3RD NORTH AMERICAN SEA DUCK CONFERENCE

NOVEMBER 10-14 2008 • QUÉBEC CITY

King Eider Sponsor Category

Red-breasted Merganser Sponsor Category

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SEA DUCK CONFERENCE

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WELCOME TO THE THIRD NORTH AMERICAN SEA DUCK CONFERENCE

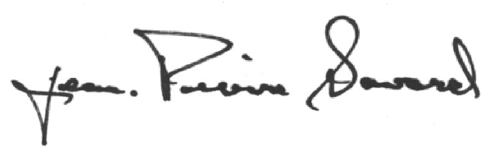
We are honoured to welcome you to Québec City, for the Third North American Sea Duck Conference. The conference is jointly hosted by Environment Canada (Canadian Wildlife Service and Science & Technology, Québec Region) and the Regroupement QuébecOiseaux, which represents birdwatcher societies and individuals interested in bird conservation. The conference is made possible because of the generous contribution of several sponsors. We sincerely thank all of them for their engagement.

We are fortunate to have four excellent plenary speakers from Europe and North America along with 66 oral presentations and 48 posters covering a variety of species and topics related to sea ducks. We are pleased that our programme avoids concurrent sessions, thus allowing participants to attend all presentations. This is a rare opportunity these days at a scientific meeting. Please take advantage of this unusual aggregation of sea duck enthusiasts to learn new things, renew friendships and create new ones.

We hope you will take some time to discover Québec City, which is celebrating its 400^{th} anniversary in 2008. Québec City (from *Kébec*, an Algonquin word meaning “place where the river narrows”) is the cradle of French civilization in North America and one of the world’s most enchanting cities, with its unequalled historical and cultural heritage. We highly recommend participants to take time to visit the historic walled Old-Québec, located in close proximity to Château Laurier, the conference headquarters.

The success of the Third North American Sea Duck Conference is now in your hands. Sit back, listen, learn, discuss, argue and enjoy.

Michel Robert
Chair, Organizing Committee



Jean-Pierre L. Savard
Chair, Scientific Committee

ACKNOWLEDGEMENTS

The holding of the Third North American Sea Duck Conference was made possible thanks to many organizations and individuals. We thank them all for their contribution.

Organizing Committee

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Daniel Bordage, Waterfowl Biologist, Canadian Wildlife Service, Québec Region
Isabelle Chartier, Conseillère Environnement, Groupe Production-Hydro-Québec
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Michel Robert (Chair), Species at risk Biologist, Canadian Wildlife Service, Québec Region
Raymond Sarrazin, Science Manager, Canadian Wildlife Service, Québec Region
Jean-Pierre L. Savard, Research Scientist, Science & Technology, Environment Canada

Scientific Committee

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Matthew C. Perry, Research Wildlife Biologist, USGS - Patuxent Research Center, USA
Greg Robertson, Research Scientist, Environment Canada, NF, Canada
Jean-Pierre L. Savard (Chair), Research Scientist, Environment Canada, QC, Canada

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Central Flyway Council
Atlantic Flyway Council
Sea Duck Joint Venture

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	Welcoming 8:30-9:00 (Salle des Plaines)	Invited Speaker: Dr. Jean-François Giroux 8:30-9:30 (Salle des Plaines)	Invited Speaker: Dr. Hannu Pöysä 8:30-9:30 (Salle des Plaines)	Invited Speaker: Dr. Margaret R. Peterson 8:30-9:30 (Salle des Plaines)
	Invited Speaker: Dr. Árni Einarsson 9:00-10:00	Break 9:30-10:00 (Foyer des Plaines)	Break 9:30-10:00 (Foyer des Plaines)	Break 9:30-10:00 (Foyer des Plaines)
	Break 10:00-10:30 (Foyer des Plaines)	10:00 4.1 Alisauskas	10:00 7.1 Guillemette	10:00 10.1 Powell
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	10:30 1.1 Savard	10:30 4.3 Slattery	10:30 7.3 Pelletier	10:30 10.3 Lok
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	11:00 1.3 Bowman	11:00 4.5 Gilchrist	11:00 7.5 Ayotte	11:00 10.5 Savard
	11:15 1.4 Perry	11:15 4.6 Mehl	11:15 7.6 Courchesne	Concluding 11:15-11:45
	11:30 1.5 Dickson	11:30 4.7 McAuley	11:30 7.7 Hollmén	
	11:45 1.6 Pearce	11:45 4.8 Lehikoinen	11:45 7.8 Buttler	
	Lunch (not provided) 12:00-13:45	Lunch (not provided) 12:00-13:45	Lunch (not provided) 12:00-13:45	
Conference Registration (Lobby) **and** **Poster Installation** (Grande-Allée AB) 13:45-22:00	13:45 2.1 Gilliland	13:45 5.1 Lovvorn	13:45 8.1 Merkel	OLD-QUÉBEC TOUR FOR DELEGATES
	14:00 2.2 Wilson	14:00 5.2 Nash	14:00 8.2 Jónsson	
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	15:15 2.7 Federer	15:15 5.7 Kilpi	15:15 8.7 Jaatinen	
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	16:00 3.1 Ouellet	16:00 6.1 O'Connor	16:00 9.1 Craik	
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	17:15 3.6 Zipkin	17:15 6.6 Vest2	17:15 9.6 Takekawa	
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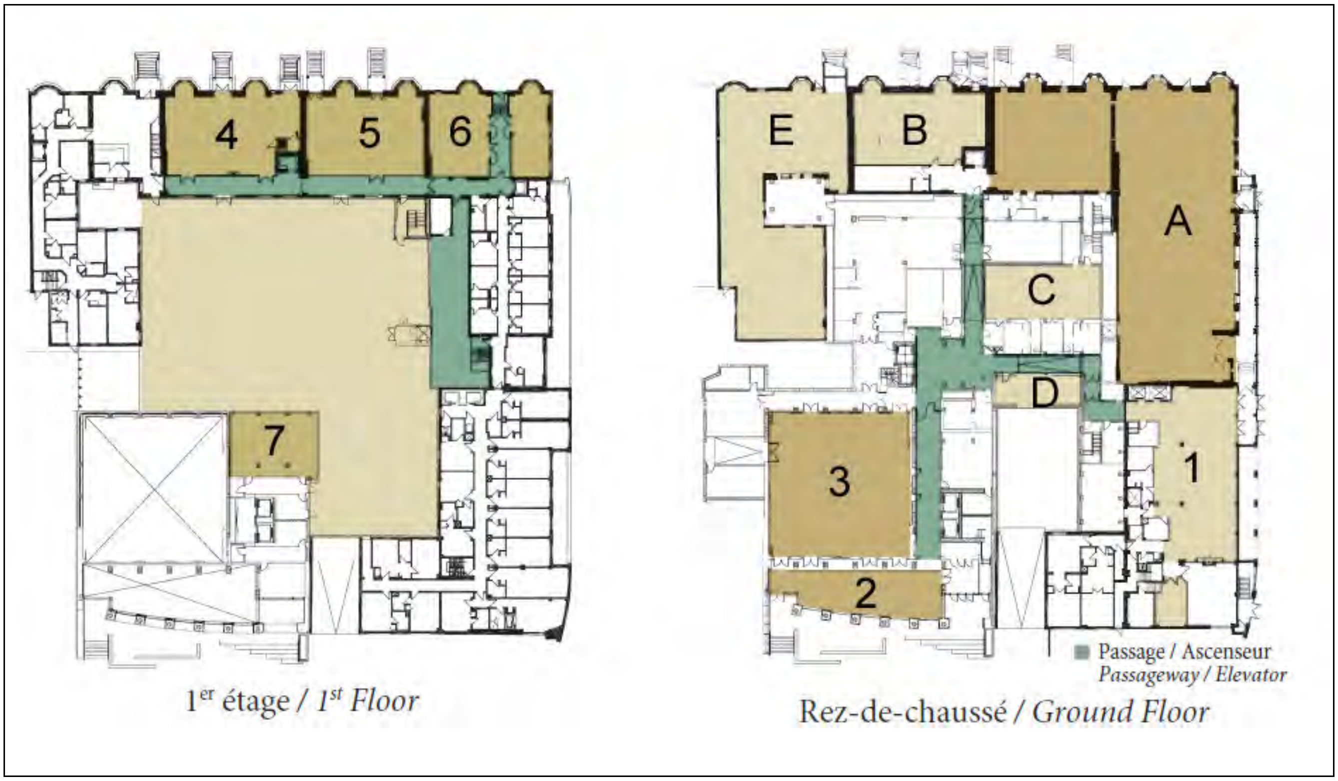
Opening Reception Hot/cold canapés & beverage (Foyer des Plaines) 18:30-22:00	**Poster Reception** Hot/cold food & beverage (Grande-Allée AB & Abraham-Martin) 18:30-22:00	Workshop 1 *Common Eider Conservation* (Salle du Jardin) 19:00-21:30 Workshop 2 *Energy vs. Sea Duck Needs* (Salle de la Colline) 19:00-21:30	**Banquet** Ticket needed (Foyer des Plaines) 19:30-22:00	

Social Events: Complimentary Breakfasts, Opening Reception, Poster Session and Banquet.

Presentations: Please note that oral presentations are named according to first author surname.

Note that this schedule does not include meetings on Sunday November 9 and on Monday November 10 (Salle du Jardin) for SDJV Continental Technical Team, Coordinators, and Board members.

CHÂTEAU LAURIER MEETING ROOMS AND FACILITIES



MEETING ROOMS

1. **Lobby**
    - Conference Registration
2. **Foyer des Plaines**
    - Opening Reception
    - Coffee Breaks
3. **Salle des Plaines**
    - Talks and Invited Speakers
    - Banquet
4. **Grande-Allée AB**
    - Posters
5. **Abraham-Martin**
    - Complimentary Breakfasts
    - Poster Reception
6. **Salle de la Colline**
    - Workshop 2 (Energy *vs.* Ducks)
7. **Salle du Jardin**
    - Workshop 1 (Common Eider)
    - SDJV Meetings (9-10 Nov.)
8. **Salon Laurier 2** (*not illustrated*)
    - Conference Secretariat
    - Talk practice and loading

CHÂTEAU LAURIER FACILITIES

A. Restaurant (St-Hubert)
B. Convenience Store
C. Pool and Sauna
D. Fitness Room
E. Health and Beauty Center

RESTAURANTS AND OTHER USEFUL INFORMATION

Hôtel Château Laurier (conference headquarters) lies on Grande-Allée Street, where delegates will find plenty of restaurants, bistros and bars. Delegates will have 1h45 to take their lunch meal, and we recommend simply walking on Grande-Allée (uphill) to find a restaurant (refer to map on page 7). Here is an idea of what delegates will find:

FAST FOOD

Ashton (poutine)	640 Grande-Allée E	(418) 522-3449
Quiznos sub	580 Grande-Allée E	(418) 522-7118
Subway	1196 d'Artigny	(418) 525-7075
Al Wadi (libanese)	615 Grande-Allée E	(418) 649-8345
McDonald's	649 Grande-Allée E	(418) 692-4848

MEXICAN & SPANISH

Carambas (mexican)	1155 de la Chevrotière	(418) 523-9191
Copas (spanish)	595 Grande-Allée E	(418) 521-2373

ITALIAN

Vieille maison du spaghetti	625 Grande-Allée E	(418) 529-6697
Casa Calzone	637 Grande-Allée E	(418) 522-3000
Rivoli Trattoria	601 Grande-Allée E	(418) 529-3071
Piazza	641 ½ Grande Allée E	(418) 523-4774

INTERNATIONAL

Voodoo Grill	575 Grande-Allée E	(418) 647-2000
St-Hubert (chicken)	In Château Laurier	
Cosmos Café	575 Grande-Allée E	(418) 640-0606
Ozone Pub	570 Grande-Allée E	(418) 529-7932
Astral	1225 Place Montcalm	(418) 647-2222
Maison du Steak	624 Grande-Allée E	(418) 529-3020

BARS & PUBS

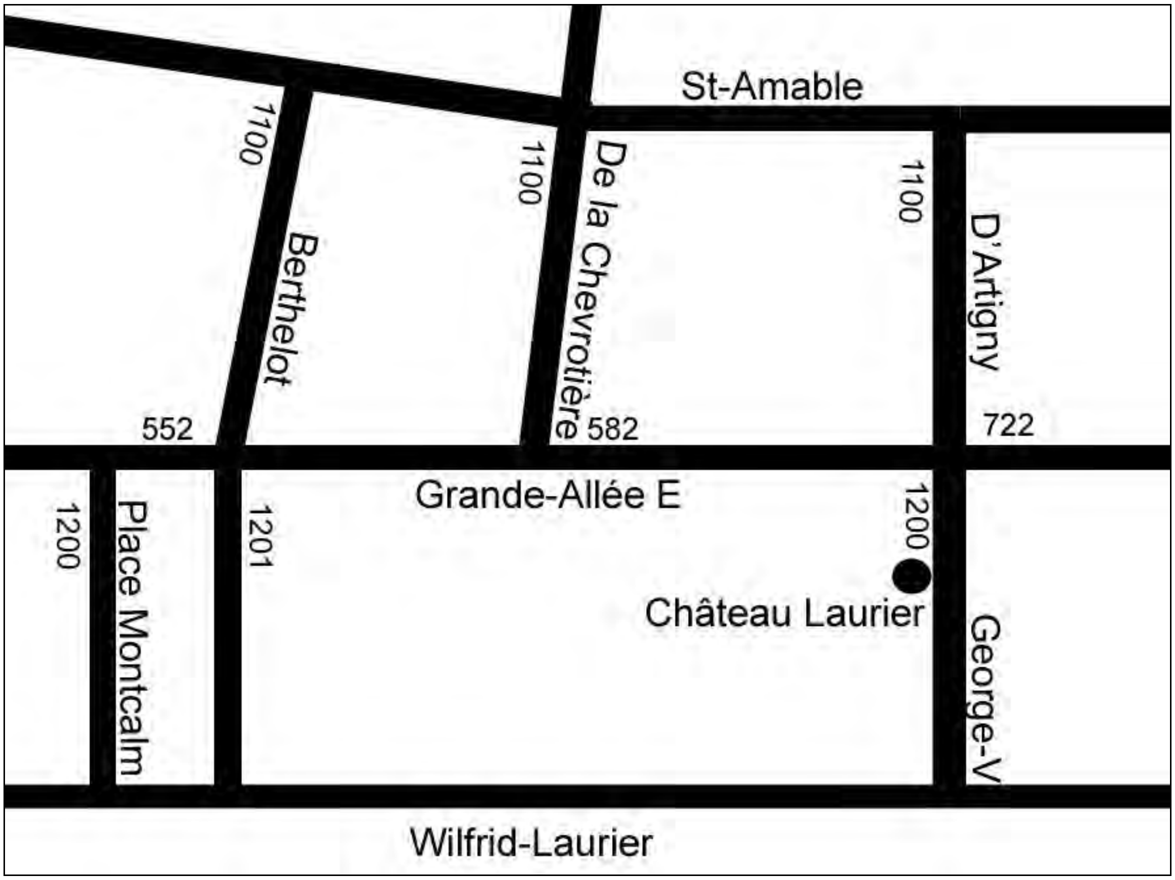
Bar Les Voûtes Napoléon	680 Grande-Allée E	(418) 640-9388
Chez Maurice	575 Grande-Allée E	(418) 647-2000
Chez Charlotte	575 Grande-Allée E	(418) 647-2000
Ozone Pub	570 Grande-Allée E	(418) 529-7932
Chez Dagobert	600 Grande-Allée E	(418) 522-0393
Société Cigare (cigar room)	575 Grande-Allée E	(418) 647-2000

ASIAN

Bamboo Express (thai)	1196 d'Artigny	(418) 522-5797
Asia (thaï & viet)	585 Grande-Allée E	(418) 522-0818
Ginko (japenese)	560 Grande-Allée E	(418) 524-2373

FRENCH

Louis-Hébert	668 Grande-Allée E	(418) 525-7812
Aux Vieux Canons	650 Grande-Allée E	(418) 529-9461
Bonaparte	680 Grande-Allée E	(418) 647-4747
Paris-Brest	590 Grande-Allée E	(418) 529-2243



Old-Québec and Plains of Abraham

Hôtel Château Laurier is located very close to Old-Québec: 5-min walk to get inside the historic walled Old-Québec, 10-min walk to famous Château Frontenac and Dufferin Terrace, and just next to the Plains of Abraham, a 108 ha park. We highly recommend delegates to take time to visit the historic walled Old-Québec (e.g., fortifications, Place Royale, Place d'Armes, Château Frontenac).

CONFERENCE MENU

Opening Reception:

- Crudités with dip
- Chips and Pretzel
- Two drinks:
    - White wine (3 choices)
    - Red wine (3 choices)
    - Canadian beers
    - Perrier, juices or soft drinks
- 10 canapés:
    - Proscuitto & pesto marinated bocconcini cheese
    - Spiral of house smoked salmon with cream cheese & capers
    - Asparagus & smoked turkey on rye bread, orange emulsion
    - Pissaladière (olive, anchovy, onion on a flaky pastry)
    - Curry & yogurt marinated poultry satay
    - Tuna imperial roll with a thaï sauce
    - Purse of candied duck
    - Parmesan fondue brochette

Complimentary Breakfast (buffet):

- Orange juice
- Butter & homemade jam
- Coffee, tea or herbal tea
- Main dish according to the day:

Tuesday:

- Breakfast pastries, fresh sliced fruits
- Yoghourt, cheddar cheese
- Egg, cheese & ham wrap

Wednesday:

- Yoghourt martini with seasonal fruit
- Assorted muffin, banana bread
- Egg, spinach and cheese bagel

Thursday:

- Breakfast pastries, fresh sliced fruits
- Yoghourt, cheddar cheese
- Bacon & egg English muffin sandwich

Friday:

- Yoghourt martini with seasonal fruit
- Assorted muffin, banana bread
- Spinach, cheese & bacon crepe

Poster Reception:

- Two drinks
    - White wine (3 choices)
    - Red wine (3 choices)
    - Canadian beers
    - Perrier, juices or soft drinks
- Tuna tataki with rice vermicelli served in a chinese box
- Conik of nachos & house salsa
- Chef's sheppard's pie: beef tartar, corn & blue potato
- Ceasar salad our way!
- Asian style salmon tartar in a mini-cone
- Lime scallop ceviche
- Mini hamburger of beef with Frère Jacques cheese
- Re-invented fish & chip, house tartar sauce
- Wellington of red deer
- Chicken satay
- Blueberry pannacotta conik
- B-52 mousse shooter
- Mini sugar pie
- Assortment of fine regional cheese

Coffee Breaks:

- Coffee, tea, herbal tea or fruit juices
- Assortment of pastries (Tue AM)
- Apple bread (Tue PM)
- Zucchini bread (Wed AM)
- Fresh baked scones (Wed PM)
- Banana bread (Thu AM)
- Muffins (Thu PM)
- Freshly baked cookies (Fri AM)

Banquet (ticket needed):

- Duck rillette sundae topped with duck foie gras chips, caramelized balsamic vinegar
- Cream soup of leek & Québec potato garnished with bacon
- Québec pork tenderloin marinated in honey from the Musée de l'abeille & Labrador tea, wild mushrooms risotto, mini-vegetables
- Guinea fowl with Sortilège liquor sauce, wild mushrooms risotto, mini-vegetables
- Hazelnut, caramel & chocolate dome
- Coffee, tea or herbal tea
- Half-bottle of wine

Bon appétit!

Conference Programme

This schedule does not include meetings on
Sunday (November 9) and Monday (November 10)
for SDJV Continental Technical Team and Board members
(Salle du Jardin)

Please note that all oral presentations
are given in a single room
(Salle des Plaines)

13:45 - 21:00 **Conference Registration** (Lobby) **and Poster Installation** (Grande-Allée AB)

Material for registered delegates will be available at Hôtel Château Laurier Monday from 13:45 to 21:00 and Tuesday morning from 7:00 to 8:30.

On-site registration will be available for participants.

Posters will be available for viewing throughout the meeting, but there will also be a Poster Reception on Tuesday night. We recommend that poster presenters mount their posters on the easels provided on Monday afternoon or Monday evening. Material for mounting the posters will be provided.

Please note that posters must be removed by Friday afternoon, before 14:00.

18:30 - 22:00 **Opening Reception** (Foyer des Plaines)

We will begin the meeting festivities on Monday evening at 18:30, with an Opening Reception at Hôtel Château Laurier. The reception will include two drinks as well as hot and cold canapés. A cash bar will also be available.

7:00 - 8:30 Complimentary Breakfast (Abraham-Martin)

8:30 - 9:00 Welcoming and Introduction (Salle des Plaines)
Jean-Pierre L. Savard and Michel Robert

9:00 - 10:00 Invited Speaker
Dr. Árni Einarsson, Mývatn Research Station Iceland
Barrow's Goldeneye in Iceland: responses to spatial and temporal variation in food resources

10:00 - 10:30 Break (Foyer des Plaines)

10:30 - 12:00 **Session 1: Migration** — **Chair: Dr. Dirk V. Derksen**

10:30 1.1 Moulting, Staging and Wintering Locations of Common Eiders Breeding in the Gyrfalcon Archipelago, Ungava Bay
Jean-Pierre L. Savard*, Louis Lesage, Scott G. Gilliland, H. Grant Gilchrist and Jean-François Giroux*

10:45 1.2 The Migration Patterns of Northern Common Eiders and King Eiders in the Eastern Canadian Arctic and West Greenland
Anders Mosbech*, Flemming R. Merkel, Christian Sonne and H. Grant Gilchrist*

11:00 1.3 Characterization of Annual Movements, Distribution and Habitat Use of Pacific Black Scoters
Timothy D. Bowman, ***Jason L. Schamber****, W. Sean Boyd, Dan H. Rosenberg, Daniel Esler, Mike J. Petrula and Paul L. Flint*

11:15 1.4 Migrational Routes and Timing of Black Scoters, Surf Scoters and Long-tailed Ducks Along the Atlantic Flyway After Being Instrumented with Satellite Transmitters
Matthew C. Perry*, Keith McAlony, Taber D. Alison, Simon Perkins, Scott G. Gilliland, Alicia M. Berlin and Glenn H. Olsen*

11:30 1.5 Importance of Eastern Chukchi Sea and Southeastern Beaufort Sea as Spring Staging Areas for King and Common Eiders
Lynne Dickson*, Steffen Oppel, Garnet Raven, Abby N. Powell and Timothy D. Bowman*

11:45 1.6 Evolutionary Ecologies of North American Merganser Species: Inferences from Genetic, Mark-recapture and Satellite Telemetry Data
John M. Pearce

12:00 - 13:45 Lunch (not provided)

13:45 - 15:30 **Session 2: Techniques** — **Chair: Dr. W. Sean Boyd**

13:45 2.1 Survey Design for Wintering Eiders: The Effect of Sampling Intensity
Scott G. Gilliland *and H. Grant Gilchrist*

14:00 2.2 Fixed-wing Aerial Surveys of Sea Ducks in Alaska: Issues and Improvements for Estimating Population Abundance and Trends
Heather M. Wilson*, Robert M. Platte and Julian B. Fischer*

14:15 2.3 Radar Observations at Avalon Seawatch to Address SDJV Monitoring Prerequisites
Doug Forsell*, David Mizrahi, Bob Smith, Glenn Davis, Ken Behrens and Chris Brown*

14:30 2.4 OBIS-SEAMAP as a Toolbox for Managing Sea Duck Tracking Data
Ramunas Zydelis*, Patrick N. Halpin, Andrew J. Read, Benjamin D. Best, Ei Fujioka, Lucie J. Hazen, and Connie Kot*

14:45 2.5 Plasma Yolk Precursor Concentrations and Egg Laying in Captive Spectacled Eiders: Can Yolk Precursors be Used to Estimate Breeding Propensity in Free Ranging Eiders?
David E. Safine*, Tuula E. Hollmén, Ann E. Riddle, Daniel Esler and Tony D. Williams*

15:00 2.6 Using Fatty Acids to Estimate Diets of Threatened Spectacled and Steller's Eiders
Shiway Wang*, Tuula E. Hollmén and Sara Iverson*

15:15 2.7 Stable Isotope Fractionation Factors for Quantifying Spectacled Eider Nutrient Allocation to Egg Production
Rebekka Federer*, Tuula E. Hollmén, Daniel Esler and Matthew Wooller*

15:30 - 16:00 Break (Foyer des Plaines)

16:00 - 17:30	**Session 3: Winter Ecology** — **Chair: Dr. Daniel Esler**
16:00	3.1 Multi-scale Winter Habitat Discrimination Between Barrow's and Common Goldeneyes in the St. Lawrence Marine System ***Jean-François Ouellet****, Magella Guillemette and Michel Robert*
16:15	3.2 The situation for the Long-tailed Duck in the Baltic Sea ***Leif Nilsson***
16:30	3.3 Habitat and Foraging Ecology of Surf Scoters Wintering in the Mesohaline Chesapeake Bay ***David M. Kidwell*** *and Matthew C. Perry*
16:45	3.4 Spatial Modelling of Common Eider using Distance Sampling and Generalised Additive Models (GAMs) ***Ib Krag Petersen***
17:00	3.5 Does Choice of Winter Region Affect Nesting Success of King Eiders in Northern Alaska? ***Steffen Oppel*** *and Abby N. Powell*
17:15	3.6 Overwintering Distributions of Sea Ducks in the Nearshore Habitat of the Eastern US and Canada from 1991-2002 ***Elise Zipkin*** *and Emily D. Silverman*
17:30 - 18:30	Free time
18:30 - 22:00	**Poster Reception** (Grande-Allée AB & Abraham-Martin)

The Poster Reception will be held at Hôtel Château Laurier and will include two drinks as well as hot and cold food; a cash bar will also be available.

We encourage each delegate to attend the Poster Reception, as it will be a great occasion to interact with authors. Posters will be available for viewing throughout the meeting.

All poster presentations and authors are listed at the end of this schedule.

7:00 - 8:30	Complimentary Breakfast (Abraham-Martin)
8:30 - 9:30	Invited Speaker (Salle des Plaines) **Dr. Jean-François Giroux**, Université du Québec à Montréal, Canada — The Common Eiders of the St. Lawrence Estuary: past, present and future
9:30 - 10:00	Break (Foyer des Plaines)
10:00 - 12:00	**Session 4: Population Dynamics** — **Chair: Dr. John M. Pearce**
10:00	4.1 Population Biology of King Eiders at Karrak Lake, Nunavut ***Ray T. Alisauskas****, Dana K. Kellett and Katherine R. Mehl*
10:15	4.2 Harlequin Duck Population Dynamics Following the 1989 Exxon Valdez Oil Spill: Assessing Injury and Projecting a Timeline to Recovery ***Samuel A. Iverson*** *and Daniel Esler*
10:30	4.3 Apparent Annual Survival of Lesser Scaup and White-Winged Scoter Females from the Canadian Western Boreal Forest ***Stuart Slattery*** *and Bob Clark*
10:45	4.4 Applying Demographic Modelling Techniques to Support Sea Duck Conservation: the Continuing Case of the Northern Common Eider ***Scott G. Gilliland****, Gregory J. Robertson, H. Grant Gilchrist, Sébastien Descamps, Robert F. Rockwell, Jean-Pierre L. Savard,, Anders Mosbech and Flemming R. Merkel*
11:00	4.5 Influence of the Greenland Eider Harvest on the Population Dynamics of Common Eiders Breeding at East Bay, Southampton Island, Nunavut ***H. Grant Gilchrist****, Sébastien Descamps, Eric Reed and Gregory J. Robertson*
11:15	4.6 Adult Survival of Common Eiders in Newfoundland and Labrador – Results from Ducks Unlimited Canada's Eider Initiative ***Katherine R. Mehl****, Mark Gloutney, Regina Wells and Alain Lusignan*
11:30	4.7 Survival and Recovery Rates of Common Eiders Banded on Maine Coastal Islands ***Daniel G. McAuley****, R. Bradford Allen, Patrick O. Corr, Linda Welch, Brian Benedict, and James E. Hines*
11:45	4.8 Female Biased Mortality at Different Life Stages Contributes to the Male Biased Sex Ratio in Eider Duck ***Aleksi Lehikoinen****, Markus Öst, Mikael Kilpi and Tuula E. Hollmén*
12:00 - 13:45	Lunch (not provided)
13:45 - 15:30	**Session 5: Management** — **Chair: Dr. Anders Mosbech**
13:45	5.1 Delineating Marine Protected Areas for Threatened Eiders in a Climatically Changing Bering Sea ***James R. Lovvorn****, Jacqueline M. Grebmeier, Lee W. Cooper, Joseph K. Bump, and Samantha E. Richman*
14:00	5.2 Involving Rural Communities in the Conservation of the Common Eider in Northern Québec and Southern Labrador, Canada ***Patricia A. Nash***
14:15	5.3 Spectacled Eiders in a New Oilfield on the Colville River Delta, Alaska ***Charles B. (Rick) Johnson****, Julie P. Parrett, Pamela E. Seiser and Caryn L. Rea*
14:30	5.4 Origin and Availability of Large Cavities for Barrow's Goldeneyes in Eastern North America ***Marie-Andrée Vaillancourt****, Pierre Drapeau, Michel Robert and Sylvie Gauthier*
14:45	5.5 Effects of Chronic Oil Spills on Wintering Long-tailed Ducks in the Baltic Sea ***Kjell Larsson***
15:00	5.6 Selenium Accumulation and Implications for Surf Scoters Wintering in the San Francisco Bay Estuary ***Susan W. De La Cruz****, John Y. Takekawa, A. Keith Miles, John M. Eadie, Eric C. Palm, and Matthew T. Wilson*
15:15	5.7 Impact of Re-established White-tailed Sea Eagles (*Haliaeetus albicilla*) on Breeding Common Eiders ***Mikael Kilpi****, Aleksi Lehikoinen and Markus Öst*
15:30 - 16:00	Break (Foyer des Plaines)

16:00 - 17:30 **Session 6: Foraging** — **Chair: Dr. Robert Rockwell**

16:00 6.1 A Comparison of Surf Scoter Behaviour During the Spring Staging and Wing Moult Periods
Mark O'Connor, Jean-Pierre L. Savard, ***Rodger D. Titman*** *and Scott G. Gilliland*

16:15 6.2 Dive Performance of Common Eiders Implanted with Satellite Transmitters
Christopher J. Latty*, Tuula E. Hollmén, Margaret R. Petersen, Abby N. Powell and Russel D. Andrews*

16:30 6.3 Nutrient and Energy Acquisition by Harlequin Ducks Foraging for an Exotic Crab, *Carcinus maenas*, and a Native Crab, *Hemigrapsus oregonensis*
Allegra M. Schafer*, Alicia M. Wells-Berlin, Mary Ann Ottinger and Matthew C. Perry*

16:45 6.4 Exogenous Resources Contribute to Egg Formation in Arctic-Nesting Common Eiders: Evidence from Stable Isotopes
Édith Sénéchal*, Joël Bêty, H. Grant Gilchrist, Keith A. Hobson and Sarah E. Jamieson*

17:00 6.5 Foraging Values of *Mulinia lateralis* and *Ischadium recurvum*: Energetics Effects on Surf Scoters Wintering in the Chesapeake Bay
Alicia M. Wells-Berlin*, Matthew C. Perry and Mary Ann Ottinger*

17:15 6.6 Common Goldeneye on the Great Salt Lake, Utah: Abundance, Nutrient Reserve and Food Habit Dynamics in Winter
Josh L. Vest*, Michael R. Conover, John Luft and Clay Perschon*

17:30 - 19:00 Dinner (not provided)

19:00 - 21:30

Workshop 1 (Salle du Jardin)

Common Eider Conservation

Organized by Dr. Jean-Pierre L. Savard
(Environment Canada)
and Dr. Jean-François Giroux
(Université du Québec à Montréal
and La Société Duvetnor Ltée)

During this workshop, we will review Common Eider conservation issues and management initiatives in Europe, focus on Eastern North America's important management issues and discuss the possibility of writing a Common Eider management plan for Eastern North America.

