurasia. Nest density, clutch size, egg dimensions, earliest hatch dates and nest success (i.e. whether at least one egg hatched) was recorded. Nest predators were recorded in 2013 with the use of camera-traps and from direct observations. A total of 536 nests was located in the Chaun River delta over the years. Average nest density was 2.08 nests/km^2 (range = 0.98–3.33 nests/km^2) and nest density appeared to increase over the study period. Clutch averaged 3.69 eggs (s.d. = 1.099; range = 1–7 eggs, *n* = 424 clutches). Mean clutch size decreased during the study, through there being a decreasing proportion of large clutches of 5 and 6 eggs. Extraordinary clutch of 7 eggs was observed once in 2003. Apparent nest success, recorded in 2009–2013, ranged from 28.1–72.2% and averaged 45.7% across years. Weather variables, such as the date when temperatures rose above zero, the timing of snow melt, late May and early June temperatures, and a general (integrated) measure of spring weather conditions were tested to effect nest density, clutch size and nesting chronology.

09:10

Natal and breeding site fidelity for Whooper Swans in Iceland

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Abstract

The Icelandic-breeding population of Whooper Swans, now numbering c. 29,000 birds, migrates mainly to Britain and Ireland, with some 500-1,300 birds overwintering in Iceland. Swans in family groups and non-breeding flocks, in three discrete study areas in northern Iceland (Myvatnsheidi, Skagafjordur and Jokuldalsheidi), have been caught and marked with plastic leg-rings from the 1980s onwards. Spring observations made at Skagafjordur since 1988 have provided additional data on the return rates and occupancy of breeding territories for individual swabs identified by their ring codes and natural bill markings. This presentation considers sex differences in the dispersal patterns of Whooper Swans,

originally ringed as cygnets, returning to Iceland to breed. In particular, whether females are more likely than males to return to natal area to breed (which would support optimal out-breeding hypotheses) is assessed, and whether returning offspring nest closer to their parents than unrelated birds is considered. For newly-formed pairs, whether males (which take the lead in defending a territory) are more likely than females to bring a new mate to their previous nesting area is analysyed, and the extent to which this pattern is modified by the age or breeding experience of each member of the new pair is addressed.

09:30

Observations on breeding in the BLACK SWAN (*Cygnus atratus)* in south east Queensland, Australia

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ABSTRACT

Between 2007 and 2012 the breeding biology of a population of banded Black Swans on the Gold Coast, south east Queensland, Australia was studied. The number of non-breeding pairs varied between 5 and 11 pairs in each year of the study with the number of breeding pairs varying between 13 and 23 pairs per annum. Between 23 and 39 breeding attempts were recorded each year and 36% of all breeding attempts were unsuccessful. The percentage of breeding failures increased in years of high rainfall as did the number of breeding pairs and breeding attempts.

The majority of pairs (65%) bred once per year, 35 pairs (22%) bred twice, 11 (7%), three times, 2 (1%) four times and 7 (5%) bred 5 times in a year. While most follow on breeding attempts were preceded by a failed breeding attempt 41 (28%) of second breeding attempts followed a successful breeding attempt with 4 cases where 3 broods of cygnets were hatched in a single year. However, birds consistently nesting three to five times per annum did not have, on average, better productivity than those nesting only once or twice per annum during the period of the study.

The mean age of first recorded pairing for birds of known age was 2.8 years old and the mean age of first breeding was 3.1 years old. The mean number of cygnets hatched per breeding attempt varied between 1.6 and 2.6 cygnets for each year of the study with the lowest productivity associated with the years of highest rainfall. The mean number of cygnets reared varied between 1.0 and 2.3 cygnets per breeding attempt.

Cygnets were hatched in every month of the year, with the exception of November. The highest numbers of cygnet hatchings were recorded in March to April and August to September, avoiding the wettest times of the year.

Seventeen of the 78 banded birds (21.8%) recorded breeding changed mate at least once during the study period. Seven of these (9%) were known to be as a result of divorce, where the previous mate was known to be still alive and 3 (3.9%) were a result of the death of a previous mate with the remainder as cause unknown.

Breeding birds were in better body condition than same age birds from non-breeding pairs which were in turn in better condition than non-breeding flock birds. The results from this study are discussed in relation to climate and opportunistic breeding behaviour in this species.

