
5th Pan-European Duck Symposium

16th-20th April 2018

Isle of Great Cumbrae, Scotland

# Programme and Abstracts

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Colin A Galbraith (Colin Galbraith Environment Consultancy)

Richard Hearn (Wildfowl & Wetlands Trust / Duck Specialist Group)

Matthieu Guillemain (Office National de la Chasse et de la Faune Sauvage / Duck Specialist Group)

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Carl Mitchell (Wildfowl & Wetlands Trust)

David Rodrigues (Polytechnic Institute of Coimbra)

Diana Solovyeva (Russian Academy of Sciences)

Chris Waltho (Independent Researcher)

# PROGRAMME

**Monday 16th April: Pre- meeting Workshop on marine issues 11.00 – 16.00.**

## DAY1 (Tuesday 17th April)

Chair: Chris Waltho

9:00 – 9:05
Chris Waltho – Welcome.

9:05 – 9:10
Provost Ian Clarkson - North Ayrshire Council.

9:10 – 9:20
Lady Isobel Glasgow - Chair of the Clyde Marine Planning Partnership.

9:20 – 9:30
Colin Galbraith – The aims and objectives of the Conference.

9:30 – 10:20
**Plenary 1**
Dr. Jacques Trouvilliez, (Executive Secretary of the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA))

**10:20 - 10:45 Coffee break**

### SESSION 1 POPULATION DYNAMICS AND TRENDS

Chair: Colin Galbraith

10:45 – 11:00
***New pan-European data on the breeding distribution of ducks.***
Verena Keller, Martí Franch, Sergi Herrando, Mikhail Kalyakin, Olga Voltzit and Petr Voříšek

11:00 – 11:15
***Trends in breeding waterbird guild richness in the southwestern Mediterranean: an analysis over 12 years (2005-2017).***
Sidi Imad Cherkaoui and Saas Hanane

11:15 – 11:30
***Changes over 45 years: duck populations in the Clyde Estuary.***
Chris Waltho, Ted Schlicke, Scot Mathieson, Colin A. Galbraith, Des B.A Thompson, John Clark and Iain Gibson

11:30 – 11:45
***Long-term trends in the populations of wintering ducks in Sweden.***
Leif Nilsson and Fredrik Haas

11:45 – 12:00

***Changes in the sex ratio of the Common Pochard Aythya farina in Europe and North Africa.***

Kane Brides, Kevin A. Wood, Richard D Hearn and Thijs P.M. Fijen

**12:00 - 13:30 Lunch**

## Session 2: POPULATION DYNAMICS AND TRENDS CONTINUED

Chair: Matthieu Guillemain

13:30 – 13:45

***Forty years of bird survey in the Archipelago sea: sharing a valuable data base.***

Céline Arzel and Lennart Saari

13:45 – 14:00

***Climate impacts and synchrony in population dynamics of European and North American ducks.***

Robert G. Clark, Matthieu Guillemain, David J. Messmer, Mark C. Drever and Tom Langendoen

14:00 – 14:15

***Population dynamics of King Eiders: ecological links to winter and breeding grounds.***

Ray T. Alisauskas and Dana K. Kellett

14:15 – 14:30

***Mallard population decrease in the Netherlands, why? Exploring population dynamics of Mallard (Anas platyrhynchos) and Gadwall (A. strepera).***

Menno Hornman, Loes van den Bremer, Hans Schekkerman, Henk van der Jeugd, Marc van Roomen, Erik van Winden and Chris van Turnhout

14:30 – 14:45

***Juvenile production and adult sex ratios in the declining West Siberian/North European population of long-tailed duck wintering in the Baltic Sea: implications for conservation.***

Kjell Larsson

14:45 – 15:00

***Changes in nesting success and breeding abundance of a Spectacled Eider Somateria fischeri population in Chukotka, Arctic Russia, 2003-2016.***

Diana V. Solovyeva, Sergey L. Vartanyan, Morten Frederiksen and Anthony D. Fox

**15:00 - 15:30 Coffee break**

## SESSION 3 MONITORING, MARKING AND NEW TECHNIQUES.

Chair: Richard Hearn

15:30 – 15:45

***Assessing the potential of escape distance as an alternative to demographic invariants in waterfowl.***

Alain Caizergues

15:45 – 16:00

***Differential detection of wintering waterfowl during aerial and terrestrial surveys in Camargue, a methodological approach.***

Jocelyn Champagnon, Coline Canonne, Alain Tamisier, Philippe Vandewalle, Grégoire Massez and Jean-Baptiste Mouronval

16:00 – 16:15

***Assessment of duck census efficiency using monitoring of individually marked diving ducks.***

Markéta Čehovská, Petr Musil, Zuzana Musilová, Klára Poláková and Jan Zouhar

16:15 – 16:30

***Migration of Teal Anas crecca wintering in Portugal. The use of Nasal saddles vs. PTTs vs. GPS/GSMs.***

David Rodrigues, Maria Ester Figueiredo, Fernando Luís Arede, Loïc Podvin and António Fabião

16:30 – 16:45

***Monitoring methods used on breeding Common Scoter Melanitta nigra in Scotland.***

Ed Burrell, Carl Mitchell, Larry Griffin and Geoff Hilton

16:45 – 17:00

***The power of stable isotope techniques to identify moulting habitats and diets in a fish eating duck.***

Diana Solovyeva, Jason Newton, Keith Hobson, Sergey Vartanyan, Natalia Kharitonova and Anthony D. Fox

17:00 – 17:15

***Female Spectacled Eiders nesting at Chaun Delta, Chukotka, Russia share a common area for wing moult.***

Chris Waltho, Diana Solovyeva, Jason Newton and Sergey Vartanyan

17:15 – 17:45

**Discussion and key messages from day 1.**

17:45

**Dinner and evening Poster session.**

## DAY 2 (Wednesday 18th April)

08:30 – 08:35 Announcements

**08.35 – 09:15**
**Plenary 2** ***Duck population dynamics and current European trends – a personal view.***
Professor Tony Fox, (University of Aarhus - Denmark)

## Session 4 HABITAT MANAGEMENT
Chair: Andy Green

09:15 – 09:30
***Codispersal services by ducks: implications for redistribution of native species under climate change and expansion of alien species.***
Andy J. Green, Ádám Lovas-Kiss and David M. Wilkinson

09:30 – 09:45
***Dispersal of aquatic ferns and flowering plants by mallards on autumn migration in central Europe.***
Ádám Lovas-Kiss, Balázs Vizi, Orsolya Vincze, Attila Molnár V. and Andy J. Green

09:45 – 10:00
***Artificial digestion as a tool to understand dispersal of plants by waterbirds.***
Casper H.A. van Leeuwen

10:00 – 10:15
***Feather isotopes ($\delta^{15}N$) record the historical consequences of anthropogenic subsidies of nitrogen to coastal foodwebs.***
Anders Pape Møller, Karsten Laursen and Keith A. Hobson

**10:15 - 10:45 Coffee break**

Chair: Andy Green

10:45 – 11:00
***Changes in duck breeding populations in the Czech Republic: effect of feeding conditions vs. climatic changes.***
Petr Musil, Zuzana Musilová, Klára Poláková, Markéta Čehovská and Jan Zouhar

11:00 – 11:15
***Winter flooding, a 'win–win' management practice for rice producers and waterfowl conservation in Europe.***
Claire A. Pernollet, Anne Brogi, Amadou Niang, François Cavallo, Michel Gauthier-Clerc, François Mesléard and Matthieu Guillemain

11:15 – 11:30

***Beaver facilitation of waterbirds in the boreal: population and community level responses.***

Petri Nummi, Sari Holopainen, Veli-Matti Väänänen and Hannu Pöysä

11:30 – 11:45

***Wintering ducks change the habitat use of wintering sites: site-specific dynamic over 50 years.***

Zuzana Musilová, Petr Musil, Jan Zouhar and Matyáš Adam

11:45 – 12:00

***Using an agent-based model (SWAMP) to predict the response of waterfowl to drought, urban expansion, and reduced water for agriculture and managed wetlands in California.***

John M. Eadie, Matt L. Miller, Kevin M. Ringelman, Joseph P. Fleskes, Elliott Matchett, Robert H. Blenk and Jeffrey C. Schank

12:00 – 12:15

***Mussel and lemming abundances explain the population dynamics of long-tailed duck.***

Jukka Rintala, Karsten Laursen and Anders Møller

**12:15 - 13:45 Lunch**

## Session 5 MIGRATION AND WINTER ECOLOGY

Chair: David Rodrigues

13:45 – 14:00

***Relative influence of food density and habitat structure on risk taking of ducks foraging during spring migration.***

Mike Eichholz and Adam Behney

14:00 – 14:15

***Allocation of body reserves during winter in eider Somateria mollissima as preparation for spring migration and reproduction.***

Karsten Laursen, Anders Pape Møller, Lars Haugaard, Markus Öst and Jouni Vainio

14:15 – 14:30

***Common Eiders in their wintering grounds in German North and Baltic Sea waters: Space use, activity patterns and interaction with human activities.***

Katharina Fließbach, Nele Markones and Stefan Garthe

14:30 – 14:45

***The Flu Flyways project: Modelling global waterfowl flyways to simulate the spread of Highly Pathogenic Avian Influenza viruses.***

Erik Kleyheeg, Mariëlle van Toor and Kamran Safi

14:45 – 15:00

***"Massive" outbreak of high pathogenic Avian Influenza among wild ducks at Lake Constance in autumn 2016.***

Wolfgang Fiedler and Hans-Günther Bauer

**15:00 - 15:30 Coffee break**

## Session 6: SUSTAINABLE USE OF POPULATIONS

Chair: Sari Holopainen

15:30 – 15:45

***Duck harvest survey schemes in Europe: a review and statistical evaluation.***

Matthieu Guillemain, Philippe Aubry, Gitte H. Jensen and David Scallan

15:45 – 16:00

***Sustainable management of migratory European ducks: finding model species.***

Sari Holopainen, Céline Arzel, Johan Elmberg, Anthony David Fox, Matthieu Guillemain, Gunnar Gunnarsson, Petri Nummi, Kjell Sjöberg, Veli-Matti Väänänen, Mikko Alhainen and Hannu Pöysä

16:00 – 16:15

***Hunting management is more powerful than climate warming to drive distribution of the Mediterranean wintering duck species.***

Elie Gaget, Thomas Galewski, Isabelle Le Viol, Fréderic Jiguet and Matthieu Guillemain

16:15 – 16:30

***Trends in hunter methods, adaptations, and specialisation in harvesting over-abundant Lesser Snow Geese (Chen caerulescens caerulescens).***

Craig A. Miller.

16:30 – 16:45

***Trends in harvest data of huntable ducks in Italy.***

Michele Sorrenti, Daniel Tramontana and Alfonso Lenzoni

16:45 – 17:00

***Assessment of the risks associated with the import and release of hand-reared mallards for hunting purposes.***

Eli K. Rueness, Luis Cadahia-Lorenzo, Kristian Hoel, Pär Söderquist, Gaute Velle, and Maria Asmyhr

17:00 – 17:45

***Island movements of common eider females in Breiðafjörður, West Iceland.***

Jón Einar Jónsson, Árni Ásgeirsson, Jón Jakobsson and Ellen Magnúsdóttir

17:15 – 17:45

**Discussion and key messages from day 2**

**Dinner, workshops and meetings from 17:45 onwards.**

# DAY 3 (Thursday 19th April)

08:30 – 08:35 Announcements.

## Session 7: DUCKS IN THE MARINE ENVIRONMENT

Chair: Mikael Kilpi

08:35 – 08:50

***Recreational boat activity influence abundance and distribution of moulting common scoters.***

Ib Krag Petersen, Rasmus Due Nielsen, Ole Roland Therkildsen and Thorsten Johannes Skovbjerg Balsby

08:50 – 09:05

***The Sensitivity of eleven wintering waterbird species to marine activity around the Orkney Islands.***

David Jarrett, Aonghais Cook, Ian Woodward, Jared Wilson and Elizabeth Humphreys

09:05 – 09:20

***Monitoring seaducks in the southern North Sea and Baltic Sea.***

Nele Markones, Henriette Schwemmer, Margus Ellermaa, Kai Borkenhagen, Nils Guse and Stefan Garthe

09:20 – 09:35

***An invasive alien provides a novel food source for moulting and wintering Common Scoter Melanitta nigra in the German Bight.***

Johanna Kottsieper, Philipp Schwemmer, Anthony D. Fox and Stefan Garthe

**Coffee break**

**EXCURSION**

10:15 Depart for excursion.

17:00 Return to Centre.

19:00 Conference Dinner.

# DAY 4 (Friday 20th April)

08:30 – 08:35 Announcements.

08:35 – 09:15

**Plenary 3** ***Distribution, abundance, and movements of (mostly) sea ducks in eastern North America and implications for their conservation and management***

Professor Scott R McWilliams, (University of Rhode Island - USA), Peter Paton, (Avian Ecology Group, Department of Natural Resources Science, University of Rhode Island) and Jay Osenkowski, (Division of Fish & Wildlife, Rhode Island Department of Environmental Management).

## Session 8 CONSERVATION AND MANAGEMENT OF POPULATIONS

Chair: Tony Fox

09:15 – 09:30

***Distribution changes, community composition and the role of protected areas in Europe.***

Diego Pavón-Jordán, P. Clausen, O. Crowe. M. Dagys, B. Deceuninck, K. Devos, V. Encarnaçao, A.D. Fox, T. Frost, C. Gaudard, M. Hornman, V. Keller, T. Langendoen, Ł. Ławicki, S.H. Lorentsen, L. Luigujoe, W. Meissner, B. Molina, P. Musil, Z. Musilova, L. Nilsson, J.Y. Paquet, J. Ridzon, A. Stipniece, N. Teufelbauer, J. Wahl, M. Zenatello and Aleksi Lehikoinen

09:30 – 09:45

***Rapid decline of Common Eiders at Forvie National Nature Reserve, Scotland – context, demographic mechanisms and management.***

Stephen Baillie, Charlotte Altass, Annabel Drysdale, Andrew Douse, Samuel Langlois Lopez, Graham J Pierce and Thomas Cornulier.