Speakers will include:

- *Dr. Flemming R. Merkel (Greenland)*
- *Dr. Jón Einar Jónsson (Iceland)*
- *Dr. Markus Öst & Dr. Mikael Kilpi (Finland)*
- *Dr. Ib Krag Petersen (Denmark)*

Workshop 2 (Salle de la Colline)

**Human Energy Needs vs. Sea Duck Needs:
Industry, Conservation and Government Perspectives**

Organized by Dr. Matthew C. Perry
(USGS-Patuxent Wildlife Research Center)

This workshop will provide objective review from leaders in the energy industry and major conservation organizations in regard to the positive and negative factors affecting sea ducks from energy development. Increasing human populations, especially in the East, have placed more pressure on the breeding, moulting, staging and wintering habitats used by North American sea duck populations. Oil platforms, hydro power reservoirs and wind turbines have usurped habitats that are important to sea ducks, but there is a possibility that these changes have not affected populations and in some cases could be providing improved habitat. Direct mortality from oil spills and wind turbines have concerned waterfowl managers, but little is known how this mortality affects populations. The discussion in this workshop will attempt to provide current information on energy and sea duck needs with a goal to narrow the divide so we can seek solutions to satisfy human needs while minimizing impact to sea ducks.

7:00 - 8:30	Complimentary Breakfast (Abraham-Martin)
8:30 - 9:30	Invited Speaker (Salle des Plaines) **Dr. Hannu Pöysä**, Finnish Game & Fisheries Research Institute, Finland — Ecology of alternative reproductive tactics in goldeneyes
9:30 - 10:00	Break (Foyer des Plaines)
10:00 - 12:00	**Session 7: Physiology and Diseases** — **Chair: Dr. James R. Lovvorn**
10:00	7.1 Migrating with Common Eiders: Why Is Flight Time so Short? ***Magella Guillemette****, David Pelletier, Jean-Marc Grandbois and Mélyssa Giroux*
10:15	7.2 Adaptive Variation in Diving and Foraging Patterns of Common Eiders Wintering in Sea Ice Habitats ***Joel P. Heath****, H.Grant Gilchrist and Ronald C. Ydenberg*
10:30	7.3 To Fly or not to Fly: High Flight Costs in a Large Sea Duck do not Imply an Expensive Life Style ***David Pelletier****, Magella Guillemette, Jean-Marc Grandbois and Patrick J. Butler*
10:45	7.4 Effects of Body Size on the Carrying Capacity of Habitat for Sea Ducks: Does a Common Prey Base Support Fewer Large Animals? ***Samantha E. Richman*** and James R. Lovvorn
11:00	7.5 The Effect of Body Mass on Swimming Speed While Diving in Common Eiders ***Catherine Ayotte*** *and Magella Guillemette*
11:15	7.6 Cyclic Mortality Events in Common Eider in Massachusetts: Current Diagnostic Findings and Protocol for Systematic Disease Investigation and Population Health Assessment ***Sarah J. Courchesne*** *and Julie C. Ellis*
11:30	7.7 Exposure of Wintering Sea Ducks to Microbial Pollution in Near-Shore Industrialized Sites in Southwest Alaska: Is Eutrophication Creating an Ecological Trap? ***Tuula E. Hollmén****, Paul L. Flint, Kimberly A. Trust and Chitrita DebRoy*
11:45	7.8 Avian Cholera among Common Eiders Nesting in the Canadian Arctic: Emergence of an Old Disease in a New Environment? ***Isabel Buttler****, H. Grant Gilchrist, Catherine Soos and André Dallaire*
12:00 - 13:45	Lunch (not provided)
13:45 - 15:30	**Session 8: Trends and Breeding Ecology** — **Chair: Dr. Katherine R. Mehl**
13:45	8.1 Recent Population Trends of Common Eiders Breeding in Northwest Greenland as Derived from a Community-Based Monitoring Program ***Flemming R. Merkel****, Anders Mosbech, H. Grant Gilchrist and Sébastien Descamps*
14:00	8.2 Population Trends of Common Eider in Iceland 1906-2007: Time-Series Analyses of Trends and Impacts of Weather ***Jón Einar Jónsson***, *Arnþór Garðarsson, Jenny A. Gill, Ævar Petersen and Tómas G. Gunnarsson*
14:15	8.3 Status and Trends of North American Sea Ducks *Timothy D. Bowman,* ***Emily D. Silverman*** *and Scott G. Gilliland*
14:30	8.4 Nest Predation and Frequencies of Conspecific Nest Parasitism in Common Eiders ***Alain Lusignan****, Katherine R. Mehl, Mark Gloutney and Ian Jones*
14:45	8.5 Differential Partial Clutch Predation Explaining Habitat-specific Clutch Size in Eiders ***Markus Öst****, Mikael Wickman, Edward Matulionis and Benjamin Steele*
15:00	8.6 Post-hatching Improvement of Body Condition in Female Common Eiders: What Comes First, Heart Mass, Digestive Organs or Locomotion Muscles? ***Mylène Delorme*** *and Magella Guillemette*
15:15	8.7 The Effect of Relatedness on Conspecific Brood Parasitism in Barrow's Goldeneyes: Behaviour of Hosts and Parasites ***Kim Jaatinen****, Sonja Jaari, Robert B. O'Hara, Markus Öst and Juha Merilä*
15:30 - 16:00	Break (Foyer des Plaines)

16:00 - 17:30	**Session 9: Breeding Ecology** — **Chair: Kathryn Dickson**
16:00	9.1 Nest-site Selection and Nest Success of Colonial Red-breasted Mergansers in Eastern New Brunswick ***Shawn R. Craik** and Rodger D. Titman*
16:15	9.2 Breeding Population Size, Production and Nesting Chronology of Spectacled Eiders on the Yukon-Kuskokwim Delta, Alaska: A Quarter-Century of Change ***Julian B. Fischer**, Robert A. Stehn, Timothy D. Bowman and Robert M. Platte*
16:30	9.3 Breeding Ecology of Spectacled and King Eiders on the Arctic Coastal Plain of Alaska, 1993–2008 ***Betty A. Anderson**, Alice A. Stickney, Pamela E. Seiser and Caryn L. Rea*
16:45	9.4 Selection of Diverse Nest Sites by Common Eiders ***Benjamin Steele** and Markus Öst*
17:00	9.5 Breeding Habitat Preferences of 15 Bird Species on South-western Finnish Archipelago Coast: Applicability of Digital Spatial Data Archives to Habitat Assessment ***Mia Rönkä**, Harri Tolvanen, Esa Lehikoinen, Mikael von Numers and Mauri Rautkari*
17:15	9.6 Breeding Synchrony, Sympatry and Nesting Areas of Pacific Coast Surf Scoters in the Northern Boreal Forest ***John Y. Takekawa**, Susan W. De La Cruz, Matthew T. Wilson, Eric C. Palm, Julie Yee, David R. Nysewander, Joseph R. Evenson, John M. Eadie, Daniel Esler, W. Sean Boyd, and David H. Ward*
17:30 - 19:30	Free time
19:30 - 22:00	**Banquet** (Ticket needed) – Salle des Plaines

The Conference Banquet will include an aperitif and a high-quality 4-service dinner, including 375 ml of wine (half a bottle; per person) and a state-of-the-art show. Paper and poster awards, as well as various participation prizes will also be presented in the course of the evening banquet.

We encourage every delegate to attend the Conference Banquet, as it should be a festive, memorable evening.

7:00 - 8:30	Complimentary Breakfast (Abraham-Martin)	
8:30 - 9:30	Invited Speaker (Salle des Plaines) **Dr. Margaret R. Petersen**, USGS, Alaska Science Center, USA	Distribution and migration of sea ducks as determined through satellite telemetry: from species to populations to individual strategies
9:30 - 10:00	Break (Foyer des Plaines)	
10:00 - 11:30	**Session 10: Movements and Ecology**	**Chair: Dr. H. Grant Gilchrist**
10:00	10.1 Movements and Survival of First-year King Eiders ***Abby N. Powell** and Steffen Oppel*	
10:15	10.2 Nonbreeding Movements and Site Use of Male Barrow's Goldeneyes ***W. Sean Boyd** and Daniel Esler*	
10:30	10.3 Site Use and Spring Migration of Pacific Surf Scoters: Do They Ride a "Silver Wave" of Herring Spawn North? ***Erika Lok**, Daniel Esler, John Y. Takekawa, Susan W. De La Cruz, W. Sean Boyd, David R. Nysewander, Joseph R. Evenson and David H. Ward*	
10:45	10.4 Population Delineation, Habitat Use and Diet of Surf Scoters from the Southern Portion of their Winter Range ***David H. Ward**, Sharon Herzka, Kathy Brodhead and Daniel Esler*	
11:00	10.5 Wing Moult Chronology, Duration and Synchronicity in Captive Harlequin Ducks, Surf Scoters, White-winged Scoters and Long-tailed Ducks ***Jean-Pierre L. Savard**, Matthew C. Perry, Jean-François Savard, Alicia M. Wells-Berlin and Scott G. Gilliland*	
11:15 - 12:00	Concluding Remarks ***Jean-Pierre L. Savard and Michel Robert***	

The Organizing Committee will arrange
a tour for delegates interested in visiting
Old-Québec on Friday afternoon

POSTER PRESENTATIONS

Atlantic Coast

1 Relationships Between Breeding, Moulting and Wintering Locations of Common Eiders Breeding in the St. Lawrence
Jean-Pierre L. Savard, Jean-François Giroux and Louis Lesage

2 Variability in Wing Moult Chronology and Nutrient Dynamics in Male Surf Scoters near Nain, Labrador, from 2004 to 2006
Scott G. Gilliland and Jean-Pierre L. Savard

3 Prebasic Moult by Male Red-breasted Mergansers at Anticosti Island, Québec
Shawn R. Craik, Jean-Pierre L. Savard and Rodger D. Titman

4 Home Range and Movements of Moulting Surf Scoters (*Melanitta perspicillata*) as Documented by Satellite Telemetry
Mark O'Connor, Scott G. Gilliland, Jean-Pierre L. Savard and Rodger D. Titman

5 Winter Distribution and Abundance of Common Eiders in the Northwest Atlantic and Hudson Bay
Scott G. Gilliland, H. Grant Gilchrist, Daniel Bordage, Christine Lepage, Flemming R. Merkel, Anders Mosbech, Bruno Letournel and Jean-Pierre L. Savard

6 Blood Lead Levels of Common Eiders (*Somateria molissima*) from the St. Lawrence Estuary and Ungava Bay, Québec, Canada
Stéphane Lair, Guylaine Séguin and Jean-Pierre L. Savard

7 Surgical Implantation of Two Models of Satellite Transmitters in Common Eiders (*Somateria molissima*) and Surf Scoters (*Melanitta perspicillata*)
Guylaine Séguin, Stéphane Lair, Jean-Pierre L. Savard and Louis Lesage

8 Abundance and Distribution of Harlequin Duck in the Hudson Bay and James Bay Area
François Morneau, Michel Robert, Jean-Pierre L. Savard, Pierre Lamothe, Marcel Laperle, Nathalie D'Astous, Serge Brodeur, Robert Décarie and Isabelle Chartier

9 Hydro-Québec Studies on Scoters
François Morneau and Isabelle Chartier

10 Long-tailed Duck Nesting Ecology in the Churchill, Manitoba, Area
Matthew C. Perry and Robert Alison

11 Development of a Sea Duck Captive Colony and Dive Tank Facility for Behavioural and Energetics Research
Matthew C. Perry and Alicia M. Wells-Berlin

12 Effects of Surgically Implanted Transmitters with Percutaneous Antennae on Breeding Behaviour of Captive Sea Ducks and Lesser Scaups Used as Surrogates for Wild Sea Ducks
Matthew C. Perry, Glenn H. Olsen and Alicia M. Wells-Berlin

13 Techniques Used for Food Habits of Atlantic Coast Sea Ducks, 1999-2008
Peter C. Osenton, Matthew C. Perry, Alicia M. Wells-Berlin and David M. Kidwell

14 Behavioural and Physiological Observations of White-winged Scoters with Surgically Implanted Transmitters
Glenn H. Olsen and Matthew C. Perry

15 Surgical Implantation of Satellite Transmitters: Techniques for Improving Results Based on Captive Diving Duck Studies
Glenn H. Olsen and Matthew C. Perry

16 Natural Infection Rate of West Nile Virus in a Colony of Captive Diving Ducks: Monitoring WNV in the Tribe *Mergini* and the Genus *Aythya*
Linda C. Lyon, Matthew C. Perry, Glenn H. Olsen, Erik K. Hofmeister, Benedict B. Pagac, Jr., Peter C. Osenton, and Jennifer A. Godhardt-Cooper

17 A Seasonal Survey of Haematological Values for Some Captive Diving Ducks in the Tribe *Mergini* and the Genus *Aythya*
Linda C. Lyon, Matthew C. Perry and Glenn H. Olsen

18 Sea Duck Distributions off the Eastern United States: Results from the 2008 Atlantic Coast Wintering Sea Duck Survey
Emily D. Silverman, Kathy Fleming, Mark Koneff and J. Andy Royle

19 Spatial and Temporal Variation of Foraging Long-tailed Ducks Wintering on the Nantucket Shoals
Timothy White and Richard Veit

Alaska

38 Preliminary Assessment of Mortality of Sea Ducks with Implanted Transmitters
Margaret R. Petersen, Daniel H. Rosenberg and Daniel M. Mulcahy

39 Biochemical and Clinical Responses of Common Eiders to Implanted Satellite Transmitters
Christopher J. Latty, Tuula E. Hollmén, Margaret R. Petersen, Abby N. Powell and Russel D. Andrews

40 Prevalence of Avian Influenza Viruses in Sea Ducks Sampled in Alaska, 2006-2008
J. Christian Franson, Paul L. Flint, Margaret R. Petersen, Deborah A. Rocque, Kimberly A. Trust, Timothy D. Bowman and Hon S. Ip

41 Mercury Concentrations in Blood of Moulting and Wintering Harlequin Ducks from Alaska
Lucas Savoy, Paul L. Flint, Jason L. Schamber, Denny Zwiefelhofer, Bart Hoskins, Heather Brant, Christopher Perkins, Robert Taylor, Oksana Lane and Kimberly A. Trust

42 How important are Body Reserves for King Eider Egg Formation in Northern Alaska?
Steffen Oppel and Abby N. Powell

43 Assigning Sea Ducks to Wintering Regions in the Bering Sea Using Stable Isotopes of Feathers
Steffen Oppel and Abby N. Powell

44 Occurrence of Sea Ducks on Major Estuaries – A Good Reason for Aggressive Monitoring and Protection of Boreal Watersheds
William W. Larned

45 Occurrence and Characteristics of Adenoviruses in Sea Ducks (*Mergini*) in Alaska
Ann E. Riddle and Tuula E. Hollmén

46 Using Time-Lapse Cameras to Document Nest Predators and Behavioural Interactions at Spectacled Eider Nests
Julie P. Parrett, Charles (Rick) Johnson, Pamela E. Seiser and Caryn L. Rea

47 Aerial Population Surveys of Common Eiders in Near Shore Waters and Along Barrier Islands of Western and Northern Alaska
Karen S. Bollinger and Christian P. Dau

48 Feather Abnormalities of Spectacled Eiders: Possible Indicators of Age Related Stress and Body Condition
Christian P. Dau

TUESDAY INVITED SPEAKER

Dr. Árni Einarsson, Director
The Myvatn Research Station
IS-660 Myvatn
Iceland
e-mail: arnie@hi.is
http://www.hi.is/~arnie/engframe.htm

Barrow's Goldeneye in Iceland: Responses to Spatial and Temporal Variation in Food Resources

A small population of Barrow's Goldeneyes (*Bucephala islandica*) lives in spring-fed freshwater habitats in Iceland. Food resources in this habitat vary greatly in time and space and have been monitored for three decades. The local vertebrate populations, including the Barrow's Goldeneye and several other duck species, respond strongly to this variation through behaviour and demography. The data highlights questions about ecosystem stability and population regulation of ducks.

Abstracts for Session 1: Migration

1.1 Moulting, Staging and Wintering Locations of Common Eiders Breeding in the Gyrfalcon Archipelago, Ungava Bay

Jean-Pierre L. Savard[1], Louis Lesage[2], Scott G. Gilliland[3], H. Grant Gilchrist[4] and Jean-François Giroux[5]

[1] Environment Canada , Wildlife Research Division, 1141 Route de l'Église, P. O. 10100, Sainte-Foy, Québec, Canada G1V 4H5; e-mail: jean-pierre.savard@ec.gc.ca
[2] Environment Canada, Canadian Wildlife Service, 1141 Route de l'Église, P. O. Box 10100, Sainte-Foy, Québec, Canada G1V 4H5
[3] Environment Canada, Canadian Wildlife Service, 6 Bruce Street, Mount Pearl, Newfoundland, Canada, A1N 4T3
[4] Environment Canada , Wildlife Research Division, National Wildlife Research centre, 1125 Colonel By Drive/Raven Road, Ottawa, Ontario, K1A 0H3
[5] Département des sciences biologiques, Université du Québec à Montréal (UQÀM), 141 Président-Kennedy, SB-2630, P.O. 8888, Succursale Centre-ville, Montréal, Québec, Canada, H3C 3P8

We implanted 14 female and 1 male eiders with satellite transmitters. Birds originated from three colonies within the Gyrfalcon Archipelago located in the Nunavik on the west coast of Ungava Bay, Canada. During pre-moult, females remained in the vicinity of their nesting islands. Core home ranges during pre-moult averaged 836 ha (n=14; range: 29-3 010 ha). Their home ranges were smaller during the moult period (average core area=584 ha; n=13; range: 29-2 122) and moult areas were within a radius of 100 km of their breeding colony. Birds were most mobile during the post-moult period with core home ranges averaging 2 853 ha (n=8; range: 171-8 542 ha). Movements of Common Eiders from their pre-moult area to their moulting areas occurred mostly in early August. Fall departure from Ungava Bay varied among birds and occurred between 14 October and 16 November. A female left Ungava Bay on 7 November and had reached Anticosti Island on 14 November suggesting a quick direct migration with no staging. Six females wintered in Greenland, one in the Gulf of St. Lawrence and one in Newfoundland and one male in Newfoundland. For the five females wintering in Greenland, distance between moult and winter sites averaged 1 200 km (range: 1 054-1 370). The two birds wintering in Newfoundland averaged 1 481 km and the female wintering in the Gulf of St. Lawrence 2 173 km between wintering and breeding sites. Core winter home ranges averaged 2 754 ha (range: 139-10 970). Core home ranges averaged 8 times larger in Canada (mean=5 537 ha; n=3; range: 893-10 970) than in Greenland (mean=667 ha; n=4; range: 139-1361). These results shed light on the annual distribution of this subspecies which is essential to understand before establishing specific management plans.

1.2 The Migration Patterns of Northern Common Eiders and King Eiders in the Eastern Canadian Arctic and West Greenland

Anders Mosbech[1], Flemming R. Merkel[1,2], Christian Sonne[1] and H. Grant Gilchrist[3]

[1]National Environmental Research Institute, Department of Arctic Environment, University of Aarhus, P.O. Box 358, DK-4000, Roskilde, Denmark; e-mail: amo@dmu.dk
[2]Greenland Institute of Natural Resources, P.O. Box 570, 3900 Nuuk, Greenland
[3] Environment Canada, Science and Technology, National Wildlife Research Centre, 1125 Colonel By Drive, Ottawa, Ontario, Canada K1A 0H3

We tracked the year round movements of Northern Common Eider (*Somateria molissima borealis*) and King Eider ducks (*Somateria spectabilis*) using implanted satellite transmitters. Transmitters were implanted in 87 Common Eiders and 36 King Eiders at breeding, moulting and wintering sites. Following implantation, locations were received from a few weeks and for up to two years. We used location data to identify key marine habitats. We also compared patterns of movement, migration distance, timing, duration and rate of movement between the two species and among different flyways. King Eiders that moulted in West Greenland wintered in Southwest Greenland, where a major offshore wintering site was identified. Several King Eiders that wintered in west Greenland were tracked flying south of Baffin Island during their spring migration to breed in areas further north. Later, during their moult migration, they flew north of Baffin Island back to moulting areas in West Greenland; thus migrating clockwise around Baffin Island in one year (distance 6000 km). The Common Eider movements ranged from sedentary birds that nested within 45 km of their wintering area in West Greenland to migration routes into arctic Canada that exceeded 2000 km. We identified subpopulations of Common Eiders each with its own migration pattern that differed in migration length and timing and partitioning of the autumn migration (both moult and post-moult migrations). Subpopulations also differed in their structural size. The differences in migration pattern seem to be adaptations to temporal variation in regional ice cover regimes at breeding and moulting areas that may constrain their foraging opportunities. Spring migration speeds averaged 60 km per day while autumn migration where much faster (190 km per day) suggesting that Common Eiders in general stop to feed while travelling to breed and do so more often during spring migration.

1.3 Characterization of Annual Movements, Distribution and Habitat Use of Pacific Black Scoters

Timothy D. Bowman[1], **Jason L. Schamber**[2], W. Sean Boyd[3], Dan H. Rosenberg[4], Daniel Esler[5], Mike J. Petrula[4] and Paul L. Flint[2]

[1] U.S. Fish and Wildlife Service, Migratory Bird Management, 1011 E. Tudor Road, Anchorage, Alaska 99503, USA
[2] Alaska Science Center, U.S. Geological Survey, 4210 University Drive, Anchorage, Alaska 99508, USA; e-mail: jschamber@usgs.gov
[3] Canadian Wildlife Service, Pacific Wildlife Research Centre, RR1 5421 Robertson Rd, Delta, BC V4K 3N2, Canada
[4] Alaska Department of Fish and Game, 525 West 67th Ave, Anchorage, Alaska 99518, USA
[5] Centre for Wildlife Ecology, Simon Fraser University, 5421 Robertson Road, Delta, British Columbia V4K 3N2, Canada

The Pacific population of Black Scoters (*Melanitta nigra*) breeding in Alaska has undergone a steady numerical decline in recent decades. Much of the life-history and ecology of this population remains unknown, making it difficult to identify factors underlying the decline. Satellite telemetry can help describe broad-scale patterns of seasonal distribution, habitat use and links among annual cycle stages. These are critical data for interpreting population trends and developing conservation strategies. We implanted 84 Black Scoters (50 females and 34 males) with satellite transmitters at various stages of their annual cycle in 2003-2007. We marked birds at three wintering locations (two in Alaska and one in British Columbia), one mixed wintering/staging location in Alaska and one breeding location in Alaska. Spring and fall migration movements primarily followed coastlines. Important staging areas in Alaska included the Kuskokwim Shoals, Kvichak Bay and Kamishak Bay; also Rose Spit in the Queen Charlotte Islands was significant for birds migrating to and from British Columbia. Arrival of birds to apparent breeding areas coincided with locations and timing of current aerial surveys designed for sea ducks in Alaska. Most birds moulted either at Kuskokwim Bay (Kuskokwim Shoals and Jack Smith Bay) or Kvichak Bay, Alaska. Kvichak Bay was particularly important during moulting and staging for birds from all marking locations. Individuals exhibited high levels of fidelity to breeding and wintering areas. However, birds from multiple breeding areas wintered sympatrically and various wintering aggregations bred sympatrically. By integrating our data with survey counts and genetic data we hope to improve our ability to monitor population trends and provide information for delineation of management units.

1.4 Migrational Routes and Timing of Black Scoters, Surf Scoters and Long-tailed Ducks Along the Atlantic Flyway After Being Instrumented with Satellite Transmitters

Matthew C. Perry[1], Keith McAlony[2], Taber D. Alison[3], Simon Perkins[3], Scott G. Gilliland[4], Alicia M. Wells-Berlin[1] and Glenn H. Olsen[1]

[1] USGS, Patuxent Wildlife Research Center, 12100 Beech Forest Road, Laurel, MD 20708 USA
[2] Canadian Wildlife Service, 7 Waterfowl Lane, P.O. Box 6227, Sackville, New Brunswick, Canada E4L 1G6
[3] Massachusetts Audubon Society, 208 South Great Road, Lincoln, MA 01773
[4] 5th Floor, Queen's Square, 45 Alderney Drive, Dartmouth, Nova Scotia B2Y2N6

The migrational route and timing of Surf Scoters (*Melanitta perspicillata*), Black Scoters (*Melanitta nigra*) and Long-tailed Ducks (*Clangula hyemalis*) in the Atlantic Flyway were studied with implantable satellite transmitters (PTT-100; Microwave, Inc) during 2001-07. Scoters were instrumented with 39-gram transmitters, whereas Long-tailed Ducks with 26 g transmitters. Wintering Surf Scoters instrumented in Chesapeake Bay in March and April (2001-05) migrated to staging areas and then to breeding areas mainly in the boreal forest. Staging Black Scoters instrumented in May and June (2002-04) on the Restigouche River of New Brunswick, Canada, migrated to breeding areas mainly in transitional areas between the boreal forest and the tundra. Males of both scoter species migrated to James Bay or the Labrador coast for moulting. Surf Scoters were also instrumented in August 2005 while moulting in Labrador and migrated in October to wintering areas along the Atlantic Coast. The average annual distance traveled by Surf Scoters and Black Scoters was 5146 km and 4676 km, respectively. Long-tailed Ducks instrumented in Nantucket Sound in December 2007 traveled to Chaleur Bay and St. Lawrence River for staging in May and then to the Hudson Bay area. One female Long-tailed Duck traveled approximately 3000 km to Baffin Island within two weeks. The St. Lawrence River and the Chaleur Bay were major staging areas during northern migration and Nantucket Sound and Chesapeake Bay were major wintering areas. Mortality was less than 10% for late winter to spring instrumentation for scoters, but was 35% for moulting Surf Scoters and over 50% for early wintering Long-tailed Ducks. One Surf Scoter was shot by a hunter two years after instrumentation. However, mortality occurred most frequently during the first two weeks after instrumentation.

1.5 Importance of Eastern Chukchi Sea and Southeastern Beaufort Sea as Spring Staging Areas for King and Common Eiders

Lynne Dickson[1], Steffen Oppel[2], Garnet Raven[1], Abby N. Powell[3] and Timothy D. Bowman[4]

[1] Environment Canada, Canadian Wildlife Service, Room 200, 4999-98 Avenue, Edmonton, Alberta, Canada T6B 2X3; e-mail: lynne.dickson@ec.gc.ca
[2] Department of Biology and Wildlife, 211 Irving 1, University of Alaska, Fairbanks, Alaska 99775-6100, USA
[3] U.S. Geological Survey, Alaska Cooperative Fish and Wildlife Research Unit and Institute of Arctic Biology, 209 Irving I., University of Alaska, Fairbanks, Alaska, 99775-7020, USA
[4] U.S. Fish and Wildlife Service, 1011 East Tudor Road, Anchorage, Alaska, 99503, USA

More than 500,000 King (*Somateria spectabilis*) and Common eiders (*Somateria mollissima v nigra*) are known to cross the Chukchi and Beaufort seas on spring migration to breeding areas in northern Alaska and western arctic Canada. Periodic aerial surveys have reported large numbers of both eider species in early open water along the land-fast ice edge in eastern Chukchi Sea and southeastern Beaufort Sea indicating both areas are heavily used during spring migration. However, questions remained regarding what proportion of each eider population used each area and how long each eider stayed. Using satellite telemetry technology, we tracked spring migration of 67 King Eiders and 18 Common Eiders wintering in the Bering Sea and North Pacific. All of the King Eiders (n=56) and 15 of 16 Common Eiders migrating to breeding areas in western North America stopped in the eastern Chukchi Sea staying an average of 21 ± 10 (SD) days and 22 ± 11 days respectively. Furthermore, 6 of 11 King Eiders migrating to breeding areas in Siberia also staged there for at least a week. Although only a sample of two, Common Eiders that remained in Siberia to breed did not stage in eastern Chukchi Sea. All King and Common eiders migrating to breeding areas in western arctic Canada stopped in the southeastern Beaufort Sea. Common Eiders remained in the area an average of 19 ± 9 days (n=16), whereas King Eiders remained about a week longer (27 ± 9 days, n=21). Six male King Eiders that did not continue on to a breeding area remained in the area over 2 months (65 ± 59 days). The high international importance of both eastern Chukchi Sea and southeastern Beaufort Sea to eiders should be taken into consideration when planning for offshore oil and gas development in either region.

1.6 Evolutionary Ecologies of North American Merganser Species: Inferences from Genetic, Mark-recapture and Satellite Telemetry Data

John M. Pearce[1]

[1]U.S. Geological Survey, Alaska Science Center, 4210 University Drive, Anchorage Alaska 99508, USA

Little is known about the general ecology of the three merganser species that occur in North America. In this talk, I will synthesize results from a multi-year, comparative analytical approach that includes genetic, mark-recapture and satellite telemetry data from across North America. Results from this work inform our understanding of breeding site fidelity and population genetic structure in the Hooded Merganser (*Lophodytes cucullatus*), sex-biased dispersal and migration to nonbreeding areas by the Common Merganser (*Mergus merganser*) and evolutionary trade-offs between reproduction and survival and the lack of cavity nesting by the Red-breasted Merganser (*M. serrator*). Data suggest that high levels of site fidelity in Hooded Merganser, inferred by mark-recapture, may not accurately characterize the degree of female philopatry and thus be an inconsistent indicator of population genetic structure. Genetic data from nonbreeding Common Mergansers suggest both permanent dispersal and seasonal migration among breeding populations and that such behaviours lead to genetic heterogeneity within moulting and wintering flocks. Lastly, the lack of genetic differentiation among North American Red-breasted Merganser samples is a classic pattern for a ground-nesting species that has recently expanded its range post-Pleistocene. Overall, results suggest that by combining inferences from multiple data types, limitations of genetic data can be informed by mark-recapture and *vice versa*.