9:50

Trends in long-term Bewick's Swan breeding success data, in relation to population development and climate change

Jan Beekman, et al.

10:10

Geographic variation in clutch size and egg weights from the Interior and Rocky Mountain Populations of Trumpeter Swans, *Cygnus buccinator*

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Abstract

Several studies have investigated spatial or temporal variation with both clutch size and egg weights in waterfowl and other avian species (Svagelj et al 2012, Christians 2002, Klomp 1970, Blackburn 1991a, Dunn and MacInnes 1987). One study by Rohwer (1988) and another by Rohwer and Eisenhauer (1989) looked at clutch size and egg weights in trumpeter swans comparing between those that breed in Alaska (PCP: Pacific Coast Population) and Montana (RMP: Rocky Mountain Population). However since that time, trumpeter swans have been reintroduced into the Midwest around Wisconsin, Michigan, Minnesota, and Iowa and have been labeled as the Interior Population. The Interior Population (IP) has grown 13% during 1968 – 2012 and over 16% between 2005 and 2012 (Groves 2011). The Rocky Mountain Population (RMP) has grown only 6.3% from 1968 – 2010 and 13% from 2005 – 2010. Since larger clutch sizes and heavier eggs may be an indication of fitness as well as resource availability we investigated if there were significant differences in clutch size and egg weights between the Interior Population and Rocky Mountain Population of trumpeter swans.

A total of 1,113 eggs at 283 nests were measured or weighed in addition to information found in the literature. Average clutch size ranged from 5.8 eggs per nest in Minnesota and Grand Prairie Alberta to 3.5 eggs per nest for the Wyoming wild birds. Average egg mass ranged from 373.80 grams in MN to 333.25 grams for the WY wild birds. The Interior population average clutch size of 5.6 eggs (s.d. = 1.70, CV = 30.85%, n = 121) was found to be significantly different ($P = 0.006$) than the Rocky Mountain population's average clutch size of 4.3 eggs (s.d. = 1.43, CV = 33.03, n = 65). Similarly, the Interior population's average egg weight of 366.43 grams (s.d. = 32.53, CV = 8.88%, n = 120) was significantly different statistically ($P \leq 0.001$) than the Rocky Mountain populations average egg weight of 336.98 grams (s.d. = 32.32, CV = 9.59%, n = 65).

The mean clutch size and egg size was within the range of other studies involving trumpeter swans. However, clutch size and egg weights varied significantly between the Rocky Mountain and Interior populations of trumpeter swans. Life History strategies (Lack 1968), individual fitness (Rockwell et al 1977), variation in the environment (Smith and Fretwell 1974, Rohwer 1992) have all shown that there are numerous drivers the might explain differences in clutch size and egg weights. Eventually those drivers can be broken down into 2 categories: Genetics and Environmental Factors (Perrins and Jones 1974, Figuerola and Green 2005).

10:50

Density and productivity comparisons between two distinctive breeding flocks of Trumpeter Swans in southcentral Alaska

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Abstract

Trumpeter Swan (*Cygnus buccinator*) aerial surveys were conducted in the Susitna Flats and the Matanuska-Knik River during the nesting periods of 2010 through 2013. Nesting swans exhibited differences in density and productivity in the two areas apparently influenced by habitats, climate, and disturbances. The Susitna Flats swan nesting grounds (300,000 acres) located 25 miles northwest of Anchorage is 10 times larger in size than the Matanuska-Knik River (30,000 acres) located 30 miles northeast of Anchorage. The Susitna Flats is enclosed in the Susitna Flats State Game Refuge while the Matanuska-Knik River is primarily within the Palmer Hay Flats State Game Refuge on the west and the Knik River Public Use Area on the east. The Knik River Public Use Area is State recreational land having the highest motorized off-road vehicle use in Alaska while the Susitna Flats is limited to minimal motorized vehicle access and use. The density of nesting pairs of swans in the Matanuska-Knik River is denser than the nesting pairs in the Susitna Flats. Nesting pairs of swans in the Matanuska-Knik River average 12 pairs while the average in the Susitna Flats is 16 pairs. Productivity of the nesting pairs of swans averages over 4.0 cygnets per pair at fledging in the Matanuska-Knik River with lower numbers near 3.0 cygnets per pair in the Susitna Flats. The cygnet survivability during the summer months is usually high in both areas and varies between 75% and 96%. Spring of 2013 was delayed by a month in

the Susitna Flats due to several large snowfalls and lower than normal temperatures throughout the month of April. The snowpack and frozen water bodies delayed the beginning of swan nesting during their normal time in mid-April. The late nesting in the Susitna Flats in 2013 resulted in low numbers of cygnets in broods averaging less than 2.0 in June compared with higher numbers of 4.0 cygnets per brood in Matanuska-Knik River which thawed out earlier.