09:45 – 10:00

***Inaccuracy of flyway boundaries and possible impact of global warming on the spatial distribution of Common Pochard (Aythya ferina).***

Benjamin Folliot, Alain Caizergues, Jocelyn Champagnon and Matthieu Guillemain

**10:00 - 10:30 Coffee break**

10:30 – 10:45

***A comparison of the behaviour of paired and unpaired male dabbling ducks prior to nesting in an early and a late breeder.***

Céline Arzel, Johan Elmberg and Matthieu Guillemain

10:45 – 11:00

***Nest site fidelity with common scoters and long-tailed ducks in north Iceland.***

Ib Krag Petersen, Rasmus Due Nielsen, Aevar Petersen, Hannah Robson, Anja Cervencl and Anne Louise Harrison

11:00 – 11:15

***Conservation of Velvet Scoter on Tabatskuri Lake in Georgia***

Nika Paposhvilii

11:15 – 11:30

***Cyprinids in waterfowl habitats – the problem and how to manage it?***

Ilkka Sammalkorpi

11:30 – 11:45

***Waterbird monitoring to inform guidelines for site protection and development***

John Calladine, Ian Woodward, Graham Austin and Teresa Frost

11:45 – 12:00

***Closing discussion and conclusions.***

# LIST OF POSTERS

A Caizergues & B. Folliot - *Age-related differences in demographic parameters and fitness-related traits in Common Pochards*

M. Čehovská, P. Musil, Z. Musilová, K. Poláková, & J. Zouhar - *Movements of diving duck broods and their effect on duckling survival*

M. Ellis & R. Hearn - *The re-development of a duck wing survey in the UK*

S. Ferguson, B. Zonfrillo, I. Gibson, I. Livingstone & J. Clark - *Safeguarding wetlands in a dynamic urban environment - the Seven Lochs Wetland Park*

D. Giunchi, L. Vanni, N.E. Baldaccini, A. Lenzoni, M. Sorrenti, P. Luschi & G. Cerritelli - *First tracking data on Eurasian teals (Anas crecca) provides new information on their spring migration phenology*

M. Guillemain, C.A. Pernollet, J.-F. Maillard & J.-B. Mouronval - *The Ruddy duck problem in France: current situation and future prospects*

K. Haas & U. Köhler - *Cutting off the influx of treated sewage to large hypertrophic ponds: How do water birds respond to a changing habitat? A replicated long-term experiment 2000-2017*

M. Hancock, T. Smith, A. Douse & H. Robson - *Patterns of freshwater habitat use by a rare breeding duck, the common scoter, and implications for scoter conservation*

T.E. Holm & O.R. Therkildsen - *Monitoring nocturnal foraging movements of tufted ducks* Aythya fuligula *using radar tracking*

M. Janaus, A. Mednis & A. Stīpniece - *Duck nesting success at two Latvian Ramsar sites*

M. Kilpi - *An update of the population size of Common Eiders in the core area of the Finnish breeding range*

E. Kleyheeg - *Quantifying Mallard duckling survival by citizen science in the Netherlands*

N. Mitchell - *Trends in breeding duck populations at Loch Leven National Nature Reserve*

P. Musil, Z. Musilová & K. Poláková - *Estimate of flyway population size in Red-crested Pochards* Netta rufina *in Central and Western Europe: methodological issue or wrong flyway delineation*

I.K. Petersen, R.D. Nielsen, A. Petersen, H. Robson, A. Cervencl & A.L. Harrison - *Nest site fidelity with common scoters and long-tailed ducks in north Iceland*

K. Poláková, P. Musil & Z. Musilová - *Facultative heterospecific brood parasitism in clutches and broods in duck species in South Bohemia, Czech Republic*

D. Rodrigues, M.E. Figueiredo & L. Podvin - *The use of camera-traps to read nasal saddle codes on ducks. Should we use photo, video or both?*

P. Sizeland - *Identifying opportunities to safeguard wetland and floodplain habitat across Central Scotland*

S. Svazas, A. Kozulin, M. Janaus, A. Mischenko, A.D. Fox & A. Czajkowski - *Status and trends of Common Pochard* Aythya ferina *population in Eastern Europe*

S. Vardeh, J. Bellebaum, H. Kruckenberg, A.A. Sokolov, P. Glazov, S. Oppel, J. Loshchagina, O. Pokrovskaya, N.A. Sokolova, V.A. Sokolov, J.F. Masello & P. Quillfeldt - *Understanding the decline of sea ducks in the Baltic Sea – an integrative approach*

# ABSTRACTS (IN ALPHABETIC ORDER)

# Population dynamics of King Eiders: ecological links to winter and breeding grounds

**R.T. Alisauskas[1,2*] & D.K. Kellett[1,2]**

[1] Prairie and Northern Wildlife Research Centre, 115 Perimeter Road, Saskatoon, Saskatchewan, Canada, S7N 04
[2] Department of Biology, University of Saskatchewan, 112 Science Place, Saskatoon, Saskatchewan, Canada, S7N 5E2

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We report on our long-term (1995-2016) mark-recapture study of female King Eiders nesting at Karrak Lake, Nunavut, in Canada's central arctic. We drew inference from 687 nesting adults females captured 1786 times and individually marked over 21 breeding seasons. We used Pradel's models for estimating annual survival, per-capita recruitment and rate of population change; we also used a canonical estimator of abundance, from knowledge of numbers captured and capture probability. Furthermore, we considered ecological covariates, including 3 sources of integrated climate data during winter and spring migration, and on the nesting area to partition annual variation in survival, and local conditions at Karrak Lake to understand drivers of local population change. The North Pacific Index during winter and spring migration as well as the North Atlantic Oscillation during winter, each accounted for 21%, 30%, and 20% respectively, of annual variation in survival. We inferred that these patterns held for North American King Eider females that shared winter areas in both the North Pacific and North Atlantic waters. Covariates for annual variation in recruitment rate at Karrak Lake included timing of ice break up (25% ), number of nests (1%), and the North Pacific Index during spring migration (4%). Process variance of rate of population growth at Karrak Lake was 0.022, that of recruitment was 0.021 and that of survival was 0.002, showing that the main driver of population change at Karrak Lake was recruitment (r-square = 0.77) rather than survival (r-squared = 0.10). We use the strong links of recruitment and especially survival to integrated climate data to reconstruct and infer historical trends in relative population size for King Eiders that breed in North America's arctic.

**ORAL**

# A comparison of the behaviour of paired and unpaired male dabbling ducks prior to nesting in an early and a late breeder.

**C. Arzel[1, 2], J. Elmberg[3] & M. Guillemain[4]**

[1] Wetland Ecology Group, Department of Forest Sciences, FI-00014 University of Helsinki, Finland
[2] Section of Ecology, University of Turku, FI-20014 Turku, Finland
[3] Natural Sciences, Kristianstad University, SE-291 88, Kristianstad, Sweden
[4] Office National de la Chasse et de la Faune Sauvage, Unité Avifaune Migratrice, La Tour du Valat, Le Sambuc, FR-13200 Arles, France.

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Mate-guarding represents a time investment and is, therefore, traded-off against other activities critical for survival. We investigated how this investment translated in allocation of time in an early and a late breeder, Mallard *Anas platyrhynchos* and Teal *Anas crecca*. We predicted the differences in allocation of time between paired and unpaired males to be larger in Mallard than in Teal. Mallard has a greater capacity to store energy than Teal and should thus be able to allocate more time to mate guarding than Teal. In addition, Mallard are earlier breeders than Teal, and mate guarding behaviour should be particularly strong prior to nesting. Consequently, we predicted: - an increase in mate guarding in paired males at the expense of time allocated to foraging, - an increase in harassment by unpaired males at sites closer to the breeding grounds, for both species.
We studied ducks at 4 locations along the northwest European flyway from early spring to just prior to the onset of nesting. We assessed the time budget of male Teal and Mallard per site, date and time of day, using only data when both paired and unpaired males of the same species were observed on the same occasion.
Our results support the hypotheses that Mallard by having a higher capacity to store energy and earlier nesting time, invest more time in mate guarding than Teal. Paired Mallard males allocated more time to vigilance and were more easily disturbed as compared to unpaired males during the latest stages of migration. Upon arrival at the breeding ground, paired Teal males conversely allocated more time to resting, as compared to unpaired males, probably to replenish their body reserves. By following established pairs to their breeding grounds, and then attempting extra-pair copulations, unpaired males may still have an opportunity to breed.

**ORAL**

# Forty years of bird survey in the Archipelago sea: sharing a valuable data base

**C. Arzel [1, 2*] & L. Saari[3]**

[1] Section of Ecology, University of Turku, Finland
[2] Wetland ecology group, University of Helsinki, Finland
[3] Department of Forest Sciences, University of Helsinki, Finland

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Long term databases are crucial tools to monitor biodiversity changes through time. They reveal to be essential when it comes to understanding the effect of climate change on our environment and to predict changes yet to come. Nevertheless to collect data on the long term is time consuming and expensive leading often to incomplete data or to databases with irregular methodology. In this context long term databases collected by a single person following a strict methodology over the years are extraordinary valuable. We present such exceptional database and its potential to investigate changes in bird population in response to factors such as the recent climate changes.

Lennart Saari has carried out bird counts with strictly the same methodology for four decades (1975 - 2015) at Aasla, an island from the Archipelago Sea, in southern Finland (60º18´N, 21º57´E). The bird censuses consist of a combination of point and round counts. The censuses cover all inland water and the whole shoreline. Censuses were repeated 9 times around the year: late April-early May, mid-May, late May-early June, early July (brood count), August, September, late October - early November, December and January. In addition, the number of waterfowl seen on a daily basis has also been collected, as well as arrival and departure dates. The ice melted in the turn of April-May at its latest (some winters were practically ice free) and in a few January counts the sea was frozen.

We present relationships between environmental factors, such as ice break-up date, NAO effect, and population demographic parameters of waterfowl species. We also show the database and where and how it can be accessed since our aim is to make this valuable database available to a broad audience.

**ORAL**

# Rapid decline of Common Eiders at Forvie National Nature Reserve, Scotland – context, demographic mechanisms and management

**S. Baillie[1], C. Altass[2], A. Drysdale[3], A. Douse[4], S. Langlois Lopez[5], G.J. Pierce[6] & T. Cornulier[5]**

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[3] Forvie NNR, Little Collieston Croft, Collieston, Ellon, Aberdeenshire AB41 8RU
[4] Scottish Natural Heritage, Great Glen House, Leachkin Road, Inverness, IV3 8NW
[5] Institute of Biological and Environmental Sciences, University of Aberdeen, Zoology Building, Aberdeen, UK
[6] CESAM & Departamento de Biologia, Universidade de Aveiro, 3810-193 Aveiro, Portugal and Instituto de Investigacións Mariñas (CSIC), Eduardo Cabello 6, 36208, Vigo, Spain

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Common Eiders (*Somateria mollissima*) are a designated feature of the Sands of Forvie SSSI, which once held the largest breeding colony in the United Kingdom. The population increased between the 1960s and 1980s, reaching a peak of 6700 in 1984. An initially slow decline accelerated after 2010, with only 1537 birds counted in 2017, an overall reduction of 77%. We place this decline in the context of regional and national changes, where WeBS counts show a UK decline of 27% between 1989/90 and 2015/16.

A 1961-1980 population study found high adult survival (0.93 to 0.96), moderate first year survival (0.67), an age of first breeding of 2-4 years and high duckling losses due to avian predation. Population growth was maintained with little or no immigration. Since 1981 counts of adults and numbers of ducklings fledged have been recorded. We use new age-specific survival estimates based on birds ringed between 1961 and 1980 to model population changes between the early 1960s and the present. Our models indicate that initial losses were largely driven by demographic processes internal to the population, but that more recently substantial emigration was also involved.

We review likely ecological causes of these changes and propose future work to identify management solutions. Forvie is unusual in being a mainland colony. Predator numbers have increased greatly in North-east Scotland and their potential impact was already apparent by the late 1970s, when electric fencing provided effective management. We assess the effectiveness of current approaches to reducing nest predation. Other colonies on the East Coast of Scotland have already disappeared, almost certainly as a result of mammalian predators. The ecological causes of the current decline at Forvie remain uncertain but predation is a strong candidate. Given the urgent need to address this issue we recommend an adaptive management approach.

**ORAL**

# Changes in the sex ratio of the Common Pochard *Aythya ferina* in Europe and North Africa

**K. Brides[1*], K.A. Wood[1], R.D. Hearn[1] & T.P.M. Fijen[2]**

[1] Wildfowl & Wetlands Trust, Slimbridge, Gloucestershire GL2 7BT, UK.
[2] Plant Ecology and Nature Conservation Group, Wageningen University & Research, Droevendaalsesteeg 3a, 6708PB Wageningen, the Netherlands.

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Assessments of the sex ratio among Common Pochard *Aythya ferina* flocks were undertaken in countries across Europe and into North Africa in January 2016, for comparison with results from surveys carried out over the same area in January 1989 and January 1990. The mean (±95% CI) proportions of males in the population were estimated as 0.617 (0.614–0.620) in 1989–1990 and 0.707 (0.705–0.710) in 2016; this difference between surveys was found to be highly significant.

Whilst male bias increased with latitude in both surveys, this relationship was weaker in 2016 as the increases in male bias between 1989–1990 and 2016 were greater in countries further south. Given that the sex ratio of Pochard broods is approximately 1:1 at hatching, the strong male bias observed among adult birds is indicative of lower survival of females compared with males. The results of this study suggest that factors adversely affecting female survival rate (relative to that of males) may partly explain the decline in overall Common Pochard abundance.

**ORAL**

# Monitoring methods used on breeding Common Scoter *Melanitta nigra* in Scotland

**E. Burrell, C. Mitchell*, L. Griffin & G. Hilton**

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Common Scoter *Melanitta nigra* populations are declining in the western highlands, which is one of two major centres for the remaining UK population, including at the Inverness Lochs Special Protection Area which holds the bulk of the remaining birds. It is difficult to resolve this problem, because there is very limited evidence regarding the cause of the decline and the feasibility of candidate solutions. In the main, study methods for scoters are not well established. Fieldwork undertaken from 2012, has included; spring counts to establish potential breeding numbers; recording the location of birds and undertaking detailed bathymetry to describe feeding distribution; nest location and the deployment of temperature loggers beneath clutches of eggs to investigate incubation cycle and nest fate; deployment of nest/trail cameras to determine nest fate; capture of females on the nest and deployment of geolocators to determine wintering sites; hydro-acoustic monitoring of marked individuals to describe detailed habitat use of successful females. The results of the monitoring methods and suggestions for habitat management are presented.

**ORAL**

# Assessing the potential of escape distance as an alternative to demographic invariants in waterfowl

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Assessing demographic parameters is a difficult task that requires the collection CMR data over the long-term. Yet, demographic parameters are needed for one seeking to determine the best possible conservation strategy, or to assess sustainable harvest rates of quarry species. Most of the time therefore, managers which have to provide guidelines in the absence of complete data, resort to demographic invariants such as body mass from which $\lambda_{max}$ and hence sustainable harvest rates can be derived. Unfortunately, demographic invariants such as body suffer from a lack of resolution. According to theory, the proportion of time and energy allocated to reproduction, including the defence of young against potential predators, should be inversely proportional to life expectancy and therefore a good predictor of $\lambda_{max}$.
Here, we examine the potential of escape distance of incubating females as an alternative to body-mass for assessing $\lambda_{max}$ in waterfowl. From 2009 to 2016, nesting of different waterfowl species (Coot, Common Pochard, Mallard…) was monitored on the lake of Grand-lieu (France). For each nest the escape distance of the incubating female was noted along with the number of eggs and the stage of incubation. We predicted that escape distance should be positively correlated to adult survival probability but could also be affected by factors related to nesting effort such as clutch-size and the time elapsed since the beginning of incubation.

**ORAL**

# Age-related differences in demographic parameters and fitness-related traits in Common Pochards

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Due to a dramatic decline over the past ten years, the status of Common Pochard populations in the North-west European flyway has been revised so that they are now placed in the endangered category. Despite hypotheses about the possible reasons of this decline have been put forward, one must recognise that factors underlying ecological requirements and population dynamics of this species are still poorly known. Assessing fitness traits and demographic parameters is a prerequisite towards a better understanding of factors underlying population dynamics and thus a research priority in such endangered species.
Here, we present a compilation of demographic parameters and fitness-related traits such as individual quality/maturity both, “extracted” from the literature, and derived from data collected in France as part of an ongoing CMR monitoring scheme. We focus on the age of the individual as the main explanatory variable with the aim to allow the parameterisation of age-structured population models which could hence be used to explore the trajectories of Common Pochard populations under different management policies.

**POSTER**

# Waterbird monitoring to inform guidelines for site protection and development

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Seventy years of systematic waterbird monitoring in Britain and Ireland has provided data on their distribution and trends. This has enabled the identification of important sites for protection under statutory designation within domestic and EU legislations. Designated sites are not immune from development, however, but are subject to stringent guidelines governing their use or change of use. Changes of use subject to regulation include not only land claim and industrial or other commercial developments but also developments intended to enhance conservation value.