ABSTRACTS FOR SESSION 2: TECHNIQUES

2.1 Survey Design for Wintering Eiders: The Effect of Sampling Intensity

Scott G. Gilliland[1] and H. Grant Gilchrist[2]

[1]Environment Canada, Canadian Wildlife Service, Mount Pearl, NL, Canada, A1N 4T3; e-mail: scott.gilliland@ec.gc.ca
[2]Environment Canada, Science and Technology, National Wildlife Research Centre, 1125 Colonel By Drive, Raven Road, Carleton University, Ottawa, Ontario, Canada K1A 0H3.

Well-designed surveys provide estimates of population size and associated error. Variance components that are often incorporated in survey design are detection probability and geographic variability. Wintering eiders are associated with linear landscape features, their geographic distribution is clumped and the methods used to estimate these sources of variability are difficult to implement. An additional source of variance not often considered is error in estimation of the flock sizes themselves. We surveyed eiders wintering in Hudson Bay, Canada. Eiders were restricted to small open water areas along flow edges, polynyas and among a 1,200 km^2 region of pack ice. We conducted two types of surveys: 1) we covered all open water areas ("spaghetti surveys") and 2) employing traditional strip transect surveys within a large block of pack ice. Sampling intensities for the strip transect surveys were high (11% and 7% in 2002 and 2003, respectively), but produced poor estimates of population size (2002: 474,510 ± 993,503, n=12 (CI); 2003: 86,614 ± 55,378, n=10). Corresponding spaghetti counts were 135,090 and 105,342, respectively. The frequency distribution of flock sizes was highly skewed, with a large portion of the population occurring in a few, very large flocks. We treated the spaghetti counts as the true population and created a re-sampling program to estimate population sizes at various sampling intensities. Sampling intensities ≥40% were required to produce unbiased estimates of population size and intensities >90% were required for 95% of the estimates to be within ±10% of true population size. Similar sampling intensities were required to produce quality estimates of population size for various eider surveys in eastern Canada. We recommend high sampling intensities for populations in which a large component occurs in large, rare flocks. We suggest the combined use of photographic counts to ensure accurate estimates of flock sizes.

2.2 Fixed-wing Aerial Surveys of Sea Ducks in Alaska: Issues and Improvements for Estimating Population Abundance and Trends

Heather M. Wilson[1], Robert M. Platte[1] and Julian B. Fischer[1]

[1]U. S. Fish and Wildlife Service, Migratory Bird Management, 1011 E. Tudor Road, Anchorage, Alaska 99503, USA; e-mail: heather_wilson@fws.gov

Interest in surveying sea duck populations has grown in response to concern over the widespread decline of many species. In Alaska, species-specific sea duck surveys have taken on special priority due to the national listing of two locally-breeding species as Threatened and several others as 'Focal' or 'Species of Concern'. Overall, the need for increased effort and precision in sea duck surveys has been identified as an urgent priority for improving long term population monitoring and robust detection of trends. However, survey design for sea ducks can be challenging, due to their large ranges, off/near-shore distributions and tendency to occur in aggregations. Further, the ability to monitor populations can be hampered by improper timing of surveys, incomplete coverage of breeding or wintering areas and failure to account for detection probability. We highlight several current surveys used to monitor population trends for sea ducks in Alaska (e.g., Alaska Black Scoter Breeding Survey, Cook Inlet Steller's Eider Survey and Yukon Flats Scoter Survey) and efforts to improve survey precision and accuracy via methods such as repeated surveys within-seasons, double observer mark-recapture approaches and stratification. Specifically, we examine the effects of survey timing and observers on detection probabilities and associated estimates of population abundance. Finally, we provide recommendations for improving future sea duck surveys.

2.3 Radar Observations at Avalon Seawatch to Address SDJV Monitoring Prerequisites

Doug Forsell[1], David Mizrahi[2], Robert Fogg[2], Glenn Davis[2], Kenneth Behrens[2] and Christopher Brown[2]

[1]USFWS, Chesapeake Bay Field Office, 177 Admiral Cochrane Annapolis, MD, 21409, USA; e-mail: Doug_Forsell@fws.gov
[2]New Jersey Audubon Society, Cape May Bird Observatory, 600 Route 47 North, Cape May Court House, NJ, 08210

New Jersey Audubon Society has conducted daily waterbird migration counts at Avalon, NJ, from sunrise to sunset between 22 September and 22 December since 1995. Observers attempt to count all migrating birds passing to the south within about 5.5 km of shore, although this distance varies with visibility. In 2007, over 492,000 scoters (*Melanitta* spp.), approximately half of the estimated Atlantic populations, were counted. The SDJV identified three potential biases that should be evaluated before counts of visible migration can be used to reliably monitor sea duck populations. On 15 days between 29 October and 1 December 2007, we used vertical and horizontal X-band marine radar 24 hours a day and visual observations, mostly in daylight hours, to verify the radar observations. We attempted to address the following questions: (1) Do sea ducks migrate at night making daylight counts unreliable; (2) What proportion of sea duck migration occurs beyond an observer's visual limit; and (3) What proportion of migrating sea ducks move northward and may be double counted. Radar data and 10 hours of visual observations against the moon's reflection on the water, suggests that very little movement occurs after sunset. Visual detection of waterbird movements are limited to approximately 7.4 km from shore under ideal conditions and about 5.5 km under typical conditions. No sea duck flocks were observed by radar that were not detected by observers although several flocks were detected by observers that were not recorded by the radar. We found that 4.6 percent of the scoter flocks and 1.66 percent of the individual scoters were observed flying north in daylight. We also found that approximately 0.95 percent of the individual scoters passed before sunrise and after sunset the prescribed starting and ending time of the count.

2.4 OBIS-SEAMAP as a Toolbox for Managing Sea Duck Tracking Data

Ramunas Zydelis[1], Patrick N. Halpin[2], Andrew J. Read[1], Benjamin D. Best[2], Ei Fujioka[2], Lucie J. Hazen[1] and Connie Kot[2]

[1] Center for Marine Conservation, Duke University Marine Laboratory, 135 Duke Marine Lab Rd, Beaufort, NC 28516, USA; e-mail: zydelis@gmail.com
[2] Marine Geospatial Ecology Laboratory, Nicholas School of the Environment, Duke University, Durham, NC 27708, USA

Our ability to understand, conserve and manage marine biodiversity is fundamentally limited by the availability of relevant taxonomic, distribution and abundance data. The OBIS-SEAMAP is a web-based geo-database of marine mammal, seabird (including sea ducks) and sea turtle distribution and abundance data globally. The OBIS-SEAMAP information system is aimed to support research, management and conservation of marine megavertebrates through promoting scientific data commons and providing users with a broad array of web-based products and services. The database supports georeferenced data of animal distributions at sea, colony based counts and tracking information and is open to all marine biologists sharing vision of data commons and partnership. Boat, shore and aerial surveys and telemetry data are submitted by government, academic, industry and non-profit providers by communicating directly with archive developers and using data content management system. Contributing satellite tracking information might seem particularly appealing to sea duck investigators and ongoing tracking data could be assimilated directly through Satellite Tracking and Analysis Tool (STAT). The OBIS-SEAMAP archive is equipped with multi-faceted data search and extraction, state-of-art online mapping and cutting edge viewing features, including animated animal movements, which will be demonstrated at the Sea Duck Conference using a sample of an actual sea duck tracking dataset. Contributed datasets are standardized, integrated with rich species profiles and compliant metadata. In addition to benefiting from the toolset available at OBIS-SEAMAP, data contributors increase their visibility, public outreach and develop potential for new collaborations. We encourage you to contribute your datasets to OBIS-SEAMAP and to contact us with suggestions of how to refine and improve the archive. The OBIS-SEAMAP database is accessible online at: http://seamap.env.duke.edu.

2.5 Plasma Yolk Precursor Concentrations and Egg Laying in Captive Spectacled Eiders: Can Yolk Precursors be Used to Estimate Breeding Propensity in Free Ranging Eiders?

David E. Safine[1], Tuula E. Hollmén[1,2], Ann E. Riddle[1], Daniel Esler[3] and Tony D. Williams[4]

[1] Alaska SeaLife Center, PO Box 1329, Seward, Alaska 99664, USA; e-mail: david_safine@alaskasealife.org
[2] University of Alaska Fairbanks, School of Fisheries and Ocean Sciences, PO Box 730, Seward, Alaska 99664, USA
[3] Centre for Wildlife Ecology, Simon Fraser University, 5421 Robertson Road, Delta, British Columbia, V5K 3N2, Canada
[4] Centre for Wildlife Ecology, Simon Fraser University, 8888 University Drive, Burnaby, British Columbia, V5A 1S6, Canada

Estimates of breeding propensity are important for understanding potential sources of constraints on productivity of declining sea duck populations. To estimate breeding propensity on nesting areas, the breeding status of birds needs to be determined. Breeding status of females of some waterfowl species has been determined non-lethally using the plasma yolk precursors vitellogenin (VTG) and very low density lipoprotein (VLDL). To evaluate yolk precursor concentrations in relation to egg laying by Spectacled Eiders (*Somateria fischeri*), we collected blood samples from captive females (n = 5) prior to egg-laying in 2007 and 2008. We bled each female at approximately weekly intervals until VTG exceeded 1.4 µg/ml, a threshold previously used to classify breeding status in Greater Scaup (*Aythya marila*). Females began rapid follicle growth 15.5 (SE 2.3) and 10.7 (SE 1.2) days prior to laying of the first egg in 2007 and 2008, respectively. Initial pre-laying concentrations of VTG and VLDL were 0.13 µg/ml (SE 0.08) and 2.92 mmol/l (SE 0.41), respectively. Concentrations of VTG and VLDL for females in rapid follicular growth were 1.95 µg/ml (SE 0.24) and 11.06 mmol/l (SE 1.04), respectively. VTG and VLDL levels were highly correlated (r = 0.86, P < 0.001). Egg laying rates in 2007 were 1.4 days/egg (SE 0.1). Free-ranging Spectacled Eiders initiate nests approximately 7 days after arrival on breeding areas; given our finding that rapid follicle growth is detectable 11-16 days before egg laying, we conclude that plasma yolk precursors can be used to estimate breeding propensity in Spectacled Eiders that migrate to breeding areas. Yolk precursors may also be used to estimate breeding propensity in other sea ducks with relatively brief pre-laying intervals and longer periods of follicular development.

2.6 Using Fatty Acids to Estimate Diets of Threatened Spectacled and Steller's Eiders

Shiway Wang[1], Tuula E. Hollmén[2] and Sara Iverson[3]

[1] Alaska SeaLife Center, 301 Railway Avenue, PO Box 1329, Seward, Alaska 99664 USA; e-mail: shiway_wang@alaskasealife.org
[2] University of Alaska Fairbanks, Alaska SeaLife Center, 301 Railway Avenue, PO Box 1329, Seward, Alaska 99664 USA
[3] Dalhousie University, Department of Biology, 1355 Oxford Street, Halifax, Nova Scotia, Canada B3H 4J1

The Spectacled Eider (*Somateria fischeri*) and the Alaska-breeding population of Steller's Eider (*Polysticta stelleri*) were listed as threatened under the provisions of the U.S. Endangered Species Act in the 1990s. Spectacled Eiders declined over 95% from 1970s to 1990s in their breeding grounds in western Alaska and were listed in 1993. The Alaska-breeding population of Steller's Eiders was listed in 1997 due to near-disappearance from western Alaska and significant reductions in nesting ranges in Alaska. Reasons for the declines remain unknown, but changes in the marine environment and available food resources have been listed as potential causes and threats to recovery of both species. Due to the importance of further understanding nutrient requirements and habitat associations of threatened populations, development of diet assessment techniques was listed as a recovery task for both species in 2006. Fatty acid (FA) signature analysis provides a minimally invasive method for exploring and understanding foraging ecology in marine birds. We validated the use of FA signatures of subcutaneous adipose tissue biopsies for estimating diets of captive adult male Spectacled (N = 8) and Steller's Eiders (N = 8). We assessed the quantitative characteristics of FA deposition and developed calibration coefficients (CCs) for individual FAs to account for eider lipid metabolism. CCs were estimated from captive eiders fed a long-term known baseline diet. Quantitative FA signature analysis (QFASA), using these CCs, was then validated in eiders fed controlled mixed-species diets (switched from baseline diet to experimental diet 1 then switched to experimental diet 2). Qualitatively, FA signatures revealed distinct separation of the three diets in both eider species. Overall, diets of captive eiders were well estimated by QFASA. We conclude that applying FA signature analysis techniques to eiders in the wild has the potential to provide information about foraging ecology and habitat associations of threatened populations.

2.7 Stable Isotope Fractionation Factors for Quantifying Spectacled Eider Nutrient Allocation to Egg Production

Rebekka Federer[1,2], Tuula E. Hollmén[1,2], Daniel Esler[3] and Matthew Wooller[1,4]

[1] School of Fisheries and Ocean Sciences, University of Alaska, 245 O'Neill Building, Fairbanks, AK 99775, USA; e-mail: rebekka_federer@alaskasealife.org
[2] Alaska SeaLife Center, 301 Railway Ave., Seward, AK 99664, USA
[3] Centre for Wildlife Ecology, Simon Fraser University, 5421 Robertson Road, Delta, Canada BC V4K 3N2
[4] Alaska Stable Isotope Facility, University of Alaska, 437 Duckering Building, Fairbanks, AK 99775, USA

Many sea ducks, including Spectacled Eiders (*Somateria fischeri*), migrate between marine nonbreeding and freshwater breeding habitats. These habitats have distinct stable isotopic (e.g., carbon and nitrogen) compositions, which can be used to identify sources of nutrients invested in clutch formation. In turn, this information contributes to conservation by identifying when and where nutritional constraints on reproductive performance might be expressed. An important consideration in this approach is how stable isotope signatures change between diet and egg components (i.e., isotopic fractionation), so that these can be accounted for when comparing signatures of egg components to putative sources. Diet-to-egg stable isotopic fractionation factors have been calculated for some birds; however, these values have not been established for sea ducks and they can not be accurately determined from field studies. For our research, we established stable-carbon and nitrogen isotopic fractionation factors between diet and egg tissues of captive reared Spectacled Eiders in 2006 and 2007 (n=37 and 39 eggs, respectively). Results indicated similar isotopic fractionation patterns with some variation in means between years. For carbon, we found a $\delta^{13}C$ increase in albumen (2.1-3.0‰), yolk protein (1.8-2.4‰), eggshell (12.3-13.8‰) and shell membrane (3.1-4.1‰) relative to diet values and a decrease in $\delta^{13}C$ for whole yolk (1.4-2.1‰) and yolk lipid (2.6-3.5‰) relative to diet. For nitrogen, the $\delta^{15}N$ of all tissues increased relative to diet (albumen 3.4-4.3‰, whole yolk 3.1-3.3‰, yolk protein 3.6-4.7‰, eggshell 2.6-3.7‰ and shell membrane 4.3-5.1‰). These data are consistent with some previously described isotopic fractionation estimates for other species, but also identify important differences in egg protein fractionation relative to other studies. Our study provides the framework for nutrient allocation modeling for Spectacled Eiders, as well as better estimations of source contributions to egg production for other sea ducks.

ABSTRACTS FOR SESSION 3: WINTER ECOLOGY

3.1 Multi-scale Winter Habitat Discrimination Between Barrow’s and Common Goldeneyes in the St. Lawrence Marine System

Jean-François Ouellet[1], Magella Guillemette[1] and Michel Robert[2]

[1] Département de biologie, Université du Québec à Rimouski, 300 allée des Ursulines, Rimouski, Québec, Canada G5L 3A1; e-mail : jean-francois_ouellet03@uqar.qc.ca
[2] Service canadien de la faune, Environnement Canada, 1141 route de l’Église, Sainte-Foy Québec

Barrow’s and Common Goldeneyes (*Bucephala islandica*, *B. clangula*) are closely related species that appear very much similar in several aspects. Both species have similar body mass, feed on benthic invertebrates and winter in equal numbers in the St. Lawrence marine system, which is the core of the winter range of Barrow’s Goldeneyes in Eastern North America. The results presented here are part of a comparative study addressing the role of competition and body mass on winter resource selection by goldeneyes. We analyzed winter distribution data collected on both species of goldeneyes in the St. Lawrence marine system: 1) large-scale synoptic views provided by helicopter-borne surveys and 2) fine-scale localizations recorded through in-site observation using laser binoculars. Habitat description was obtained through spatial analyses, remote-sensing and benthic sampling. Distribution patterns were compared across species on the basis of patchiness and habitat use. A multi-scale analysis showed a decreasing level of sympatry as spatial resolution was refined. Barrow’s Goldeneye distribution appeared more clustered than that of Common Goldeneye. Both species showed strong and equal preference for the tidal zone. Barrow’s Goldeneye was more tolerant to ice cover and more closely associated with rocky substrate and dense fucacea cover. Common Goldeneye was more closely associated with river mouths and soft bottom. We conclude that resource partitioning occurred among the two species when a fine scale resolution is considered.

3.2 The situation for the Long-Tailed Duck in the Baltic Sea

Leif Nilsson[1]

[1]Ecology Building, S-223 62 Lund, Sweden, e-mail: leif.nilsson@zooekol.lu.se

At the first ever total survey of the wintering sea ducks of the Baltic sea during 1992-93, the total population of Long-tailed Ducks in the area was estimated to be in the order of 4.3 million individuals compared to an earlier estimate of about 2 million. A new survey was scheduled for 2007-08 but could not be completed in those years. From Swedish offshore waters extensive surveys are also available from the period 1965-1976, whereas time series of counts are available from some areas for 1969 – 2008. On the basis of these data long-term changes in numbers and distribution of wintering Long-tailed Ducks in Swedish waters are analysed and compared with data from other sources for the entire Baltic. Marked changes in the appearance and numbers were found for the Long-tailed Ducks in many areas of the Swedish Baltic coast. Annual counts over the last forty years showed significant decreases in numbers. In the same way numbers in one major region in 2007 were only 25% of the total for the same region in 1974. The results from the Swedish counts will be compared with data from other sources and discussed in relation to different threats to the Baltic population of Long-tailed Ducks such as oil pollution, exploitation of important feeding grounds for windfarms and other kinds of exploitation in the marine areas. There are indications of marked decreases also in other Baltic areas.

3.3 Habitat and Foraging Ecology of Surf Scoters Wintering in the Mesohaline Chesapeake Bay

David M. Kidwell[1,2] and Matthew C. Perry[1]

[1] U.S. Geological Survey Patuxent Wildlife Research Center, 12100 Beech Forest Road Laurel, MD 20708, USA
[2] National Oceanic and Atmospheric Administration, Center for Sponsored Coastal Ocean Research, 1300 East West Highway, Room 8326, Silver Spring, MD 20910 USA; e-mail: David.Kidwell@noaa.gov

The Chesapeake Bay estuary is a seasonally important area for Surf Scoters (*Melanitta perspicillata*), with an estimated 1/3 of the Atlantic population residing within the estuary for at least a portion of the winter. Surf Scoters principally feed on bivalves in the Bay with their food sources especially prone to a suite of anthropogenically-derived stressors including overfishing, increased turbidity and eutrophication. Within this context, we examined Surf Scoter distribution, habitat and foraging ecology in the mesohaline region of the Chesapeake Bay during 2004-2006 through comparisons of biological and physical characteristics of benthic habitats among scoter feeding and non-feeding sites. Scoters averaged 5,682 per survey (largely dependent on the presence or absence of rafts >10,000) and feeding scoters were routinely located at discrete sites. Benthic samples were taken seasonally via Peterson dredge and divers at feeding sites and compared against non-feeding sites. Surf Scoters foraged over hard bottom (oyster bar and packed clay) and sand habitats, but avoided mud habitats. Oyster bars sampled were degraded, with low densities of oysters interspersed with soft substrates. Bivalves dominated the macroinvertebrate community composition in terms of density and biomass. Densities of the infaunal clams *M. lateralis* and *G. gemma* significantly increased over winter regardless of foraging activity. A similar increase was found for densities of the epifaunal mussel *I. recurvum* between summer and spring. However, foraging activity over winter appeared to influence densities of *I. recurvum*, decreasing at feeding sites ($p = 0.028$), but not at non-feeding sites ($p = 1.0$). Lack of foraging over mud habitats, where visibility can be limited, suggests that Surf Scoters may be visual predators and have likely been impacted by sedimentation. The strong correlation of *I. recurvum* with oyster bars suggests that current oyster bar restoration efforts (currently 1% of historic levels) may positively impact Surf Scoters.

3.4 Spatial Modelling of Common Eider, using Distance Sampling and Generalised Additive Models (GAMs)

Ib Krag Petersen[1]

[1]Department of Wildlife Ecology and Biodiversity, National Environmental Research Inst., Univ. of Aarhus, Grenaavej 12, DK-8410 Roende, Denmark; e-mail: ikp@dmu.dk

The Danish marine waters constitute major staging and wintering grounds for huge numbers of migratory waterbirds. At least 5-7 million individuals of more than 30 bird species winter in these areas and much greater numbers exploit them for staging and migration. As part of the National Programme for Monitoring of the Aquatic Environment and Nature (NOVANA) waterbird numbers and distributions are monitored for wintering birds every three winters and for moulting birds every sixth summer. The surveys are carried out as a combination of land based counts in lakes and inlets, aerial “total count” surveys in coastal areas with a complex geography and as aerial line transect surveys in more open marine areas. The aerial line transect sampling method enables the fitting of a detection function, using Distance Sampling principles. Covariates relevant for the detection function were incorporated, such as sea state (sea surface conditions), bird cluster size and observer efficiency. Easy access to GPS equipment has improved the geographical accuracy of observations dramatically and at the same time access to high quality environmental covariates (bathymetry, distances to relevant features, sediment types and hydrographical data) has improved. In combination this has made the development of spatial modelling tools attractive. This method was used to estimate total numbers of Common Eiders *(Somateria mollissima)* in Danish marine waters in the winter of 2004. Based upon almost 10,000 km of transect lines, a total number of 541,000 Common Eiders was estimated and their spatial distribution described. Geographical coordinates, bathymetry and distance to coast were included as significant environmental covariates. Outside of the area of the spatial modelled data, another 83,000 Common Eiders was counted, leading to an estimated total national wintering population of 624,000 individuals.

3.5 Does Choice of Winter Region Affect Nesting Success of King Eiders in Northern Alaska?

Steffen Oppel[1] and Abby N. Powell[2]

[1] Department of Biology and Wildlife, 211 Irving 1, University of Alaska, Fairbanks, AK 99775-6100, USA, e-mail: steffen.oppel@gmail.com
[2] U.S. Geological Survey, Alaska Cooperative Fish & Wildlife Research Unit and Institute of Arctic Biology, 209 Irving I., University of Alaska, Fairbanks, AK 99775-7020, USA

Events during the non-breeding season may affect the body condition of migratory birds and thus influence their ability to produce a clutch and raise offspring during the breeding season. Revealing such seasonal interactions is especially important for sea ducks, as climate change will alter marine and terrestrial habitats at different rates. Arctic-nesting sea ducks often rely on endogenous nutrients for reproductive efforts and are thus potentially subject to seasonal interactions. In this study we test whether nesting success of King Eiders (*Somateria spectabilis*) breeding in Alaska differs among individuals wintering in different regions in the Bering Sea. We monitored nesting success at two sites in northern Alaska and determined the region in which a nesting female spent the previous winter by using stable isotope ratios of head feathers. We used multi-model inference to assess the relative importance of winter region, observer effects, study site, study year, size of the female and nest age on daily nest survival rates. Apparent nest success did not differ among females wintering in different regions in the Bering Sea. Using multivariate models of daily nest survival rates, we found some support that King Eiders wintering in the northern Bering Sea had slightly lower rates of daily nest survival than birds wintering in more southern parts of the Bering Sea. We conclude that wintering in different regions in the Bering Sea has only little influence on the nesting success of King Eiders.

3.6 Overwintering Distributions of Sea Ducks in the Nearshore Habitat of the Eastern US and Canada from 1991-2002

Elise Zipkin[1] and Emily D. Silverman[2]

[1]US Geological Survey, Patuxent Wildlife Research Center, 12100 Beech Forest Rd., Laurel, MD 20708; e-mail: ezipkin@usgs.gov
[2]US Fish and Wildlife Service, Division of Migratory Bird Management, 11510 American Holly Drive, Laurel, Maryland 20708, USA

To assess the nearshore winter distributions of sea ducks along the Atlantic coast of the United States and Canada, aerial surveys were conducted between mid-January and mid-February in 1991, ‘92, ’94, ’95 and 1997-2002. The surveys were flown a quarter mile off the shore (parallel to the coast) from southern Georgia to New Brunswick and Nova Scotia. Sea ducks were counted in 10 nautical mile segments and roughly 440 segments were flown each year. Approximately 85,000 Black Scoters (*Melanitta nigra americana*), 100,000 Surf Scoters (*Melanitta perspicillata*), 25,000 White-winged Scoters (*Melanitta fusca deglandi*), 414,000 Common Eiders (*Somateria mollissima*) and 95,000 Long-tailed Ducks (*Clangula hyemalis*) were recorded on these surveys. Because the timing and scale of movements by wintering sea ducks are not well characterized, data from these surveys provide limited information about abundance. Analyses of these data will nonetheless improve our understanding of both inter-annual variation in nearshore distributions and interspecific differences in aggregation, information that is important to designing an effective winter monitoring program. All five species were frequently detected in large flocks (greater than 100 individuals) ranging from 49% (Long-tailed Ducks) to 93% of individuals (Common Eiders) found in flocks. Common Eiders (annual median latitudes ranged from 44.0–44.4°N) and White-winged Scoters (40.8–44.4°N) were distributed farther north than Black Scoters (37.1–41.9°N), Surf Scoters (36.8–41.4°N) and Long-tailed Ducks (37.3–41.0°N). In general, the observed distributions of the sea ducks remained fairly constant over the duration of the survey (i.e., no apparent large latitudinal shifts).

WEDNESDAY INVITED SPEAKER

Dr. Jean-François Giroux, Professor
Département des sciences biologiques
Université du Québec à Montréal
P.O. Box 8888, Station Centre-Ville
Montréal (Québec), Canada H3C 3P8
e-mail: giroux.jean-francois@uqam.ca
http://www.bio.uqam.ca/professeurs/giroux_jf.htm

The Common Eiders of the St. Lawrence Estuary: Past, Present and Future

The objective of this plenary talk is to summarize information on the St. Lawrence Estuary Common Eiders (*Somateria mollissima dresseri*) based on data collected by several agencies and colleagues. The birds are nesting on about 35 islands scattered along the estuary with 7 of them harbouring over 80% of breeding pairs. Satellite tracking has shown that some eiders remain in the estuary to moult while others move to the Gulf of St. Lawrence or directly to the wintering grounds in coastal Maine. Monitoring of this population has been achieved through a unique collaboration with two non-profit organisations that collect down in the most important colonies. Revenues generated by eiderdown harvesting are reinvested in protecting and managing the islands and in education programs. The accuracy of these annual censuses varies according to colony size and access. Approximately 30,000 pairs of Common Eiders nest in the estuary but their numbers greatly fluctuate throughout the years. Some declines have been associated with the presence of foxes in colonies or with avian cholera outbreaks, but others could not be related to a specific cause. Duckling predation by Great Black-backed Gulls (*Larus marinus*) appears to be a major problem in some colonies. Broods that survive move to the mainland coast where food resources determine their distribution. Contrary to the nesting islands, few brood rearing sites are protected from human disturbance or habitat destruction. The Common Eider is a valued quarry species for coastal duck hunters. In the early 1970s, 75% of the recoveries of adult females banded in the St. Lawrence River corridor originated from the estuary with the rest of the birds being retrieved along the Atlantic Coast, especially in Maine and Massachusetts. Recent results from on-going banding programs reveal an opposite trend. It is interesting to note that the proportion of adult females that carry the bacteria responsible for avian cholera varied among colonies and years. In 2004, an ambitious management plan that proposed population objectives and specific management measures for the Québec Common Eiders has been prepared through the collaboration of several agencies.

ABSTRACTS FOR SESSION 4: POPULATION DYNAMICS

4.1 Population Biology of King Eiders at Karrak Lake, Nunavut

Ray T. Alisauskas[1], Dana K. Kellett[1] and Katherine R. Mehl[2]

[1] Environment Canada, Science and Technology, Prairie and Northern Wildlife Research Centre, 115 Perimeter Road, Saskatoon, Saskatchewan, Canada S7N 0X4;
e-mail: ray.alisauskas@ec.gc.ca
[2] Department of Biology, University of North Dakota, Grand Forks, ND 58202, USA

We captured 378 female King Eiders (*Somateria spectabilis*) for a total of 811 captures times during nesting from 1995 to 2007 at Karrak Lake, Nunavut (67°14"N, 100°15"W), in Canada's central arctic. This local population nests semi-colonially at high densities on the islands of Karrak and nearby Adventure Lake. It is associated with a large mixed colony of Snow (*Chen caerulescens*) and Ross's Geese (*Chen rossii*). We estimated (±95%CL) apparent survival probability ($\hat{\phi}$), detection probability ($\hat{p}$) and annual rate of population change ($\hat{\lambda}$) of nesting females using Pradel's model with Program Mark. We also derived an estimate for annual abundance ($\hat{N}$) of nesting females. We considered 15 models in the candidate set which included constant, time-varied and time trend structure in each of the 3 latent parameters. The best model {Φ(T) p(t) λ(T)} had a weight of 0.90 and was 6.2 QAICc units better than the next best model; all other models had weights of <0.03. Rate of population change switched from rapid increase of 36%/year at the start of the study to a population decline of 19%/year most recently; the slope of the monotonic relationship between λ and year of study was -0.048±0.017 on a logit scale. Apparent annual survival also declined over the same period from 0.88±0.05 in 1995 to 0.66±0.09; the slope between survival and year of study was -0.12±0.07 on a logit scale. Although survival declined, the decline in recruitment was even more rapid resulting in increased seniority during the study. The estimated number of nesting females on the study area increased from 59±24 in 1995, peaked at 186±40 in 2001 and 2002, then declined to 102±32 in 2007. Although local density dependence may have limited population growth in about 2001 and 2002, the continued decline more recently may be related to events outside of the breeding season.

4.2 Harlequin Duck Population Dynamics Following the 1989 *Exxon Valdez* Oil Spill: Assessing Injury and Projecting a Timeline to Recovery

Samuel A. Iverson[1] and Daniel Esler[1]

[1]Centre for Wildlife Ecology, Department of Biological Sciences, Simon Fraser University, 5421 Robertson Road, Delta, British Columbia V4K 3N2

Harlequin Ducks (*Histrionicus histrionicus*) have been studied extensively in Prince William Sound during the restoration phase following the 1989 *Exxon Valdez* oil spill, leading to one of the most thorough considerations of wildlife population injury following an oil spill ever undertaken. We compiled demographic and survey data collected during the 18 years since the spill to construct a set of projection matrix models, which we used to evaluate the timing and extent of mortality related to the spill, determine the sensitivity of the population to variation in demographic attributes and estimate a timeline to recovery under different scenarios and assumptions. Survival rates of radio-marked female Harlequin Ducks were lower in oiled than unoiled areas of Prince William Sound 6-8 years after the spill, but had equilibrated by 11-13 years after. We estimated that mortalities due to chronic exposure to lingering oil were nearly double those during the acute phase of the spill, but that movements between unoiled and oiled areas were more important to population recovery than had been expected. Despite high site fidelity, the much larger number of birds outside of the spill zone provided a pool of individuals to facilitate a rescue effect for the depressed, oiled population. A timeline to full recovery was estimated to be 20 years under the most-likely formulation of model inputs, with a range of 13 to 32 years for the best-case and worst-case scenarios, respectively. Our findings confirm assertions that effects of oil spills on wildlife populations are expressed over much longer time frames than previously assumed. Specifically, the degree and duration of mortality associated with chronic exposure to residual oil were much higher than anticipated at the time of the spill and greatly exceeded acute mortality, which is more obvious and has been the primary concern following most spills.