11:10

Trumpeter Swan brood response to wetland draw-down and changes in food abundance

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Abstract

Drawdown of ponds in Aurora, Ontario, increased the abundance of invertebrates and plants, especially snails and *Lemna*. The response following re-flooding was ephemeral, lasting only one year. Wild Trumpeter swans (*Cygnus buccinator*) and their cygnets responded to the food abundance by foraging intensively and selectively. The nutritional composition of these foods, especially the protein, calcium, phosphorus and magnesium, satisfied their requirements for skeletal growth and development, and was higher than that of the available commercial duck grower rations. The development of the skeleton of a cygnet to fledgling stage requires deposition of 169g of calcium, 76g of phosphorous, and 2.1g of magnesium over about 117 days, in addition to the other tissue building and maintenance requirements. The feeding behaviors of the cygnets can be considered typical of specific appetitive behavior.

11:30

The exception to the rule: retreating ice front makes Bewick's swans migrate slower in spring than in autumn

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Abstract

In the vast majority of migratory bird species studied so far, spring migration has been found to proceed faster than autumn migration. In spring, selection pressures for rapid migration are purportedly higher, and migratory conditions such as food supply, daylength, and/or wind support may be better than in autumn. In swans, however, spring migration appears to be slower than autumn migration. Based on a comparison of Tundra swan tracking data with long-term temperature data from wheather stations, it has previously been suggested that this was due to a capital breeding strategy (gathering resources for breeding during spring migration) and/or to ice cover constraining spring but not autumn migration. Here we directly test the hypothesis that Bewick's swans follow the ice front in spring, but not in autumn, by comparing three years of GPS tracking data from individual swans with concurrent ice cover data at five important migratory stop-over sites. In general, ice constrained the swans in the middle part of spring migration, but not in the first (no ice cover was present in the first part) nor in the last part. In autumn, the swans migrated far ahead of ice formation, possibly in order to prevent being trapped by an early onset of winter. We conclude that spring migration in swans is slower than autumn migration because spring migration speed is constrained by ice cover. This restriction to spring migration speed may be more common in northerly migrating birds that rely on freshwater resources.

12:50

Moult migration of non-breeding Whooper Swans, *Cygnus cygnus,* in the south-eastern Baltic region

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Abstract

Non-breeding Whooper Swans *Cygnus cygnus* in the south-eastern Baltic region use three different moult migration strategies. The vast majority migrate to traditional moulting grounds in Russia. Other non-breeders carry through a moult migration but stop to moult in the Baltic States. The third group consists of birds that moult in a fishpond close to their site of hatching or breeding.

Non-breeding Whooper Swans were recorded moulting for the first time in Latvia in 1989, in Estonia in 1993 and in Lithuania in 1997. Moulting has been recorded at 13 sites, three in Estonia and five each in Latvia and Lithuania. The total number of moulting non-breeders increased from at least 83 birds in 2003 to at least 187 birds in 2012. During the years 2003–2012 the total number of moulters was stable around 10% of the estimated number of non-breeders in this population. The majority of the neck-collared birds found moulting as non-breeders in the Baltic States originated from within 25 km of the moulting site, the others from countries, including Germany and Poland, situated to the south of the moulting site. Distances between sites of hatching or breeding and moulting for these two groups ranged 0–81 km and 191–836 km, respectively. The propensity to moult locally differs greatly among different parts of the Baltic States. This might be related to the fact that the Whooper Swans breeding in this region are of mixed origin. Of non-breeders caught for ringing, 40% were 2nd calendar year birds, the others older.