Potential developers do not necessarily understand how developments might interact with a site's ecological integrity and can be unaware of long-term data available for and underpinning the designations of sites. Recognising a need for increased awareness of and to facilitate accessibility to that information, Scottish Natural Heritage and the Northern Ireland Environment Agency recently commissioned reviews to act as a preliminary source of information for potential developers of some extensive estuarine sites designated as Special Protection Areas (SPAs). These included the Firth of Forth in Scotland and five Sea Loughs in Northern Ireland. Contents include:

Simple guidelines on the planning application processes, specifically the Habitat Regulations Assessment (HRA) that is applicable to Natura designated sites including SPAs;

A review of the mechanisms that drive changes in water birds within those estuaries and where applicable including local case studies;

Accounts for each listed species (for each site) describing their within-site distributions, population sizes and trends (which are also compared to wider trends) and some basic ecology.

The reviews aim to provide those involved with HRAs (developers, planners and others assessing applications for development and otherwise advising on developments) with locally relevant information on the ecology of qualifying bird species, factors that can affect them and guidance on assessing those impacts with the HRA process.

**ORAL**

# Assessment of duck census efficiency using monitoring of individually marked diving ducks

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Assessment of the population size and evaluation of population trends is essential for effective management for nature conservation. However, waterbird monitoring in the breeding season leads to underestimation of population size when not regarding to detection probability. The detectability of individual species could vary in various stages of the breeding season.
Therefore, we analyse recording probability (i.e. probability to be counted in any single count during breeding season) in three sympatric duck species (Red-Crested Pochard *Netta rufina*, Common Pochard *Aythya ferina* and Tufted Duck *Aythya fuligu*la). In total, we used 59 records of 21 females of Red-crested Pochard, 327 records of 327 females of Common Pochard and 313 records of 173 females of Tufted Duck. We analysed the probability of recording of individually marked ducks in relation to independent variables such as stage of breeding season (pre-breeding, incubation, brood rearing, post-brood period), timing (month), individual year, actual local population size, water surface area and extent of littoral vegetation.
The recording probability of all three investigated diving duck species was significantly affected by their actual reproductive status and timing of breeding season. The highest probability of marked female record was in pre-breeding, brood rearing and post-brood periods, i.e. in April, May and the 2ndhalf of July and finally in the 1sthalf of August. We found no effect of year and local population size, water surface area and extent of littoral vegetation.
Duck census at the beginning of the incubation season (i. e. in May) can provide reasonable data for the estimate of the annual population size of the investigated diving duck species.

**ORAL**

# Movements of diving duck broods and their effect on duckling survival

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The fishpond systems in South Bohemia are important breeding sites for diving ducks. However, the conditions for successful brood rearing (up to fledging) change during the breeding season. The water transparency decreases as the result of grazing effect of high density of fish stock and cause the decrease in food availability and lack of food supply. The nesting site may not be convenient for duck rearing. In this regard, duck broods move to sites with better feeding conditions and anti-predation refuge. However, these movements lead to increased mortality of ducklings.

Based on individually marked females, we revealed 298 movements of 72 females of Common Pochard *Aythya ferina* and 295 movements of 111 females of Tufted Duck *Aythya fuligula*. Statistically significant negative correlation between distance of movements and survival rates was confirmed in Tufted Duck ($r = -0,431$, $P = < 0.001$, $n = 295$). The relative survival of Common Pochard duckling decreases with the length of their movements, but this relation is not significant ($r = -0,144$, $P = 0.147$, $n = 298$). The ducklings move most frequently 0 - 2 km from the nesting pond and the distance over 2 km is usually critical for them. The maximum distance of movement with duckling was 5 km in these two species. Females, who had lost ducklings, were recorded longer than 5 km from nesting site.

The distance between suitable ponds, as well as the connectivity of the landscape, are important for the successful movements of diving ducks and could be applied for appropriate management fishpond regions and other wetland sites.

**POSTER**

# Differential detection of wintering waterfowl during aerial and terrestrial surveys in Camargue, a methodological approach

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Situated in Southern France, Camargue is a 150,000 ha wetland of major importance in Europe for wintering Anatidae species and coots. Standardized aerial surveys were conducted during daytime on Greylag Goose *Anser anser*, Common Coot *Fulica atra* and nine species of ducks, monthly from September to March since 1964 by three successive observers, over ca. 150 sites in Camargue. In parallel, terrestrial counts were conducted on some of these sites, on the same species, over the last 25 years. Some factors are known to influence detection e.g. identity of observer, vegetation cover and method. To take them into account, we input both aerial and terrestrial counts in a hierarchical model run in a Bayesian framework that separates ecological process and detection process. The goal is to get an estimation with less uncertainty of the waterfowl numbers and a more straightforward dynamic picture of the spatiotemporal distribution of each species.

**ORAL**

# Trends in breeding waterbird guild richness in the southwestern Mediterranean: an analysis over 12 years (2005-2017)

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The present study investigates species richness trends of six breeding waterbird guilds over twelve years (2005–2017) in nine wetlands in Morocco. We demonstrated that the species richness has varied significantly and positively over the 12 years for the Anatidae (population growth (λ) = 1.049 ± 0.022), Threskiornithidae (1.622 ± 0.119), and Ardeidae (1.051 ± 0.022), whereas the Podicipedidae (1.000 ± 0.022), Rallidae (1.021 ± 0.022), and waders (1.011 ± 0.009) have remained stable. Our results also demonstrate the absence of declining tendency in the six studied guilds. Coordinating research efforts among Mediterranean countries is recommended to shed light on the spatiotemporal dynamic of breeding waterbirds.

**ORAL**

# Climate impacts and synchrony in population dynamics of European and North American ducks

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Environmental variability can affect populations of widely-separated organisms sharing life-history and life-cycle traits, yet few studies have explored dynamics of species that may be affected by common environmental drivers in widely-separated continents. We tested for similar population trends and synchrony in dabbling and diving duck species from Western Europe (EU) and North America (NA), 1974-2012.

Annual population dynamics of eight ecologically or taxonomically equivalent species-pairs on each continent were evaluated. Synchrony was assessed as the evidence for correlation in annual growth rates, while shared time-trends were assessed as the linear correlation between population sizes. Growth rates and population sizes were estimated within Gompertz population models fit in a state-space modelling framework to control for density dependence and observation error in the duck counts. We tested whether two dominant climate cycles, the Atlantic Multi-Decadal Oscillation (AMO) and North Atlantic Oscillation (NAO), explained annual variation in population growth rates or size estimates on each continent.

Between continents, population estimates from EU and NA were positively correlated in four of eight species-pairs, but in no species-pair were annual changes in population growth synchronous. There was evidence that the large-scale climate indices had weak influences on annual growth rates of some species, but notably, population sizes were positively correlated with the AMO index (not NAO) in EU and NA in four of eight species-pairs. If not simply coincidental, positive cycling of the AMO in recent decades may have produced more favourable environmental conditions for duck populations, while other (local) factors masked annual synchrony in the response of paired continental populations to this factor. Periods of generally warmer, wetter conditions produced by an extended positive phase of the AMO may have enhanced over-winter survival or reproductive success due to higher food quality or availability. However, alternate mechanisms hypothesized to explain these patterns must be tested.

**ORAL**

# Using an agent-based model (SWAMP) to predict the response of waterfowl to drought, urban expansion, and reduced water for agriculture and managed wetlands in California

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We developed a Spatially-explicit Waterfowl Agent-based Modelling Program (SWAMP) to evaluate alternative landscape scenarios in the Sacramento Valley, CA arising due to urban expansion, drought, and concordant shifts in water allocation priorities. Scenario 1 represents the current management regime, while all other scenarios consider increased urbanization and/or moderate to severe drought. Scenario 2 examines the effects of drought, but with wetland restoration goals being met and current rice acreage; Scenario 3 examines the impact of wetland restoration not being met; and Scenario 4 examines the effect of extensive idling of rice acreage. Scenario 5 represents a worst-case situation with expansive urbanization, wetland restoration goals not met, and extensive rice acreage idled. We used SWAMP to simulate the foraging activities, time activity budgets, lipid reserves, and mortality of 1.2 million ducks under each scenario. In SWAMP, birds select and consume food in patches at a rate that is dependent on the density of food on that patch, modelled as a type II functional response. Birds leave patches based on current energy stores and patch depletion, modelled as an approximation of the marginal value theorem. We parameterized the model using published values for true metabolizable energy (TME) of foods, metabolic rates and expenditures under different activities, lipid metabolism and conversion, and food storage capacity. Models were run for 180 simulated days – the duration of time over which most waterfowl overwinter in the Central Valley. Our results indicate that rice idling due to restricted water supplies would have the greatest impact on body condition and survival of waterfowl. Under Scenarios 4 and 5, birds entered into energy deficit by late December and mortality rates escalated exponentially (assuming birds did not leave Butte Basin). Failure to meet wetlands restoration goals was not as severe if those acreages remained in rice, but energy deficits and mortality increased substantially if rice acreage was instead idled. Our study helps inform managers of the potential implications of restricted water conditions in CA using a novel spatially-explicit agent-based modelling approach.

**ORAL**

# Relative influence of food density and habitat structure on risk taking of ducks foraging during spring migration

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Indirect risk effects of predators on prey behaviour can have more of an impact on prey populations than direct consumptive effects. Predation risk can elicit more vigilance behaviour in prey, reducing the amount of time available for other activities, such as foraging, which could potentially reduce foraging efficiency. We assessed how ducks perceived predation risk in various habitat types, how strongly perceived risk versus energetic demand affected foraging behaviour, and how these characteristics are influenced by life history traits. We manipulated food abundance in different wetland types in Illinois, USA to reduce confounding between food abundance and vegetation structure. Mallards fed more intensively and, along with blue-winged teal, used longer feeding stints in open habitats, consistent with the hypothesis limited visibility was perceived to have a greater predation risk than unlimited visibility. The species temporally nearest to nesting, wood ducks, were willing to take more risks for a greater food reward, consistent with an increase in a marginal value of energy as they approached nesting. Our results indicate duck species value energy differently based on the surrounding vegetation structure and density, increases in the marginal value of energy can be more influential than perceived risk in shaping foraging behaviour patterns, and species with a faster life history strategy were willing to engage in riskier behaviour, by feeding more intensively, for a greater food reward. Species with a faster life history strategy devoted 17 % more time to feeding when in high food density treatment plots vs. control plots. The percentage of time species with a slower life history strategy devoted to feeding was not affected by food density. We conclude the value of various food items is not solely determined by energy contained in the item but by conditions in which it is found and the state of the forager.

**ORAL**

# The re-development of a duck wing survey in the UK

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Duck wing surveys are a valuable source of information on the composition of duck harvests. They can also provide useful information on trends in the breeding success of huntable ducks. Such surveys are carried out in a number of European countries, including Denmark, Finland and France. In the UK, following a period of inactivity, the British Association for Shooting & Conservation (BASC) undertook a pilot wing survey in 2017/18 in order to assess methods and the level of interest in developing an annual national duck wing survey.
During October 2017, BASC contacted their wildfowling clubs to request that they collect duck wings during the 2017/18 hunting season. These wings were then reviewed at a 'wing bee' in March 2018 to determine the species, age and sex of each bird.
Here we report on the results of the pilot survey, the lessons learnt from this pilot, and the plans for the further development of a national scheme in the UK.

**POSTER**

# Safeguarding wetlands in a dynamic urban environment - the Seven Lochs Wetland Park.

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The Seven Lochs Wetland Park in west central Scotland will become Scotland's largest urban nature park, bringing together almost 20 sq km of lochs, parks, nature reserves and woodlands between Glasgow and Coatbridge. It comprises seven hydrologically connected lochs and associated wetlands, including two Sites of Special Scientific Interest, five local nature reserves and a country park.

The park is already well visited. Drumpellier Country Park, which includes Lochend Loch and Woodend Loch SSSI, attracts approximately 1 million visits annually. This will increase as the park becomes established as a visitor attraction, and as a result of new housing development within and around the park.

Hogganfield Loch, perhaps the most urbanised waterbody in the complex, is a key site in the Glasgow region for both breeding and wintering wildfowl. Many waterfowl are relatively tame resulting in it being the most studied site. Waterfowl ringing has been undertaken at both Hogganfield and Lochend Lochs. Mute and Whooper swan dominate the ringing effort, but duck ringing includes mallard, gadwall, tufted duck, goldeneye and goosander.

Waterbird populations are a useful indicator of biodiversity and environmental quality across the Wetland Park, but continued monitoring through WeBS requires training and support for a team of volunteer counters. Both Hogganfield Loch and Drumpellier Country Park have a long history of introducing Glaswegians to their waterbirds and a key objective of the Seven Lochs Wetland Park is to continue to develop this local participation. A range of approaches are planned to bring people close to the nature on their doorstep, and involve them in recording and monitoring activities.

The Seven Lochs Wetland Park will become a major new hub for natural heritage conservation and learning and engagement in Scotland. Involvement in on-going recording and monitoring will help park managers ensure the future sustainable management of the park against a backdrop of planned new development and increasing visitor numbers.

**POSTER**

# “Massive” outbreak of high pathogenic Avian Influenza among wild ducks at Lake Constance in autumn 2016

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Lake Constance bordering Austria, Germany and Switzerland is one of Europe’s most important inland waterbird wintering areas with 230,000 individuals in mid winter (Tufted Ducks *Aythya fuligula*, Pochards *Aythya ferina* and Coot *Fulica atra* dominating with 45,000 – 60,000 individuals each, Mallard *Anas platyrhynchos* 10,000). Ring recoveries of wintering ducks origin from a sector between Central Finland and Ucraine and reach the Ural area. Although low pathogenic avian influenza is regularly detected there are only two cases of confirmed high pathogenic AI outbreaks known from Lake Constance: virus type H5N1 in 2006 and H5N8 in 2016.

In contrast to the 2006 outbreak there were noticeable numbers of dead waterbirds visible around the lake during the 2016 outbreak and these cases were registered and reported by birders along with the regular waterbird counts. Even when considering only the cases confirmed by veterinary authorities (51% positives out of 596 bird samples) the outbreak in 2016 was many times stronger in terms of wild bird victims than the first one (0,2% positives out of 1799 samples). By bringing together the official veterinary data from the three states and counts and observations from birders with existing ringing and GPS tracking data and data from a sentinel flock of mallards kept close to the first outbreak enables us to describe the phenology of a high pathogenic avian influenza outbreak in a European inland waterbird area.

Despite the massive impression of the outbreak an effect on waterbird numbers present at the lake was not detectable. Three quarters of all victims were Tufted Ducks while they only contributed one quarter of the birds present. Victim numbers peaked within the first 5 days after the first registration and then faded out almost completely within 50 days despite stable waterbird numbers.

**ORAL**

# Common Eiders in their wintering grounds in German North and Baltic Sea waters: Space use, activity patterns and interaction with human activities

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Survey data indicate that total numbers of common eiders *Somateria mollissima* wintering in both the Baltic and the Wadden (North) Sea have declined steeply in recent decades. Although several factors are known to be involved in the observed decline of the species, likely causes particularly in wintering areas are not well understood and identified. 39% of the biogeographic population are estimated to utilize wintering sites in the German parts of the Baltic and the North Sea, areas which are heavily impacted by human activities. It is therefore crucial to assess the influence of factors such as shellfish fisheries, ship traffic, offshore wind energy or set net fisheries on the common eider population wintering in Germany to provide information for management decisions, nature conservation regulations or marine spatial planning. As a first step towards this, it is necessary to characterize the space requirements, diel activity patterns and habitat associations of the species in the studied area.
For this, we 1) use long term monitoring data from aerial and ship-based surveys to describe the winter distribution and to determine the biotic and abiotic factors linked to winter habitat selection; and 2) plan to equip a total of 24 common eiders in both Baltic and North Sea waters with back-attached GPS/GSM transmitters with integrated dive sensors to identify home ranges and diel activity patterns in the wintering area. We present here the results of the analysis of the monitoring data and from the first individuals carrying GPS devices and discuss possible conflict areas with human uses. Studying the interactions between the species' space use and human activities will shed light on the underlying causes of the population decline and provide information for a more effective protection of the common eider in its wintering grounds.