4.3 Apparent Annual Survival of Lesser Scaup and White-Winged Scoter Females from the Canadian Western Boreal Forest

Stuart Slattery[1] and Bob Clark[2]

[1] Ducks Unlimited Canada, Box 1160, Stonewall, Manitoba, Canada, R0C 2Z0
e-mail: s_slattery@ducks.ca
[2] Environment Canada, 115 Perimeter Road, Saskatoon, Saskatchewan S7N 0X4, Canada

Lesser Scaup (*Aythya affinis*) and White-winged Scoters (*Melanitta fusca*) are two species that breed sympatrically, but largely migrate and winter allopatrically. Our best estimates of continental populations of these taxa have been highly correlated since about 1980, particularly in the Northwest Territories. This correlation exists even after correcting for long-term population declines, suggesting that they may share limiting factors, possibly in the NWT. Unfortunately, little demographic information is available for these species to begin looking for potential shared constraints, particularly from their core boreal breeding areas. Therefore, our objectives were to examine 1) interspecific variation in apparent annual survival and 2) survival implications of individual covariates including structural size, body condition at capture and resighting period (year after release and later). From 2001 – 2007, we captured 174 White-winged Scoter females using floating mist nets and 175 Lesser Scaup females using a combination of decoy and nest trapping at Cardinal Lake, about 80 km south of Inuvik, NWT. Birds were marked with unique colour and shape coded nasal discs and were resighted on the study area in subsequent years. We then analyzed resighting data separately for each species, allowing for constant and annual variation in survival and resighting rates, plus covariate effects on survival, including quadratic terms. For scoters, the best supported model had constant apparent survival (0.69, se = 0.04) and time dependent resighting rates. Effects of structural size and body condition were estimated imprecisely. For scaups, the best supported model included constant survival and resighting rates and a positive correlation with body condition at capture (beta = 0.91, se = 0.41). Therefore, apparent annual survival for an average condition scaup female was estimated at 0.65 (se = 0.08).

4.4 Applying Demographic Modelling Techniques to Support Sea Duck Conservation: the Continuing Case of the Northern Common Eider

Scott G. Gilliland[1], Gregory J. Robertson[2], H. Grant Gilchrist[3], Sébastien Descamps[3], Robert F. Rockwell[4], Jean-Pierre L. Savard[5], Anders Mosbech[6] and Flemming R. Merkel[6]

[1]Wildlife Research Division, Environment Canada, 6 Bruce Street, Mount Pearl, NL, A1N 4T3 Canada; e-mail: scott.gilliland@ec.gc.ca
[2]Canadian Wildlife Service, Environment Canada, 6 Bruce Street, Mount Pearl, NL, A1N 4T3 Canada; e-mail: greg.robertson@ec.gc.ca
[3]Wildlife Research Division, Environment Canada, National Wildlife Research Centre, Ottawa, ON, K1S 5B6, Canada
[4]American Museum of Natural History, Central Park West at 79th Street, New York, NY, 10024, USA
[5]Wildlife Research Division, Environment Canada, 1141 route de l'Église, P.O. Box 10100, Ste-Foy, QC, G1V 4H5 Canada
[6]National Environmental Research Institute, P.O. Box 358, DK-4000, Roskilde, Denmark

One serious sea duck conservation issue was the apparent decline of northern Common Eiders in the late 1990s and concerns that harvests in Greenland and eastern Canada were excessive. In response, we developed a population model to examine the impact of harvest in the two countries. The model suggested that the harvest in west Greenland should be reduced by ~40% to be sustainable. Here, we assess the performance of the model after the harvest reductions in Greenland were implemented in 2001. First, we inputted recent harvest statistics from Greenland to see whether projections generated by the original model matched population increases recently observed in Greenland and arctic Canada. The original model was limited because several fecundity and survival rates specific to this population were not yet available. Therefore, our second step was to include vital rate data recently collected from an ongoing demographic study in East Bay, northern Hudson Bay. When the current levels of Greenlandic harvest were included, the model projected growth at 5% year; somewhat lower than the annual growth rates of 10-15% observed in Greenlandic colonies. With vital rates collected from East Bay after the harvest reduction, an 11% annual increase was projected and matching the observed population growth rate of 11% at East Bay. Overall, these results suggest that our original model was adequate for assessing the impact of harvest in Greenland. The lower projected population growth than observed in Greenland may have resulted from underestimating total population size. The high growth rates observed in the wild may; 1) indicate that eiders were well below carrying capacity prior to harvest regulations and can grow rapidly when at low population densities and/or 2) show relatively high variance in growth rates, so stochastic models may be worth considering in future modeling exercises.

4.5 Influence of the Greenland Eider Harvest on the Population Dynamics of Common Eiders Breeding at East Bay, Southampton Island, Nunavut

H. Grant Gilchrist[1], Sébastien Descamps[1], Eric Reed[2] and Gregory J. Robertson[3]

[1] Environment Canada, Science and Technology, National Wildlife Research Centre, Ottawa, ON, K1S 5B6
[2] Canadian Wildlife Service, Environment Canada, 351 St. Joseph Blvd, Gatineau, QC, K1A 0H3
[3] Environment Canada, Science and Technology, Mount Pearle, NF, A1N 4T3

The northern Common Eider duck is heavily harvested in both west Greenland and Atlantic Canada. Information on eider survival rates and sources of mortality is necessary for their effective management. In response, a population of Common Eiders has been monitored annually by Environment Canada since 1996 on Southampton Island, Nunavut (northern Hudson Bay). The colony is the largest in the Canadian Arctic and supports between 4000 and 8000 breeding pairs annually. Hundreds of individuals have been banded each year in support of a long-term demographic study, in which we can now derive accurate estimates of survival. In 2001, revised harvest regulations were implemented in Greenland, which shortened the hunting season there by 4 months and dramatically reduced the number of eiders harvested each winter. Our results suggest that the decline in the Greenland harvest has led to a rapid and significant increase in population size at East Bay and that this has resulted from a detectable increase in both juvenile and adult survival rates. We conclude that harvest in Greenland appears to be a primary determinant of eider duck population dynamics in the Canadian arctic. This result is supported by the results of both banding and satellite telemetry studies, in which it was found that 75% of eiders from this breeding population winter in south west Greenland.

4.6 Adult Survival of Common Eiders in Newfoundland and Labrador – Results from Duck's Unlimited Canada's Eider Initiative

Katherine R. Mehl[1], Mark Gloutney[2], Regina Wells[3] and Alain Lusignan[4]

[1] Department of Biology, University of North Dakota, 10 Cornell Street, Grand Forks, North Dakota 58202-9019, USA; e-mail: katherine.mehl@und.edu
[2] Ducks Unlimited Canada, PO Box 430, Amherst, Nova Scotia, Canada B4H 3Z5
[3] Ducks Unlimited Canada, 6 Bruce Street, Mount Pearl, Newfoundland and Labrador, Canada
[4] Department of Biology, Memorial University, St. John's, Newfoundland, Canada, A1B 3X9

Ducks Unlimited Canada's Eider Initiative was established as a 5-year research initiative. The goal of this research was to gather baseline data useful in ultimately building a population model useful to guide Common Eider (*Somateria mollissima dresseri*) harvest regulations and management decisions. We used capture-mark-recapture techniques to estimate survival parameters for eiders nesting among three geographic areas in Newfoundland and Labrador. During 2004-07 we captured 8,225 ducklings (1 day old), 755 pre-fledged juvenile (>30 day old) and 2,552 adult Common Eiders. Captures to date include 16 known age eiders. Known age captures included birds as young as 1 year of age (*n* = 3 females). However, most known age captures were 2 (*n* = 6 females) and 3 (*n* = 4 females, 3 males) years of age. Nesting status was unknown for birds 1 year of age. Recapture of both males and females provide evidence of natal philopatry for both sexes. So far we have received a total of 263 hunter band recoveries, most (*n* = 223) of which were for eiders marked at < 30 days of age. Most of these harvested eiders (74%; 164/223) were shot along the coasts of Newfoundland and Labrador. Results suggest that adult survival varied widely among years and study sites, ranging from as low as 57% to as high as 99% among sites and years. Captures included one female and one moulting male recaptured live in Maine.

4.7 Survival and Recovery Rates of Common Eiders (*Somateria mollissima*) Banded on Maine Coastal Islands

Daniel G. McAuley[1], R. Bradford Allen[2], Patrick O. Corr[1], Linda Welch[3], Brian Benedict[3] and James E. Hines[4]

[1] USGS Patuxent Wildlife Research Center, 5768 south Annex A, Orono, Maine, USA 04469-5768; dan_mcauley@usgs.gov
[2] Maine Department of Inland Fisheries and Wildlife, 650 state St., Bangor, Maine, USA 04401
[3] Maine Coastal Islands National Wildlife Refuge, P.O Box 279, Milbridge, Maine, USA 04658
[4] USGS Patuxent Wildlife Research Center, 12100 Beech Forest Road, Laurel, Maryland, USA 20708-4017

Banding efforts for Common Eiders (*Somateria mollissima)* have not been constant over time. Survival and recovery rates are only available for adult females and there is a need for current information on both sexes. During the 1970s to mid- 1980s there was an effort to band female eiders on a few islands in Maine. Numbers of adult females banded per year ranged from 120 to 609. Since then, 0-50 birds have been banded each year. Since 2002 we have banded >10,000 eiders. We have banded >6,000 females and >4,000 males. We have >1,100 recaptures of previously banded birds and >500 recoveries of dead birds. We used Program Mark to determine survival and recovery rates from band recovery data. Preliminary results indicated that 2 models were very close. Model 1 indicated survival was constant (0.864, SE 0.35) for both sexes over time while recovery rates varied by sex and years. Yearly recovery rates for males ranged from 0.018 SE 0.003 (2003) to 0.028 SE 0.004 (2005) and for females ranged from 0.008 SE 0.002 (2004) to 0.023 SE 0.003 (2005). Model 2 indicated survival and recovery rates were constant over years but varied by sex. Using model 2, female survival was 0.966 SE 0.052 and recovery rate was 0.012 SE 0.001 while male survival was 0.899 SE 0.046 and recovery rate was 0.023 SE 0.002. We will also present survival estimates using mark-recapture data from recaptures of live birds.

4.8 Female Biased Mortality at Different Life Stages Contributes to the Male Biased Sex Ratio in Baltic Eider Ducks

Aleksi Lehikoinen[1], Markus Öst[2], Mikael Kilpi[3] and Tuula E. Hollmén[4]

[1] Department of Biological and Environmental Sciences, P.O. Box 65, FI-00014 University of Helsinki, Finland. e-mail: aleksi.lehikoinen@helsinki.fi
[2] Aronia Coastal Research Team, YH Novia & Åbo Akademi University, FI 10600 Ekenäs, Finland.
[3] Aronia Research, YH Novia & Åbo Akademi University, FI 10600 Ekenäs, Finland
[4] Alaska SeaLife Center and School of Fisheries and Ocean Sciences, University of Alaska Fairbanks, P.O. Box 1329, Seward, AK 99664-1369, USA

The breeding potential of a monogamous animal population should be maximized during equal operational sex ratio, but adult sex ratios of ducks often show a male bias. We studied the sex ratio of Common Eiders (*Somateria mollissima*) in the Baltic Sea in 1979–2005 using migration and hunting statistics. Both data sets showed significantly increasing adult male bias. Hunting statistics also showed a significant increase in the proportion of juvenile males. To clarify when the observed male bias arises, we studied the mortality rate of adults and pre-fledglings and determined the primary sex ratio of eiders in the Baltic Sea. Based on 418 sexed hatchlings, the primary sex ratio in 2003–2006 was equal (50% females). However, the sex ratio of ducklings found dead between hatch and fledging was clearly female biased (59%, n = 118). Concurrently, the mortality of adult females has increased rapidly since the early 1990s, coinciding with an onset of a rapid population decline of the entire eider population nesting in the Baltic. The proportion of juveniles in the hunting bag significantly decreased over the study period, indicating a decrease in breeding success. Mortality of breeding females has increased significantly due to predation by American Minks (*Mustela vison*) and increasing numbers of White-tailed Sea Eagles (*Haliaeetus albicilla*), likely leading to a large impact on population size. The observed shift in adult sex ratio, the declining trend in breeding success and declining population size may be primarily caused by differential mortality of the sexes during breeding. Our results suggest that the impaired survival of both female ducklings and adults contributes to the current male bias at our study site and are likely linked to the population decline.

Abstracts for Session 5: Management

5.1 Delineating Marine Protected Areas for Threatened Eiders in a Climatically Changing Bering Sea

James R. Lovvorn[1], Jacqueline M. Grebmeier[2], Lee W. Cooper[2], Joseph K. Bump[1] and Samantha E. Richman[1]

[1] Department of Zoology, University of Wyoming, Laramie, Wyoming 82071, USA; e-mail: lovvorn@uwyo.edu
[2] Chesapeake Biological Laboratory, University of Maryland Center for Environmental Science, Solomons, Maryland 20688, USA

The world population of Spectacled Eider (*Somateria fischeri*), a threatened species, winters in packed ice of the Bering Sea. In that area, warming trends are causing rapid change in benthic prey communities and increased prospects for bottom trawl fishing that may further affect those communities. To assess long-term changes in the extent and location of habitat essential to eiders, we used historical data on benthic prey, sea ice and weather in a computer model of eider energy balance that integrated field, laboratory and remote sensing studies. In simulations, costs of flight when openings in the ice close, or to maintain geographic position in the moving ice pack, differed little among years with varying ice conditions. However, non-foraging costs were much lower for birds resting on ice vs. floating on water, so that loss of sea ice in the future might greatly decrease the area with enough food to meet the eiders' energy needs. Species and dispersion of dominant preys shifted dramatically between 1970–1974, 1993–1994 and 1999–2001, changing the areas where a foraging eider could balance its energy budget. If essential habitat had been delineated based on data from 1970–1974, most viable habitat in the later periods would have been excluded. Moreover, unless all viable areas in 1993–1994 had been classified as essential, the protected habitat might not have included the much smaller region that was still viable in 1999–2001. For delineating protected areas, our findings emphasize the value of mechanistic models to define critical habitat elements and long-term data to assess the inclusive area needed to provide those elements over time.

5.2 Involving Rural Communities in the Conservation of the Common Eider in Northern Québec and Southern Labrador, Canada

Patricia A. Nash[1]

[1]Quebec-Labrador Foundation, Québec Lower North Shore Field Desk, P.O. Box 495, Lourdes-de-Blanc-Sablon, Québec, Canada G0G 1W0, e-mail: tnash@qlf.org

The Quebec-Labrador Foundation (a private non-profit organization) is working with first nations and settler communities in northern Québec and Labrador to conserve Common Eider (*Somateria mollissima*) populations. The residents of these coastal communities live a semi-subsistent lifestyle and are closely connected to the local environment. A number of research, education and habitat protection projects, which involved residents (youth and adults), have been implemented with great success. These projects included hiring interns to conduct field research with Ducks Unlimited, collecting local ecological knowledge, producing an educational brochure, broadcasting public service announcements on community radio, developing an educational display, holding conservation camps for youth and building, monitoring and maintaining nesting structures. A wildlife conservation club was formed by residents in Québec and Labrador with the intent of making communities responsible for conservation. Residents are now aware of the impacts of spring hunting, human disturbance and predation on these ducks. A change in people's attitudes was observed. Local leaders are now taking an active role in the conservation of the Common Eider.

5.3 Spectacled Eiders in a New Oilfield on the Colville River Delta, Alaska

Charles B. (Rick) Johnson[1], Julie P. Parrett[1], Pamela E. Seiser[1] and Caryn L. Rea[2]

[1] ABR, Inc. Environmental Research & Services, P.O. Box 80410 Fairbanks, AK 99708, USA; e-mail: rjohnson@abrinc.com
[2] ConocoPhillips Alaska, Incorporated, P.O. Box 100360, Anchorage, AK 99510-0360, USA

We studied the effects of construction and operation of a new oilfield drill site (CD-3) on the Spectacled Eider (*Somateria fischeri*) on the Colville River delta, northern Alaska. The study was conducted during 2005–2007, when CD-3 was constructed and became operational. CD-3 is a roadless drill site supplied by helicopters and airplanes. The gravel footprint contains a well pad and 0.9-km-long airstrip, which together cover ~9.1 hectares of tundra. We used long-term data from aerial surveys for pre-breeding Spectacled Eiders to evaluate distribution and habitat use among 3 construction periods: 1993–1997, 1998–2004 and 2005–2007. We incorporated baseline data on nest locations from 2001 to 2004 to conduct similar evaluations for eiders nesting near CD-3. Annual numbers of pre-breeding eiders on the Colville delta (501 km^2) ranged from 10 to 70 and the number of nests in the nest-search area (18 km^2) ranged from 7 to 20; the pattern of annual variation did not suggest development effects. Pre-breeding eiders were significantly closer to oilfield facilities after construction than before ($P < 0.04$). Successful nests averaged 98–429 m closer to the oilfield facilities than failed nests and thus were exposed to higher levels of disturbance. No significant differences were found in distance to facilities among years or between fates of Spectacled Eider nests ($P \geq 0.36$). Duration of helicopter overflights were significantly longer at successful than at failed nests in 2007 ($P = 0.02$) but not in 2006 ($P = 0.17$). Failed nests tended to have more fixed-wing flights within 200 m, but this comparison was inconclusive due to small sample size ($n = 5$ nests $\leq$ 200 m). Habitat use differed slightly among periods, but overall use of preferred habitats did not decline significantly after construction of oilfield facilities ($P \geq 0.24$).

5.4 Origin and Availability of Large Cavities for Barrow's Goldeneyes in Eastern North America

Marie-Andrée Vaillancourt[1], Pierre Drapeau[1], Michel Robert[2] and Sylvie Gauthier[3]

[1]Département des sciences biologiques, Université du Québec à Montréal, Montréal, Québec, Canada H3C 3P8; e-mail: mavaillancourt@gmail.com
[2] Environment Canada, 1141 route de l'Église, P.O. Box 10100, Québec, Québec, Canada G1V 4H5
[3] Natural Resources Canada, Canadian Forest Service, Laurentian Forestry Centre, 1055 du PEPS, P.O. Box 10380, Stn. Sainte-Foy, Québec, Québec, Canada G1V 4C7

The eastern North American population of Barrow's Goldeneyes (*Bucephala islandica*) is listed as "Special Concern" in Canada and breeds in the eastern boreal forests of Québec. In western North America, this species is known to nest primarily in Pileated Woodpecker (*Dryocopus pileatus*) cavities, but nesting requirements for the eastern population remain poorly documented. Within the breeding area of the eastern population of Barrow's Goldeneyes, we 1) determined the regional abundance of Pileated Woodpeckers, 2) measured availability of excavated and non-excavated cavities, 3) identified cavities with suitable characteristics for breeding goldeneyes and 4) assessed the potential of unharvested and managed landscapes for providing cavity trees. We surveyed cavities in 116 transects distributed in unharvested stands, linear remnant strips and cutblocks. No Pileated Woodpeckers were detected in areas occupied by Barrow's Goldeneyes, although a few individuals were detected in adjacent lowland, mixedwood forests. All cavities (n=110) were in standing dead trees and both excavated (n=60) and non-excavated (n=50) cavities occurred mainly in *Abies balsamea* snags, in proportion to this tree species availability in stands. Only 10 trees (0.2% of all trees sampled, diameter at breast height ≥20 cm) supported cavities suitable for breeding goldeneyes. These were all natural cavities, mainly (89%) chimneys in snags at the advanced decay stage. We determined a DBH threshold above which probability of cavity occurrence is enhanced. Remnant linear forests had lower potential cavity tree densities than their unharvested equivalents. We found that large cavities are rare in the natural forests where the eastern North American populations of Barrow's Goldeneyes breeds, suggesting that nesting cavities may be a limiting factor for this population at risk. Current even-aged management that mainly relies on clearcuts further alters the availability of large-cavity trees, compromising the potential of this landscape to offer adequate breeding conditions for Barrow's Goldeneyes.

5.5 Effects of Chronic Oil Spills on Wintering Long-tailed Ducks in the Baltic Sea

Kjell Larsson[1]

[1] Department of Biology, Gotland University, SE-621 67 Visby, Sweden,
e-mail: Kjell.Larsson@hgo.se

The Baltic Sea is an important marine area for wintering sea ducks and has been classified by IMO as a Particularly Sensitive Sea Area. Surveys in the 1990s showed that more than 25 % of the European Long-tailed Duck (*Clangula hyemalis)* population, or more than 1 million birds, wintered at the offshore Hoburgs bank, as well as along the eastern coast of the island of Gotland, in the central Baltic Sea. A shipping route from southern Baltic Sea to the Finnish Bay with very frequent traffic, that is, approximately 22 000 ships per year, cross the EU Natura 2000 site Hoburgs Bank. In addition, approximately 20 000 ships per year also pass close to the area. Hundreds of smaller oils spills, each of less than 1 ton, are registered along the route each year. Weekly winter surveys of oiled birds at southern Gotland between 1996/97 and 2007/08 and analyses of birds that had drown in fish nets showed that several tens of thousands of Long-tailed Ducks were injured by oil each year in central Baltic Sea. Of 998 analysed birds that drowned in fish nets at Hoburgs bank 11.8 % were found to have oil in the plumage. There was no clear relationship between the number of oiled birds observed and the number of registered oil spills in different years. There are several indications that the European Long-tailed Duck population has decreased drastically in numbers in recent years. Although any kind of oil discharge from ships is strictly prohibited in the Baltic Sea, chronic oiling is most likely one important cause for the population decline. A larger research project, financed by Nord Stream AG, on the interactions between the bottom fauna and the Long-tailed Duck and other mussel eating sea ducks in the Baltic Sea will start in 2008.

5.6 Selenium Accumulation and Implications for Surf Scoters Wintering in the San Francisco Bay Estuary

Susan W. De La Cruz[1], John Y. Takekawa[1], A. Keith Miles[2], John M. Eadie[3], Eric C. Palm[1] and Matthew T. Wilson[3]

[1]U. S. Geological Survey, Western Ecological Research Center, San Francisco Bay Estuary Field Station, 505 Azuar Drive, Vallejo, CA 94592, susan_wainwright@usgs.gov
[2]U. S. Geological Survey, Western Ecological Research Center, One Shields Avenue, University of California, Davis, CA 95616
[3]University of California, Davis, Department of Wildlife, Fish and Conservation Biology, One Shields Avenue, University of California, Davis, CA 95616

The San Francisco Bay estuary is a critical wintering area for nearly half of lower Pacific Flyway Surf Scoters (*Melanitta perspicillata*). Selenium (Se) contamination is prevalent in the estuary and wintering scoters accumulate high concentrations prompting human consumption advisories. Winter contaminants may contribute to population decline if they compromise body condition or cause cross-seasonal effects on reproduction. We studied wintering scoters to: 1) examine the influence of movements and diet on Se concentrations; 2) evaluate Se effects on pre-migratory condition and the potential for cross-seasonal effects. During 2004-2006 we radio-marked 160 scoters to examine site fidelity and foraging areas. We collected 139 female scoters, analyzed gastrointestinal tracts for diet, conducted proximate analysis of condition and measured liver Se. We satellite-marked 22 scoters to find them on breeding grounds in Canada. Se ranged from 7.4 to 119 µg/g dw and was at concentrations associated with reproductive impairment (98% of scoters), sublethal effects (i.e. oxidative stress, 56%) and mortality (16%) in waterfowl. Concentrations were significantly higher throughout winter in northern sub-embayments (San Pablo and Suisun Bays) compared to the Central Bay (ANOVA: $F_{2,154}$=35.18, P<0.001). The Se enriched invasive clam, *Corbula amurensis,* dominated diets in Suisun and San Pablo through late winter. In contrast, Central Bay diets consisted of soft bodied prey items and the clam *Venerupis philippinarum*. Radio-marked scoters displayed high site fidelity and small kernel home ranges, providing evidence that Se was accumulated near collection sites. By late January radio-marked scoters left San Pablo and Suisun Bays and moved to the Central Bay where their Se exposure was lowered. In a preliminary AIC_c analysis evaluating protein content, the candidate model best supported by the data included Se and year. Mean Se concentration in eggs collected from SFB scoters was 1.71 ± 0.122 µg/g dw and below concentrations of concern for waterfowl.

5.7 Impact of Re-established White-tailed Sea Eagles (*Haliaeetus albicilla*) on Breeding Common Eiders

Mikael Kilpi[1], Aleksi Lehikoinen[2] and Markus Öst[3]

[1] Aronia Research, YH Novia & Åbo Akademi University, FI 10600 Ekenäs, Finland ; e-mail: mikael.kilpi@sydvast.fi
[2] Department of Biological and Environmental Sciences, P.O. Box 65, FI-00014 University of Helsinki, Finland
[3] Aronia Coastal Research Team, FI 10600 Ekenäs, Finland

At the entrance of the Gulf of Finland (SW-Finland) White-tailed Sea Eagles have been almost extinct for at least 75 years. Starting in the early 1990s, the archipelago has seen an increase in eagle numbers and the species is currently increasing fast. Common Eiders have since the past 50 years been the most common duck species breeding in these archipelagoes, but the population has been on a decreasing trajectory since the mid-1990s. We documented the abundance and breeding success of Common Eiders in two adjacent study areas starting in 1990. Breeding eiders are currently decreasing at a rate of about 10% per annum. Eiders fare worst on barren outer islands, better on islands with a mosaic of shrubs and best on wooded small islands closer to the mainland. We also documented eagle abundance opportunistically in the field and using data from a bird observatory in the area. Breeding eagles in the area numbered only 4-6 pairs in 1995-1999 and have since increased to about 25 pairs with permanent territories. Simple GIS-exercises hint that no islands in the study area fall outside putative hunting ranges of breeding eagles and the eagle population is further bolstered by immature birds. Eagle kills on Eider nesting islands have been kept track of since a notable change (in 1998) occurred. In the early 1990s, breeding eider females where not killed by eagles, but since 1998, a yearly proportion of up to 5-7% of all females are killed. Secondary predation by large gulls and crows following eagle hunting episodes also caused a major decline in breeding success, but we argue that one of the main causes for the observed decline in breeding eider numbers is eagle predation. This is not surprising, but perhaps an unintended outcome of a very successful management scheme for the eagles.

ABSTRACTS FOR SESSION 6: FORAGING

6.1 A Comparison of Surf Scoter Behaviour During the Spring Staging and Wing Moult Periods

Mark O'Connor[1], Jean-Pierre L. Savard[2], **Rodger D. Titman**[1] and Scott G. Gilliland[3]

[1] Department of Natural Resource Sciences, McGill University, Montreal, Québec, Canada H9X 3V9; e-mail: mark.oconnor@mail.mcgill.ca
[2] Environment Canada, Science and Technology, 1141 route de l'Église, P.O. Box 10100, Sainte-Foy, Québec, Canada G1V 4H5.
[3] Environment Canada, Canadian Wildlife Service, 6 Bruce Street, Mount Pearl, Newfoundland, Canada A1N 4T3.

The behaviour of Surf Scoters (*Melanitta perspicillata*) on spring staging grounds was studied to determine whether behavioural changes occur to compensate for the energetic requirements and reduced mobility related to wing moult. We hypothesized that a shift in behaviours would occur due to the increased vulnerability of birds undergoing wing moult. During spring staging in the St. Lawrence Estuary (May 2006), modified scan-sampling showed that percentage of birds engaged in each activity varied little throughout the day and that foraging dominated the time-activity budget (45-49%) during all times. In contrast, flightless Surf Scoters in Labrador (July-August 2006) exhibited a strong diurnal pattern of activity, which likely was a consequence of their increased vulnerability. Foraging was the most intense activity during morning (64%) and evening hours (69%) and rarely occurred during afternoon periods (8%). Furthermore, foraging occupied a smaller portion of daylight observations (27%) during the early stage of moult in comparison to the later stages (47-51%), whose levels were similar to those observed during staging. Potential causes of this shift in behaviour include prey depletion as moult progressed or increased energetic demand due to exercise towards end of moult; it is unlikely that endogenous reserves fueled initial stage of moult. The limited use of near-shore habitats and strong reaction to disturbance by flightless scoters further supports the hypothesis that behaviour of moulting scoters is influenced by their vulnerable state. Additionally, regression tree analysis showed proportion of time spent foraging on moulting grounds to be inversely related to daylength, suggesting that energy budgets are at, or near equilibrium and that nocturnal foraging does not occur. Consequently, increased human activity in the remote areas used by Surf Scoters undergoing remigial moult is should be a source of concern.

6.2 Dive Performance of Common Eiders Implanted with Satellite Transmitters

Christopher J. Latty[1], Tuula E. Hollmén[2,3], Margaret R. Petersen[4], Abby N. Powell[5] and Russel D. Andrews[2,3]

[1] University of Alaska Fairbanks, Department of Biology and Wildlife, 211 Irving I Bldg., University of Alaska Fairbanks, Fairbanks, AK 99775 USA, chrislatty@gmail.com
[2] Alaska SeaLife Center, PO Box 1329, Seward, AK 99664 USA
[3] University of Alaska Fairbanks, School of Fisheries and Ocean Sciences, PO Box 1329, Seward, AK 99664 USA
[4] U.S. Geological Survey, Alaska Science Center, 4210 University Drive, Anchorage, AK 99508 USA
[5] U.S. Geological Survey, Alaska Cooperative Fish & Wildlife Research Unit, Department of Biology and Wildlife, 209 Irving I Bldg., University of Alaska Fairbanks, Fairbanks, AK 99775 USA

Implanted transmitters have become an important tool for studying sea duck ecology, but their effects on the physiology and dive performance of the host remain largely undocumented. To address this, we assessed how abdominally implanted transmitters with percutaneous antennas affect vertical dive speeds, stroke frequencies and dive durations of captive Common Eiders (*Somateria mollissima*). We recorded video of six birds diving 4.9 m prior to surgery to establish baselines, implanted birds with 38–47 g platform transmitter terminals and then recorded diving at staggered intervals for 3.5 months post-surgery to determine whether there were differences. Both descent and ascent speeds were slower than baseline for most post-surgery days; descent speeds decreased 16–25% and ascent speed 17–44%. Dive durations were longer than baseline until day 22. Foot stroke frequencies while foraging on the bottom were slower for most measurement days between 15–107 days post-surgery. If birds that rely on benthic invertebrates for sustenance are less efficient divers after being implanted with a satellite transmitter, some repercussions are inevitable. Researchers considering use of implanted transmitters with percutaneous antennas should be mindful of these effects and the likelihood of concomitant alterations in diving behaviour, foraging success and migratory behaviour compared with unmarked conspecifics.