Of cygnets hatched in Latvia and known to be alive about 99% left the Baltic States to moult somewhere else in their 2nd–6th calendar year. One sixth of these were re-sighted in Finland during moult migration and one individual was re-sighted at the White Sea coast (Russia) during pre-moult migration. Moulting sites were recorded for four individuals: two marked with neck collars and two fitted with satellite transmitters. All four moulted in the Arkhangelsk Region of Russia. Distances between sites of ringing and moulting ranged 1,283–1,662 km. All individuals were recorded moulting as two or three year old birds. Those moulting in Russia left Latvia/Estonia before 20 June and returned after mid September. Departure pattern from Latvia/Estonia is influenced by the severity of the winter, the birds leaving later after a severe winter.

No Whooper Swan marked in Lithuania has been reported moulting in Russia. Otherwise, Lithuanian birds show the same pattern of pre-moult departure and post-moult return as the Latvian birds, including a large proportion of the marked birds re-sighted in Finland.

13:10

The autumn migration of the Bewick's Swan, *Cygnus columbianus bewickii,* in Poland

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The Bewick's Swan *Cygnus columbianus bewickii* breeding in arctic Russia, migrates for winter to western Europe (particularly to Germany, Netherlands and Great Britain). In the past its migration route was going mainly across southern Fennoscandia and only few occurred in northern Poland. During last few dozen years the population number of the Bewick's Swan has been decreasing.

The subject of presented analysis concerns the occurrence of the Bewick's Swan during its autumn migration across Poland in the period of the last 5 decades (1961-2010). Together over 1500 times the species was observed in mentioned time, including almost 28 000 individuals. Though collected data within this period were noted with different accuracy, however some general characteristic and trends are possible to be mentioned.

Birds were observed both in mixed flocks (with other swan species) and in flocks consisted only of the bewicks in a number of few to almost 300 individuals. The average size of autumn flock in Poland amounts to 18 individuals. Most of flocks up to 10 birds have been occurred within following decades (from 58% to 69%). And on the other hand the number of flocks with 50-100 birds has increased from 5% to 9%.

In two last decades 71% and 87% of the Bewick's Swan presence were noted in central Poland. Analysing the time of autumn occurrence of the species in Poland one may note that it starts a little bit earlier from the beginning the early 1980s. In the 1970s 71% swans crossed Poland in 1st and 2nd decade of November, however in next decades most birds migrated in 3rd decade of October and 1st decade of November.

The Bewick's Swan when migrating across Poland prefers to stop in ponds (almost 60% birds occurred there). Next preferred habitats are lakes (18%), meadows and arable fields (9%), Baltic Sea shore waters (Gulf of Gdansk 6%) and rivers (4%).

In decades 1961-1970 and 1971-1980 there were 31% and 28% of young birds indicated within migrating flocks. In the last decade 2001-2010 this proportion was only 13%.

13:30

Seasonal migration of Bewick's Swans on the East-European tundra of Russia

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Abstract

Information about migration of the Bewick's swan was collected during 1973-2012 in tundra of Nenents autonomous district of Archangelskaya region and basin of Pechora River (Komi Repulic). Migrations were studied by methods of terrestrial and avian records and regular observation on stationary places.

Spring migrations. From mouth part of Severnaya Dvina River Bewick's swan flies to Malozemelskaya, Bolshezemelskays tundra and Yugorskij peninsula along Barents Sea coast, and part of them through Pechora River basin. In Malozemelskaya tundra arrival of swans occurred at 3-17 of May, mass migration occurred at 18-25 May, finishing of migration – at 5 of May. In Bolshezemelskaya tundra birds appears at 30 of April-8 of May, mass migration occurs in take place in third decade of May-first decade of June, and finishing of migration was observed at 8-18 of June. On Yugorskij peninsula first swans were registered at 7-9 of May, mass migration registered at 23-30 of May, and finishing of migration observed at 9-13 of June.

Summer migrations. In Malozemelskaya tundra they take place at 9-16 of June, mass migration observed from 18 to 27 June, and finishing at 1-27 of July. In Bolshezemelskaya tundra migration of swans registered at 10-23 of June, mass movement – at 10 of June – 19 of July, and ending of migration at 27 of June-31 of July. On Yugorskij peninsula migration of Bewick's swans were registered at 19-28 of June, active phase before 29 of June, and finishing of migration proceeds from 4 to 28 of July.