**ORAL**

# Inaccuracy of Flyway Boundaries and Possible Impact of Global Warming on the Spatial Distribution of Common Pochard *(Aythya ferina)*

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To settle the ongoing debate about the potential origins of the decline of Common Pochard in the in the northern European flyways, and provide adequate population management, it is crucial to better understand flyway delineation. We addressed this question using 2,819 and 1,214 indirect recoveries of Common Pochards ringed between 1960 and 2017 in the Northwest European and Central Europe flyways, respectively. Between 38.1% and 48.6% of the individuals were recovered in another flyway than the one where they were originally ringed, suggesting strong permeability between flyways. Changes in spring ring recovery locations that support an eastwards shift of the breeding population were recorded over three periods 1960-1990, 1990-2001 and 2001-2017, corresponding to periods of population increase, stability and decline in the northern European flyways, respectively. However, a clear change in recovery locations across months rather suggests an advanced phenology of spring migration over the study period than a pure geographic shift. Mean locations of autumn-winter recoveries did not display any particular pattern in any month, confirming the great faithfulness of Common Pochard to their wintering area on one hand, and discarding the hypothesis of a general geographic shift of the wintering range on the other. Our results therefore do not support the short-stopping hypothesis as a potential explanation to the decline of Common Pochard winter numbers in North West Europe, rather suggesting a genuine decline of Pochard numbers in this region. The strong permeability observed between putative flyways however underlines the need to consider all flyways simultaneously when assessing the future status of Common Pochard. Computing the trend in the Pochard population over the last decade for the 3 flyways simultaneously confirms the general “Vulnerable” IUCN status of this species, with an average decrease of -35%. This study underlines the high connectivity between the North-West/Central Europe flyways and the South West Asian flyway, and hence the importance to improve population censuses in the later.

**ORAL**

# Duck population dynamics and current European trends – a personal view

**A.D. Fox (supported by a cast of thousands)**

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It is not just webbed feet and a love affair with water that mark ducks out from other avian species. Their relatively large clutch sizes and long life spans make them infinitely harvestable species, perhaps like no other group excepting the Order Galliformes. Thanks to wetland site safeguard and regulation of hunting, we have witnessed a period of general expansion in the population size of common huntable duck species in Europe since the Second World War. However, in very recent years, several species have shown signs of stabilisation and yet others are beginning to decline. Such trends are awakening our complacent awareness of the shortfalls in our current monitoring mechanisms, our ability to define "populations", our capacity to monitor annual changes in their abundance and gather the demographic data necessary to interpret their trends. So just how well are the common European duck populations faring right now? Which are struggling and why? What can we do to fix those populations that seem to be advancing into decline? Some declining species are still numerically abundant while remaining legal quarry, putting them beyond the "normal" existing mechanisms for protection and regulation. Recent suggestions to apply adaptive management approaches to such species to balance the need to restore them to more favourable conservation status while remaining quarry species are exciting, but pose interesting challenges for international coordination and delivery. This plenary session will attempt to pose some relevant questions about how we may improve our knowledge of European duck population dynamics and support the effective management of these iconic species. We look forward to flow of stimulating answers to these questions in the subsequent stimulating presentations offered to this 5th Pan-European Duck Symposium!

**PLENARY**

# Hunting management is more powerful than climate warming to drive distribution of the Mediterranean wintering duck species

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Climate warming is one of the main current pressures on biodiversity, leading most species to shift poleward to find suitable habitat and food resources. However among the major anthropic pressures, climate change is not the only one affecting habitat and food. Hunting management is also widely practiced in some habitats, in order to attract game on specific lands and/or food supplies. Here we compare the general response of wintering waterbirds to climate change. The analyses were specifically conducted for Mediterranean (wintering) hunted duck species in comparison with the other waterbird species. It relies on the Mediterranean part (23 countries, 2700 sites, 145 species) of the International Waterbird Census dataset compiled by Wetlands International over the period 1991-2012, totalizing more than 25 000 count events. We investigated the yearly trend in Community Temperature Index (CTI), a community weighted mean index measuring the thermal adjustment of communities to temperature warming, and assessed the contribution of each species to this CTI trend. Over the years, CTI among Mediterranean waterbirds was increasing by 0.3°C per decade on average. Mediterranean hunted duck species were the group contributing the least to this trend, suggesting a lack of response to the temperature increases. However, population trends of these species were not necessarily showing declines. One major factor leading to specific duck-oriented habitat management in the Mediterranean is waterfowl hunting. To increase hunting opportunities, hunting managers often spread bait and/or change water regimes artificially, which increase predictability of water availability, provide ideal water levels for dabbling ducks and enhance food availability. Probably in response to such good foraging conditions, high rates of within- and between-winter philopatry have been recorded in Mediterranean dabbling ducks, as well as massive body mass increases over the recent decades. This study suggests once again the broad impact of human activities on wildlife, including very large-scale distribution processes.

**ORAL**

# First tracking data on Eurasian teals (*Anas crecca*) provides new information on their spring migration phenology

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The knowledge of waterfowl migratory strategies is crucial for developing effective conservation and management actions on these species and on their habitat at continental scale. The available satellite tracking data on migrating European ducks mostly regard the largest species, while for smaller ones, like the Eurasian teals *Anas crecca*, the information on migratory movements mostly derives from ringing recoveries. Starting from 2013, 29 Eurasian teals wintering in Italy were captured and tagged with PTTs. The departure date from wintering grounds was determined for 21 birds, 15 of them were tracked for the whole spring migration. The starting date of migration (SDM) was determined: a) as the day a given birds moved >30 km in any direction with no return to the wintering site; b) by fitting the Net Square Distance with linear or mixture models. In seven cases the SDM estimated by the two approaches coincided, while for the remaining birds method b) delayed the SDM significantly with respect to a). This occurred because starting from February most teals left their capture sites and then stopped for several weeks along the route before resuming their movement. Successive stops were usually shorter and shortened as birds arrived nearer their breeding grounds (BGs). Total migratory speed resulted to be quite slow (<50 km/day), but teals moved at high speed (~900 km/day) when considering only the segments spent flying. All birds followed the Black Sea-Mediterranean flyway; BGs were highly scattered in Central and North-Eastern Europe, reaching also the East of the Urals. These results outline for the first time the spring migratory strategies of European teals at individual level.

**POSTER**

# Codispersal services by ducks: implications for redistribution of native species under climate change and expansion of alien species

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Seed dispersal has been considered the most important ecosystem service provided by birds. However, the majority of research has focused on frugivores and scatter-hoarding corvids, wrongly implying that birds are not important vectors for plant species that lack a fleshy fruit or a large nut. Ultimately, this research habit is likely to be explained by Darwin's legacy, as we will explain. Using new data from the UK and a growing European database, we describe the broad range of plants and invertebrates dispersed by dabbling ducks via gut passage (endozoochory). For example, intact seeds from 25 angiosperm plant species were recovered from mallard droppings in the north-west of England in 2016, and we germinated 12 of these species. Viable moss fragments were dispersed, as well as invertebrates such as sponges and bryozoans (moss animals). We illustrate the major implications of these findings for the spread of alien species, as well as the redistribution of native species in response to climate change and to changing patterns of bird migration. Migratory ducks provide far greater maximum dispersal distances than other vectors such as wind or water, such that they are critical vectors if plants and invertebrates are to change their distributions in pace with climate change. Urban duck populations can help by spreading genotypes adapted to warmer urban environments into rural areas. This area of research provides both a major *opportunity* and *challenge* for duck biologists. Codispersal services exemplify the benefits of conserving migratory Anatidae populations in a changing world. A major challenge that remains is how to predict *which* taxa are dispersed effectively by ducks, since the limits remain very unclear and traditional methods (e.g. based on seed morphology) are inadequate.

**ORAL**

# Duck harvest survey schemes in Europe: a review and statistical evaluation

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Efficient management of migratory bird harvest requires international collaboration, in terms of both coordinated research and monitoring. Adaptive management of populations is now practiced for several goose species in Europe, and it is expected to be implemented in ducks in the near future. This will require, at minimum, regular (annual) estimation of duck population size and harvest. Such a move towards increasing policy focus onto harvest estimates is apparent at the international level, e.g. through AEWA or Birds Directive Article 12 reporting.
Most European countries are already monitoring duck hunting bags. We first review such schemes here in terms of their frequency, mode of data collection, type of information collected, etc. A wide variety of situations is observed, from very strict compulsory data reporting to loose voluntary harvest estimation, from annual surveys to surveys every 15 years only. In some countries, hunters have to report their annual bag to get a new hunting licence, while in some other countries scientists conduct questionnaire surveys to only a small sample of the hunting population, etc. The rise of cell phone apps has also changed the situation markedly over the last couple of years.
All methods have their pros and cons of course, and some countries are further limited by their national legislation. The second aim of the present analysis was to highlight the costs and benefits of each method on statistical grounds. In particular, non-respondents do not have the same importance under the survey structure of the different schemes, and some schemes also provide much more precise estimates than others.
It is hoped that such a study will help to better coordinate duck hunting surveys at the European scale, and promote the implementation of the most reliable and cost-effective survey methods in the future.

**Oral**

# The Ruddy duck problem in France: current situation and future prospects

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The Ruddy duck (*Oxyura jamaicensis*) is a small diving duck introduced to Europe in the 1950s for ornamental purposes. Some individuals escaped and established self-sustaining populations in Europe, with several hundreds of individuals living in the wild nowadays. The main problem caused by these birds is the threat they represent for the White-headed duck (*O. leucocephala*) through hybridization. The White-headed duck is already a threatened species in Western Europe, has disappeared from several countries including France, and is now confined to the Spanish territory.

A very successful Ruddy duck eradication programme has been implemented in the UK, where the species was initially introduced and where the numbers of this exotic peaked at 6 000 individuals in 2001, but were brought to only ca. 40 in 2014. France now has a particular responsibility, since all potential Ruddy ducks threatening the Spanish White-headed ducks have to originate from or cross its territory. It would hence seem most appropriate to eradicate Ruddy ducks from France too, so as to establish a safety buffer zone upstream the Iberia Peninsula.

This poster will present the results of the eradication scheme which has already been in place in France for several years, and allowed the culling of over a thousand ruddy ducks since 2010, keeping the number of birds wintering in the country around 200 individuals. It will also present the contents of a new Life Project currently in preparation, which aims at improving the field procedures and increasing the efficiency of the shooting operations, but also working on the existing captive Ruddy duck population and increasing public awareness regarding the question of introduced exotic species.

**POSTER**

# Cutting off the influx of treated sewage to large hypertrophic ponds: How do water birds respond to a changing habitat? A replicated long-term experiment 2000-2017

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The capacity for moulting water birds at the Ramsar site „Ismaninger Speichersee und Fischteiche“ near Munich, Germany, strongly depends on nutrients fed in by treated sewage: Improved nutrient retention in the upstream sewage treatment plant in the 1990s was followed by a substantial decline in water bird numbers.
Impacts of an even more extensive reduction of nutrients are tested in an ongoing, replicated oligotrophication experiment in large (70,000 m2), shallow (≤ 2.5 m), hypertrophic ponds: Since 2000 three test ponds are receiving unmixed river water only. Their maximum load of total N (1.0 mg/l) and total P (0.03 mg/l) relates to approximately 10 % of what ten control ponds continue to get from sewage. Free-floating macroalgae (e.g. *Cladophora, Hydrodictyon, Enteromorpha*, dominant elements in the hypertrophic ponds) nearly disappeared in nutrient reduced ponds, while macrophytes (e.g. *Ranunculus, Potamogeton, Zanichellia*) increased.
Water birds responded to the changing habitat promptly: Abundances decreased by more than 80 % in the first study year, in later years by still 49 to 72 %. The two site-dominant species Gadwall (*Anas strepera*) and Coot (*Fulica atra*) dropped to only 12 % and 38 %, respectively (time-averaged), compared to hypertrophic ponds. Red-crested Pochard (*Netta rufina*) used both pond types in similar abundances. Tufted Duck (*Aythya fuligula*) did so initially, but tended to avoid nutrient reduced ponds in the last six years. Responses of Common Pochard (*Aythya ferina*) varied between years, however, occasionally with higher abundances in nutrient reduced ponds.
Reducing the anthropogenic nutrient input to highly productive sites may seriously deteriorate conditions for large moult aggregations of at least two out of five common water bird species.

**POSTER**

# Patterns of freshwater habitat use by a rare breeding duck, the common scoter, and implications for scoter conservation

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The diving duck, the common scoter *Melanitta nigra*, is one of the rarest breeding birds in Britain, confined to upland Scottish lakes. We investigated patterns of lake use by breeding scoters in Scotland, in relation to habitat correlates like water depth, food abundance and fish populations. Breeding scoters occurred most often at lakes having relatively more extensive shallow water and abundant large invertebrates. Similarly, within breeding lakes, areas with shallow water were preferred by foraging scoters. Large invertebrates tended to be more abundant where there were fewer brown trout *Salmo trutta*, suggesting that scoters and trout may compete for the same prey. We are now testing this idea at four lakes within Forsinard Flows RSPB reserve in the north Highlands. Small exclosures and the re-introduction of regular angling are being used to reduce trout numbers, while we measure responses by invertebrates and the waterbirds – like scoters – that feed on them.

**POSTER**

# Monitoring nocturnal foraging movements of tufted ducks *Aythya fuligula* using radar tracking

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The Department of Bioscience, Aarhus University was commissioned by The Danish Road Directorate to undertake a baseline bird monitoring programme prior to the construction of a bridge crossing the northern, narrow part of Roskilde Fjord. The main aim of the study was to assess the risk of tufted duck collisions with the planned bridge.
In winter, up to 25,000 tufted ducks occur in Roskilde Fjord, which is designated as a Special Protection Area (SPA) in part for this species. The number of tufted ducks in the SPA constitutes 1-2 percent of the flyway population. During daytime, the tufted ducks roost on freshwater bodies around the fjord. However, little was known about their noctural foraging movements, except that they used the fjord for feeding.
The occurrence of tufted duck in Roskilde Fjord and their foraging movements between three nearby lakes and the Fjord were monitored during winter 2015. A Furuno marine radar was used to track foraging movements during January 21 – 25 and February 9-27. The radar was operated from two locations at the fjord, tracking movements in both horizontal and vertical planes. A screen dump showing the bird movements was taken automatically every 15 seconds and the emergent flight tracks were subsequently digitalised manually using a GIS program.
On average, foraging movements of tufted ducks began 45 min after sunset and lasted 19 min. The majority of tufted ducks ended their nocturnal movements in the southern, shallow waters of the fjord. An estimated 15% of the foraging movements crossed the planned bridge, and 40% of these were below 25 m, i.e. at the height of the planned bridge.
Although tufted ducks are expected to show some degree of avoidance behaviour to the bridge, depending on visibility and light conditions, the risk of collisions cannot be completely eliminated. However, we consider the potential impacts of the planned bridge on the tufted duck population occurring in Roskilde Fjord unlikely to be significant.