6.3 Nutrient and Energy Acquisition by Harlequin Ducks Foraging for an Exotic Crab (*Carcinus maenas*) and a Native Crab (*Hemigrapsus oregonensis*)

Allegra M. Schafer[1,3], Alicia M. Wells-Berlin[1,3], Mary Ann Ottinger[2] and Matthew C. Perry[1]

[1]USGS Patuxent Wildlife Research Center, 12100 Beech Forest Road, Laurel, Maryland 20708, USA; e-mail: allegra99@gmail.com
[2]Department of Animal and Avian Sciences, University of Maryland, College Park, Maryland 20742, USA
[3]Marine Estuarine Environmental Sciences Graduate Program, University of Maryland, College Park, Maryland 20742, USA

Changes in prey species availability can present energetic challenges to wintering western North American Harlequin Ducks (*Histrionicus histrionicus*). However, little is known about the impacts of invasive invertebrate species on sea duck feeding ecology. We examined the feeding behaviour of captive Harlequin Ducks and compared the energy and nutrient content of the native yellow shore crab, *Hemigrapsus oregonensis* to its competitor, the invasive exotic green crab, *Carcinus maenas*. We conducted foraging trials between October and December 2007 with nine male Harlequin Ducks to determine the ducks' intake rate of each crab species; we presented live individuals of each crab species in two densities (20 m^{-2} and 80 m^{-2}). We conducted feeding trials to determine mean gut retention time and assimilation efficiency of each crab species by the Harlequin Ducks. We also compared ash-free dry mass, fat and caloric content and carapace strength (resistance to compression force in Newtons) of the two crab species. Finally, we combined crab energy content (kilojoules) with Harlequin Duck intake rate (crabs s^{-1}) to determine gross energy intake rate (kilojoules s^{-1}) and then gross energy intake rate (kilojoules s^{-1}) with duck assimilation efficiency (%) to determine assimilable energy intake rate (kilojoules s^{-1}). Intake rate, gut retention time and assimilation efficiency did not differ between crab species. Compared to yellow shore crabs, green crabs had a significantly larger meat-to-carapace ratio (P=0.0034), 79% greater fat (P=0.0168) and 15% greater energy (P=0.0058). Yellow shore crabs required 130% more compression force for carapace failure (P=0.0301). Gross energy intake rate and assimilable energy intake rate did not differ between crab species. Therefore, energetically and nutritionally, green crabs provide a viable food option to Harlequin Ducks, if yellow shore crabs are not available. However, the potential impacts of green crabs as an invasive species must be considered within an overall ecological context.

6.4 Exogenous Resources Contribute to Egg Formation in Arctic-Nesting Common Eiders; Evidence from Stable Isotopes

Édith Sénéchal[1], Joël Bêty[1], H. Grant Gilchrist[2], Keith A. Hobson[3] and Sarah E. Jamieson[4]

[1] Centre d'Études Nordiques and Université du Québec à Rimouski, 300 Allée des Ursulines, Rimouski, Québec, G5L 3A1, Canada; e-mail : edith.senechal01@uqar.qc.ca
[2] Carleton University, Canadian Wildlife Service, National Wildlife Research Centre, 1125 Colonel By Drive, Raven Rd, Ottawa, Ontario, K1A 0H3, Canada
[3] Environment Canada, 11 Innovation Boulevard, Saskatoon, Saskatchewan, S7N 3H5, Canada
[4] Centre for Wildlife Ecology, Department of Biological Sciences, Simon Fraser University, Burnaby, British Colombia, Canada, V5A 1S6, Canada

The strategy of relying extensively on stored resources for reproduction has been termed capital breeding and this strategy is contrasted to income breeding where needs of reproduction are satisfied by exogenous resources. Most species likely fall somewhere between these two extremes and the position of an organism along this gradient will have major influence on key life history traits. Common Eiders (*Somateria mollissima*) are considered extreme capital breeders, suggesting that they depend exclusively on endogenous reserves to form their eggs and incubate. However, female eiders have been observed feeding during the pre-laying and laying periods, indicating that food acquired at that time could contribute to egg formation and thus affect their breeding strategy and success. Using stable isotopes and mixing models, we quantified the relative contribution of endogenous reserves and exogenous resources to egg formation in arctic-nesting Common Eiders. We collected reproductive females with their eggs and food items at the East Bay Migratory Bird Sanctuary (Southampton Island, Nunavut). We analyzed isotopic signatures ($\delta^{13}C$ and $\delta^{15}N$) of egg constituents (albumen, yolk lipid-free and yolk lipid), female body reserves (breast muscles and abdominal fat) and marine invertebrates potentially eaten by pre-laying and laying females (molluscs and crustaceans). Our results indicate 1) that marine invertebrate-derived exogenous nutrients strongly contribute to the formation of lipid-free egg constituents (>50% of yolk lipid-free and >70% of albumen) and 2) yolk lipids are mostly constituted from endogenous lipids. It thus appears that like arctic-nesting geese, shorebirds and other waterfowls, eiders rely extensively on exogenous resources to produce their eggs and use a mixed capital/income breeding strategy. Take-off capabilities of pre-laying and laying individuals may limit their dependence on endogenous reserves, which could explain the absence of extreme capital breeders among flying birds.

6.5 Foraging Values of *Mulinia lateralis* and *Ischadium recurvum*: Energetics Effects on Surf Scoters Wintering in the Chesapeake Bay

Alicia M. Wells-Berlin[1], Matthew C. Perry[1] and Mary Ann Ottinger[2]

[1] USGS Patuxent Wildlife Research Center, 12100 Beech Forest Road, Laurel, Maryland, USA 20708; e-mail: aberlin@usgs.gov
[2] University of Maryland, Marine Estuarine Environmental Science Program, College Park, Maryland, USA 20742

Surf Scoter (*Melanitta perspicillata*) populations wintering in the Chesapeake Bay primarily prey on two food items, hooked mussel (*Ischadium recurvum*) and dwarf surfclam (*Mulinia lateralis*). The decline of oyster reefs has decreased availability of mussels inducing scoters to switch to a more opportune food item, the dwarf surfclam. The objectives of this study were: 1) to determine the comparative nutrient composition of these prey items; 2) to evaluate the energy assimilated by scoters from these prey items; 3) to determine the functional responses of scoters foraging on four different ecologically relevant densities of each prey item; and 4) to model the foraging value of both prey items for Surf Scoters. *I. recurvum* contained higher ash, protein, lipid and energy per item than *M. lateralis*. Metabolizable energy from each prey item was 83% for *M. lateralis* and 87% for *I. recurvum*. The shell strength of *I. recurvum* was significantly stronger than *M. lateralis*. For scoters foraging in a large diving tank, intake (# s^{-1}) for *M. lateralis* was significantly higher than *I. recurvum* at high densities, but lower at the low densities. Gross energy intake (kJ s^{-1}) and metabolized energy intake (kJ s^{-1}) were significantly greater for *I. recurvum* than *M. lateralis*. Based on nutrient content, metabolizability, behaviour, intake rates and energy expenditure, the foraging value for *M. lateralis* was significantly lower than *I. recurvum*. Despite higher ash content and harder shell, which would partly offset the apparent energetic advantages of *I. recurvum*, greater foraging value of *I. recurvum* than *M. lateralis* provides a more beneficial prey item for wintering scoters. If Surf Scoters are forced to feed primarily on *M. lateralis*, the most advantageous and available prey in the Chesapeake Bay, instead of *I. recurvum*; there may be insufficient energy for them to build fat reserves needed to make migration.

6.6 Common Goldeneye on the Great Salt Lake, Utah: Abundance, Nutrient Reserve and Food Habit Dynamics in Winter

Josh L. Vest[1], Michael R. Conover[1], John Luft[2] and Clay Perschon[2]
[1] Department of Wildland Resources, Utah State University, Logan, Utah, 84322, USA; e-mail: jlvest@cc.usu.edu
[2] Utah Division of Wildlife Resources, Salt Lake City, Utah, 84114

The Great Salt Lake (GSL) is the fourth largest terminal lake in the world and a dominant water feature within the western United States with abundant invertebrate resources. Consequently, the GSL system is used annually by millions of migrating waterbirds. However, little information exists regarding overwinter ecology of waterbirds in this unique system. We designed and conducted aerial surveys to evaluate temporal and spatial dynamics of waterbirds on the GSL during the winters (November–April) of 2004-05 and 2005-06. Common Goldeneye (*Bucephala clangula*; COGO) was the most abundant waterfowl species during both winters and abundance estimates peaked ($N \approx 45{,}000$) in January. COGO spatial distribution varied through winter in relation to the amount and distribution of ice in adjacent freshwater wetlands. We also collected COGO during both winters from the GSL to evaluate food habits and nutrient reserve dynamics. Aggregate percent biomass of food items was dominated during both winters ($\bar{x}$ = 70%) by brine fly larvae (Ephydra species), a halophile. However, freshwater wetland plant seeds and invertebrates were important food items when adjacent freshwater wetlands were available. COGO nutrient reserves (i.e., total body lipid, protein and mineral content) displayed considerable variation between genders, ages and years. However, female body and lipid masses were greater in early winter of 2005-06 than in 2004-05 and generally declined at a greater rate through winter 2005-06. Male body and lipid masses did not vary through winter of 2004-05 but did decline through winter of 2005-06 which was colder, windier and had a higher lake volume with lower salinity concentrations than the winter of 2004-05. Body mass and lipid reserve estimates of GSL COGO were generally similar to those from other important wintering areas in North America. Thus, the GSL likely provides important wintering habitat for COGO in western North America.

THURSDAY INVITED SPEAKER

Dr. Hannu Pöysä, Research Professor
Finnish Game and Fisheries Research Institute
Joensuu Game and Fisheries Research
Yliopistokatu 6
FI-80100 Joensuu, Finland
e-mail: hannu.poysa@rktl.fi
http://www.rktl.fi/english/

Ecology of Alternative Reproductive Tactics in Goldeneyes

Normal nesting and brood parasitism are alternative reproductive tactics in goldeneyes (*Bucephala spp.*) and many other waterfowl. A review of hypotheses that have been proposed to explain the evolution and occurrence of brood parasitism will be given and their validity in the light of recent findings from goldeneyes will be assessed. By using long-term observational and experimental data from a Finnish Common Goldeneye population, I will bring into focus the role of nest predation in the evolution and occurrence of parasitism. Consequences of nest predation to the spatial and temporal dynamics of nest site occupation and nest success will also be considered.

ABSTRACTS FOR SESSION 7: PHYSIOLOGY AND DISEASES

7.1 Migrating with Common Eiders: Why Is Flight Time so Short?

Magella Guillemette[1], David Pelletier[1], Jean-Marc Grandbois[1] and Mélyssa Giroux[1]

[1]Département de biologie, Université du Québec à Rimouski, 300 allée des Ursulines, Rimouski, Québec, Canada G5L 3A1; e-mail : magella_guillemette@uqar.qc.ca

Bird migration remains an elusive facet of bird ecology and physiology. In this paper, we used a new technique to monitor flight activity in birds based on heart rate signature to monitor every flight performed during moult migration of Common Eiders. In addition, we recorded foraging effort and body temperature of migrating individuals. The migratory process spans from one to five days and is characterized by a large number of short flights (73% of all flights < 15 min) whereas maximum flight duration averaged 81 ± (SD) 39 min (n = 21). In order to interpret these results, we formulated three hypotheses. The first one stipulates that short flights are the result of social aggregation as eiders are known to migrate in large flocks. The second hypothesis relates the short flights to the possibility that they feed continuously during the journey, which requires to stop frequently. The third hypothesis stipulates that flight time is constrained by hyperthermia where the frequent landings would be explained by the need to cool down. These three hypotheses are discussed in relation to (1) the time occurrence of short and long flights, (2) variation in foraging effort and (3) variation in body temperature.

7.2 Adaptive Variation in Diving and Foraging Patterns of Common Eiders Wintering in Sea Ice Habitats

Joel P. Heath[1], H. Grant Gilchrist[2] and Ronald C. Ydenberg[3]

[1] Mathematical Biology Program, University of British Columbia, 121-1984 Mathematics Rd, Vancouver, BC Canada V6T 1Z2; e-mail: jheath@math.ubc.ca
[2] Environment Canada, 1125 Colonel By Drive, Raven Road, Carleton University, Ottawa, Ontario, Canada. K1A 0H3
[3] Centre for Wildlife Ecology, Simon Fraser University, 8888 University Drive, Burnaby, BC Canada V5A 1S6.

In the Canadian Arctic, Common Eiders (*Somateria mollissima sedentaria*) winter in open water sea ice habitats maintained by strong tidal currents (polynyas). To study how abiotic and physiological processes interact to affect foraging strategies, we used video to monitor underwater activities of eiders and radio telemetry to follow individuals continuously. As tidal currents slackened, eiders required less time and work to dive and spent more foraging time at depth. Energetic modeling indicated that the profitability of dives fell non-linearly with increasing current speed, so that diving becomes unprofitable at about 1.2 m/s; eiders then rest on the ice edge. When tidal amplitude was large and current profiles strong (i.e., spring tide), eiders foraged most intensely at the beginning and end of foraging periods, rather than during mid-period slack currents, when dives would be most profitable. To understand this counter-intuitive result, we considered that digestion of benthic prey limits intake rate. A dynamic state variable model incorporating a digestive constraint predicted that foraging patterns like those observed maximize energy gain over an entire tidal cycle. During weak current profiles, diving occurred in well-defined bouts, but bout structure was less evident under strong profiles. We suggest bout structure is generated by interactions between processes on several time scales, including the profitability of dives, digestive rate and the tidal and lunar cycles. A multiscale approach is necessary to understand the dynamic range of behavioural patterns that allow eiders to balance energy budgets during mid-winter in the Arctic

7.3 To Fly or not to Fly: High Flight Costs in a Large Sea Duck do not Imply an Expensive Life Style

David Pelletier[1], Magella Guillemette[1], Jean-Marc Grandbois[1] and Patrick J. Butler[2]

[1] Département de biologie, Université du Québec à Rimouski, Québec, Canada G5L 3A1; e-mail: david.pelletier@uqar.qc.ca
[2] Centre for Ornithology, School of Biosciences, The University of Birmingham, Birmingham, United Kingdom B15 2TT

A perennial question in ornithology is whether flight has evolved mostly to facilitate access to food or as an anti-predator strategy. However, flight is an expensive mode of locomotion and species using flight regularly are associated with an expensive life style. Using heart rate data loggers implanted in 13 female Common Eiders (*Somateria mollissima*), our objective was to test the hypothesis that a high level of flight activity increases their energy budget. We used the long-term recording (seven months) of heart rate (HR) as an index of energy expenditure and the heart rate flight signature to compile all flight events. Our results indicate that the eider is one of the thriftiest flying birds with only 10 min of flight time per day. Consequently, we were not able to detect any effect of flight activity on their energy budget despite very high flight costs (123 to 149 W) suggesting that flight was controlled by energy budget limitations. However, the low flight activity of that species may also be related to their prey landscape requiring few or no large scale movements. Nevertheless, we suggest that the (fitness) benefits of keeping flight ability in this species exceed the costs by allowing a higher survival in relation to predation and environmental harshness.

7.4 Effects of Body Size on the Carrying Capacity of Habitat for Sea Ducks: Does a Common Prey Base Support Fewer Large Animals?

Samantha E. Richman[1] and James R. Lovvorn[1]

[1]Department of Zoology, University of Wyoming, Laramie, WY 82071, USA;
e-mail: cruciger@uwyo.edu

Body size can be a major force structuring communities and determining habitat requirements for predators. Allometry predicts that a given habitat area or prey biomass supports fewer numbers of larger predators, but birds often deviate from this pattern. For example, foraging costs may vary among locomotor modes and intake rates with energy content, accessibility and handling of different-sized prey. Such mechanisms might affect prey densities needed for energy balance and thus population densities of different-sized predators. We compared the foraging profitability (energy gain minus cost) of two diving ducks: larger White-winged Scoters (*Melanitta fusca,* 950–1800 g) and smaller Lesser Scaups (*Aythya affinis,* 450–1090 g). We measured their dive costs with respirometry and intake rates of bivalve prey ranging in size, energy content and burial depth in sediments. For scaups feeding on prey 6–12 mm long, all clams buried >5 cm deep were unprofitable at realistic prey densities. For clams buried <5 cm, the profitability threshold decreased from 216 to 51 clams/m^2 as energy content increased from 50 to 200 J/clam. For larger scoters feeding on larger prey (18–24 mm) foraging was profitable on clams buried >5 cm in the sediments at threshold densities of 147 clams/m^2. For clams <5 cm deep, the threshold density decreased from 86 to 35 clams/m^2 as energy content increased from 380 to 850 J/clam. If scoters decreased dive costs by swimming with wings as well as feet, threshold prey densities were 10% lower. Variations in the size structure and associated accessibility and energy content of prey have a strong effect on the threshold prey densities for different-sized ducks. Periodic disturbance that substantially alters the prey size structure can create patches that favour animals of different body size and may allow their coexistence on the same prey base.

7.5 The Effect of Body Mass on Swimming Speed While Diving in Common Eiders

Catherine Ayotte[1] and Magella Guillemette[1]

[1]Département de biologie, Université du Québec à Rimouski, 300 allée des Ursulines, Rimouski, Québec, Canada, G5L 3A1; e-mail : Catherine.Ayotte@UQAR.QC.CA

For certain species like Common Eider (*Somateria mollissima*) the descent towards the bottom is an active process, which requires the movement of the legs, body and wings. In contrast, given the positive buoyancy of these birds, the ascent is almost completely passive. Because variations in buoyancy is tightly related to body mass in various sea ducks, we expect the apparent diving speed (ADS) to vary in the course of the annual cycle. In this paper, our aim is to explore if ascent ADS could be used as an index of body mass and we tested if intra-individual increases of body mass during pre-laying has an influence on the speed of ascent and descent while diving. To do so, we used data loggers recording hydrostatic pressure in relation to time for a full year that allowed us to compare ADS during the pre-laying period (high body mass) with the diving speed during the post-hatching period (low body mass). As expected, the ascending ADS was significantly higher during pre-laying (0.56 $m.s^{-1}$) compared to post-hatching (0.46 $m.s^{-1}$) although the effect size was small (0.10 $m.s^{-1}$). Similarly, the descending ADS was significantly higher during pre-laying (0.47 $m.s^{-1}$) compared to post-hatching (0.36 $m.s^{-1}$), which is contrary to our expectations. Finally, we found a highly positive correlation between ascending and descending ADS that indicates that both travelling phases are tightly related in this species. We suggest that voluntary adjustments in air volume (as ptilo-suppression and variation in air in the respiratory system) as well as the behaviour of the bird could explain these results. Finally, we discuss whether using ascent speed can be used as an index of body mass or not.

7.6 Cyclic Mortality Events in Common Eider (*Somateria mollissima*) in Massachusetts: Current Diagnostic Findings and Protocol for Systematic Disease Investigation and Population Health Assessment

Sarah J. Courchesne[1] and Julie C. Ellis[1]

[1]Tufts Cummings School of Veterinary Medicine, Department of Environmental and Population Health, 200 Westboro Road, North Grafton, MA 01536

For several decades, cyclic mortality events involving hundreds to thousands of Common Eiders (*Somateria mollissima*) have been reported on the beaches of Cape Cod in Massachusetts. Though theses events are conspicuous and generate great public concern, no systematic investigation of the scope, cause or population level significance has been performed. A particularly large die-off event occurred during the summer and fall of 2007. Both male and female adults were found dead or dying on beaches in and around Wellfleet, MA. We conducted necropsies on eiders collected from beaches; we also obtained eiders shot by hunters near the same beaches. Previous studies have speculated that intestinal parasites (acanthocephalans) were the main cause of eider mortality prior die-offs. Our findings indicate that parasitism played either a very minor or no role in the mortality events that occurred in 2007. Samples and whole cadavers were submitted to the National Wildlife Health Center where a virus was isolated from a subset of birds collected during the 2007 event. The virus has not been fully characterized and the significance of its presence is unknown. We are currently working with several agencies to develop a new protocol for disease investigation and health assessment of Common Eiders in New England. This protocol will include methods for systematically determining total morbidity and mortality, as well as further diagnostics to be performed after gross necropsy. Additionally, we will develop protocols to assess health in Common Eiders not affected by mortality events. Samples collected during this assessment will establish baseline contaminant levels, virology and bacteriology against which birds examined during mortality events may be compared. Through the dual approaches of disease diagnosis and health assessment, we hope to determine the nature and true significance of these mortality events to the long-term stability of populations of Common Eiders in New England.

7.7 Exposure of Wintering Sea Ducks to Microbial Pollution in Near-Shore Industrialized Sites in Southwest Alaska: Is Eutrophication Creating an Ecological Trap?

Tuula E. Hollmén[1], Paul L. Flint[2], Kimberly A. Trust[3] and Chitrita DebRoy[4]

[1]Alaska SeaLife Center and University of Alaska Fairbanks, School of Fisheries and Ocean Sciences, P.O. Box 1329, Seward, AK 99664, USA; e-mail: tuula_hollmen@alaskasealife.org
[2]U.S. Geological Survey, Alaska Science Center, 4210 University Drive, Anchorage, AK 99508, USA
[3]U.S. Fish and Wildlife Service, 1011 E. Tudor Road, Anchorage, AK 99503, USA
[4]Pennsylvania State University, E. coli Reference Center, University Park, PA 16802, USA

Near-shore marine habitats of southwest Alaska maintain large wintering populations of several species of sea ducks (Tribe Mergini), including Steller's Eiders (*Polysticta stelleri*) and Harlequin Ducks (*Histrionicus histrionicus*). Sea ducks are found in coastal habitats at remote, nonindustrialized areas, as well as in proximity to human communities and industrial activity. In our study, Unalaska Bay in eastern Aleutian Islands represented an industrialized wintering site and Izembek Lagoon in western Alaska Peninsula represented a nonindustrialized reference site. During 2004-2007, we evaluated prevalence and composition of fecal coliforms in Steller's Eiders (n=165) at both sites, in Harlequin Ducks (n=21) at Unalaska and in water samples (n=25) collected from areas used by ducks. The overall prevalences of *Escherichia coli* indicator organism were 16% and 67% in Steller's Eiders and Harlequin Ducks, respectively, at Unalaska and 2% in Steller's Eiders in Izembek Lagoon. Based on antigenic and genetic subtyping of *E. coli*, we found avian pathogenic strains in both Steller's Eiders and Harlequin Ducks. Additionally, we found evidence of mammalian pathogenic *E. coli* in Harlequin Ducks. Avian pathogenic *E. coli* were associated with lower serum total protein and albumin concentrations in Steller's Eiders, providing further evidence of pathogenicity to this threatened species. Water samples contained coliforms at highest concentrations near a sewage outfall area at the industrialized site and an isolate from a water sample was genetically matched with an isolate from a duck providing evidence of transmission between water and birds. Based on previous radiotelemetry studies at Unalaska, the majority of Steller's Eiders and Harlequin Ducks monitored were detected at the sewage outfall area multiple times. We conclude that ducks attracted to these eutrophicated areas with enhanced foraging conditions may be at increased risk of exposure to pathogenic microbes and that these areas may represent ecological traps for wintering sea ducks.

7.8 Avian Cholera among Common Eiders Nesting in the Canadian Arctic: Emergence of an Old Disease in a New Environment?

Isabel Buttler[1], H. Grant Gilchrist[1,2], Catherine Soos[3] and André Dallaire[4]

[1] Carleton University, Ottawa, ON, Canada
[2] Environment Canada, Science and Technology Branch, National Wildlife Research Centre, Ottawa, ON, Canada
[3] Environment Canada, Science and Technology Branch, Saskatoon, SK, Canada
[4] Canadian Cooperative Wildlife Health Centre, Faculté de Médecine Vétérinaire, Université de Montréal, St-Hyacinthe, QC, Canada.

In North America, avian cholera outbreaks caused by *Pasteurella multocida* appear to be occurring with increasing frequency and spreading to new regions, particularly in Canada's north and Atlantic coasts. Avian cholera has been detected among Snow Geese in northern Hudson Bay and outbreaks occur regularly among Snow Geese nesting on Banks Island in the Northwest Territories. Prior to 2004, there have been few reports of avian cholera in the Canadian eastern Arctic and none reported among marine birds. Cholera was recently detected among breeding Common Eider ducks in Hudson Strait, northern Québec and at East Bay, Southampton Island when it appeared in 2004. Since then, it has re-occurred annually and with greater magnitude during breeding. In 2006, over 3,500 East Bay eiders died between late June and early August (>75% of nesting females). The extent of mortality observed in these cases may have significant conservation implications to Common Eiders in the north, whose populations may have difficulty recovering following repeated large scale outbreaks. Here we review the behaviour, colony dynamics and reproductive success of Common Eiders prior to and during the cholera outbreak. We also review our field investigations in which we attempt to identify 'carrier status' in Common Eiders prior to anticipated outbreaks and determine whether the bacterium can over-winter in the Arctic environment.

ABSTRACTS FOR SESSION 8: TRENDS AND BREEDING ECOLOGY

8.1 Recent Population Trends of Common Eiders Breeding in Northwest Greenland as Derived from a Community-Based Monitoring Program

Flemming R. Merkel[1,2], Anders Mosbech[1], H. Grant Gilchrist[3] and Sébastien Descamps[3]

[1] National Environmental Research Institute, University of Aarhus, P.O. Box 358, DK-4000, Roskilde, Denmark; e-mail: fme@dmu.dk
[2] Greenland Institute of Natural Resources, P.O. Box 570, 3900 Nuuk, Greenland
[3] Environment Canada, Science and Technology, National Wildlife Research Centre, 1125 Colonel By Drive, Ottawa, Ontario, Canada K1A 0H3

Since 2000, several nesting areas of the Northern Common Eider (*Somateria mollissima borealis*) population breeding in northwest Greenland have been surveyed annually by means of a community-based monitoring program. Previous studies showed a marked decline in breeding numbers in northwest Greenland, but due to large time gaps between surveys it is uncertain when these declines happened. We enlisted the participation of local residents to lead colony surveys and this approach both reduced the logistical costs and increased the frequency of surveys, in addition to facilitating a community-based management approach. The program includes monitoring 32 eider colonies distributed over six areas in the municipality of Ilulissat, Uummannaq and Upernavik regions of west Greenland and is carried out by biologists and six teams of local observers. The program includes a further 25 colonies, which are "control" colonies distributed over the same six areas. These are surveyed only by biologists, but less frequently. Despite some turnover of local observers the monitoring programme worked well and provided valuable information on population trends. The local observers reported data in 36 of 42 possible cases (7 years * 6 areas), and only in one case was data discarded due to insufficient reporting. The breeding population increased significantly in all six areas during the survey period from 2000 until 2007; on average12.6 % per year. In comparison, Northern Common Eiders breeding in eastern Canada (East Bay, Hudson Strait) experienced a population growth similar to northwest Greenland. Both breeding populations winter primarily in southwest Greenland. In both arctic Canada and northwest Greenland, population growth began around 2002 and coincided with a reduction of approximately 65% in the harvest of eiders in southwest Greenland during winter.

8.2 Population Trends of Common Eider in Iceland 1906-2007: Time-Series Analyses of Trends and Impacts of Weather

Jón Einar Jónsson[1], Arnþór Garðarsson[2], Jenny A. Gill[3], Ævar Petersen[4] and Tómas G. Gunnarsson[1]

[1] Snæfellsnes University Centre, University of Iceland, Hafnargata 3, 340 Stykkishólmur, Iceland; e-mail: joneinar@hi.is
[2] Institute of Biology, University of Iceland, Sturlugata 7, IS 101 Reykjavík, Iceland
[3] School of Biological Sciences, University of East Anglia, Norwich, Norfolk, NR4 7TJ, United Kingdom
[4] Icelandic Institute of Natural History, Hlemmur 3, IS 105 Reykjavík, Iceland

Bird populations will be affected by global warming. Thus, improved understanding of relationships between weather events and demography is essential for future predictions. We used time-series analysis to evaluate (1) cross-correlations of weather within the four seasons and numbers of nests in seven nesting colonies of Common Eider (*Somateria mollissima)* from all over Iceland during 1961-2007; (2) impacts of catastrophic weather and human-related events in the Brokey Islands, West Iceland in 1906-2007. Data on nest numbers were collected by eider farmers, sometimes by two or three generations. The period 1961-1980 was characterized by either successful colony establishment or relative stability. Conversely, the population increased in most colonies during 1980-1990 and seems to have slowly declined ever since. Numbers dropped sharply in 1999 and 2005-2006. With a few exceptions, breeding numbers within colony were generally unrelated to weather in the preceding year. The overall increase in 1980-1990 coincided with an increase in mean annual temperature from 3.4°C to 4.0°C during the period but the decrease since the late 1990s occurred despite a continued warming trend to the present day. Impact analysis of events in the Brokey Islands data indicated that over 102 years, the catastrophic winter of 1918 had the greatest effects on eider numbers, relative to depopulation of the Brokey Islands in the 1930s, the import of American mink in 1947 and altered down-harvest approaches after 1958. Effects of weather on Common Eider in Iceland seem to be limited to extreme years, although a succession of milder winters in the 1980s coincided with the greatest increase in breeding numbers.

8.3 Status and Trends of North American Sea Ducks

Timothy D. Bowman[1], **Emily D. Silverman**[2] and Scott G. Gilliland[3]

[1] U.S. Fish and Wildlife Service, 1011 East Tudor Road, Anchorage, Alaska 99503, USA
[2] U.S. Fish and Wildlife Service, Division of Migratory Bird Management, 11510 American Holly Drive, Laurel, Maryland 20708, USA; e-mail: emily_silverman@fws.gov
[3] Canadian Wildlife Service, 6 Bruce Street, Mount Pearl, Newfoundland, Canada A1N 4T3

To evaluate status of North American sea duck populations, we examined the most reliable time series data on abundance. The ability of many current surveys to accurately measure the status and trends in sea duck populations is constrained by geographic scope, improper timing, identification problems and limited time series. Available data highlight potential declines for a number of species. Spectacled Eiders (*Somateria fischeri*) and Steller's Eiders (*Polysticta stelleri*) remain far below historic levels and are listed as threatened in the U.S. King Eiders (*Somateria spectabilis*) appear to be stable in western North America and data suggest a depressed population in Eastern North America. Pacific Common Eiders (*S. mollissima v-nigra*) have declined sharply since the 1950's. Population trends for American Common Eider (*S. mollissima dresseri*) are mixed, with apparent increases in northern parts of their range and decreases in southern parts. Trends for Hudson Bay and Northern races of Common Eider (*S. m. sedentaria and S. m. borealis*) are uncertain. Scoters are not differentiated during traditional aerial surveys, but most surveyed mid-continent areas include a mix of Surf Scoters (*Melanitta perspicillata*) and White-winged Scoters (*M. fusca*). There, scoters have consistently declined since the 1950s, with greatest declines noted in the northern boreal forest and northern prairies. Black Scoters (*M. nigra*) have declined significantly on Pacific breeding areas, with unclear trends in eastern breeding areas. Available data for Long-tailed Ducks (*Clangula hyemalis*) suggest long term declines in surveyed parts of their range, with stable numbers in recent years. Continental surveys indicate increases in population size for Bufflehead (*Bucephala albeola*), goldeneyes and mergansers (*Mergus* spp), although lack of differentiation among species in the latter two groups prohibits reliable species-specific evaluations over these species' ranges. Trends for Harlequin Ducks (*Histrionicus histrionicus*) along the Atlantic coast are stable to increasing and unknown in the Pacific.