Autumn migrations. In Malozemelskaya tundra because of worsening of weather conditions pronounced departure of swans registered at 5-13 of September. Mass migration takes place from 16 of September to 13 of October, and finishing at 5-17 of October. In Bolshezemelskaya tundra active departure of swans to wintering grounds occurs at end of August-first decade of September. First wave of migration take place from 14 of September to 1 of October, on Yugorskij peninsula at 14-29 of September.

13:50

Autumn staging swans in the Pechora Delta region of Russian Arctic.

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A census of the population of birds in autumn was carried out from 19-24 September 2012 and 18-24 September 2013.

In 2012 the regional reserve “Nizhnepechorsky” were covered. Water routes were 550 km. Aerial surveys (total length 765 km) and water surveys (total length 450 km) covered the territory of the “Nizhnepechorsky” regional reserve and “Nenetski” reserve were conducted in 2013.

The main goal of our research was to assess the number of swans concentrated in the Pechora delta during autumn migration. The main concentration of swans was in the tidal shallows at the Korovinskaya Bay on so-called freshwater river flooded shallows. In autumn birds gather in large concentrations in coastal habitats. They prefer places with abundance of *Potamogeton*, nodules of which they feed outside the breeding season.

Whooper swan is a mass species. Birds were met throughout the routes. Major concentrations were observed in shallow water and in the exits to the Pechorskaya and Korovinskaya Bays. They were noticed in mixed flocks with Bewick's swans. In 2012 broods were not met, and in 2013 six broods of Whooper swans were seen (average brood size = 2.2). After two years, the total number of swans encountered prevailed over the number of Bewick's Swan. Apparently, the birds come here to molt and gather in migrating flocks from more southern species habitat areas because of rich food base of these habitats.

Bewick's Swan is a mass species. Russian Red data book species. In 2012 and 2013 years 14 broods of Bewick's swans were seen (average brood size = 1.9). In 2012, in the northern sector on the lake “Golodnaya Guba” a flock of 776 swans were seen, including 8 broods of Bewick's swans (av. brood size = 2.1) and in the Tundra sector there were about 430 swans with 12 broods of Bewick's swans (av. brood size 2.6).The total number of swans on the Pechora sector in 2012, although double counting cannot be excluded, is 3,500-4,000. The total number of swans in the reserve “Nizhnepechorsky” was approximately 4,500 - 5,000.

According to the results of aerial surveys in 2013 the total number of swans on the surveyed area was 15,870 swans. Experts estimate at the end of September (2013) was 16000-16500 swans in the Pechora river delta. To estimate the number at the species level, we carried out selective ratio estimation of species where it was possible to do. Correlation between Whooper swan/Bewick's swan was 512/184 respectively in the region of Korovinskaya Bay (census data); on the received photo images - 427/292 respectively. This shows that correlation of number between Whooper swan/Bewick's swan varies from 1/1, 8 to 1 /2, 8, respectively. Researches conducted in 2012 in the upper regions of the delta gave a correlation of 1 /4, 2, respectively.

According to the results of two years counts we can say that the number of whooper swans in the study area during the autumn period was 10200 - 11700 individuals and Bewick's swan made 4200 - 5700 birds. According to current number of Bewick's Swan (20000) and Whooper swan (59000) nearly 20-30 % and nearly 17-20% of the birds population wintering in Western Europe stop in the Pechora delta during autumn migration.

Before our work, many researchers conducted general surveys of swans without separation them on species, or speaking only about Bewick's Swan. According to our research we can say that the Pechora delta is the one of the main places of autumn swans concentration before migration.

14:10

Lead poisoning of swans in the UK: are current regulations restricting the use of lead in gunshot and angling weights protecting swans?

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Lead poisoning is one of the most commonly reported causes of death for wild swans in Britain, second only to flying accidents which may also be related to lead toxicity. Poisoning is commonly caused by the ingestion of spent lead shot, whilst the swans are feeding in areas where hunting also occurs (Spray and Milne1988; O'Connell et al. 2008). The risk to waterbirds from poisoning from lead gunshot has resulted in legislative restrictions on its use, either over wetlands or for all shooting, in many countries across the world. In the 1970s and 1980s, lead angling weights were a major cause of mortality for Mute Swans (*Cygnus olor*) in the UK (Birkhead & Perrins 1986) probably because of their habit of frequenting urban rivers and lakes where fishing activity is high. Legislation restricting the uses of lead in angling weights was introduced in England in 1986.