**POSTER**

# Sustainable management of migratory European ducks: finding model species

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Eurasian migratory ducks are a natural resource shared between multiple European countries. Due to lack of flyway-level management and monitoring, there is a risk of "the tragedy of the commons" arising, where populations are overexploited. Effective management may also be hindered by a poor understanding of the factors that limit and regulate migratory populations throughout their flyways, and over time. Following decades of population increase, some European duck populations now show signs of levelling off or even decline, underlining the need for more active management. In Europe, we lack effective common tools to manage duck populations, despite the need and enthusiasm for establishing flyway-level adaptive management (AM) schemes for migratory birds. There are several international legal agreements (e.g. EEC Birds Directive, AEWA) that oblige European countries to sustainably manage migratory birds and their habitats. Although the lack of coordinated demographic and hunting data remains a challenge to sustainable management planning for waterfowl, AM provides a robust decision-making framework even in the presence of uncertainty.
We investigate the research and monitoring needs in Europe to successfully apply AM to ducks, and search for possible model species, focusing on freshwater duck species. Our geographical focus is NW Europe (excluding Russia), the area utilized by ducks in the East-Atlantic flyway. Based on current knowledge and their wide distribution, we suggest that Common Teal *Anas crecca*, Eurasian Wigeon *Mareca penelope* and Common Goldeneye *Bucephala clangula* would be the best species for testing the application of an AM modelling approach for ducks in Europe. Applying AM to huntable species with relatively good population data as models for broader implementation represents a cost effective way of starting to develop AM on a European flyway scale for ducks and other harvested waterbirds.

**ORAL**

# Mallard population decrease in the Netherlands, why? Exploring population dynamics of Mallard (*Anas platyrhynchos*) and Gadwall (*A. strepera*).

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The Dutch breeding population of Mallard has decreased by about 30% since 1990. This decline is apparent in most landscape types within the country and has no parallel in neighbouring countries. Driving factors may therefore be found in The Netherlands. In addition, the wintering population, consisting of both resident and migratory birds, has shown a steep decrease by 25-30% since 2000. A decline in wintering numbers is also visible at the scale of the Northwest European flyway. These negative trends contrast strongly with the positive population development of Gadwall, an ecologically closely related dabbling duck species. Dutch breeding and wintering populations of Gadwall have been increasing for decades. This increase is visible throughout Europe and can partly be attributed to a flexible response of the species to new habitats or changes in habitat suitability. As an aquatic herbivore the Gadwall obviously copes with both eutrophication of waters and the current improvement of water quality (de-eutrophication).
Hatching success in both Mallard and Gadwall is stable for the Dutch populations and comparable to that in populations elsewhere. Survival of fully grown birds in both species has increased, especially that of first year birds. Lower hunting pressure seem to play an important role. This suggests that problems for Mallard mainly occur in the part of the life-cycle for which almost no data are available: the chick period and/or the first months after fledging. Possible explanations for this will be discussed. The cause of the decline in wintering numbers, as far as it does not apply to Dutch breeding birds, is unclear. However, a shift in wintering distributions within Europe, does not seem to play a major role.

**ORAL**

# Duck nesting success at two Latvian Ramsar sites

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We compare results of duck nest counts at two Ramsar sites Lake Engure and Lake Kanieris in 1999-2017. On Lake Engure one island was gradually overgrowing with trees and received little predator control while on the other one mink trapping, reed mowing and grazing were applied. On Lake Kanieris (7 islets) vegetation and predator control has been sporadic and nearly absent. Stands of emergent vegetation received no predator control at both sites.
In Engure the well managed islet (most years *Larus ridibundus*, *Larus minutus*, *Sterna hirundo* present) sheltered in average 53,5% successful nests, the overgrowing one - 17,5% and the emergent vegetation sample region 43,5% successful nests.
In Kaņieris - islets with *Larus argentatus* colonies had in average 66,9% successful nests, islets without gulls - 24% and the emergent vegetation (scattered *Larus argentatus* nests present) - 45% successful nests. In most cases nest predators were mammals.
Further management and prospects of these populations are discussed.

**POSTER**

# The sensitivity of eleven wintering waterbird species to marine activity around the Orkney Islands

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The Orkney Islands are home to nationally significant overwintering populations of ducks, divers, auks and grebes, for which there are proposals for new SPA sites for North Orkney and Scapa Flow to reflect the importance of these areas. The Orkney Islands also have significant tidal and wave resources which are expected to be increasingly exploited in future years, as well as likely expansion of the aquaculture industry, leading to significantly higher marine traffic through these sensitive areas. This project, funded by the Scottish Government, seeks to understand how these internationally important wintering marine bird species could be affected by increased marine activity.

For eleven target species of wintering seabird, including Common Eider (*Somateria mollissima*), Long-tailed Duck *(Clangula hyemalis*), Velvet Scoter (*Melanitta fusca*), Goldeneye (*Bucephala clangula*) and Red-Breasted Merganser (*Mergus serrator*) we collected data on short term behavioural responses to marine activity using a range of methods, including observations from land and vessel based vantage points. There have been relatively few previous studies carried out specifically looking at disturbance of over-wintering waterbirds at sea. The methodological insights gained during this project may be relevant to a range of research projects involving at-sea data collection on duck species.

The initial exploratory analysis of the data gathered during the project suggests that there are significant differences in responses and avoidance strategies between waterbird species. Given the wide range of activities and anticipated developments in the marine environment, these findings may be relevant to the sustainable management of the seas around Orkney and other similar areas.

**ORAL**

# Island movements of common eider females in Breiðafjörður, West Iceland

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A long-term banding project on breeding common eiders (hereafter eider; *Somateria mollissima*), in Breiðafjörður, West Iceland began in 2014. This project is collaboration with local eiderdown farmers. All banding islands are within 15 km of the town of Stykkishólmur.
In 2014-2017, a total of 680 females were banded with colour-markers. To date, 322 live recaptures and resightings (camera with telephoto lens) are confirmed to individual nests. Twelve females have been found dead. Since 2014, the project has deployed 142 geolocator and recovered 87 (60%) as a part of the SEATRACK project. Preliminary results show wintering grounds from West Fjords in the north to Reykjanes in the south (300 km north to south). Geolocators (n=7) that were deployed in 2015 and recovered in 2017 showed that none of those females skipped breeding in 2016.
Objectives are to quantify individual variation in nest site selection and faithfulness, phenotypic variation, and to evaluate interrelationships of these parameters. The project includes 10 nesting islands, which vary in landscape, and avian/mammalian predator presence/absence: 1) Arctic fox is generally absent from study islands except Rifgirðingar, but hunting and trapping efforts are made against mink in all the islands; 2) gull or tern colonies are present in some islands and not others. Eiders are caught with pole-nooses, weighed, and measured for body size with callipers (head length, wing length, tarsus and culmen).
In 2017, recapture rates of colour-markers varied by island from 30% to 75%. Although over half the females were nest site-faithful, nest movements up to 921 meters were observed between years, with much variation among islands: the smallest and largest island-specific medians in 2016 were 7 m and 72 m, respectively. At least 16 females have switched islands between years in 2017, with the longest relocation to date 9 km (from Elliðaey to Stakksey).

**ORAL**

# New Pan-European data on the breeding distribution of ducks

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Duck populations in Europe have undergone massive changes in the distribution over recent decades. Thanks to the International Waterbird Census the distribution in winter is well known and changes in occurrence have received more and more attention in recent years. Knowledge on the breeding distribution is much more limited and scattered in many national publications. The second European Breeding Bird Atlas EBBA2 prepared by the European Bird Census Council EBCC and its partners in over 50 European countries provides for the first time pan-European data on distribution and abundance at a resolution of 50x50 km squares. In the first atlas, published in 1997, only few data were available for large areas in eastern Europe. The good coverage of the European part of Russia for EBBA2 is particularly important as this country holds significant populations of many duck species. For central and western Europe the data allow a comparison of the distribution between the two atlas periods. Fieldwork for EBBA2 was carried out from 2013 to 2017 (from 2011 in Russia). In early 2018 most data will be available at the European coordination unit and provisional maps will be available for discussion with species experts.

**ORAL**

# An update of the population size of Common Eiders in the core area of the Finnish breeding range

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It has been shown, that the Finnish population of breeding Common Eiders (*Somateria mollissima*) has been severely reduced since the mid-1990´s, based on population trajectories from a number of monitoring plots. However, the national base-line population figures have been hampered by incomplete data. Some sources state that 200 000 breeding females was the maximum, others that there perhaps has been 300 000 breeders. The Finnish Bird atlas, and the latest estimate (from 2010) from monitoring plot data arrive at a number of 100 000 breeders. In 2010, the total population in Finland had already halved.

Although the species nests in a wide area, the core of the peak population breeds in the Archipelago Sea, and the Åland Islands, harbouring perhaps 75% of all birds.

Large-scale monitoring efforts done in the Archipelago Sea (2016) and the Åland Islands (2017) confirm that the maritime archipelago is nearly void of Eiders (>90 % decrease), while archipelagoes closer to the mainland have fared better (> 50 % reduction). An estimate based on new censuses suggests that in 2017 less than 20 000 females nested in the core area. This could imply, that in this area, a peak population of perhaps 80 000 females may have bred, which in turn would imply that the total Finnish peak population was perhaps 110 000 breeders, and the population never reached 200 000 breeders.

The results of the surveys have several implications for the future of the species in Finland. The core area was a very important source of emigrants to the more marginal (sink) areas, as suggested by recent studies. As the core area population is still rapidly dwindling, there is little scope for this to continue. This will inevitably lead to a continual overall decline, and fast conservation actions are needed.

**POSTER**

# Quantifying Mallard duckling survival by citizen science in the Netherlands

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The breeding population of Mallards (*Anas platyrhynchos*) in the Netherlands has been in moderate decline for several decades, contrasting trends in the rest of Europe. Although still the most numerous of breeding waterfowl species, current estimations indicate that the Dutch Mallard population has dropped by 30% since 1990. This trend is remarkable, because Mallards typically thrive in human-dominated landscapes.
A range of possible causes for the decline of the Mallard breeding population in the Netherlands have recently been investigated and eliminated. Nest success is generally stable and relatively high compared to e.g. North American studies, adult survival is high and increasing, hunting pressure has decreased, and ring recoveries indicate very low emigration of juvenile or adult birds. One potentially contributing demographic factor that remained unidentified is duckling survival. Data on this was lacking almost entirely in the Netherlands.
To fill this knowledge gap, I designed a citizen science project with two main objectives: 1) increase public awareness of the decline of this popular species, and 2) obtain basic information on duckling mortality and survival. I used mainstream and social media to ask people to report Mallard broods, specifying the date, location, brood size and duckling age. Observers were encouraged to upload a photo, that I could use for validation. This yielded 1800 observations in 2016 and >4500 observations in 2017.
In anticipation of further analyses, I found that Mallard duckling survival in general is very low in the Netherlands. Overall, less than 20% survives the fledgling stage, with most mortality (>75%) occurring in the first three weeks after hatching. Mortality causes vary regionally, but predation and adverse weather conditions are important factors. This citizen science project will help to develop and prioritize hypotheses that should be tested in follow-up studies with a more rigid scientific design.

**POSTER**

# The Flu Flyways project: Modelling global waterfowl flyways to simulate the spread of Highly Pathogenic Avian Influenza viruses

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Despite increasing tracking efforts with GPS and satellite telemetry, the connectivity of global waterfowl migration routes still remains largely unexplored and poorly quantified. Yet, better understanding of population interactions during migration is important for the study of waterfowl ecology, and imperative to the study of global spread of avian-borne pathogens like highly-pathogenic avian influenza viruses (HPAIVs). The large economic losses and public health concerns related to recently emerged HPAIVs denote the urgent need of quantification of the connectivity network of waterfowl flyways.
Alongside with additional waterfowl tracking efforts, we propose the use of a novel simulation algorithm to identify and quantify waterfowl migration flyways: the empirical Random Track Generator (eRTG). We model migration routes using parameter values extracted from real tracks, such as the distribution of flight distances, departure dates and stopover durations, obtained by collaborators worldwide, while flexibly allowing input from new empirical data as they become available. This approach will result in a spatially and temporally explicit network of migration corridors between stopover sites. Population estimates will be used to quantify the flows of waterfowl through this network.
This model will estimate for each moment in time the community composition of waterfowl at stopover sites, as well as their origins and future destinations. Based on this, we can use epidemiological models to assess the probability of introduction, transmission and further spread of HPAIVs in waterfowl communities and compute likely routes of spread from sites of emergence towards other regions on the globe.
Finally, our approach provides a tool to reassess the role of waterfowl in the global spread of HPAIVs and guide active surveillance efforts. The ultimate goal is to refine this model such that it can be used to predict the routes and timing of future outbreaks after emergence of new HPAIV strains anywhere in the world.

**ORAL**

# An invasive alien provides a novel food source for moulting and wintering Common Scoter *Melanitta nigra* in the German Bight

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Common Scoters (*Melanitta nigra*) are numerous in the German North Sea throughout the entire year. The distribution patterns of this species have been established from ship and aircraft based Seabird at Sea (SAS) surveys since the 1990s. Based on these surveys, important moulting and wintering concentrations occur in different areas. However, the factors that influence these distribution patterns are poorly known.
To increase the understanding of this seasonal variability, we examined the potential food resources in both moulting and wintering areas. We investigated the prey composition, benthos abundance and biomass. The most common species was the American Razor Clam (*Ensis leei*), which also contributed the highest biomass. Compared to all other mussel species present in the study area, the American Razor Clam shows the highest flesh to shell ratio and thus also offers a rich food resource for Common Scoters. This might be of particular importance during moult when birds are in need of rich food resources to meet their specific nutritional demands.
A previous study demonstrated that the American Razor Clam is a prey Common Eiders (*Somateria mollissima*) regularly feed on as well. These combined data suggest that this neobiotic mussel species has become an important prey item not only for Common Scoters, but for different sea duck species since its invasion into the German North Sea in the 1980s.

**ORAL**

# Juvenile production and adult sex ratios in the declining West Siberian/North European population of long-tailed duck wintering in the Baltic Sea: implications for conservation

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The West Siberian/North European population of long-tailed duck (*Clangula hyemalis*), which breeds in the Russian Arctic and northern Fennoscandia and mainly winters in the Baltic Sea, has declined rapidly in numbers since the 1990s. Because of the rapid decline the species is classified as vulnerable on the IUCN Red list. To identify the causes of the decline and make conservation measures effective one need accurate information on basic demographic parameters. A photo survey method was used to estimate juvenile production and adult sex ratios of wintering long-tailed ducks at coastal and off-shore sea areas in the Baltic Sea. Several thousand individuals were sampled between January and May each winter from 2008 to 2017. Female age ratios of wintering long-tailed ducks, estimated as the number of first winter males, assumed equal to the number of first winter females, per adult female, fluctuated between years. Time-series from different regions were positively correlated, but female age ratios were consistently lower in the southern than in the central and northern Baltic Proper. The difference was more pronounced in years when production of first winter birds was high. The overall sex ratio of wintering adult birds was male-biased, more so in the southern Baltic Sea than in other regions. A population model was used to analyse if low production of first winter birds between 2008 and 2017 has constrained population growth. The overall mean female age ratio of 0.22 observed at spring stopover sites would in combination with survival rates lower than 0.83 for birds older than six months lead to a population decline. Considering known sources of anthropogenic mortality in the Baltic Sea, and assuming survival rates between 0.75 and 0.80, a further decline at a rate between 2.9% and 8.4% per year can be expected.