8.4 Nest Predation and Frequencies of Conspecific Nest Parasitism in Common Eiders

Alain Lusignan[1], Katherine R. Mehl[2], Mark Gloutney[3] and Ian Jones[4]

[1] Department of Biology, Memorial University, St. John's, Newfoundland, Canada A1B 3X9; e-mail: aplusign@mun.ca
[2] Department of Biology, University of North Dakota, 10 Cornell Street, Grand Forks, North Dakota 58202-9019, USA
[3] Ducks Unlimited Canada, PO Box 430, Amherst, Nova Scotia, Canada B4H 3Z5
[4] Department of Biology, Memorial University, St. John's, Newfoundland, Canada A1B 3X9

Conspecific nest parasitism (CNP) is a common alternative reproductive strategy, where a female leaves the care of her eggs and the subsequent rearing of offspring to individuals of the same species, other than herself or her mate. Several hypotheses have been proposed to explain the evolution of CNP and recent studies suggest that nest predation may be an important factor in shaping this behaviour. According to the “risk assessment” hypothesis, nest parasites should preferentially target safe nest sites when the risk of nest predation is not randomly distributed. We tested the predictions of this hypothesis using a population of Common Eiders (*Somateria mollissima*) nesting in Table Bay, Labrador, Canada, in 2007. We estimated daily nest survival in three different habitats (open areas, nest shelters and dense vegetation) and used isoelectric protein electrophoresis of egg albumen to identify parasitic eggs in a sub-sample of nests. Nests in dense vegetation had the highest probability of nest survival (0.82, 95% CI: 0.71-0.89), yet had the lowest frequency of nest parasitism (33%). In contrast, nests in shelters had both higher frequencies of nest parasitism (79% vs. 55%) and higher survival probabilities (0.73, 95% CI: 0.60-0.82; vs. 0.59, 95% CI: 0.43-0.71) than nests in open habitats. The results of this study suggest that, although the risk assessment hypothesis may explain the differences in frequency of nest parasitism between nest shelters and open areas, visibility and accessibility of nest sites is likely to have the greatest impact on where parasitic eggs are laid.

8.5 Differential Partial Clutch Predation Explaining Habitat-specific Clutch Size in Eiders

Markus Öst[1], Mikael Wickman[2], Edward Matulionis[3] and Benjamin Steele[4]

[1]Aronia Coastal Zone Research Team, Raseborgsvägen 9, FI-10600 Ekenäs, Finland;
e-mail: markus.ost@sydvast.fi
[2]Björknäsgatan 2 1A1, FI-10600 Ekenäs, Finland
[3]138 Butterfield Hill Road, Perkinsville, VT 05151 USA
[4]Department of Natural Sciences, Colby-Sawyer College, New London, NH 03257 USA

The energetic incubation constraint hypothesis (EICH) for clutch size states that birds breeding in poor habitat may free up resources for future reproduction by laying a smaller clutch. The Common Eider (*Somateria mollissima*) is considered a candidate for supporting this hypothesis. Clutch size is smaller in exposed nests, presumably because of faster heat loss and higher incubation cost and, hence, smaller optimal clutch size. However, an alternative explanation is partial predation: the first egg(s) are left unattended and vulnerable to predation, which may disproportionately affect exposed nests, so clutch size may be underestimated. We experimentally investigated whether predation on first-laid eggs in eiders depends on nest cover. We then re-evaluated how nesting habitat affects clutch size and incubation costs based on long-term data, accounting for confounding effects between habitat and individual quality. We also experimentally assessed adult survival costs of nesting in sheltered nests. The risk of egg predation in experimental nests decreased with cover. Confounding between individual and habitat quality is unlikely, as clutch size was also smaller in open nests within individuals and early and late breeders had similar nest cover characteristics. A trade-off between clutch and female safety may explain nest cover variation, as the risk of female capture by us, mimicking predation on adults, increased with nest cover. Nest habitat had no effect on female hatching weight or weight loss, while lower temperature during incubation had an unanticipated positive relationship with hatching weight. There were no indications of elevated costs of incubating larger clutches, while clutch size and colony size were positively correlated, a pattern not predicted by the EICH. Differential partial clutch predation thus offers the more parsimonious explanation for clutch size variation among habitats in Eiders, highlighting the need for caution when analyzing fecundity and associated life-history parameters when habitat-specific rates of clutch predation occur.

8.6 Post-hatching Improvement of Body Condition in Female Common Eiders: What Comes First, Heart Mass, Digestive Organs or Locomotion Muscles?

Mylène Delorme[1] and Magella Guillemette[1]

[1]Département de biologie, Université du Québec à Rimouski, 300 allée des Ursulines, Rimouski, Québec, Canada, G5L 3A1; e-mail: mylene.delorme@uqar.qc.ca

As they fast during incubation, female Common Eiders (*Somateria mollissima*) loose up to 36% of their body mass with the result that many body organs are atrophied upon hatching (Korschgen 1977). Females thus need to recover the mass loss while they need to feed for themselves, brood ducklings and avoid predation. Our objectives were to estimate the increase rate of body mass during the post-hatching period and identify in which order body organs were replenished. Eiders were collected under licence in the St. Lawrence estuary during the summers of 2006-2008, for complete dissections and RNA-DNA ratio analyses. The DNA-RNA ratios of several organs were negatively related to body mass suggesting that females at the end of incubation (lower body mass) recovered at a faster rate than females caught later during post-hatching (higher body mass). Except for heart mass and leg muscle, all organs increased faster than predicted by an isometric function (slope = 1), the small intestine being the fastest increasing organ when related to body mass (slope = 2.23), followed by the gizzard (1.74), liver (1.70), kidney (1.49) and pectoral muscle (1.46). Our study suggests that organs are replenished in the same order that they are reduced during the incubation fast. Finally, preliminary estimates of body mass increases, at both the inter and intra-individual level, will also be presented.

8.7 The Effect of Relatedness on Conspecific Brood Parasitism in Barrow's Goldeneyes: Behaviour of Hosts and Parasites

Kim Jaatinen[1], Sonja Jaari[1], Robert B. O'Hara[2], Markus Öst[3] and Juha Merilä[1]

[1] Department of Biological and Environmental Sciences, University of Helsinki, Finland, e-mail: kim.jaatinen@helsinki.fi
[2] Department of Mathematics and Statistics, University of Helsinki, Finland
[3] Aronia Coastal Zone Research Team, Ekenäs, Finland

The finding of kin biased egg donation in conspecific brood parasitism (CBP) has sparked studies re-assessing the parasitic nature of this alternative reproductive strategy. Natal philopatry may elevate local relatedness and has been a candidate explanation for the elevated relatedness between hosts and parasites in waterfowl, a group of birds in which CBP is especially common. Here we study the parasitism behaviour of nesting parasites in a cavity nesting sea duck, the Barrow's Goldeneye (*Bucephala islandica*). We assess the possible effect of relatedness on parasitism behaviour as well as on the response of hosts to parasitism, while taking the possible effects of natal philopatry into account. By examining the amount of eggs donated in relation to the pair wise distance and relatedness of host – parasite pairs we assess the relative importance of these two factors in determining the extent of parasitism. Furthermore we study the response of hosts in the face of parasitism and examine the possibility of parasite induced host clutch reduction. More specifically we study the effect of relatedness on the extent of possible clutch reduction in this population of Barrow's Goldeneyes. Our results indicate that both distance and relatedness are of importance in determining the amount of parasitic eggs donated by parasites and that clutch reduction may be an adaptation to nest parasitism. Interestingly the results also show that clutch reduction is more pronounced with elevated relatedness to the parasite.

Abstracts for Session 9: Breeding Ecology

9.1 Nest-site Selection and Nest Success of Colonial Red-breasted Mergansers in Eastern New Brunswick

Shawn R. Craik[1] and Rodger D. Titman[1]

[1]Department of Natural Resource Sciences, McGill University, Ste-Anne-de-Bellevue, Québec, Canada H9X 3V9; e-mail: shawn.craik@mail.mcgill.ca

Red-breasted Mergansers (*Mergus serrator*) breed in estuaries of the maritime provinces of Canada. However, little is known about their patterns of nest-site selection and factors influencing nest success. We studied coastal Red-breasted Mergansers that nested colonially with Common Terns (*Sterna hirundo*) on Tern Islands at Kouchibouguac National Park, New Brunswick, in 2005 and 2006. Nests were classified into one of four macrohabitats (type of cover) and seven microhabitat features were compared between: a) nests and random sites; b) successful and unsuccessful nests and c) dump (≥13 eggs) and normal nests. Of 156 nests, 153 were in marram grass (*Ammophila breviligulata*). Overhead concealment and vegetation density and height were considerably greater at nests than at random locations (n = 156). Microhabitat was similar between successful (n = 87) and unsuccessful (n = 66) nests and between incubated dump (n = 36) and normal (n = 48) nests. Apparent nest success varied little between 2005 (0.59) and 2006 (0.55) and 95% of nest losses were attributed to abandonment. The low rates of nest depredation were influenced by mobbing of avian egg predators by Common Terns. We modeled nest survival as a function of year, linear and quadratic trends of nest age and date of initiation, dump nesting and investigator activities. Model averaging indicated that nest survival increased linearly with later dates of nest initiation. Abandonment of some early initiated nests was likely attributed to dump nesting and investigator activities, although additive or interactive effects of these parameters did not improve fit of the most parsimonious model $\{S_{initiation}\}$. We conclude that Red-breasted Mergansers selected nesting habitat adaptively on Tern Islands because nests were well concealed on islands free of mammalian predators and were associated with a large breeding colony of Common Terns.

9.2 Breeding Population Size, Production and Nesting Chronology of Spectacled Eiders (*Somateria fischeri*) on the Yukon-Kuskokwim Delta, Alaska: A Quarter-Century of Change

Julian B. Fischer[1], Robert A. Stehn[1], Timothy D. Bowman[1] and Robert M. Platte[1]

[1]U.S. Fish and Wildlife Service, Migratory Bird Management, 1011 E. Tudor Road, Anchorage, Alaska 99503, USA; e-mail: julian_fischer@fws.gov

Spectacled Eiders (*Somateria fischeri*) were listed as threatened under the U.S. Endangered Species Act in 1993. Spectacled Eider delisting criteria are based in part on nest population size in western Alaska. Since 1985, we have conducted annual nest surveys for Spectacled Eiders within their core breeding area in western Alaska to assess breeding population size, annual production and nesting chronology. We adjusted nest population estimates for incomplete detection using a model that considers species, nest activity status, observer experience and habitat. We expanded estimates obtained from the ground sampled area to the entire coastal zone based on a stratified analysis of an aerial survey of the coastal zone of the Yukon-Kuskokwim Delta. These analyses show a decline in number of nests between 1985 and the early 1990s, followed by a steady increase since 1992. The number of nests increased at an average rate of 2.7% annually over the last decade. Nest success ranged from 45% to 93% between 1985 and present resulting in high annual variation in egg production. We documented an advance in timing of nest initiation of nine days between 1982 and 2007. Timing of nesting corresponded closely with spring weather conditions in surrounding villages reflecting the flexibility of Spectacled Eiders to adjust to a variable climate. This long-term study continues to meet a high priority task identified by the Spectacled and Steller's Eider Recovery Team with an annual assessment of nesting population size and annual egg production. Further, the survey provides information on a variety of other waterfowl species and provides information to document effects of climate change on eiders and other waterfowl.

9.3 Breeding Ecology of Spectacled and King Eiders on the Arctic Coastal Plain of Alaska, 1993–2008

Betty A. Anderson[1], Alice A. Stickney[1], Pamela E. Seiser[1] and Caryn L. Rea[2]

[1] ABR, Inc.–Environmental Research & Services, P.O. Box 80410, Fairbanks, Alaska 99708, USA; e-mail: banderson@abrinc.com
[2] ConocoPhillips Alaska, Inc., 700 G Street, Anchorage, Alaska 99501, USA

We studied the breeding ecology of Spectacled (*Somateria fischeri*) and King (*S. spectablis*) eiders on the Arctic Coastal Plain of Alaska from 1993 to 2008. The Spectacled Eider is listed as a threatened species under the Endangered Species Act. We recorded observations of eiders from arrival to onset of incubation (pre-nesting) during systematic road surveys in the Kuparuk Oilfield and evaluated habitat selection using GIS and statistical analyses of habitats derived from an integrated terrain unit map of the study area. Spectacled Eiders used small, shallow waterbodies with emergent margins (*Carex* spp. and *Arctophila fulva*) and flooded tundra habitats during pre-nesting but nested most often on islands or shorelines within basin wetland complexes. King Eiders used similar pre-nesting habitats, as well as larger, deep open lakes, but nested in drier tundra habitats often some distance from waterbodies. We measured incubation constancy with artificial temperature-recording eggs and found that incubation constancy exceeded 95% for both species, with most incubation recesses timed to the warmest periods of the day. We found little evidence that poor nest attendance contributed to nest failures. Time-lapse cameras at Spectacled Eider nests confirmed predation of eggs by arctic foxes (*Alopex lagopus*) and Glaucous Gulls (*Larus hyperboreus*) and identified Common Ravens (*Corvus corax*) as possible egg predators, as well as post-hatch scavengers at nests. Eider abundance and nesting effort and success were all affected by spring seasonal factors (temperature and snowmelt). Annual apparent nesting success for Spectacled Eiders ranged from 0% to 92% (in a year following arctic fox removal) and for King Eiders ranged from 7% to 75%. The breeding population of Spectacled Eiders within the Kuparuk Oilfield has remained relatively stable during the past 16 years, following the same trend as that of the larger regional population of eiders on the Arctic Coastal Plain in Alaska.

9.4 Selection of Diverse Nest Sites by Common Eiders

Benjamin Steele[1] and Markus Öst[2]

[1] Department of Natural Sciences, Colby-Sawyer College, New London, NH USA 03257
e-mail: bsteele@colby-sawyer.edu
[2] Aronia Coastal Zone Research Team, Raseborgsvägen 9, FI-10600 Ekenäs, Finland

Nest sites of Common Eiders vary widely, from slight depressions on bare rocky ledges with no vegetative cover, to underneath dense thickets of juniper on forested islands, where they are nearly invisible from above. We investigated why these very different sites are chosen rather than one type of site being preferred. We hypothesized that covered sites shield the nest from predators of eggs, but may hinder the adult female from escaping from a potential predator on adults. We also expected that young birds with many more years of reproduction before them should choose sites that maximize their survival, perhaps at the expense at that year's reproduction, while older birds might nest in covered sites that maximize nesting success. We measured visual cover and the angle through which an incubating female could escape on nests for which we knew relative ages of the females and outcome of the nesting attempt. Our capture technique simulated the approach of a predator. We found (1) nest cover was negatively correlated with escape angles, although some nests afforded both good cover and good escape routes, (2) nest cover and escape angle did not affect nest success, (3) our capturing technique was more successful on nests with greater cover and (4) older females nested in sites that had higher coverage than sites used by young females, even when controlled for type of island. These results suggest that Eiders may adjust their nest site selection to fit their expected future fitness.

9.5 Breeding Habitat Preferences of 15 Bird Species on South-western Finnish Archipelago Coast: Applicability of Digital Spatial Data Archives to Habitat Assessment

Mia Rönkä[1], Harri Tolvanen[2], Esa Lehikoinen[1], Mikael von Numers[3] and Mauri Rautkari[4]

[1] Section of Ecology, Department of Biology, FI-20014 University of Turku, Finland; e-mail: mia.ronka@utu.fi
[2] Department of Geography, FI-20014 University of Turku, Finland
[3] Environmental and Marine Biology, Department of Biology, Åbo Akademi University, Tykistökatu 6, FI-20520 Turku, Finland
[4] Tunnelitie 17 C, FI-00320 Helsinki, Finland

Knowledge about the importance of physical habitat characteristics to the breeding site selection of birds is a prerequisite for understanding their breeding habitat ecology and distribution, as well as managing their habitats. Geographical information systems (GIS) and digital data archives provide new possibilities for the quantitative and cost-effective assessment of coastal breeding habitats of birds. We tested the applicability of GIS and digital data archives to the analysis of coastal bird habitats by conducting a multivariate analysis on the relationship between physical island characteristics and the breeding site selection of 15 species of ducks, waders, larids and alcids in 2001-2005 on the fragmented archipelago coast of south-western Finland. We used GIS and environmental databases containing shoreline, bathymetry and elevation data to calculate five physical parameters for 71 small islands and their vicinity. Island area was generally the most important factor determining the presence of our target species, for instance the Velvet Scoter (*Melanitta fusca*) and the Goosander (*Mergus merganser*), but also water depth, shore openness and island elevation were important for some species. The differences and similarities in habitat preferences within and between species groups seem to reflect the breeding habitat ecology of the species. GIS and spatial data archives are becoming increasingly valuable for research and development, as well as administrative tasks. Our results indicate that physical island characteristics affect the breeding site selection and the distribution of our target species and that GIS and digital data archives provide applicable information on the breeding habitats of coastal birds and can thus function as a tool for the conservation and management of coastal environments and bird communities.

9.6 Breeding Synchrony, Sympatry and Nesting Areas of Pacific Coast Surf Scoters in the Northern Boreal Forest

John Y. Takekawa[1], Susan W. De La Cruz[1], Matthew T. Wilson[1], Eric C. Palm[1], Julie Yee[1], David R. Nysewander[2], Joseph R. Evenson[2], John M. Eadie[3], Daniel Esler[4], W. Sean Boyd[5] and David H. Ward[6]

[1] U.S. Geological Survey, Western Ecological Research Center, Vallejo, California 94592, USA; e-mail: john_takekawa@usgs.gov
[2] Washington Department of Fish & Wildlife, 600 Capitol Way North, Olympia, Washington 98501, USA
[3] Department of Wildlife, Fish and Conservation Biology, University of California, Davis, California 95616, USA
[4] Center for Wildlife Ecology, Simon Fraser University, Delta, BC, V4K3N2, Canada
[5] Canadian Wildlife Service, Pacific Wildlife Research Center, Delta, BC, V4K3N2, Canada
[6] U.S. Geological Survey, Alaska Science Center, 4210 University Drive, Anchorage, Alaska 99508, USA

Recent declines in sea ducks have increased concern about the population effects of anthropogenic factors on their wintering and breeding habitats. Little information has been available to relate coastal wintering areas with inland breeding areas for one of these species, the Surf Scoter (*Melanitta perspicillata*). We compiled results from Surf Scoters marked with radio and satellite transmitters at four wintering areas along the Pacific coast to describe their breeding synchrony, sympatry, philopatry and nesting areas selection in the Northern Boreal Forest (NBF). Their primary breeding area was located in the western NBF between the Great Slave and Great Bear Lakes in the Northwest Territories, Canada. Their mean settling date (30 May) was remarkably synchronous (± 0.9 d). We developed a nearest-neighbor statistic *C* to examine distribution of individuals from different wintering areas and found that their nesting areas were intermixed (*C* = 0.033, P = 0.10), but that nests of eight individuals found in successive years were within 1.2±0.2 km of their previous locations. Finally, we compared nesting areas and random locations with a second-order Akaike Information Criterion analysis that identified the best models from a large candidate set with stepwise selection. Key landscape features included distance to snowline, elevation gradient, distance to treeline and latitude. A nonparametric classification analysis and regression tree on these variables showed that nesting areas were found in an arc of habitat within 218 km of the snowline, in lower elevation gradients and where there were a few larger lakes. Climate change is predicted to have greatest effects on more northern ecosystems and NBF species like Surf Scoters with relatively inflexible breeding ecology may be adversely affected if they are unable to adapt quickly to rapidly changing conditions.

FRIDAY INVITED SPEAKER

Dr. Margaret R. Petersen, Research Wildlife Biologist
U.S. Geological Survey
Alaska Science Center
4210 University Dr.
Anchorage, Alaska 99508-4626 USA
e-mail: mrpetersen@usgs.gov

Distribution and Migration of Sea Ducks as Determined through Satellite Telemetry: from Species to Populations to Individual Strategies

The at-sea distribution and migration of sea ducks is poorly understood. Because of apparent declines in populations there has been and continues to be an urgent management need for information on their distribution and ecology when at-sea. With the continued development of small satellite transmitters and refined surgical technique of implanting transmitters, there has been an explosion of knowledge on the distribution and ecology of many species. Management of any migrant species requires an understanding of the connectivity between breeding, staging and wintering areas of a species. Once this connectivity is known, data from surveys and studies then can be interpreted in the context of the species or population. I present extreme examples of variation in connectivity from breeding to moulting then to wintering areas from two species: Spectacled Eider (*Somateria fischeri*) and Long-tailed Duck (*Clangula hyemalis*). These examples exhibit variability among sexes as well as differences between breeding populations. Data are consistent with results from genetic and banding studies and together present cohesive descriptions useful for management of these species. An 8-year study of five nesting populations of the Pacific Common Eider (*Somateria mollissima v-nigrum*) highlights the importance of understanding population structure of wintering species and the implications to studies of their ecology and population biology. The results suggest that wintering areas of these populations are in part dictated by the availability of open waters (polynya and flow leads) within the ice with birds migrating to the nearest waters open throughout winter. This explanation of the distribution patterns is reinforced with observations of partly or wholly resident populations. One population with strong connectivity between breeding and wintering areas exhibits variability among individuals in migration strategies. The expression of these strategies among individuals can be maintained by the high variability of ice among years and the resultant danger of ice restricting the birds' access to forage during spring staging and migration. I predict long-term shifts in the ratio of the three strategies in response to changes in ice associated with climate change. Transmitters that last multiple years will allow assessment of variation in individual strategies to environmental conditions. Future work may examine site fidelity to moulting, wintering and staging areas. Development of small, longer-lived batteries is needed to begin studies that can provide further insight into the ecology of sea ducks.

ABSTRACTS FOR SESSION 10: MOVEMENTS AND ECOLOGY

10.1 Movements and Survival of First-year King Eiders

Abby N. Powell[1] and Steffen Oppel[2]

[1] U.S. Geological Survey, Alaska Cooperative Fish & Wildlife Research Unit and Institute of Arctic Biology, 209 Irving I., University of Alaska, Fairbanks, AK 99775-7020, USA, e-mail: ffanp@uaf.edu
[2] Department of Biology and Wildlife, 211 Irving 1, University of Alaska, Fairbanks, AK 99775-6100, USA

Little is known about recruitment in many sea duck species, although many of their populations are declining. Likewise, movements and habitat use of post-fledgling/prebreeding eiders remain largely unknown. We present preliminary data on movements and survival of first-year King Eiders (*Somateria spectabilis*) trapped as juveniles on Alaska's north slope in August 2006 (n = 9) and 2007 (n = 42) based on satellite telemetry. Of the birds marked in 2006, all transmitters failed within 12 months. In 2007, we programmed transmitters to last approximately 2 years (6 hours on, 120 off) and none of the transmitters failed as of May 2008. First-year survival estimates differed depending on whether we assumed failed transmitters were dead birds and ranged from 47-63%. Mortality rates were similar among months and were not associated with any one location. Distances moved by juveniles were greatest (>400 km/month) from September-December and smallest (<200 km/month) from January-April. In general, juvenile King Eiders marked in late August remained in the Beaufort and Eastern Chukchi Seas until October. Winter locations overlapped with locations of adult King Eiders with the exception of the Kamchatka Peninsula; no juveniles used this area in any month. Most juveniles spent the winter along Chukotka, Bristol Bay and the Alaska Peninsula and around St. Lawrence Island. A few first-year King Eiders were located around Wrangell Island in October 2006 and May 2008. We will continue to monitor locations and survival of first- and hopefully second-year King Eiders to better understand this vulnerable life stage.

10.2 Nonbreeding Movements and Site Use of Male Barrow's Goldeneyes

W. Sean Boyd[1] and Daniel Esler[2]

[1] Environment Canada, Science and Technology Branch, 5421 Robertson Rd., Delta, British Columbia, Canada V4K 3N2; e-mail: sean.boyd@ec.gc.ca
[2] Centre for Wildlife Ecology, Simon Fraser University, 5421 Robertson Rd., Delta, BC, V4K 3N2

We used satellite telemetry to describe the movement patterns of adult male Barrow's Goldeneye (*Bucephala islandica*) among and within annual cycle stages. In May of 2006 and 2007, we used submerged mist nets and floating decoys placed inside breeding pair territories to capture and mark 38 adult males at Riske Creek, British Columbia. Birds were marked with 36-40g satellite transmitters (PTTs) surgically implanted into the coelomic cavity. Marked birds departed from Riske Creek in mid-late incubation and flew north to undergo wing moult on interior lakes. Most birds migrated to northern British Columbia or Alberta but several flew as far north as Great Bear Lake in the Northwest Territories, a distance of ca. 1,500 km. Argos location data suggested that individual moult sites can vary across years; for example, one male moulted near Great Bear Lake in 2006 but on Cardinal Lake in northern Alberta in 2007. Cardinal Lake was used as a staging or moulting site in both years by several PTT-tagged birds, illustrating the importance of this lake to Riske Creek breeders. All marked birds wintered on the coast of British Columbia, from the Strait of Georgia to Prince Rupert, indicating that there is little segregation by breeding site on wintering areas. Once on the coast between November and April, males moved only short distances (<50 km). In spring, some birds flew reconnaissance trips into the interior only to return to the coast within hours or days. One male undertook at least two reconnaissance trips (each 150-200 km) before "permanently" moving to the interior. Plans are to mark more males in 2008 as well as their mates and young. This ongoing work will lead to a better understanding of population delineation and identification of important habitats, which in turn will contribute to the conservation of this species.

10.3 Site Use and Spring Migration of Pacific Surf Scoters: Do They Ride a "Silver Wave" of Herring Spawn North?

Erika Lok[1], Daniel Esler[2], John Y. Takekawa[3], Susan W. De La Cruz[3], W. Sean Boyd[4], David R. Nysewander[5], Joseph R. Evenson[5] and David H. Ward[6]

[1] Centre for Wildlife Ecology, Simon Fraser University, 8888 University Drive, Burnaby, BC, V5A 1S6, Canada, eklok@sfu.ca
[2] Centre for Wildlife Ecology, Simon Fraser University, 5421 Robertson Road, Delta, BC, V4K 3N2, Canada
[3] U. S. Geological Survey, Western Ecological Research Center, San Francisco Bay Estuary Field Station, 505 Azuar Drive, Vallejo, CA, 94592, USA
[4] Canadian Wildlife Service, Pacific and Yukon Region, 5421 Robertson Road, Delta, BC, V4K 3N2, Canada
[5] Washington Department of Fisheries and Wildlife, 600 Capitol Way North, Olympia, WA, 98501, USA
[6] U. S. Geological Survey, Alaska Science Center, 1011 E. Tudor Road, Anchorage, AK, 99503, USA

We used satellite telemetry to consider the timing of spring migration of Surf Scoters (*Melanitta perspicillata*) relative to the timing of Pacific herring (*Clupea pallasi*) spawn initiation on a continental scale. In addition, within Southeast Alaska, we contrasted habitat attributes of stopover sites to those of random sites to evaluate the importance of herring spawn relative to other landscape features. We found a general correspondence in the phenologies of scoter migration and herring spawn activity, in support of the "silver wave" hypothesis that scoters are timing their spring migration to take advantage of this ephemeral but abundant food resource. In Southeast Alaska, we identified 14 important stopover sites using locations from satellite transmitter-marked Surf Scoters from 2003-2006. Using an information-theoretic model selection approach, we found that habitat attributes of these sites differed from unused sites with respect to the distance to Pacific herring spawn sites and the distance to the outer coast, while physical shoreline attributes were generally poor predictors of site use. Stopover sites were closely associated with herring spawn sites and were concentrated along the mainland coast. One site, Lynn Canal, was identified as being an exceptionally important stopover and staging site for Surf Scoters from across their Pacific winter range; roughly half of the coastally-migrating Surf Scoters used this area, many for extended periods. We conclude that the geographical context and resource availability within Southeast Alaska, specifically herring spawn sites, provides unique and potentially critical stopover habitat for spring migrating Surf Scoters.

10.4 Population Delineation, Habitat Use and Diet of Surf Scoters from the Southern Portion of their Winter Range

David H. Ward[1], Sharon Herzka[2], Kathy Brodhead[3] and Daniel Esler[3]

[1]Alaska Science Center, U. S. Geological Survey, 4210 University Dr., Anchorage, Alaska 99508; email: dward@usgs.gov
[2]Department of Biological Oceanography, Center for Scientific Investigations and Higher Education, Ensenada, Baja California, Mexico 22860
[3]Centre for Wildlife Ecology, Simon Fraser University, Burnaby, British Columbia

Declines in the numbers of Pacific Surf Scoters and a general lack of information about their life-history traits and ecology prompted studies of this species along the Pacific coast of Mexico and southern California. In winters of 2005–2008 we captured and marked scoters with satellite transmitters in Baja California to gain a more complete delineation of the winter population structure, migration routes and patterns and breeding distribution of Surf Scoters in the Pacific Flyway. We also collected birds along with potential diet items to identify foods that are important to Surf Scoters in this region. Here, we present results of this research on the migration chronology, linkages between wintering and breeding areas and diet for this overlooked segment of the Surf Scoter population. We implanted 15 adult female Surf Scoters with satellite transmitters (5 in Feb 2005 and 5 in Feb 2006 and 5 in Dec 2006) at San Quintin Bay, Baja California Mexico. Spring and fall migrations followed coastlines and important staging areas included the Oregon/Washington coast and southeast Alaska, particularly Lynn Canal. Birds used nesting areas in the western portion of the Northwest Territories and most birds moulted in southeast Alaska. Foods detected in the stomach and fecal material of Surf Scoters collected at San Quintin Bay included both soft bodied and shelled items, such as small crabs, decapods and small bivalves. A more detailed examination of the diet of Surf Scoters at this location will be presented using stable isotope ratios of nitrogen and carbon.