Here we examined both current and historical evidence of the incidence of lead poisoning in wild swans, through the analysis of blood lead levels of live birds caught in Britain during the 2010/11 winter, and, lead-poisoning induced mortality of birds recovered at sites in Britain between 1971 and 2010. Secondly, we examined variation in the incidence of lead-poisoning induced mortality of wild swans recovered in England between three time phases (1971-1987, 1988-1999 and 2000-2010) to evaluate the efficacy of increased awareness of lead poisoning brought about through mortality of Mute Swans from ingesting angler's weights and a subsequent ban on their use and legislation restricting the uses of lead gunshot.

Despite the introduction of legislation restricting the use of lead in ammunition in England (in 1999), Wales (in 2002), Scotland (in 2004) and Northern Ireland (2009), the study found that Whooper Swans (*Cygnus cygnus*) and Bewick's Swans (*Cygnus columbianus bewickii*) continued to exhibit lead-induced morbidity and mortality. Overall, 12.8 % of Bewick's Swans and 42.9 % of Whooper Swans caught during winter 2010/11 were recorded as having lead poisoning, currently classed as blood lead levels exceeding 20.0 μg/dL. The probability of Whooper Swans dying from lead poisoning in England did not vary between the three time phases. In the UK, Whooper and Bewick's Swans commonly forage on agricultural land over which it is largely legal to shoot with lead gunshot. Furthermore, compliance with the regulations restricting the use of lead gunshot in England has been poor (Cromie et al. 2010). The proportion of Mute Swans found to significantly change over time: from 25 % (1971–1987) to 4.6 % (1988–1999) and 2 % (2000–2010). These results support other evidence that legislation restricting the sale and use of lead fishing weights has had an effect in reducing lead poisoning in this species (Perrins et al. 2003). A renewed commitment from international conventions and national legislation is needed to achieve a broad-scale transition to the use of non-toxic hunting and angling materials on all environments.

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14:30

Lead shot poisoning of swans within Whatcom County, Washington and Sumas Prairie, British Columbia: sources, management and remediation

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(5) The Trumpeter Swan Society, Plymouth, Minnesota

Abstract

Swan populations in northwest Washington State and on the Sumas Prairie, British Columbia have lost at least 2,000 members to lead poisoning since 1999 through the ingestion of lead pellets. In 2001, an international effort was initiated to locate the source(s) of the lead. Between 2001 and 2006, a total of 251 trumpeter swans (*Cygnus buccinator*) were outfitted with radio transmitters and tracked over the winter period. Blood samples were collected at capture and analyzed for lead levels. Sick and dead swans were collected throughout the winter, and carcasses examined to determine cause of death and to identify gizzard contents. Results suggested that swans arrived on the wintering grounds with low blood lead levels, but some were then exposed to lethal amounts of lead shot. The locations of radio-tagged swans were used to identify forage areas and roost sites, and data for swans that subsequently died from lead poisoning were used to identify and prioritize areas for soil/sediment samples (2006-2009). This sampling identified Judson Lake (~100 acre lake spanning U.S./Canada border) as a possible source of lead pellets. Swans were deterred from using Judson Lake through parts of the last six winters (2006-07 through 2011-12). Compared to the 5-year average prior to this experimental management, lead related swan mortalities declined by 66% in the greater study area (Whatcom, Skagit and Snohomish Counties of Washington State and the Sumas Prairie of British Columbia) and 74% in the primary study area (Whatcom County and the Sumas Prairie).

Yellow (*Nuphar polysepala*) and fragrant pond lily (*Nymphaea odorata*) are the predominant aquatic plants on Judson Lake. Their extensive woody root systems may be preventing lead pellets from sinking deeper in the sediment, making the pellets accessible and a threat to swans. Temporary removal of the pond lily from a portion of the lake is anticipated to reduce the amount of lead pellets available to swans (by allowing pellets to sink deeper into the sediment).