**ORAL**

# Allocation of body reserves during winter in eider *Somateria mollissima* as preparation for spring migration and reproduction

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Capital breeders, such as the eider *Somateria mollissima,* accumulate resources before the start of breeding. Eiders preferentially feed on blue mussels *Mytilus edulis* to build up body condition. We predicted that (1) the quality of blue mussels (flesh to shell ratio) is influenced by climate and amount of nutrients in sea water; (2) body condition (estimated as scaled body mass index) and gizzard mass of eiders are built up during winter as affected by the quality of mussels, the size of mussel stocks and winter climate; and (3) scaled body mass in late winter translates into better body condition of females at the breeding grounds.
The quality of blue mussels increased with amount of nutrients (total N). Scaled body mass index of eiders increased during winter and the magnitude of the effect depended on age and mussel quality. Gizzard mass of eiders increased during winter with effects of mussel quality, mussel stocks and sex. Scaled body mass index of adult females increased from the first half of January to the second half of February on average by 1.5%, equal to c. 96 g. During the same period gizzard mass of adult females increased by 12.2%, i.e., a nearly ten-fold increase compared to that observed in scaled body mass. Body condition of females at the breeding grounds was significantly positively correlated with gizzard mass in winter, but not significantly with scaled body mass. Thus, eiders allocate body reserves to increase gizzard mass but less so to increase body mass during winter. This can be considered an adaptation to the migratory strategy of eiders due to a modest increase in body mass, but a large increase in gizzard mass allowing for high feeding capacity at stopover sites near the breeding grounds.

**ORAL**

# Dispersal of aquatic ferns and flowering plants by mallards on autumn migration in central Europe

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Five sets of faecal samples (total N = 215) were collected from mallards *Anas platyrhynchos* on autumn migration in the Tisza and Balaton regions in Hungary, central Europe. Intact diaspores were extracted, identified and their germinability assessed under standard conditions. Megaspores of the floating watermoss *Salvinia natans* were recorded in 32 samples, and a total of 16 megaspores germinated, providing the first field demonstration of endozoochory of ferns by birds. Of 21 angiosperms recorded (of which 8 germinated), 13 were terrestrial species although those most often recorded were aquatic species such as the alkali bulrush *Bolboschoenus maritimus* and the sago pondweed *Potamogeton pectinatus*. One cultivated species (the common fig) and one alien species (the hackberry *Celtis occidentalis*) were recorded. The plant communities recorded were compared with multivariate methods such as PERMANOVA. The plant taxa dispersed varied at two different spatial scales, with slight but significant differences between samples from sites separated by less than 1 km. Major differences between the two regions separated by approximately 220 km were strongly influenced by the absence of *S. natans* from the Balaton region. Most taxa dispersed are generally assumed to disperse by water, wind or self-dispersal, and waterfowl will provide much greater maximum dispersal distances. This is a unique study of the spatial variation in plants dispersed by endozoochory by a migratory waterfowl species. More studies are vital before we can understand which plants are dispersed by migratory birds.

**ORAL**

# Monitoring seaducks in the southern North Sea and Baltic Sea

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The German offshore areas in the southern North Sea and Baltic Sea host internationally important numbers of four seaduck species: Common Eider *Somateria mollissima*, Long-tailed Duck *Clangula hyemalis*, Common Scoter *Melanitta nigra* and Velvet Scoter *Melanitta fusca*. Their concentration areas are largely covered by protected areas established in accordance with the EU Birds Directive and subsequently designated as nature conservation areas protected under national law. A seabird monitoring scheme is carried out since 2008 to fulfil reporting commitments according to the relevant directives of the European Union (Natura 2000, MSFD) and to the regional marine conservation conventions (OSPAR, HELCOM).
We give an overview of current distribution patterns, numbers, trends and population structure of seaducks wintering and moulting in German waters based on monitoring results and additional long-term ship-based and aerial survey data.
In German waters, Common Eiders and Common Scoters mainly occur in the coastal North Sea and the western parts of the Baltic Sea. Long-tailed Ducks and Velvet Scoters on the other hand are clearly confined to the Baltic Sea, in particular to the eastern parts of the German offshore areas. Wintering numbers in Germany of all four species account for significant proportions of their biogeographic population, ranging from 10–66 %. While severe population decreases over the last decades have been reported for all seaducks at the level of the whole Baltic Sea, numbers in German sea areas have recently not shown substantial declines.
Abundance data is complemented by data on population structure derived from digital photographs taken during ship-based surveys. These allow conclusions on breeding success and sex-specific differences in survival and distribution and thus shed light on the driving processes of large-scale population dynamics. Relatively high proportions of immature birds in winter 2016/2017 compared to low values in previous years indicated good breeding success in 2016.

**ORAL**

# Distribution, abundance, and movements of (mostly) sea ducks in eastern North America and implications for their conservation and management

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Many sea ducks travel thousands of kilometers annually between breeding, molting, and wintering areas, making them potentially vulnerable to many anthropogenic disturbances. For example, during winter most sea ducks in eastern North America inhabit nearshore coastal areas where >400,000 ha are now leased for offshore wind energy developments (OWED) by the Bureau of Ocean Energy Management (BOEM). We combined spatial distribution models of marine birds from aerial and boat-based surveys with spatial conservation prioritization (SCP) software to identify sites with high marine bird conservation priority that aided evaluation of proposed OWED sites, and led to the ban of OWED in nearshore waters <20 m deep in Rhode Island. We also assessed movements of satellite-tagged sea ducks throughout their annual cycle to delineate key habitats selected on their wintering grounds, along with migration routes to and from breeding and molting areas. In general, sea ducks demonstrated overall weak to moderate connectivity between life stages; however, the strength of connectivity was dependent on which life stages were compared, with molting to wintering connectivity usually the strongest. We discuss the important implications of this information for the delineation of populations and their conservation and management.

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**PLENARY**

# Duck nest predators and predation rates in eutrophic and oligotrophic boreal wetlands: an artificial nest experiment

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The majority of European duck nest in boreal wetlands. In Finland 50% of duck species are listed as threatened in the latest Finnish red list of birds. Especially species and populations breeding in eutrophic wetlands have declined and their breeding success has dropped. The mechanisms behind these phenomena are not known, but e.g. alien predators are suspected of being a significant factor. A similar decline has not been observed in oligotrophic wetlands. During the nesting period ducks face trade-offs between survival and foraging. Earlier studies conducted in Sweden showed that ducks are more abundant in eutrophic wetlands despite the higher rate of nest predation, assumingly because of more ample food availability.

We examined these trade-offs by placing artificial Mallard nests in the oligotrophic Evo area in South Finland and in eutrophic Maaninka in Central Finland. The nests were placed on the shoreline of different wetland types. Each shore nest also had a control counterpart located in the forest further from the shoreline. Wildlife cameras were used to monitor the predators visiting the nests during a week-long period.

Nest predation risk differed considerably between the eutrophic and oligotrophic study regions. Sixty-four percent of nests in Maaninka were predated, while the predation percentage at Evo was only 24%. Most predated nests were predated by corvids, with Magpie (*Pica pica*) being the most frequent predator. Raccoon Dog (*Nyctereutes procyonoides*), an alien predator, was the most frequent mammalian predator, taking 26% of all the nests preyed upon. These results not only underline earlier study results that nest predation risk is higher around eutrophic wetlands, but also the significance of alien predators affecting nest survival of ducks. The removal of alien predators, such as Raccoon Dogs, could have a considerable positive effect on the breeding success of ducks.

**ORAL**

# Trends in hunter methods, adaptations, and specialisation in harvesting over-abundant Lesser Snow Geese (*Chen caerulescens caerulescens*).

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The North American mid-continent Lesser Snow Goose (*Chen caerulescens caerulescens*) population has undergone rapid growth, resulting in extensively habitat damaged their tundra breeding grounds in the Hudson Bay region of Manitoba and Nunavut provinces in Canada. In response, the U.S. Fish and Wildlife Service (USFWS) enacted a conservation order in 1999 to reduce overpopulation. Under the order, hunters are allowed to take snow geese after March 10th (continuing after other waterfowl seasons have closed), without bag limits, hunt from sunset to ½ hour after sunset, and use electronic calls and unplugged shotguns. These methods are unlawful under regulations imposed by the Migratory Bird Treaty Act of 1918, but were suspended to promote harvest birds during spring migration.

To provide a better understanding of hunter adoption and effect of liberalized hunting methods on achieving management goals, we analysed harvest trends from 1999 through 2017. We collected data via Illinois' annual mail survey of randomly selected waterfowl hunters. In addition to descriptive statistics, we analysed reported annual harvest in relation to the use of electronic calls, unplugged shotguns, and post-sunset hunting. Use of these methods were positively correlated with harvest. Methods of take had a significant effect on annual harvest. Trends show hunters experienced a learning curve to adopt successful methods needed to harvest Snow Geese. Further, a new, specialized type of hunter has emerged through use of these methods.

Use of hunting as a means to reduce over-abundant populations of waterbirds requires flexibility in management approaches to harvest methods. Recognizing regulatory constraints imposed under the Migratory Bird Treaty Act of 1918 between the United States, Canada, and Mexico are unique, it is important to consider management and policy flexibility when addressing over-abundant populations.

**ORAL**

# Trends in breeding duck populations at Loch Leven National Nature Reserve

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Loch Leven is the largest lowland loch in central Scotland, with nearly 1,600ha of freshwater habitat. The loch is shallow (average depth 3.9m), surrounded by rich agricultural land, rural settlements with some small-scale industry which have over the years contributed to a history of eutrophication issues.

Since its establishment as a National Nature Reserve in 1964, the loch has been the subject of regular research and monitoring. Over these years a considerable data set for wildfowl numbers, fish & invertebrate populations, water quality and macrophyte abundance has accumulated. A series of review papers have been published at periodic intervals. Using a standard monitoring protocol, this paper extends the data run another 10 years, summarises trends from this period and relates this to changes over the last 50 years.

Surveys from a boat covering the loch shoreline and islands in calm conditions have been used to map spring pairs and numbers of juveniles produced.

Nest surveys on St Serfs Island, undertaken by 6-10 people taking 3 days to cover the whole island have been carried out in week 3 April & May and week 2 June. These had been undertaken regularly until 2003 but then ceased until 2014 when they were reinstated on a triennial basis. Comparisons are made with the intensive nest searches and monitoring which were carried out during 1967-1971.

The most numerous nesting duck species were Mallard and Tufted Duck with lesser numbers of Gadwall. For both Mallard and tufted duck nest surveys show a decline in nests with the decline since 1981 being statistically significant.

Gadwall nest surveys show nesting numbers have not changed significantly since 1967.

However these declines are not reflected in brood data, by taking peak counts of young aged over 3 weeks from boat based surveys as a measure of site productivity it is demonstrated that Mallard & Gadwall productivity at Loch Leven has remained stable throughout. There is a weak negative trend in terms of numbers of juvenile Tufted duck noted at 3 weeks and over, however the rate of this decline is much less than the species breeding population at the site.

**POSTER**

# Feather isotopes ($\delta^{15}N$) record the historical consequences of anthropogenic subsidies of nitrogen to coastal foodwebs

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Large amounts of nitrogen are used as fertilizer across the globe annually exceeding 100 million metric tonnes, with potential consequences for primary productivity and effects at higher trophic levels. We measured $\delta^{15}N$ values in feathers of eiders *Somateria mollissima* wintering on the Danish coast in 2015-2016 and a century ago, by using museum specimens. Blue mussels *Mytilus edulis* that are filter feeders relying on phytoplankton as food constitute the main diet of eiders. Feather $\delta^{15}N$ increased by 40% during the past century reflecting increased terrestrial runoff of N through agricultural use of fertilizer, in turn supporting increased primary production in shallow coastal systems. This increase in $\delta^{15}N$ was associated with an increase in body mass and longer duration of moult. However, there was a recent decrease in the quality of feathers as reflected by more fault bars and a higher degree of feather wear suggesting that longer duration of moult comes at a cost in terms of poorer feather quality. These findings imply that terrestrial nitrogen subsidies to coastal marine systems from anthropogenic sources has profound effects on species such as the eider as revealed by the effects on body condition and plumage quality and hence the ability to fly and dive. Analyses of stable isotopes in historical samples can be used as a general method for investigating aspects of global change.

**ORAL**

# Estimate of flyway population size in Red-crested Pochards *Netta rufina* in Central and Western Europe: methodological issue or wrong flyway delineation

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The Central Europe/west Mediterranean flyway population of Red-Crested Pochard increase on the long-term scale and its numbers are well covered by international monitoring programmes. In this contribution, we compare breeding population estimates summarised under BirdLife International and non-breeding population estimates performed by Wetlands International (i.e. International Waterbird Census). We found that current estimates of wintering population changes exceed two-time the estimates of breeding population size. This difference can be explained by under-estimation of breeding numbers due to low detectability of this species, due to mortality at the end of wintering period or mixing of Central Europe/west Mediterranean and Black Sea/east Mediterranean flyways. Moreover, there are records of migrating birds in Central Europe which can be explained by migration of birds from Black Sea/east Mediterranean and/or West-central Asia/Southwest Asia to or through the Central Europe.
The poster will include up-to date analysis of data sampled by The 2nd European Breeding Bird Atlas as well as by the actual results of International Waterbird Census.

**POSTER**

# Changes in duck breeding populations in the Czech Republic: effect of feeding conditions vs. climatic changes

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The changes in breeding populations of duck species has been well monitored in the Czech Republic over last 100 years.
The growth in numbers of breeding populations of most of duck species and its spread into new breeding sites was related to increase in trophic level of fishponds since the end of 19th century. The drop in population size was recorded since the early 1980s, when numbers of most of duck species started to decrease. This decrease is still continuing and recently (2015-2017) breeding population size reached about 15 % of breeding population size recorded in the early 1980s. This decrease was the most pronounced in benthophagous species, such as Tufted Duck, Common Pochard, Common Goldeneye, Shoveler or Common Teal. On the contrary, growth in breeding numbers of mostly herbivorous Red-crested Pochard contrasted with these declines. Differences in trends of breeding population can be explained much more by feeding preferences than by trends in flyway (Pan-European) population which seems to be more affected by global climate changes. The main drives of changes in breeding population size of duck species seem to be both (1) decrease in reproduction success and (2) abmigration of females with low breeding success in previous breeding season. The competition for food between Carps and ducklings is likely the main cause of low breeding success.
Nevertheless, the application of alternative fishpond management, i.e. using non-Carp fish stock was recently (2014-2016) found as useful tool resulting in increase of local reproductive success that illustrate the numbers of females rearing duckling as well as reproductive success of individually marked (nasal saddled) duckling females. Moreover, the actual local feeding condition could affect post-breeding movements of marked females of diving ducks.

**ORAL**

# Wintering ducks change the habitat use of wintering sites: site-specific dynamic over 50 years

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Waterbird species have different requirements with respect to their non-breeding areas, aiming to survive and gain condition during the non-breeding period. Non-breeding areas selection could change in time and space driven by the climate change and by habitat requirements of the species.

To contribute to the explanation of the mechanism shaping non-breeding areas selection, we provide site-specific analyses of distributional changes in wintering ducks in central Europe; located in a middle of its flyways (1966–2015). We identified species habitat requirements and changes in habitat use at the level of 733 individual wintering sites for six duck species using citizen-science monitoring data. We calculated site-specific mean numbers and estimated site-specific trends in numbers.

The site-specific approach revealed a general effect of site mean winter temperature (three out of six species), wetland type (all species) and land cover (all species) on site-specific numbers. We found increasing site-specific trends in numbers in the northern part of the study area (Eurasian Teal *Anas crecca* and Common Pochard *Aythya ferina*). Common Merganser *Mergus merganser* and Common Pochard increased their site-specific numbers on standing industrial waters. Common Merganser increased site-specific numbers in urban areas and likely tolerate disturbance while Common Goldeneye was the opposite.