10.5 Wing Moult Chronology, Duration and Synchronicity in Captive Harlequin Ducks, Surf Scoters, White-winged Scoters and Long-tailed Ducks

Jean-Pierre L. Savard[1], Matthew C. Perry[2], Jean-François Savard[3], Alicia M. Wells-Berlin[2] and Scott G. Gilliland[4]

[1] Environment Canada , Wildlife Research, 1141 Route de l'Église, P. O. Box 10100, Sainte-Foy, Québec, Canada G1V 4H5; e-mail: jean-pierre.savard@ec.gc.ca
[2] USGS-Patuxent Wildlife Research Center, 12100 Beech Forest Road, Laurel, Maryland 20708 USA
[3] Department of Biology, University of Maryland, College Park, Maryland, 20742-4415
[4] Environment Canada, Canadian Wildlife Service, Mount Pearl, Newfoundland and Labrador, Canada A1N 4T3

Moulting is an energetically costly activity and understanding moult chronology is important when developing avian management plans. Many sea ducks moult in remote northern regions of North America and because of difficulties of maintaining them in captivity relatively little is known about their moulting process. In recent years, the USGS-Patuxent Wildlife Research Center has been successful in maintaining breeding sea ducks in captivity and these captive flocks provide a unique opportunity to study the moult process and the duration of the flightless period. We monitored the wing feather moult of 19 Harlequin Ducks (*Histrionicus histrionicus*), 8 Surf Scoters (*Melanitta perspicillata*), 17 White-winged Scoters (*M. fusca*) and 11 Long-tailed Ducks (*Clangula hyemalis*) from early June to late September. We measured the onset and duration of moult as well as the growth rate of primaries for each individual and compared feather growth, moult synchronicity and the length of the flightless period within and between sexes and among species. Weight, blood parameters and behaviour of ducks were monitored as possible corollary factors to feather moult. We found significant differences in moult patterns between sexes and among species and, although the captive conditions do not reflect conditions in the wild (e.g. photoperiod and nutrition), our results do reveal what we believe are biologically relevant differences in the timing, speed and duration of moult that will guide future studies of the moulting process in wild populations of sea ducks.

POSTER ABSTRACTS

1. Relationships between Breeding, Moulting and Wintering Locations of Common Eiders Breeding in the St. Lawrence

Jean-Pierre L. Savard[1], Jean-François Giroux[2] and Louis Lesage[3]

[1] Environment Canada, Wildlife Research, 1141 Route de l'Église, P. O. Box 10100, Sainte-Foy, Québec, Canada G1V 4H5; e-mail: jean-pierre.savard@ec.gc.ca
[2] Département des sciences biologiques, Université du Québec à Montréal (UQÀM), P.O. Box 8888, Succursale Centre-ville, Montréal, Québec, Canada, H3C 3P8
[3] Environment Canada, Canadian Wildlife Service, 1141 Route de l'Église, P. O. Box 10100, Sainte-Foy, Québec, Canada G1V 4H5

We implanted 32 females and 8 male eiders with satellite transmitters between 2006 and 2008. Birds were captured on islands in the Gulf of St. Lawrence and the estuary. Preliminary results for 20 of the 40 birds indicate that males and females used several moulting sites. Females from the same island moulted in different areas: for example 3 of 5 females from Innu Island in the Mingan Archipelago moulted at Anticosti Island only 70 km away and 2 in Maine 800 km away. Of 3 males captured on Bicquette Island near Rimouski, 1 moulted on the south shore (60 km away), 1 at Anticosti Island (375 km) and 1 in Maine (980 km). However, 3 of 4 females from Brandy Pot Island in the St. Lawrence estuary moulted on the north shore near the mouth of the Saguenay River, just 24 km away and 1 near Rivière-du-Loup on the south shore only 10 km from the island. This bird returned to the same moulting site the following year. Two migration routes were identified: one overland across the Gaspé Peninsula to the coast of Maine and one around the Gaspé Peninsula. Results of the 20 birds marked this spring will be presented as well. The results suggest a complex relationship between moulting and breeding areas. It is still unknown how and when sea ducks select their moulting sites. Greater understanding of these relationships will greatly improve management of the species.

2. Variability in Wing Moult Chronology and Nutrient Dynamics in Male Surf Scoters near Nain, Labrador, from 2004 to 2006

Scott G. Gilliland[1] and Jean-Pierre L. Savard[2]

[1] Environment Canada, Canadian Wildlife Service, 6 Bruce Street, Mount Pearl, Newfoundland, Canada, A1N 4T3; e-mail: scott.gilliland@ec.gc.ca
[2] Environment Canada , Wildlife Research Division, 1141 Route de l'Église, P. O. 10100, Sainte-Foy, Québec, Canada G1V 4H5;

We used development of the 9th primary as a measure of wing moult progression. Moult chronology differed between years (ANCOVA, $F=19.49$, $df=2$, $p \leq 0.0001$, $n=742$). Accounting for variability in capture date, ninth primaries averaged 14.1±3.0 mm (±SE) longer in 2006 than 2004 (Post Hoc test $p<0.000$) and 18.9±3.1 mm longer in 2006 than 2005 (Post Hoc test $p<0.000$). There was no difference in moult chronology between 2004 and 2005 (Post Hoc test $p=0.17$). The rate of increase of the ninth primary in the population was similar across years (2.9±0.1 mm per day; ANCOVA, $F=360.5$, $df=1$, $p \leq 0.0001$, $n=742$) between 20 July and 22 August. Assuming similar growth rate of the ninth primary of Surf Scoters and Barrows Goldeneyes (4.04±0.05 mm per day), primaries may have been shed an average of 3.5 d and 4.8 d earlier in 2006 than 2004 and 2005, respectively. Body mass was stable during wing moult over the three years of study (ANCOVA, $p=0.12$, $n=648$). However, birds averaged 27±7 g heavier in 2004 than 2005 (Post Hoc test $p>0.000$) and 33±7 g heavier in 2004 than 2006 (Post Hoc test $p>0.000$, ANCOVA, $p>0.000$). There was no difference in body mass between 2005 and 2006 (Post Hoc test $p=0.75$). In 2005, we collected 36 male scoters and examined relationships between ninth primary length and water, lipid, protein and ash content of the liver, the breast, the leg and the whole carcass and 9th primary length with plumage mass. All relationships were non-significant except plumage mass. Plumage mass increased 0.59 g per mm growth of the ninth primary (SLR, $p \leq 0.0001$, $n=16$) during ninth primary growth from 0 to 70 mm. Plumage mass stabilized at 95.2±8.2 g (±SD, $n=20$) during primary growth from 70 to 125 mm. These results suggest that Surf Scoters moulted in a rich feeding area and relied on diet to meet their nutritional requirements during wing moult.

3. Prebasic Moult by Male Red-breasted Mergansers at Anticosti Island, Québec

Shawn R. Craik[1], Jean-Pierre L. Savard[2] and Rodger D. Titman[1]

[1] Department of Natural Resource Sciences, McGill University, Ste-Anne-de-Bellevue, Québec, Canada H9X 3V9; e-mail: shawn.craik@mail.mcgill.ca
[2] Environment Canada, Science and Technology, 1141 Route de l'Église, P.O. Box 10100, Sainte-Foy, Québec, Canada G1V 4H5

The prebasic moult is a major metabolic event in the annual cycle of Anatinae as it involves replacement of wing and body plumages. However, little is known of the duration and chronology of the flightless period and the intensity of the prebasic body moult in different feather regions of Red-breasted Mergansers (*Mergus serrator*). We examined the prebasic moult for 39 postbreeding male Red-breasted Mergansers collected from flocks of flightless males in shallow coastal bays at Anticosti Island, Québec, from July to September 2005 and 2006. We estimated that birds were flightless for 28-29 days. The flightless period was highly synchronous among males as old remiges were shed between 23 July and 13 August and birds regained flight between 21 August and 11 September. Using polynomial regression, we examined the intensity of body moult in relation to the length of the ninth primary for eleven feather regions: head, side, collar, belly, back, leg, tail, scapular/humeral and greater, median and lesser coverts. Much of the head region obtained basic plumage before birds were flightless. Moult intensities on the side, collar and back declined throughout the flightless period whereas intensities increased on the belly and tail with greater lengths of primaries. Rectrices were often replaced in two waves but were still developing when birds regained flight. Greater coverts were shed with flight feathers and most old median and lesser coverts were lost within 10 days of flight feather shedding. Moult intensities in the leg and scapular/humeral regions were variable, which indicated more prolonged periods of feather replacement in comparison to other regions. We suggest that the staggered pattern of moult among feather regions may serve to minimize nutritional and energetic demands for male Red-breasted Mergansers during the prebasic moult.

4. Home Range and Movements of Moulting Surf Scoters as Documented by Satellite Telemetry

Mark O'Connor[1], Scott G. Gilliland[2], Jean-Pierre L. Savard[3] and Rodger D. Titman[1]

[1] Department of Natural Resource Sciences, McGill University, Montreal, Québec, Canada H9X 3V9; e-mail: mark.oconnor@mail.mcgill.ca
[2] Environment Canada, Canadian Wildlife Service, 6 Bruce Street, Mount Pearl, Newfoundland, Canada A1N 4T3.
[3] Environment Canada, Science and Technology, 1141 route de l'Église, P.O. Box 10100, Sainte-Foy, Québec, Canada G1V 4H5.

Strong susceptibility to boat disturbance by moulting sea ducks and their ability to travel long distances makes radio-tracking difficult in offshore habitats. To overcome this problem, we used satellite telemetry to describe the movements of 15 Surf Scoters (*Melanitta perspicillata*) during their wing moult in northern Labrador. High mortality rates (47%) contributed to only seven scoters being tracked until the end of moult. Transmitters were programmed with an intense duty cycle of 3 h ON, 4 h OFF to ensure maximum number of high quality transmissions per day. End of moult was estimated based on 75% regrowth of the 9^{th} primary feather. We calculated moulting home range using kernel estimators at both 50% and 95% confidence intervals. As well, daily distance traveled was estimated based on distance between mean locations at each period of the day. Core areas used during the wing moult were small (3.3 ± 1.3 km^2), suggesting that birds were quite sedentary throughout this period. However, long-range movements (as much as 17 km per day) by some individuals reveal the high mobility of Surf Scoters, even while flightless. Considering that birds used different foraging and resting sites on a daily basis suggests that despite the constant presence of birds at an observation site, there was likely significant turnover of individuals present. Finally, the sessile transmitters resulting from mortality showed that given a duty cycle that is sufficiently short to receive several high quality locations per day, satellite telemetry can be a useful tool for studying daily movements of waterfowl.

5. Winter Distribution and Abundance of Common Eiders in the Northwest Atlantic and Hudson Bay

Scott G. Gilliland[1], H. Grant Gilchrist[2], Daniel Bordage[3], Christine Lepage[3], Flemming R. Merkel[4], Anders Mosbech[4], Bruno Letournel[5] and Jean-Pierre L. Savard[6]

[1]Environment Canada, Canadian Wildlife Service, Mount Pearl, Newfoundland and Labrador, Canada A1N 4T3; e-mail: scott.gilliland@ec.gc.ca
[2]Environment Canada, Science and Technology, National Wildlife Research Centre, 1125 Colonel By Drive, Ottawa, Ontario, Canada K1A 0H3.
[3]Environment Canada, Canadian Wildlife Service, P.O. Box 10100, Québec City, Québec, Canada G1V 4H5.
[4]National Environmental Research Institute, P.O. Box 358, DK-4000, Roskilde, Denmark.
[5]Office national de la chasse et de la faune sauvage, P.O. Box 4422, 97500, Saint-Pierre et Miquelon, France.
[6]Environment Canada, Science and Technology, P.O. Box 10100, Québec City, Québec, Canada G1V 4H5.

In the past decade, we completed the first-ever surveys of Common Eiders (*Somateria mollisima*) along the Atlantic and Hudson Bay coasts of Canada and the west coast of Greenland. The survey covered the known wintering ranges of *S. m. borealis* and *S. m. sedentaria* and the Canadian wintering range for *S. m. dresseri*. *S. m. dresseri* winters along the coasts of New Brunswick and Nova Scotia where we found 52,500 birds. The greatest concentrations occurred along the southeastern coast of Nova Scotia and southwestern coast of New Brunswick. *S. m. borealis* winters in Québec, Newfoundland and south west Greenland totalling 673,000 birds. The greatest concentrations occurred in the ice-free areas along the north coast of the Gulf of St. Lawrence and northeast coast of Newfoundland (190,000 birds; 2003 & 2006) and southwest coast of Greenland (463,000 birds, 1999). *S. m. sedenteria* winters in a restricted area around the Belcher Islands, Hudson Bay where we found 255,000 birds. Although we covered most of the significant wintering areas, anecdotal reports suggest some eiders occasionally winter along the coasts of Labrador and northeast Hudson Bay.

6. Blood Lead Levels of Common Eiders from the St. Lawrence Estuary and Ungava Bay, Québec, Canada

Stéphane Lair[1], Guylaine Séguin[1] and Jean-Pierre L. Savard[2]

[1] Centre québécois sur la santé des animaux sauvages / Canadian cooperative Wildlife Health Centre. Faculté de médecine vétérinaire, Université de Montréal, CP 5000, St-Hyacinthe, Québec, Canada J2S 7C6; e-mail: stephane.lair@umontreal.ca
[2] Environment Canada, Science and Technology, 1141 route de l'Église, P.O. Box 10100, Sainte-Foy, Québec, Canada G1V 4H5

Blood lead levels were measured in 76 Common Eiders (*Somateria molissima*) from the St. Lawrence Estuary and Ungava Bay as part of a basic health assessment prior to the implantation of radio-transmitters. Lead levels were measured on fresh whole blood using a portable blood lead analyzer (LeadCare; ESA, Inc.,Chelmsford, Massachusetts 01824, USA). Lead was detected in all samples tested with levels ranging from 0.02 to 2.83 µmol/L [median = 0.13 µmol/L]. Levels measured in birds from Ungava Bay, Nunavik [median; range = 0.07; 0.02 – 0.18 µmol/L] were, with few exceptions, lower than levels detected in birds from the St. Lawrence Estuary. Lead levels were usually higher in birds from the Southwest St. Lawrence Estuary [median; range = 0.14; 0.05 – 2.83 µmol/L] than the Northeast St. Lawrence Estuary [median; range = 0.12; 0.07 – 0.15 µmol/L]. At 2.83 µmol/L the level measured in one of the seventy-six eiders was over the proposed clinically significant threshold. Based on this finding and even though the subject in question presented no clinical sign compatible with lead poisoning this bird was not used for implantation. The LeadCare portable unit is easy to operate in field and enables the detection of birds with subclinical lead intoxication that might decrease chances of survival. The results reported here indicate that lead exposure is common in this species in the St. Lawrence Estuary. However, the impact of this exposure on these populations remains unclear.

7. Surgical Implantation of Two Models of Satellite Transmitters in Common Eiders (*Somateria molissima*) and Surf Scoters (*Melanitta perspicillata*)

Guylaine Séguin[1], Stéphane Lair[1], Jean-Pierre L. Savard[2] and Louis Lesage[2]

[1] Centre québécois sur la santé des animaux sauvages / Canadian cooperative Wildlife Health Centre. Faculté de médecine vétérinaire, Université de Montréal, CP 5000, St-Hyacinthe, Québec, Canada J2S 7C6; e-mail: guylaine.seguin@umontreal.ca
[2] Environment Canada, Science and Technology, 1141 Route de l'Église, P.O. Box 10100, Sainte-Foy, Québec, Canada G1V 4H5

Two different models of Argos-compatible transmitters [PTT-100 Implantable (Microwave Telemetry, Inc. Columbia, MD, USA; n= 24; weight = 39 – 41 g) and H.A.B.I.T. Implantable PTT (H.A.B.I.T. Research Ltd., Victoria, BC, Canada; n= 40; weight = 33 – 41 g)] were aseptically implanted in Common Eiders (*Somateria mollissima*; n= 55) and Surf Scoters (*Melanitta perspicillata*; n= 9) under isoflurane anaesthesia. These transmitters were inserted in the right air sacs where they were fixed to the coelomic cavity wall using nylon sutures. This intervention enabled perpendicular positioning of the percutaneous external antenna exiting between the right pubic bone and synsacrum. The weights of the implanted devices represent from 1.6% to 2.8% and from 3.4% to 5.8% of the total body weight of Common Eiders and Surf Scoters respectively. All birds survived the procedures that lasted between 44 to 146 min [median = 75 min] for Common Eiders and from 71 to 114 min [median = 92 min] for Surf Scoters. The insertion of the transmitters into the relatively small coelomic cavities of the Surf Scoters proved to be of a greater challenge than encountered in the Common Eiders. Moreover, the poor flexibility of the antenna on the H.A.B.I.T. transmitters makes the implantation of that particular model especially difficult when dealing with smaller species such as the Surf Scoter. This problem was not encountered in the case of the Common Eider, in fact, no difference was noted between the two type of transmitters with regards to the ease of implantation and the duration of the surgery. Ongoing telemetric follow-up should provide comparative data in regards to the working life of these two models of transmitters and the long-term survival of implanted birds.

8. Abundance and Distribution of Harlequin Duck in the Hudson Bay and James Bay Area

François Morneau[1,2], Michel Robert[3], Jean-Pierre L. Savard[3], Pierre Lamothe[4,5], Marcel Laperle[4,6], Nathalie D'Astous[1,7], Serge Brodeur[1,8], Robert Décarie[1,9] and Isabelle Chartier[4]

[1] GREBE Inc., 2045, rue Stanley, Montréal, Québec, Canada H3A 2V4
[2] Present adress: 63 rue Champagne, Saint-Basile-le-Grand, Québec, Canada, J3N 1C2
[3] Environnement Canada, 1141 route de l'Église, P.O. Box 10100, Sainte-Foy, Québec, Canada G1V 4H5
[4] Hydro-Québec, 75 boul. René-Lévesque Ouest, 10e étage, Montréal, Québec, Canada, H2Z 1A4
[5] Present adress: 128, Ch. des Lièges, Saint-Jean d'Orléans, Québec, Canada, G0A 3W0
[6] Present adress: 25 Brabant, Waterloo, Québec, Canada J0E 2N0
[7] Present adress:125 Du Sureau, Sainte-Julie, Québec, Canada, J0L 2S0
[8] Present adress: Parc Canada, 122 boul. Gaspé, Gaspé Québec, Canada, G4X 1A9
[9] Present adress: Environnement Canada, 351 boul. St-Joseph, Gatineau, Québec, Canada, K1A 0H3

As part of the Hydro-Québec Grande-Baleine (Great Whale) hydroelectric project feasibility studies, we conducted Harlequin Duck *(Histrionicus histrionicus)* surveys in 1990 and 1991 in the eastern Hudson Bay and James Bay drainage basins. We counted 142 and 420 Harlequin Ducks in 1991 and 1992, respectively, of which 142 (1991) and 356 (1992) were found in the area surveyed both years. Most individuals were in pairs in 1991 and 1992 and the overall sex-ratio did not deviate significantly from 1:1. The highest numbers of Harlequin Ducks counted over the two years were found on the Little Whale River, Des Loups-Marins Lake and Nastapoka, À l'Eau Claire and Boutin Rivers. Highest pair densities were observed in June 1992 on rivers located in tundra and forest tundra i.e., the lower Little Whale, À l'Eau Claire and Nastapoka Rivers, as well as in the D'Iberville Lake area. In 1992, pair densities varied between 0.003 and 0.093 pair/km, depending on the watershed and followed a latitudinal gradient. We located two broods in 1991 and had found three during a preliminary survey conducted in 1989. Broods were located on Boutin, Nastapoka and Great Whale Rivers, as well as along the Hudson Bay coast. The difference in the number of Harlequin Ducks found in June 1991 and 1992 may be related to meteorological and methodological factors. Considering the vastness of northern Québec and the limited area surveyed during this study, we suggest that Harlequin Ducks breeding in northern Québec may well number in the thousands and may thus represent a very high proportion of the Greenland moulting and wintering populations.

9. Hydro-Québec Studies on Scoters

François Morneau[1] and **Isabelle Chartier**[2]

[1] 63 rue Champagne, Saint-Basile-le-Grand, Québec, Canada, J3N 1C2
[2] Hydro-Québec, Barrages et Environnement, 75 boul. René-Lévesque Ouest, 10e étage, Montréal, Québec, Canada, H2Z 1A4; e-mail: chartier.isabelle@hydro.qc.ca

In 1989 and 1990, as part of the environmental studies for the Grande-Baleine hydroelectric project, Hydro-Québec conducted several studies on Black Scoter (*Melanitta nigra*) and Surf Scoter (*Melanitta perspicillata*) in catchments south of Hudson Bay in Québec. The objectives were to describe nesting and brood rearing habitats and to determine breeding range and spring migration patterns. In order to describe nesting habitats, a search was conducted in 1990 for nests around lakes inhabited by indicated pairs, in an area known for its relatively high brood density. Brood rearing habitat description was based on several physico-chemical and biological parameters for 17 lakes where broods have been observed and 15 lakes where no broods have been observed. Breeding range determination was based on brood surveys conducted in a 150,000-km^2 area of northwestern Québec and on published breeding occurrences. Finally, the chronology and strategy of spring arrival were determined in 1990 from repeated aerial censuses. Investigators found two nests of Surf Scoter. They were located in open spruce-lichen stands, under the ends of low branches, 10 and 15 meters from the shore. Brood rearing habitat is very similar for both species: small acidic lakes about 22.8 ha in area, with an average maximum depth of 4.9 meters and a bottom composed of coarse-grained till deposits. The known breeding range of Surf Scoter is more extensive than that of Black Scoter. Both species have a higher breeding density on the Lake Plateau of the central Québec-Labrador Peninsula. Spring arrival lasts from mid-May to the first week of June, with Surf Scoter arriving earlier than Black Scoter. Indicated pairs of both species are found mostly on small lakes (≤ 100 ha) while groups of migrants usually rested on large lakes (≥500 ha).

10. Long-tailed Duck Nesting Ecology in the Churchill Area, Manitoba

Matthew C. Perry[1] and Robert Alison[2]

[1] USGS, Patuxent Wildlife Research Center, 12100 Beech Forest Road, Laurel, Maryland 20708 USA; e-mail: mperry@usgs.gov
[2] 312-2757 Quadra Street, Victoria, BC V8T 4E5, Canada

The population demographics and breeding ecology of the Long-tailed Ducks (*Clangula hyemalis*) in the Churchill, Manitoba, area have been studied during the last four years to assess breeding ecology and predation in regard to potential global warming issues on this population. The Churchill area represents the most southern distribution of this species' breeding range. Interspecific relationships with Common Eiders (*Somateria mollissima*) and Arctic Terns (*Sterna paradisaea*), which nest simultaneously and in the same habitat, are reported. Intensive predation has occurred in recent years from Herring Gulls (*Larus argentatus*). A large nesting population of Arctic Terns appears to be a good deterrent to prevent predation on Long-tailed Duck nests from Herring Gulls. The location of the Long-tailed Duck nest and the vegetation surrounding it is important in regard to predation as well. Nests were located an average 2.2 m from the water edge and 31 cm above water surface and woody vegetation cover was important to avoid gull predation. Nesting on islands also appears to deter mammalian predation. Biotic or abiotic factors of the habitat surrounding the areas used for nesting or loafing by ducks were correlated with nesting attempts and success. The diversity and abundance of macro-invertebrates available for food for ducklings and adults were less important than the protection from predation, as many broods are moved shortly after hatching. Banding data from the site indicate females are philopatric and apparently bring their second-year females to the site, but not second-year males, which have not been captured at Churchill. Data were compared with historic data collected by Dr. Alison in the 1970s, to determine long-term trends that could be caused by climate change.

11. Development of a Sea Duck Captive Colony and Dive Tank Facility for Behavioural and Energetics Research

Matthew C. Perry[1] and Alicia M. Wells-Berlin[1]

[1] USGS, Patuxent Wildlife Research Center, 12100 Beech Forest Road, Laurel, Maryland 20708 USA; e-mail: mperry@usgs.gov

A captive colony of four sea duck species was established at Patuxent Wildlife Research Center, Maryland, during 2003-2007. White-winged Scoters were obtained as adults from the University of Wyoming in 2003 and as deserted eggs from Redberry Lake, Saskatchewan, in 2003 and 2004. Eggs of Surf Scoters (*Melanitta perspicillata*) were obtained in 2004 from Lac Malbaie, Québec and eggs of Long-tailed Ducks (*Clangula hyemalis*) were obtained in 2004 from Churchill, Manitoba. One-year old Harlequin Ducks (*Histrionicus histrionicus*) were obtained from a private propagator in 2006. Eggs collected from the wild were hatched in artificial incubators and ducklings reared at Patuxent in facilities designed for sea ducks. Growth measurements and background blood parameters were collected for ducks in all seasons. Behavioural studies were conducted to obtain diurnal activity budgets and to determine influence of implanted transmitters. Two concrete dive tanks (2.44m x 1.83m x 2.44m) were constructed with two viewing ports each and circulating filtered freshwater. Dive tanks are housed in an enclosed structure with temperature and humidity control and an elevated platform for admitting ducks and food organisms to the tanks. Energetics studies have been conducted in the dive tanks with Surf Scoters and with Harlequin Ducks using several natural food organisms. The dive tanks were also used to document the effect of implanted transmitters on diving ability of sea ducks. Captive White-winged Scoters, Surf Scoters and Long-tailed Ducks have all produced eggs and reared ducklings in pens equipped with a ground-level water pool 4 m in diameter and 0.75 m in depth. One short-term study of selenium was conducted with Common Eiders (*Somateria mollissima*), but ducks were sacrificed at the termination of study. Currently 56 individuals of four species comprise the captive sea duck colony. The colony and dive tanks provide an excellent facility for numerous types of studies with sea ducks.

12. Effects of Surgically Implanted Transmitters with Percutaneous Antennae on Breeding Behaviour of Captive Sea Ducks and Lesser Scaups Used as Surrogates for Wild Sea Ducks

Matthew C. Perry[1], Glenn H. Olsen[1] and Alicia M. Wells-Berlin[1]

[1] USGS, Patuxent Wildlife Research Center, 12100 Beech Forest Road, Laurel, Maryland 20708 USA

This study monitored captive sea ducks and Lesser Scaups (*Aythya affinis*) used as surrogates of wild sea ducks that were instrumented with surgically implanted 26 g and 39 g dummy PTT-100 transmitters. White-winged Scoters (*Melanitta fusca*) and Surf Scoters (*Melanitta perspicillata*) were surgically implanted with 39 g PTT-100 and Long-tailed Ducks (*Clangula hyemalis*) were instrumented with 26 g PTT-100 transmitters. All ducks were paired by "free-pair bonding" in pens with 4-7 ducks each in a captive colony. Maintenance and reproductive behaviours were recorded along with productivity during the 2007 and 2008 breeding season (April-June). No differences (p>0.05) between the instrumented and the control ducks were detected for major groups of behaviours. Control females laid 65 eggs and instrumented females laid 31 in the two years. The instrumented ducks laid 16 malformed eggs, whereas no malformed eggs were laid among control ducks. Statistical analyses on the length, width and weight of eggs indicated that there were differences (p<0.05) between the instrumented and control ducks. Some of the malformed eggs were not measured because they were crushed or had no eggshell. Duck body mass at the beginning and end of the study was not different (p>0.05) between ducks with transmitters and those without transmitters. Blood data revealed no major differences between the two groups of ducks. An unexpected finding was that two of the five female Lesser Scaups ejected the transmitters through a hole in the skin at antenna site. Based on preliminary data from this study it appears that the instrumentation of female Lesser Scaups and sea ducks with an implantable transmitter immediately before the breeding season caused no change in behaviour, but did affect normal egg production in the scaup. We recommend that a smaller transmitter be used for future studies of diving ducks of similar size or smaller than Lesser Scaups.

13. Techniques Used for Food Habits of Atlantic Coast Sea Ducks, 1999-2008

Peter C. Osenton[1], Matthew C. Perry[1], Alicia M. Wells-Berlin[1] and David M. Kidwell[1]

[1] USGS, Patuxent Wildlife Research Center, 12100 Beech Forest Road, Laurel, Maryland 20708 USA; e-mail: posenton@usgs.gov

Food selection among 12 species of Atlantic Coast sea ducks was determined during 1999-2008 to better understand feeding ecology at various habitats used during migration and winter. Hunter-killed ducks were the main source of samples from major areas including Chesapeake Bay, Long Island Sound, Nantucket Sound, New England coast and Maritime Provinces. A total of 1319 ducks were analyzed consisting of scoters (*Melanitta* spp.; n=678), Common Eiders (*Somateria mollisima*; n=361), Long-tailed Ducks (*Clangula hyemalis*; n=142) and *Bucephala* spp. (n=130). A smaller sample was analyzed for five other sea duck species. Food selection was determined by analyses of the gullet (esophagus and proventriculus) and gizzard and summarized by aggregate percent for each species. Food material removed from the two organs was placed in open petri dishes and dried at room temperature. Each species of food in the samples was separated in the dishes by use of tweezers and dissecting instruments and with the aid of a dissecting stereo microscope. Each food item, grit and debris were measured volumetrically and then saved in a reference collection. Analyses of ducks with food in both organs showed that gizzard contents provided higher volumes and a broader perspective of foods consumed relative to the gullet alone. This allowed for the use of a much smaller sample size of ducks, as many ducks had no measureable food in gullet (>84% in this study). A higher number of food organisms were identified in the gizzard compared to the gullet (174 vs. 85). When sample size was adequate, comparisons were made among age and sex groupings and also among local sites in major habitat areas.

14. Behavioural and Physiological Observations of White-winged Scoters with Surgically Implanted Transmitters

Glenn H. Olsen[1] and Matthew C. Perry[1]

[1] USGS Patuxent Wildlife Research Center, 12100 Beech Forest Road, Laurel, Maryland 20708, USA; e-mail: golsen@usgs.gov

The USGS Patuxent Wildlife Research Center in Laurel, Maryland USA maintains a research colony of White-winged Scoters (*Melanitta fusca*) and three other sea duck species. Four adult female White-winged Scoters received dummy satellite transmitter implants in November 2007. Dummy satellite transmitters were manufactured by Microwave Telemetry, Inc. (Columbia, Maryland USA) to be identical in external configuration and weight to their commercially available satellite transmitters. Transmitters are gas sterilized using ethylene oxide. White-winged Scoters are anesthetized with isoflurane and standard surgical procedures used for implantation. Blood samples for complete blood counts and serum chemistries were obtained from the four scoters and from four controls at the time of surgery and at three month intervals to document duck health. Our hypothesis is that there would be no statistical differences ($P < 0.05$) in blood values between implanted and control ducks. Focal sampling of four implanted and four control White-winged Scoters was initiated three months before the breeding season and continues into fall. Total duration and proportion of behaviour categories are measured, with the hypothesis that no behavioural differences exist between implanted and control White-winged Scoters. Preliminary analysis of observation data shows no significant differences for spatial relations (land, $F=1.93$, $P=0.1672$; water, $F=2.03$, $P=0.1562$). Similar results are seen for event categories: resting ($F=1.32$, $P=0.2522$), sleeping ($F=0.60$, $P=0.4381$), standing ($F=0.70$, $P=0.4080$), swimming ($F=0.41$, $P=0.5208$) and diving ($F=0.51$, $P=0.4773$). These observations will be updated and the results of the nesting season will be reported.