15:10

Swans killed by poison bait and analysis of poaching cases in China

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Abstract

Three kinds of swans live in the north of China, such as the Mute Swan, Whooper Swan and Bewick's Swan. All swans are included in the list of national protective law against hunting and trade. In China, the swans have long migration routes and big over-wintering population size along the Yellow and Yangtze rivers. Swans are very important resources which appreciated and loved by the local people, but in the same time, these waterfowls are chief hunting objects for poachers. More than ten kinds of tools or methods are used for hunting by poachers, including guns, crossbow, nets, snare, steel trap, electric trap, poison bait, searchlight, slip noose, fishing lures and others. Poisoning is a very dangerous poaching, when the complete destruction of natural environment is happening. Of course, these toxic prey into the restaurants and harmed local people more directly. About 46 % of poaching cases and 68 % of captive waterfowl involved poisoning (MaMing *et al*. 2012). The bait as chemical Carbofuran or Furadan ($C_{12}H_{15}NO_3$) was widely used in China. According to investigations, the Atropine Sulfate [$(C_{17}H_{23}NO_3)_2 \cdot H_2SO_4$] was generally used as antidote in field. Half of the provinces have swan-hunting records in recent ten years (2002-2013), such as Liaoning, Tianjin, Henan (along the Yellow River), Shanxi, Shanaxi, Shandong, Jiangxi, Shanghai, Hunan, Hubei, Anhui and Xinjiang. In some places, the number of poaching is based on ton count. According to conservative estimates, 600-1200 swans are illegally killed or poisoned each year. Price factor is the main reason for illegal poaching, an increasing trend in the number of cases in winter. Poaching activities are still very common phenomenon during spring and autumn in China.

Key words: poaching, poison bait, steel trap, cases, price.

Figure 1. Swans and ducks killed by poison baits in China (from Xiaoxiangchenbao 2013)

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15:30

Research identifying the causative agent of "Pink Feather Syndrome" in swans

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Abstract:
In 2004, The Regal Swan Foundation's (RSF) research and veterinary team began collaborating with Her Majesty's Swan Warden, Dr. Christopher Perrins to determine the causative agent responsible for turning swans pink in color. During the course of the research, swans affected with the discoloration were observed and reported in Cork, Ireland; Swan Lifeline, Eton, England; along the Thames and the Dorset area of Abbotsbury Swannery, Abbotsbury, England, Affected swans were also seen in Central and West Florida and various other sites in the U.S along with pelicans, egrets, ibis and herons.

Due to suppressed immune systems caused by factors such as lead poisoning or other health related conditions, the swans eventually succumbed to pneumonia and died. The affected swans could not affectively rid their feathers of the bacteria thus resulting in the inability to zip feathers to keep warm and remain water repellent.

Research results determined that a topical bacteria was causing swan feathers to turn pink. DNA sequencing, to determine the organism, was begun at Michigan State University and later progressed to Indian River State College when new technology became available.

This session will provide an overview of the research methodology and results rendered from testing feathers collected throughout Central and West Florida from various species of captive swans and feathers from Trumpeter Swans from Minnesota.

Research to date has indicated a diverse community of bacteria on the swan feathers, including several genera of pink bacteria. Several of the isolates analyzed produce a kerotinolytic enzyme.

Determination of the exact organism(s) causing this condition may aid in prevention and treatment of the syndrome in both captive and wild swans. It may also benefit other bird species. The identification of this causative agent(s) is vital, as the numbers of affected swans and swan deaths continue to rise.

Workshop

16:50

Estimating population viability by applying stochastic growth models to annual counts of swan populations

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Format: 3-hour workshop presentation requiring tables for participants to set up their own computers and a screen with LCD projector and white-board for use by instructors.

Abstract: Stochastic growth models provide a straightforward approach to evaluating annual counts of adult swans and cygnets in order to identify important patterns of population growth that influence population viability. We will develop the conceptual basis for an information-theoretic approach to testing alternative stochastic growth models potentially applicable and biologically reasonable for describing long-term patterns of annual change in swan populations. Potential models include stochastic growth models with and without density-dependence that incorporate and estimate constant or time-varying carrying capacities as well as effects of environmental variation and management actions. We will develop the concept of effective population size (N_e), the classic 50:500 rules of thumb and suggestions for practical estimation of N_e. We will demonstrate applications of this approach to estimating population viability for Greater Yellowstone Trumpeter Swan (*Cygnus buccinator*) populations and other species considered for listing as endangered species such as Greater Sage-grouse (*Centrocercus urophasianus*) and Lesser Prairie-Chickens (*Typanuchus pallidicinctus*). Participants will learn how to apply these methods using standard statistical programs such as SAS, SYSTAT or R.