The site-specific dynamics of bird numbers helped us to identify general preference for sites reducing winter harshness (warmer areas, running waters and more wetlands in the site vicinity); as well as indicate climate-driven changes in spatial use of wintering sites (northern range changes and changes in preference for industrial waters). The fine-scale (site-specific) approach would be able to point out large-scale range and distribution shifts driven by climate and environmental changes regardless limited availability of large-scale datasets.

**ORAL**

# Long-term trends in the populations of wintering ducks in Sweden

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Annual midwinter counts of waterbirds started in Sweden 1966, since January 1967 being a part of the International Waterfowl Counts (IWC) coordinated by Wetlands International. The counts are made from the ground by voluntaries covering one or more counting units. In addition to the ground counts country-wide aerial surveys in the archipelagos were made in 1971-78, 1987-89, 2004 and 20015. Partial surveys of Swedish offshore waters were made in 1970-74 with full coverage in these areas in 2007-2011 and 2015-16.
Annual national TRIM indices were calculated for 19 species. Of these 17 showed significantly increasing long-term trends and one species (the Long-tailed Duck) was significantly decreasing. Ground counts do not cover the Long-tailed Duck properly. From the surveys of all Swedish waters it is estimated that the total wintering population of Long-tailed Ducks decreased from about 1.4 millions in 1992-93 to 440000 in 2009 and 370000 in 2016. The offshore banks could not be surveyed in the 1970s but for comparable areas surveyed in 1970s, 2009 and 2016, the estimated population of Long-tailed Ducks decreased from about 600000 to 100000. In contrast with the breeding population of Eiders in the Baltic, the wintering population on the Swedish west coast did not show any decline. Some other species also differed between the west coast and the Baltic. Most increases in wintering numbers probably is an effect of milder winters with markedly less sea-ice especially in the archipelagos. Within the country, the increase in winter populations of several species was more marked in the northern part of the study area than in the south.

**ORAL**

# Beaver facilitation of waterbirds in the boreal: population and community level responses

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Boreal waters in general are not very productive habitats for ducks. Beavers (*Castor* spp.) facilitate ducks by creating suitable inundated habitat for them by damming. We first studied the facilitative effect of beaver on a water bird community of seven waders and ducks in boreal ponds by using the before-after control-impact method. The study took place in southern Finland during 1988–2009. Natural experiments were created as beavers caused disturbance by flooding 14 forest ponds. For each flooded pond, one non-flooded pond was used as a control. All seven species of the study increased during the beaver flooding, while changes were negligible in the control ponds. The number of water bird species was significantly higher during beaver inundation than before beaver activity, as was the water bird abundance. Common Teal (*Anas crecca*) and Green Sandpiper (*Tringa ochropus*) showed numerically the most positive response to flooding.
We secondly focused in more detail on population processes of the Common Teal. It was shown that beaver ponds harboured more invertebrates and has shallower depths than non-disrupted boreal ponds. This led not only to higher densities of Teal broods, but also for their better survival. On a landscape level up to 70 % of downy Teal broods were found in inundated areas consisting of about 7 % of the total shoreline of the study area. While considering a plethora of variables affecting Teal breeding success in a 20 year study, we found that food and beaver flood abundance were the most important factors affecting Teal breeding success in the boreal landscape. We also studied scale-related teal response in beaver and non-beaver landscapes. There was a manifest facilitative effect of beaver at the patch scale in sedentary broods, while in the vagile adults the effect only emerged clearly at the landscape scale.

**ORAL**

# Conservation of Velvet Scoter on Tabatskuri Lake in Georgia

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The populations of Velvet Scoter (*Melanitta fusca*) is decreasing worldwide and the species is classified as Vulnerable by IUCN. A geographically isolated population of Velvet Scoter breeds in the Caucasus between north-east Turkey and South Georgia, size of which was unknown prior to our study. Not long ago the breeding area of Velvet Scoter included several lakes of Javakheti highland (Georgia). However, due to direct habitat destruction, overfishing and illegal hunting breeding area of Velvet Scoter is critically reduced and currently the species only remains on Tabatskuri Lake. Based on our observation there are no more than 15 pair of Velvet Scoter on Tabatskuri Lake. They are distribution in the northern part of the lake near the small island, which is used for breeding. Unfortunately, Armenian Gull represents strong competitor in breeding sites which is one of the limiting factor of increase of Velvet Scoter population. In addition, other threats facing Velvet Scoter population in Tabatskuri Lake are: 1. Loss of breeding habitat; 2. Disturbance and destroying the nests; 3. Abandoned fishing nets. For those reasons the breeding success is low, approaching maximum 2 duckling from per nest. We have actively worked with the local community to raising the awareness on the Velvet Scoter and the treats facing its population.

**ORAL**

# Distribution changes, community composition and the role of protected areas in Europe

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Evidence is accumulating that avian species, and particularly waterbirds, are responding to anthropogenic pressure and climate change by, *inter alia*, changing their distributions, both in the breeding and non-breeding season. This ongoing process raise a question about the effectiveness of the current network of protected areas delivering climate change adaptation for waterbird species at larger scale than individual countries. To improve the knowledge concerning this topic, we analysed 24 years of data on wintering waterbirds (International Waterbird Census) across 21 European countries. Specifically, our goals were (1) to test if the winter abundances of 25 species have changed during the past three decades in northeastern, central and southwestern Europe and if such trends in wintering numbers differed between protected and unprotected areas (Special Protection Areas, SPAs), (2) to assess potential changes in species richness (i.e. number of species) over the study period in the three different regions, and (3) to compare whether changes in richness is linked to the amount of protected land in each region. The results of the analyses will be discussed.

**ORAL**

# Winter flooding, a 'win–win' management practice for rice producers and waterfowl conservation in Europe

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In North America and in Asia, winter flooding has been demonstrated to enhance food resource accessibility to waterfowl in post-harvest ricefields, the farmers in turn benefitting from waterfowl ecosystem services. Through a set of empirical and experimental studies, we tested if similar benefits could be expected in Europe.
The mean number of wintering ducks in five major rice production regions of Western Europe is positively related with total wetland area (natural wetlands plus flooded ricefields), suggesting complementarities between these habitats for waterfowl conservation. Applying a variety of agricultural practices to 50 harvested ricefields in Camargue (France), we demonstrate the existence of vast amounts of duck food resources (ca. 500 kg/ha of rice and weed seeds on the ground after harvest). Seed availability greatly decreases across the winter (-89% for rice seed mass and -69% for weeds), seed depletion being accentuated by ploughing. Winter flooding is the main determinant of nocturnal use of the fields by wintering ducks (on average 24 and 0.3 ducks/ha in flooded and unflooded fields, respectively). In return, experiments show that winter flooding accelerate decomposition of some weeds and waterfowl foraging in flooded ricefields enhance straw stalks reduction. A cost-benefit analysis shows that winter flooding is economically realistic in France considering agronomic and environmental constraints and advantages. Harvesting rice in flooded fields is four times more profitable to farmers and more than eight times more profitable for the Camargue society than the traditional burning-ploughing (benefits-to-costs ratios for farmers: 4.30 vs. 0.93; for society: 6.81 vs. 0.73).
In Europe, the proportion of ricefields flooded during winter varies considerably between countries (0.17–62%), owing to differences in policy initiatives such as Agri-Environment Schemes. Promoting winter flooding of ricefields in Europe would benefit both farmers and wintering ducks.

**ORAL**

# Nest site fidelity with common scoters and long-tailed ducks in north Iceland

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Nest site fidelity amongst common scoters and long-tailed ducks was examined in a 15 km$^2$ study area in northeast Iceland. Each June from 2009 to 2017 nests were located and females ringed or recaptured in the study area. Each year between 30 and 42 nests of common scoters and between 10 and 20 nests of long-tailed duck could be located. All nests and all recaptures were entered into a GIS-database. More than 70 % of all common scoter females caught were recaptured one or several times between years. In the field season of 2017 more than 90 % of the common scoters and over 50 % of the long-tailed ducks were recaptures, all with known nest locations from previous captures.
This extensive data set of nine consecutive breeding seasons allows evaluating the nest site fidelity for the two species. These findings will be related to nest site fidelity of a few common scoters breeding in the Norwegian highland.

**POSTER**

# Recreational boat activity influence abundance and distribution of moulting common scoters

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Human use of the marine environment has increased during the last 100 years. Anthropogenic disturbances from ships, wind farms, recreational use and fisheries all expectedly influence the distribution and numbers of birds and marine mammals. Moulting sea ducks in particular are vulnerable to disturbance during their three weeks flightless wing feather moult.
The relation between the level of human disturbance (mainly recreational boat activity) and numbers/distribution of moulting sea ducks was examined in a 600 $km^2$ study area in Sejerøbugten, central Denmark – an area important to moulting and wintering sea ducks. Information on sea ducks abundance and distribution was obtained by use of high-resolution digital orthophotos during the moulting season in late summer of 2014 and 2015. The level of human disturbance was recorded during the same period by use of a digital radar, situated on the northernmost point of the island of Nekselø. This enabled us to quantify the level of boat activity at high spatial and temporal scale and subsequently enabled us to relate bird density, also obtained with high spatial and temporal scale, to levels of sailing intensity.
Using Generalized Linear Mixed Models we demonstrated a significant negative relationship between densities of common scoter *Melanitta nigra* and the level of human disturbances, both when based on long-term (months) and short-term (24 hours) disturbance data. No relationship was found between common eider *Somateria mollissima* density and the level of human disturbance, neither when based on long-term nor on short-term disturbance data.
Based on the analyses two areas with potential future sailing restrictions were proposed.

**ORAL**

# Facultative heterospecific brood parasitism in clutches and broods in duck species in South Bohemia, Czech Republic

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Heterospecific brood parasitism (HBP) frequently occurs in waterfowl, though much less often than conspecific brood parasitism. In this study, we assess the rate of HBP among clutches and broods of five sympatric breeding duck species: Gadwall *Anas strepera*, Mallard *Anas platyrhynchos*, Red-crested Pochard *Netta rufina*, Common Pochard *Aythya ferina* and Tufted Duck *Aythya fuligula* from nest and brood surveys carried out in the Třeboň Biosphere Reserve and surrounding area (South Bohemia, Czech Republic) in 2006–2015 inclusive.
Assessment of 2 323 clutches and 3 056 broods found a higher rate of HBP in clutches than in broods. The rate of HBP in the broods of host birds did not increase with the rate of HBP in host clutches for the five species investigated. The highest proportion of brood parasitism recorded was among Red-crested Pochard. Tufted Duck showed the lowest difference in the HBP rate between clutches and broods; Mallard the highest. From the parasitising female's perspective, the rate of HBP in clutches increased with the rate of HBP in broods for each species investigated. We can conclude that the choice of host affects the success of HBP (i.e. the frequency of HBP in clutches vs. rate of HBP in broods), and that this can differ between the five species included in the study. Tufted Duck seems to be the most suitable host species as well as the most successful parasite.

**POSTER**

# Mussel and lemming abundances explain the population dynamics of long-tailed duck

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Long-tailed Duck *Clangula hyemalis* numbers in the Baltic Sea have declined by ca. 65% from 4.6 million birds in 1993–1995 to 1.6 million birds in 2007–2009, and the species was classified as globally threatened in the IUCN Red List in 2012. Here, we quantify the effects of environment changes on the breeding grounds (Taimir Peninsula in western Siberia) and at the wintering area (southern Baltic Sea) to the long-term population dynamics of the species. The autumn juvenile/adult ratio of the species has decreased during the last two decades, suggesting declining reproduction success. Probably as a consequence of global climate warming, also affecting the Arctic winter, lemming abundances (*Lemmus sibirica* and *Dicrostonyx torquatus*) have declined during the last decades with the consequence of food shortage in spring and summer for lemming predators; thus, fledgling production of some ground-nesting birds has decreased because predators shift to eggs and young during poor rodent years. Mussels, whose populations have decreased in the southern Baltic Sea, form the main diet of Long-tailed Ducks during winter. On the basis of hierarchical state-space population modelling of the series of spring migration counts, describing winter population development, from the Gulf of Finland, juvenile proportions in Danish wing samples and the Siberian lemming index, we quantified the effect of mussels and juvenile production to the population dynamics. Mussels and juvenile production explained 50% and 10%, respectively, of population dynamics. On the other hand, lemmings explained 30% of the juvenile/adult ratios. Our results suggest that the deterioration of environment conditions in the southern Baltic Sea, such as mussel population decreases due to hypoxia and bottom death, has been the most important reason for the Long-tailed Duck population decline during recent decades. Therefore, temperature increase due to global climate change forms a substantial threat for Long-tailed Ducks in the future.

**ORAL**

# Migration of Teal *Anas crecca* wintering in Portugal. The use of Nasal saddles vs. PTTs vs. GPS/GSMs

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The Teal is the most abundant duck species during winter and is exclusively a wintering migratory species in Portugal. More than 4400 teal were captured and ringed in Portugal since 1993. From those, more than 3700 were nasal saddled and produced more than 8600 resights (www.pt-ducks.com). The recoveries, recaptures and resights, modelled through GIS, allowed the definition of migratory routes from breeding grounds to Portuguese wintering sites. Most teal used the East Atlantic migratory route, with breeding grounds from Iceland to Siberia. The use of 5 PTTs since February 2017 produced new information, some unexpected, and will allow better future GIS modelling. The advantages and limitations of the use of PTT versus GPS/GSM on this species will be discussed, since during the winter 2017/18 will be used also 5 GPS/GSMs.

**ORAL**

# The use of camera-traps to read nasal saddle codes on ducks. Should we use photo, video or both?

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Reading codes of nasal saddles on ducks usually require the use of a telescope and that the duck is at <350 m from the observer. Using camera traps placed at positions with high concentration of marked ducks allowed the reading of hundreds of codes, of hundreds of different individuals, from *Aythya* to *Anas* species, including those with smaller sized saddle – *Anas crecca*, both during day-light and during the night, proving to be efficient. Recent models of camera traps have the option of doing HD videos that allow the reading of codes within some occasions where only photos did not work. However, comparing the results using the hybrid mode (taking photos and doing video), did not proved that video statistically improved camera trap efficiency. New test delineation was designed, data are being collected and results will be presented.

**POSTER**

# Assessment of the risks associated with the import and release of hand-reared mallards for hunting purposes

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The mallard (*Anas platyrhyncos*) is among the world's most popular game species and the annual harvest in Europe is estimated to 4.5 million individuals. Since the 1970s restocking mallard populations with hand-reared birds has been common practice to increase populations for hunting purposes. In Norway, this interest has increased over the last few years and today approximately 10,000 birds are released annually. The Norwegian Environment Agency and the Norwegian Food Safety Authority therefore requested a risk assessment of the import of hand-reared mallards from Sweden and their release in Norway.

We applied a semi-quantitative risk assessment method to evaluate possible risks for biodiversity, nutrient status, and animal health and welfare. Risk assessments are based on three different scenarios with increasing releases, as the magnitude of impact is often dependent on number and density of released mallards.

We conclude that there are risks of genetic impact on wild populations, which are expected to accumulate with time and increasing numbers. Further, there are risks of several ecological effects, including increased competition for food and attraction of predators. Dense populations of ducks can be expected to have trophic impacts caused by the input of extra nutrients, but the magnitude of impact is site-specific, dependant on density, and number of consecutive years of releases. There is some risk of introducing diseases when importing mallards, including highly pathogenic avian influenza and Newcastle disease. Also this risk increases with number of imported individuals. Documented low first-year survival of released mallards will reduce the risk of negative long-term effects on biodiversity, however, causes of mortality are likely to induce suffering to mallards prior to death.

To fill knowledge gaps related to impacts of releases, various methods are suggested; genotyping and ringing of all released mallards (2017, 8000 released mallards were ringed), monitoring of concerned ecosystems, including water quality testing.

**ORAL**

# Cyprinids in waterfowl habitats – the problem and how to manage it?

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Several recent articles and reviews have paid attention to the large scale decline of diving ducks and other waterfowl species in European and North American lakes and wetlands and to the role of fish in the change. Especially benthivorous or omnivorous cyprinid species like bream (*Abramis brama*), roach (*Rutilus rutilus*), carp (*Cyprinus carpio*), crucian carp (*Carassius carassius*) and the alien Prussian carp (*Carassius gobio*) have been discussed in connection to this megatrend which is related to eutrophication of water bodies. Declines of breeding populations of e.g. Tufted duck (*Aythya fuligula*), Pochard (*A. ferina*) and Slavonian grebe (*Podiceps auritus*) have been observed especially in eutrophic Finnish lakes. However, these species still thrive in many eutrophic, fishless ponds and wetlands. Eutrophication s.l., deliberate or accidental fish introductions, selective fishing and restoration measures aiming at improving water quality like raising of water level or aeration to prevent oxygen depletion in winter may all have favored the increase of cyprinid populations. The problem has recently been tackled in some Finnish SPA and Natura 2000 sites by applying the methods of fish removal used in biomanipulation of eutrophic lakes. I review the basic indications in waterfowl, water quality and fish parameters used in identification of the potential or need for biomanipulation, emphasizing the dependence of waterfowl on both limnological parameters and fish populations of the habitat. Finally, I give examples of biomanipulation measures that have been successfully implemented and conclude with some principles on monitoring, planning and implementation of foodweb management which can help in solving the problems caused by cyprinids in temperate waterfowl habitats.

**ORAL**

# Identifying opportunities to safeguard wetland and floodplain habitat across Central Scotland

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Ducks, and other water birds, utilise a suite of wetlands, some recognised and designated as key sites, but also many sites dispersed across wider landscapes. Identifying and safeguarding these wetlands at a landscape scale is a significant challenge for conservation management. Scottish Natural heritage leads the EcoCoLife project that aims to improve ecological coherence across a range of fragmented habitat types across central Scotland that includes wetland and floodplain habitats. The project has tested and proven an approach using a GIS-based and expert led method to identify on-the-ground opportunities where practical management might improve connectivity across fragmented habitats, thereby addressing species resilience in the face of land use and environmental negative pressures. This has been described as an "ecological coherence protocol". The model also makes a measure of benefits to people through the identification and quantification of ecosystem services using the EcoServ-GIS application.
The protocol necessarily looks for opportunities in the wider landscape beyond existing protected areas to extend their networking effect into adjoining and neighbouring areas. Using an understanding of where habitat core areas prevail and modelling different scales of dispersal from those is central to the method. This, together with analysis of topographic, hydrological and biophysical features provides strategic scale maps where the potential for safeguarding and creating habitat might be targeted. The project follows this up with a feasibility assessment of individual sites, then implements management and physical works where feasible and where resources are available.
The EcoCoLife project is a LIFE+ Biodiversity project funded by the LIFE financial instrument of the EU.
The project works with species and habitat specialists from a number of partner organisations including; RSPB, Scottish Wildlife Trust, Buglife, Butterfly Conservation Scotland, East Ayrshire Coalfield Environment Initiative and Scottish Environment Protection Agency.

**POSTER**

# Changes in nesting success and breeding abundance of a Spectacled Eider *Somateria fischeri* population in Chukotka, Arctic Russia, 2003-2016.

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The Spectacled Eider *Somateria fischeri* is a specialised sea duck confined to breeding in the Yukon-Kuskokwim Delta and Arctic coasts of Alaska and Russia. Almost nothing is known about its status and breeding biology in the Russian Arctic. Annual stratified systematic nest searches were carried out of Spectacled Eider nests on Ayopechan Island in the Chaun Delta, Arctic Russia during 2003-2016. Mean nest densities were similar during 2008-2009 but declined by 8.0% per annum during 2009-2016. Mean clutch size and annual female survival did not change over the same period, during which time annual nest survival and hatching success declined significantly. A simple three age-class matrix model estimated annual asymptotic population growth rate (λ) using observed fecundity from the beginning (1.1 hatched chick per female, λ = 0.864) and end (0.45 hatched chick per female, λ = 0.828) of the study period. This confirmed that to stabilise this population required 3 immigrant recruits for every local recruit at the beginning of the study and 9 towards the end. Declines in annual nest survival appear linked to (i) declines in nesting Sabine's Gulls *Xema sabini* and Arctic Terns *Sterna paradisaea* with which nesting Spectacled Eider associated and gained protection from predators, and (ii) marginally significant increases in large gull and mammalian predators at the site. Should current trends in nest density and fecundity continue, the survival of this breeding spectacled eider population is in jeopardy.

**ORAL**

# The power of stable isotope techniques to identify moulting habitats and diets in a fish eating duck

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Scaly-sided Mergansers *Mergus squamatus* are the most freshwater of seaducks, breeding on freshwater rivers in Far East Russia, Korea and China, wintering on similar habitat in China and Korea, and moulting on primarily fresh rivers. The species is a specialist fish eater supplemented by frogs and insect larvae in the diet. Earlier stable isotope studies showed that most Scaly-sided Mergansers of both sexes moulted on freshwater, although some non-breeding and failed breeding females may undertake moult migration to brackish and marine waters. To investigate moulting provenance, we combined wing, breast and head feather $\delta^2H$, $\delta^{13}C$ and $\delta^{15}N$ stable isotope ratios (males and females, total of 97 samples, including repeated sampling of the same birds in different years) with geolocator data (only from nesting females) to establish habitats (fresh, brackish, or saltwater) used by both sexes during wing and contour feathers moult. These results confirmed the considerable power of using $\delta^2H$ stable isotope techniques to assign wing feather growth on fresh water to geographical area, even down to the specific river. $\delta^{13}C$ and $\delta^{15}N$ stable isotope ratios in contour (head and breast) feathers of females suggested that these feathers were grown on freshwater habitats that were different to those where wing feathers were grown, most likely on the winter quarters. This confirms patterns in other saw-bill duck species that suggest body moult more usually takes place outside of the summering areas.

**ORAL**

# Trends in harvest data of huntable ducks in Italy

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Ducks are well monitored in Eurasia and Africa by International Waterbird Census (IWC) and for many species are available good population trends. Other monitoring schemes are in place for breeding population, but not with the same international scale and accuracy of the IWC data. Very few data are available for the migration period, and also the productivity at the start of post nuptial migration is more or less unknown. Many duck species are hunted all over their flyways, so different sources of data are needed to understand population demography and harvest impact. We collected bag reports in Italy from different subjects, in order to estimate a mean harvest for season and also to analyze trends of harvest index for a set of region for which were available good series of data. We obtained good data from 4 regions in North-center of Italy with important wildfowling tradition and we calculate trends for the 9 huntable ducks in Italy, *Anas plathyrhynchos*, *Anas crecca*, *Anas acuta*, *Spatula clypeata*, *Spatula querquedula*, *Mareca penelope*, *Mareca strepera*, *Ayhtya ferina* and *Ayhtya fuligula*. The data set spans from hunting season 2003-2004 to season 2015-2016. We used TRIM program to assess trends in harvest, and we also corrected totals by hunting days and number of hunters, in order to achieve a trends that reflects the presence in these areas. Trends are compared with the ones of IWC, both at national and international level. In many case we found a correlation between the two sources, and a species approach is presented. We consider that the bag data trends could give information on migrant population, because the highest harvest are obtained in autumn months, before the IWC counts. Such information could so integrate the evaluations on population demography of Eurasian huntable ducks.

**ORAL**

# Status and trends of Common Pochard *Aythya ferina* population in Eastern Europe

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A recent European review of the status of breeding Common Pochard showed substantial declines since the 1980s, with greatest decreases manifest in Eastern Europe. Based on data discussed at a workshop held in 2017, we present an updated status report on breeding and moulting concentrations in this region, particularly based on new information from the European Russia, Belarus and the Baltic States. Trends in Eastern Europe show continued declines in breeding abundance. We attempt to further investigate the reasons behind the observed recent declines in nesting numbers, which suggest that they were mainly caused by the habitat and land-use change, also increased predation (particularly from invasive mammal species). However, other factors, such as the impacts of climate change on wetlands in Eastern Europe (especially in the steppe zone), must also be involved in explaining the continued dramatic changes in the nesting abundance of the species. Important moulting sites of the species in Eastern Europe are currently largely unknown, except for the one in the Nemunas River delta. There is an urgent need for better information relating to the key factors affecting breeding success and abundance among Common Pochard, which is currently showing such unfavourable status throughout Europe.

**POSTER**

# Artificial digestion as a tool to understand dispersal of plants by waterbirds

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Dispersal by waterbirds is increasingly recognized as an important mechanism by which terrestrial, riparian and aquatic plant species disperse within and among wetland ecosystems. However, much of our current knowledge is based on experimental quantifications of seed survival and retention times in living waterbirds under controlled laboratory conditions. I developed a method to simulate digestion by waterbirds *in vitro,* and used this to compare the suitability of a wide variety of European plant species for endozoochory by waterbirds. This provides information on which seed traits are crucial for dispersal by waterbirds, which I use to explain differences in the distributions of these plants. This information increases our understanding of which (exotic) plant species can use waterbirds for their dispersal or range expansions in our globally changing world.

**ORAL**

# Understanding the decline of sea ducks in the Baltic Sea – an integrative approach

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The wintering population of all sea ducks in the Baltic Sea declined by about 60% between 1994 and 2009. For long-tailed ducks (*Clangula hyemalis*), the decline was 65% from 4.3 to 1.5 Million birds, resulting in the species' re-classification as globally threatened (vulnerable) on the IUCN Red List. Velvet Scoters (*Melanitta fusca*) and Common Scoters (*Melanitta nigra*), too, are classified as endangered on the HELCOM Red List after a decline by 56% and 47%, respectively. Our understanding of the threats and reasons for decline in the Arctic breeding grounds has substantial gaps due to the inaccessibility of these areas. According to our current knowledge, likely explanations for the long-tailed duck's decline are mortality as by-catch in gillnet fisheries and reduced reproductive rates since 1994. To identify reasons for this, and ultimately define counter-measures, we need to understand the drivers of reductions in fecundity of sea ducks wintering in the Baltic Sea. We will determine breeding success of sea ducks on their breeding grounds in the Russian Arctic and investigate habitat choices during migration, at resting and wintering sites using stable isotope analyses and geolocation devices. Additionally, we examine the diet of sea ducks using genetic analyses of faecal material collected during the breeding seasons of three successive years. The first breeding season of our study was characterised by very cold spring conditions, which were associated with a late start of breeding and low breeding success. We will present preliminary results from this exceptional breeding season in the Russian Arctic.

**POSTER**

# Changes over 45 years: duck populations in the Clyde Estuary

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The Clyde Estuary was, historically, grossly polluted for at least 100 years. In the 1960s and 1970s, major efforts began to improve water quality.

During the 1970s, the benthic invertebrate fauna of the outer estuary was dominated by very high abundances of a few species, principally *Corophium volutator*, *Nereis diversicolor* (now, *Hediste diversicolor*) and *Hydrobia ulvae* (now, *Peringia ulvae*).

The mudflats supported important populations of a characteristic guild of bird species, notably shelduck and pintail, together with redshank and dunlin). By the late 1970s, substantial water quality improvements were achieved, especially declines in inputs of Particulate Organic Matter (POM) and increases in Dissolved Oxygen (DO). This appeared to trigger a regime shift from a high biomass/low diversity fauna to a lower biomass/higher diversity one. Evidently due to the reduction in POM and increase in DO, there was an expansion of bottom feeding fish, especially flounders, across the estuarine flats. Flounders fed on the same species (especially *Corophium*) as the waders, shelduck and pintail, and it appears that increased competition led to a crash in the bird guild.

What has happened since? Combining bird trend data from WeBS, with data on water quality, fish and invertebrates from the Scottish Environment Protection Agency (SEPA), this paper reviews duck (and other coastal bird species') trends in the Clyde Estuary over the last 40 years. Mussel-feeding goldeneye and common eider increased until the mid-1990s, but numbers have declined since then. Mallard and red-breasted merganser show variable but slow increases. In contrast, the herbivorous wigeon and teal have shown dramatic increases from the late 1980s. Other coastal waterbirds are dominated by increasing numbers of fish-eating species.

**ORAL**

# Female Spectacled Eiders nesting at Chaun Delta, Chukotka, Russia share a common area for wing moult.

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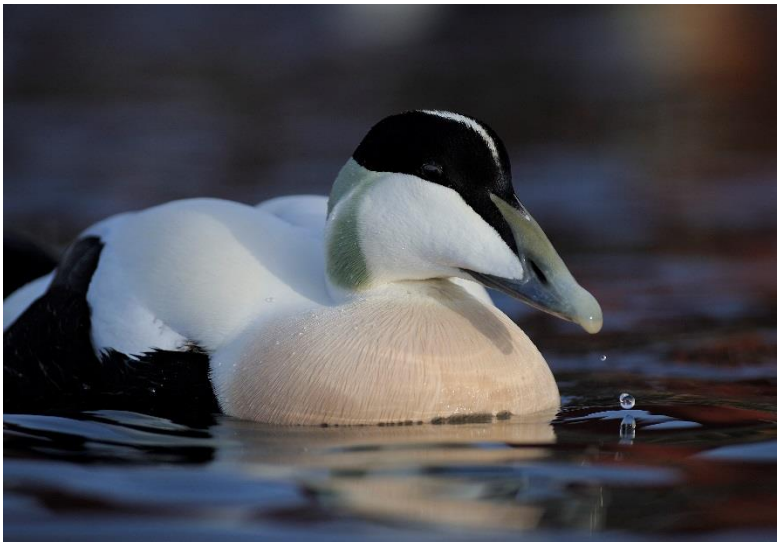
To date only four sites have been discovered where Spectacled Eider undergo wing moult, two in Alaska and two in Russia.
At the Chaun Delta, Chukotka, Russia, a breeding population of Spectacled Eider has been studied since 2002. In 2013, wing feather samples were taken from 12 nesting females by DS (*et al.*). Down samples were also taken from 15 nests. δ15N and δ13C stable isotope analysis was undertaken by JN at the Scottish Universities Environmental Research Centre.
Results for the wing feathers showed that there was little variation in the δ15N and δ13C stable isotopes across the birds sampled. This suggests that these females shared a common area for growing their wing feathers.
Comparison with previous satellite transmitter and stable isotope studies from Alaska strongly suggest that this moult site is located along the Bering Strait coast of Chukotka, most probably at the previously identified Mechigmenskiy Bay. Using the shortest coastal route, Mechigmenskiy Bay is located c1300 km eastwards from the Chaun Delta, and approximately 80% of the way to the wintering area south of St Lawrence Island.
There was no difference in the δ15N signature between wing and down samples, indicating a similar level of nutrition and source prey. However, the δ13C showed substantial differences between the two feather types, indicating that they were grown in different locations and at a different time. There was also considerable variation in the δ13C signature for the down feathers, all indicating less marine environments than for the wing feathers, including one with a freshwater signature.
This study confirms that females nesting at Chaun Delta use the same site (Mechigmenskiy Bay) for wing moult. It also demonstrates that down growth takes place at a different time and at a wider range of locations than for wing moult.

**ORAL**



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