15. Surgical Implantation of Satellite Transmitters: Techniques for Improving Results Based on Captive Diving Duck Studies

Glenn H. Olsen[1] and Matthew C. Perry[1]

[1] USGS Patuxent Wildlife Research Center, 12100 Beech Forest Road, Laurel, Maryland 20708, USA; e-mail: golsen@usgs.gov

The USGS Patuxent Wildlife Research Center in Laurel, Maryland USA maintains research colonies of White-winged Scoters (*Melanitta fusca*), Surf Scoters (*Melanitta perspicillata*), Long-tailed Ducks (*Clangula hyemalis*), Harlequin Ducks (*Histrionicus histrionicus*) and Lesser Scaups (*Aythya affinis*). All but the Harlequin Ducks have been used to test techniques and results of implanting satellite transmitters in the coelomic cavity. To date, dummy transmitters have been implanted in four adult female White-winged Scoters, two adult male Surf Scoters, two adult female Long-tailed Ducks and eight Lesser Scaups. The dummy satellite transmitters were manufactured by Microwave Telemetry, Inc. (Columbia, Maryland USA) to be identical in external configuration and weight to their commercially available satellite transmitters. All transmitters are gas sterilized using ethylene oxide prior to implanting. A similar number of each species are designated as control ducks. Health monitoring consists of physical examinations, complete blood counts and serum chemistries presurgical and post-surgical every two to three months. Over the two years of the study, the technique for attaching the tefflon cuff to the antenna has changed as the result of observations of the cuff becoming loose. The shape of the small (25 gram) transmitters has been modified in consultation with the manufacturer to better fit the profile of the coelomic cavity. Two ducks without implants and one duck with an implant have died in the past two years. One duck has rejected the transmitter, with the wound healing in less than two weeks and the duck having a transitory elevation in white blood cell count. Results at the meeting will include the 2008 breeding season, currently in progress.

16. Natural Infection Rate of West Nile Virus in a Colony of Captive Diving Ducks: Monitoring WNV in the Tribe *Mergini* and the Genus *Aythya*

Linda C. Lyon[1], Matthew C. Perry[2], Glenn H. Olsen[2], Erik K. Hofmeister[3], Benedict B. Pagac, Jr.[4], Peter C. Osenton[2] and Jennifer A. Godhardt-Cooper[1]

[1] University of Wisconsin-Wisconsin Veterinary Diagnostic Laboratory, 445 Easterday Lane, Madison, Wisconsin 53706, USA; e-mail: LLyon@wisc.edu
[2] USGS-Patuxent Wildlife Research Center, 12100 Beech Forest Road, Laurel, Maryland 20708, USA
[3] USGS-National Wildlife Health Center, 6006 Schroeder Road, Madison, Wisconsin 53711, USA
[4] US Army Center for Health Promotion and Preventative Medicine, North, Building 4411 Llewellyn Ave., Fort Meade, Maryland 20755, USA

West Nile Virus (WNV), a recent emerging disease in the Americas, is a potential threat to sea ducks and other diving ducks wintering on the Chesapeake Bay. Three species of captive sea duck (n = 43) and one pochard species (n = 37) raised at an open-air facility located in the Chesapeake Bay region were sampled four times during the period from the first week in April 2006 to the first week in November 2006, to determine the natural infection rate and effects of WNV in these species. The captive colony population consisted of 9 Surf Scoters (*Melanitta perspicillata*), 18 White-winged Scoters (*Melanitta fusca*), 16 Long-tailed Ducks (*Clangula hyemalis*) and 37 Lesser Scaups (*Aythya affinis*). Serum was collected and blood smears were prepared at each sampling. Oropharyngeal swab samples were collected from each duck immediately preceeding the bleeding. All mortalities were necropsied and post mortem tissues were tested for WNV infection. *Culex* species mosquitoes within the open-air facility were trapped, identified and tested for WNV throughout the study. Although one pooled sample of *Culex* mosquitoes tested WNV positive the first week in October, only one duck, a female Lesser Scaup, tested positive for WNV during the course of the study. The antibody titers for the positive Lesser Scaup were 1:80, 1:320, 1:80 and 1:160, respectively. The mosquito maximum likelihood estimation (MLE) was calculated to determine WNV activity in the mosquito population around the duck facility. The overall MLE per 1,000 mosquitoes was 1.63. Microscopic evaluation of the blood smears determined that all four species had been bitten by mosquitoes, at some time prior to blood sampling, due to the presence of the circulating mosquito-borne hemoparasite, *Plasmodium relictum*. The results from this study suggest that there is no evidence of a threat to diving duck populations from WNV in the Chesapeake Bay area.

17. A Seasonal Survey of Haematological Values for Some Captive Diving Ducks in the Tribe *Mergini* and the Genus *Aythya*

Linda C. Lyon[1], Matthew C. Perry[2] and Glenn H. Olsen[2]

[1] University of Wisconsin-Madison, Department of Forest and Wildlife Ecology, 1630 Linden Drive, Madison, Wisconsin 53706, USA; e-mail: LLyon@wisc.edu
[2] USGS-Patuxent Wildlife Research Center, 12100 Beech Forest Road, Laurel, Maryland 20708, USA

There are few published reports describing haematological values for diving ducks, primarily due to the inaccessible habitats of these species. Blood values from a population of captive diving ducks could set haematological parameters and serve as a reference for free-ranging diving ducks. A colony of captive Long-tailed Ducks (*Clangula hyemalis*), Surf Scoters (*Melanitta perspicillata*), White-winged Scoters (*Melanitta fusca*) and Lesser Scaups (*Aythya affinis*) was sampled for blood values on four different occasions in 2006; 5−7 April (n = 75), 19−20 June (n = 75), 29−31 August (n = 75) and 31 October−2 November (n = 75), covering the seasonal periods of spring migration, breeding, post-breeding and fall migration. The blood values obtained include, packed cell volume, plasma total solids, red blood cell count, mean corpuscular volume, hemoglobin, white blood cell differentials, total white blood cell count and haemosporidian (*Plasmodium* and *Haemoproteus*) prevalence. Haemosporidians can exist at chronic, low levels in wild birds, relapsing during times of stress (hormonal and environmental) and impact the haematology values. Average weights for males and females of each species were also included. Seasonal trends were evident between the species and intraspecific variations existed in the seasonal means between the sexes, most notably in the total white blood cell count, heterophils, eosinophils, lymphocytes, monocytes and hemoparasites. Long-tailed Ducks had the highest prevalence of *Haemoproteus* and *Plasmodium*. Two previously unreported phenomena were observed, refractile heterophils during all seasons and enlarged blast-like, thrombocytes and lymphocytes, primarily during the fall migration period. Baseline haematological parameters are important in diving duck health and conservation efforts. Although the sample size was limited and the ducks were in captivity, these data can serve as a reference for free-ranging diving ducks during the periods of spring migration through fall migration.

18. Sea Duck Distributions off the Eastern United States: Results from the 2008 Atlantic Coast Wintering Sea Duck Survey

Emily D. Silverman[1], Kathy Fleming[1], Mark Koneff[1] and J. Andy Royle[2]

[1] Branch of Population and Habitat Assessment, Division of Migratory Bird Management, U.S. Fish & Wildlife Service, Laurel, MD 20708; e-mail: emily_silverman@fws.gov
[2] US Geological Survey, Patuxent Wildlife Research Center, Laurel, MD 20708

In February 2008, the U.S. Fish & Wildlife Service (FWS) conducted an aerial survey of sea ducks along the U.S. Atlantic coast. This survey represented the first of three years of pre-requisite survey development, aimed at establishing an operational survey to monitor the abundance of sea ducks along the eastern coast of the U.S. and Canada. An earlier FWS annual sea duck survey conducted between 1991-2002 was discontinued because of budget constraints and concerns about design. The 2008 effort included 3,712 km of east-west aerial transects spaced 5 km apart and extending from Cape Cod, MA (42°06'N) to Palm Beach, FL (26° 56'N). These 400-m strip transects consisted of alternating transect pairs extending offshore to the average 6- and 15-m depth-clines. They were supplemented by survey tracks running parallel to the coastline, situated ¼ and ½ mi offshore. The coastline tracks were designed to replicate the discontinued nearshore survey and monitor north-south migratory shifts occurring during the survey period. We present data illustrating distributions of the most abundant species: Black Scoters (*Melanitta nigra americana*) exhibited the most uniform distribution throughout the survey area, while Surf Scoters (*M. perspicillata*) were concentrated at bay mouths and nearshore Cape Cod; White-winged Scoters (*M. fusca deglandi*) were present in large numbers near Montauk Pt., off Long Island and over the Nantucket Shoals, an area also favoured by Long-tailed Ducks (*Clangula hyemalis*). Results from a few replicated transects and the coastal tracks indicate that distributions did not shift substantively during the survey. The 2009 survey will sample more in areas identified in 2008 as high abundance, conduct more transects to the 6-m depth-cline and include more replicated transects. In addition, we plan to modify the survey to better assess the distribution of Black Scoters off northern Florida, where several large flocks were seen well offshore.

19. Spatial and Temporal Variation of Foraging Long-tailed Ducks Wintering on the Nantucket Shoals

Timothy White[1] and Richard Veit[2]

[1] Department of Biology, City University of New York, College of Staten Island, 2800 Victory Boulevard, Staten Island, New York, 10314; e-mail: White@mail.csi.cuny.edu
[2] Department of Biology, City University of New York, College of Staten Island, 2800 Victory Boulevard, Staten Island, New York, 10314; e-mail: Veitrr2003@yahoo.com

We conducted aerial surveys over the Nantucket Shoals during February and March 2008 to elucidate the foraging distribution and abundance of Long-tailed Ducks (*Clangula hyemalis*) wintering on the Nantucket Shoals. The North American population of Long-tailed Ducks has been estimated to contain between 1 million and 2.5 million individuals. Nantucket CBC data have revealed a dramatic increase of Long-tailed Ducks wintering there since the 1970's. Thus, the area around Nantucket Island could possibly support 20%-50% of North America's wintering population of Long-tailed Ducks. At sunrise, from December through March, hundreds of thousands of Long- tailed Ducks fly south over Nantucket Island, presumably to feed on the Nantucket Shoals during the day. This spectacular commute also occurs at sunset as Long-tailed Ducks fly north over the island to roost on Nantucket Sound at night. Long-tailed Ducks collected over the shoals during January 1997 and December 2006 and were feeding on pelagic amphipods (*Gammarus annulatus*). Long-tailed Ducks were clustered at spatial scales ≥ 400m during March and ≥600 m during February 2008. This suggests that aggregations of this size form in response to the clustering of pelagic amphipods. Long-tailed Duck density over the Nantucket Shoals during February and March 2008 was 78.9 ducks km^2 and 17.08 km^2, respectively. On December 31, 2008 we estimated 102,000 Long-tailed Ducks from land during a daily commute from the shoals to roosting locations on the Nantucket Sound.

20. Contaminants in Common Eiders (*Somateria mollissima*) Compared to 22 Other Species of Birds, Maine U.S.A.

Wing Goodale[1], David Evers[1], Steve Mierzykowski[2], R. Bradford Allen[3], Charlie Todd[3], Linda Welch[4], Scott Hall[5], Julie C. Ellis[6] and Kurunthachalam Kannan[7]

[1] BioDiversity Research Institute, 19 Flaggy Meadow Road, Gorham, Maine 04038, U.S.A., e-mail: wing_goodale@briloon.org
[2] U.S. Fish and Wildlife Service, Maine Field Office, 1168 Main Street, Old Town, Maine 04468 U.S.A.
[3] Maine Department of Inland Fisheries and Wildlife, 650 State St., Bangor, Maine 04401 U.S.A.
[4] U.S. Fish and Wildlife Service, Maine Coastal Islands NWR, P.O. Box 279, Milbridge, Maine 04658 U.S.A.
[5] National Audubon Society, 159 Sapsucker Woods, Ithaca, New York 14850 U.S.A.
[6] Tufts University, Cummings School of Veterinary Medicine, Dept. of Environmental and Population Health, 200 Westboro Rd., North Grafton, Massachusetts 01536 U.S.A.
[7] Wasworth Center, NY State Department of Health, Empire State Plaza, P.O. Box 509, Albany, New York, 12201

In 2007 we measured 192 contaminants in Common Eider (*Somateria mollissima*) three-egg composites collected from six locations in Maine, spanning the entire coast. We compared these results to contaminant levels in 54 egg-composites of 22 other species of Maine birds, representing seabirds, shorebirds, wading birds, raptors and passerines. We analyzed the egg composites for mercury (Hg), polychlorinated biphenyls (PCB), polybrominated diphenyl ethers (PBDE), perfluorinated compounds (PFCs) and organochlorine pesticides (OCs). We detected all of these contaminants in our eider samples. Out of the 23 species tested, Common Eiders eggs ranked fourth lowest in contaminant load, with Red-winged Blackbird (*Agelaius phoeniceus*), Virginia Rail (*Rallus limicola*) and Willet (*Catoptrophorus semipalmatus*) having lower contaminant levels; Bald Eagles (*Haliaeetus leucocephalus*) and Peregrine Falcons (*Falco peregrines*) had the highest levels. Stable nitrogen and carbon isotope analysis suggest that eiders are feeding at a lower trophic level than other seabirds such as Double-crested Cormorants (*Phalacrocorax auritus*) and Herring Gulls (*Larus argentatus*). This suggests that eiders are biomagnifying less toxics than other species because of their low trophic level blue mussel (*Mytilus edulis*) denominated diet. The toxic levels detected in eider eggs varied by up to 19.9 times from site to site, indicating that local sources may be contributing to the bioavailability of contaminants. At sites where eiders had elevated contaminants, Herring Gulls and Double-crested Cormorants also had higher levels, suggesting that contaminants become elevated simultaneously in multiple food webs.

21. Resistance to Human Disturbance Increases with Incubation in Breeding Common Eiders

Stéphanie Walter[1], **Yves Rigou**[1] and Magella Guillemette[1]

[1] Département de biologie, Université du Québec à Rimouski, 300 allée des Ursulines, Rimouski, Québec, Canada, G5L 3A1; e-mail: yves.rigou@uqar.qc.ca

Nest defence theory proposes that resistance to human disturbance increases as the amount of energy invested in the clutch increases. In this paper, our aim is to test the hypothesis that female Common Eiders (*Somateria mollissima dresseri*) are more reluctant to come back to their nest after a disturbance occurring in the first half of incubation than females being disturbed later during incubation. We used temperature data loggers to quantify the time interval between the occurrence of disturbance (a female leaving its breeding site) and the return to its nest. After three visits at two experimental colonies, 65 % of the nest located at Île Rouge (n = 20) and 30 % of the nests studied at Île Bicquette (n = 78) were abandoned. The difference between colonies was attributed to the fact that Bicquette is a forested island leaving less opportunities for large gulls to depredate the nest whereas Île Rouge is an open island with grassy vegetation. Of the 36 abandoned nest, 47 % occurred immediately following our visits. Among the clutches that survived a first visit, 278 minutes on average were spent off the nest by females disturbed in the first half of incubation compared to 58 minutes for females disturbed in the second half (p = 0.028). Longer time intervals off the nest are likely to leave more time to avian predators to find and depredate nests. These results thus support our hypothesis that female eiders are less sensitive to disturbance as incubation progresses and we suggest that biologists investigating breeding biology of sea ducks should work at the end of the incubation when possible.

22. The Use of Beaver Ponds Habitat by Sea Ducks in Boreal Forests of Québec

Marie-Hélène Ouellet D'Amours[1,2], Julie Labbe[1,2], Louis Imbeau[2], Marcel Darveau[1,3], Daniel Bordage[4]

[1] Ducks Unlimited Canada (DUC), 710, rue Bouvier, bur. 260, Québec (Québec) G2J 1C2; e-mail: m_ouellet@ducks.ca
[2] Universite du Québec en Abitibi-Temiscamingue, 445, boul. de l'Universite Rouyn-Noranda (Québec) J9X 5E4
[3] Département des sciences du bois et de la foret, Universite Laval, 2405, rue de la Terrasse, Québec (Québec) G1V 0A6
[4] Environment Canada, Canadian Wildlife Service (CWS), 1141 route de l'Église, P.O. Box 10100, Québec, (Québec) Canada G1V 4H5

Eight sea duck species nest in the inland forest of boreal Québec, totalling 30% of all waterfowl breeding pairs. Thus, it is important that we get a better understanding of the natural factors influencing nesting sea duck habitat use and selection. Results of a recent study using CWS helicopter survey data revealed that 48% of sea ducks (indicated breeding pairs) for all species combined were observed on either a pond (waterbody < 8 ha) or a stream. In parallel to that study, wetland mapping projects conducted by DUC suggest that beavers (*Castor canadensis*) influence an important proportion, if not the vast majority of these ponds and streams. Wetlands created by beavers are important constituents of the boreal forest ecosystems, not only regarding their essential role in regulating the exchanges between terrestrial and aquatic systems, but also because they provide key habitat for many animal species. So, are sea ducks and beavers related? We investigated breeding waterfowl helicopter survey data collected from 1990 to 2005 by the CWS and its partners over a 300 000 km² area, south of the 51st parallel in Québec, Canada, to find out. Wetland and beaver dam locational information were extracted from the provincial forest inventory maps. We are currently quantifying the use of beaver ponds by sea ducks in our study area. Preliminary results suggest that Hooded Merganser (*Lophodytes cucullatus*) and Common Goldeneye (*Bucephala clangula*) are the sea duck species that use beaver ponds most consistently. Thus, in these landscapes, sea duck conservation may be much more influenced by beaver, stream and small wetland management than previously thought. Because human activity is rapidly increasing in the boreal Québec, sea duck populations could be impacted in the long term if small habitats are not adequately managed.

23. Breeding Distribution of Sea Ducks in the Québec Northern Interior (51–58º N)

Louis-Vincent Lemelin[1], Emilie Berthiaume[2], Alisa Guerette-Montminy[2,3,4], Marcel Darveau[2,3], Steve Cumming[3], Daniel Bordage[5] and Stéphane Lapointe[6]

[1] Ducks Unlimited Canada, 710, rue Bouvier, bureau 260, Québec, Québec, Canada G2J 1C2; e-mail: l_lemelin@ducks.ca
[2] Ducks Unlimited Canada, 710, rue Bouvier, bureau 260, Québec, Québec, Canada G2J 1C2
[3] Département des sciences du bois et de la forêt, Université Laval, 2405, rue de la Terrasse, Québec, Québec, Canada G1V 0A6
[4] Deceased
[5] Canadian Wildlife Service, 1141, route de l'Église, P.O. Box 10100, Québec, Québec, Canada G1V 4H5
[6] Hydro-Québec, Unité Environnement, 855, rue Sainte-Catherine Est, 9e étage, Montréal, Québec, Canada H2L 4P5

Interior regions of northeastern North America have traditionally been considered depauperate in waterfowl species, including sea ducks. However, the breeding distribution and abundance of sea ducks in northern Québec has been poorly documented. It has therefore not been possible to establish habitat relationships for these species or to assess the effects of human activities on their populations. In this study, we present updated maps of the breeding distribution and abundance of sea duck species in the region, based on a synthesis of data from several recent (post 1990) surveys. These included the Waterfowl Breeding Population and Habitat Survey of the U.S. Fish and Wildlife Service and several others conducted by Hydro-Québec and the Canadian Wildlife Service in the course of environmental impact assessments for hydroelectric projects. For several species, our new distribution maps are markedly different from those currently found in textbooks and bird guides. We identified significant breeding range extensions, northwards for Bufflehead (*Bucephala albeola*), Hooded Merganser (*Lophodytes cucullatus*) and Common Merganser (*Mergus merganser*) and southwards for Long-tailed Duck (*Clangula hyemalis*). On the other hand, we found no evidence for the presence of Harlequin Duck (*Histrionicus histrionicus*) over a large contiguous part of its traditionally mapped breeding range. Overall mean densities remained relatively low, consistent with traditional expectations. The maximum density observed was 33 indicated breeding pairs per 100 km², for Surf Scoter (*Melanitta perspicillata*) on a large reservoir. We plan to extend these descriptive results by using biotic, geographic and climatic variables to model the distribution and abundance of sea duck species and waterfowl in general, within eastern Canada. This will lead to the development of national models as a contribution to the Boreal Avian Modelling project.

24. Chubut Steamer-Duck (*Tachyeres leucocephalus*): Breeding Habitat Requirements and Selection in Patagonia, Argentina

María Laura Agüero[1] and Pablo García Borboroglu[1,2]

[1] Centro Nacional Patagónico (CONICET), Boulevard Brown 2825 U9120ACF, Puerto Madryn, Chubut, Argentina; e-mail: laguero@cenpat.edu.ar
[2] Wildlife Conservation Society, 2300 Southern Boulevard, Bronx, New York 10460, USA; e-mail: pgborbor@cenpat.edu.ar

Chubut Steamer-Duck is a flightless anatid endemic of the Central Patagonia marine coast, Argentina. IUCN listed this species as near threatened based on its restricted distribution range and low population size. Chubut Steamer-Duck's breeding habitat requirements and selection were studied along the Chubut Province marine coast, Argentina, between 2004 and 2006. The study area covered a 341 km coastal sector and included 32 islands, encompassing its main breeding area. The general habitat was characterized and to evaluate the microhabitat selection, 10 habitat variables were quantified at 169 nests and at 166 random points at northern San Jorge Gulf. In this sector, nests were only located on small and medium-sized islands and islets (9.87 ± 12.92 ha; range=0.5-54.4 ha) and relatively close to mainland (1.15 ± 1.14 km; range= 0.01–5.6 km). Nesting areas were adjacent to the coastline, located within sheltered bays and inlets with shallow protected waters. Multivariate analysis to compare nest and random-points characteristics showed that Chubut Steamer-Ducks selected sites with higher shrub-type vegetation cover (63.91 ± 30.14%), flat surfaces (3.74 ± 1.91°) with high proportion of silt-clay (60.18 ± 37.49), but low percentages of rock (4.2 ± 13.54). Nests were built on the ground, mainly under bushes and nesting material consisted mainly on downfeathers, branches and mollusk shells. The nests mean external and internal diameters were 33.3 and 19.8 cm, respectively, whereas mean nest depth and external height were 8.8 and 4.1 cm, respectively. General habitat requirements seem to be related mainly to the proximity to adequate water bodies for adults and chicks to forage and a safer place to raise ducklings, while nest-site selection may be associated with concealment from aerial predators and protection from weather. The information presented will allow better implementation of conservation measures for this species and its habitats.

25. Population Size and Distribution of Chubut Steamer-Duck (*Tachyeres leucocephalus*) in Patagonia, Argentina

María Laura Agüero[1] and Pablo García Borboroglu[1,2]

[1] Centro Nacional Patagónico (CONICET), Boulevard Brown 2825 U9120ACF, Puerto Madryn, Chubut, Argentina; e-mail: laguero@cenpat.edu.ar
[2] Wildlife Conservation Society, 2300 Southern Boulevard, Bronx, New York 10460, USA; e-mail: pgborbor@cenpat.edu.ar

Chubut Steamer-Duck (*Tachyeres leucocephalus*) is a flightless species endemic of the Central Patagonia marine coast, Argentina. We present the first reliable population size estimate, a critical need for setting conservation priorities. From 2004 to 2007, surveys were conducted along 412 km of mainland coast and 87 km of island coast in the Chubut Province, encompassing its main breeding area. Mid season direct counts of breeding pairs, lone ducks and subadults were performed. To determine the best census technique we conducted boat and ground counts along 36 km of coast and calculated correction factors by categories and census methods to obtain more accurate population estimates. The global detectability of boat census was 19% higher than ground census. However, detectability differed among categories: boat census detected 70% and 75% more pairs and males, respectively, while ground census detected 9% and 5% more females and subadults respectively. Hence, for boat census it is recommended applying these appropriate correction factors. We extrapolated calculated densities to unsurveyed sectors. Survey data were used to generate a distribution map using GIS. Total population size for the Chubut Province would not exceed 4700 individuals, with 33% (1565) represented by adults (pairs and lone ducks). Within the Chubut Province, the breeding distribution ranges, at least, from Rawson to near Santa Cruz Province boundary. The 62.9% of the total population is located north of San Jorge Gulf, with three main concentration areas: Bahía Melo (31.2%), Bahía Bustamante/Caleta Malaspina (18.1%) and Bahía Camarones/Cabo Dos Bahías (13.6%). Southwards there are reports of very few individuals. Results from our study are currently the only systematic estimate of Chubut Steamer-Duck abundance. This has a multitude of implications regarding management strategies, habitat management goals and research objectives. A regular monitoring scheme should be applied to assess the population growth trend of this unique sea duck species.

26. Does Weather Influence Breeding Numbers and Spring Arrival Date in Common Eiders in North-West Iceland?

Jón Einar Jónsson[1], Arnþór Garðarsson[2], Jenny A. Gill[3], Ævar Petersen[4] and Tómas G. Gunnarsson[1]

[1] Snæfellsnes University Centre, University of Iceland, Hafnargata 3, 340 Stykkishólmur, Iceland; e-mail: joneinar@hi.is
[2] Institute of Biology, University of Iceland, Sturlugata 7, IS 101 Reykjavík, Iceland
[3] School of Biological Sciences, University of East Anglia, Norwich, Norfolk, NR4 7TJ, United Kingdom
[4] Icelandic Institute of Natural History, Hlemmur 3, IS 105 Reykjavík, Iceland

Bird populations and their phenology (i.e. timing of nesting) will be affected by global warming, particularly changed frequencies and distributions of depressions and severe weather events. Thus, improved understanding of relationships between weather events and demography is essential for future predictions. We examined relationships between weather within the four seasons and breeding numbers and arrival date in two nesting colonies of Common Eider (*Somateria mollissima)* in North West Iceland (Bíldsey Breiðafjörður 1978-2007 and Lækur, Dýrafjörður 1953-2007). Arrival date of breeding hens was independent of number of breeding hens at both colonies. Number of breeding hens in Bíldsey were positively related to mild, wet winters and breeding hens arrived earlier in windy springs compared to calmer springs. At Lækur, breeding hens arrived later following windy and wet winters, compared to drier, calmer winters. Average clutch size at Lækur decreased slightly following especially wet and warm autumns. Unfavourable conditions during autumn, winter and spring may interfere with accumulation of body reserves which sustain the hens during breeding and into brood rearing. These findings suggest that changes in the distribution and frequencies of depressions could affect the future of this species.

27. Changes in Numbers and Distribution of Sea Ducks along the Sweedish Coast – a Possible Effect of Global Warming?

Leif Nilsson[1]

[1] Ecology Building, S-223 62 Lund, Sweden; e-mail: leif.nilsson@zooekol.lu.se

Annual counts of wintering sea ducks and other waterfowl have been undertaken in a standardized manner in a number of larger reference areas in different parts of the Swedish coast during the period 1969 – 2008 as a part of the International Midwinter Counts (IWC) coordinated by Wetlands International. Moreover, two complete country-wide surveys were undertaken during the period. Marked changes in the winter situation was noted over the years with the first twenty-year period appreciably colder than the second, including five winters with heavy ice-coverage, compared to no heavy ice-winter in the second period. All sea duck species increased markedly in numbers over the 40-year period, some species showing fluctuations around a steady level for the first 20 years, increasing more markedly during the latter, milder period. In the country-wide surveys Tufted Ducks (*Aythya fuligula*) increased from 54 000 to 230 000, whereas the Common Goldeneye (*Bucephala clangula*) increased from 19 000 to 75 000. During the same time there was a shift in the distribution of sea ducks in inshore Swedish waters with decreases in the southern open coasts and increases in the archipelago areas further north. Wintering sea ducks also spread to areas in the Bothnian Sea that started to be ice-free during the recent mild period. The Swedish results are discussed in relation to the results of IWC in other European countries to elucidate whether the increasing trends reflect real population changes in numbers or changes in distribution.

28. Migration Patterns, Breeding- and Moulting Locations of King Eiders Wintering on the Coast of Norway as Determined from Satellite Telemetry

Jan Ove Bustnes[1], Anders Mosbech[2], Christian Sonne[2] and Geir Helge Systad[1]

[1] Norwegian Institute for Nature Research, The Polar Environmental Centre, NO-9296 Tromsø, Norway; e-mail: jan.o.bustnes@nina.no
[2] National Environmental Research Institute, Department of Arctic Environment, PO Box 358, Frederiksborgvej 399,DK-4000 Roskilde, Denmark

The coast of northern Norway is a major wintering area for arctic King Eiders (*Somateria spectabilis*). However, the origin of this population has not been known and in this study we deployed satellite transmitters in 10 eiders (5 males and 5 females) in north-eastern Norway, near the Russian Border. Six of the birds departed in early April and flew over open sea, staging in sea ice in the Pechora Sea and Kara Sea. During the breeding period birds also moved far inland, including mid Taymyr Peninsula. They started to depart in August and most birds moulted in the Pechora Sea. This study thus demonstrates that the King Eiders wintering in north-eastern Norway originate from the western half of Arctic Russia, in the area between Yamal Peninsula and eastern Taymyr Peninsula. It thus seems that the Taymyr Peninsula is the dividing point between eastern and western flyways, as demonstrated for Steller's Eiders. It also demonstrates the importance of the Pechora Sea as a staging and moulting area for this population, which corresponds with recent discoveries of huge populations of blue mussels in the area.

29. Physiological Mechanisms Linking Body Condition, Climate Change and the Timing of Reproduction in Common Eiders

Oliver P. Love[1], Joël Bêty[1], John P. McMurtry[2] and **H. Grant Gilchrist**[3]

[1] Département de Biologie et Centre d'études nordiques, Université du Québec à Rimouski, Rimouski, Québec, Canada G5L 3A1; e-mail: olovea@sfu.ca
[2] Animal Biosciences and Biotechnology Laboratory, United States Department of Agriculture, Beltsville, Maryland 20705-2350
[3] Canadian Wildlife Service and Carleton University, Ottawa, Ontario K1S 5B6

Conservation physiology can provide the causal mechanisms underlying subtle human-induced changes to individual condition, behaviour and reproductive strategies that proximately affect individual organismal fitness, ultimately affecting population dynamics. As such, understanding individual variation in physiological traits can help provide conservation biologists with the underlying (usually unrecognized) reasons for why a population may be in decline due to human-induced change. In particular, determining how and why physiological mechanisms link individual reproductive strategies (e.g., whether to initiate breeding, the timing of breeding, quantity versus quality of offspring) with energetic condition and variation in environmental variables may be key to interpreting how climate change ultimately influences the persistence of some sensitive Arctic sea duck populations. As a model to better understand the underlying mechanisms that connect climate change, energetic body condition and reproductive decisions in Arctic birds, we have been examining numerous physiological indicators in pre-breeding CommonE iders (*Somateria mollissima*) breeding at East Bay, Nunavut. Using data on inter-year variability in climatic conditions we can examine how and why climate variation influences the timing of breeding through alterations of key physiological mechanisms that individuals rely on to maximize reproductive output. Specific physiological traits that we are examining in pre-breeding eiders include: 1) the stress hormone corticosterone, 2) triglycerides – an energetic metabolite, 3) leptin - a lipid feedback hormone and 4) oxidative stress levels. Using data collected from three field seasons with marked differences in climatic conditions, we can firstly examine how physiology mediates key life-history reproductive decisions. Secondly, this information enables a more complete understanding of how individuals of varying condition and physiological make-up are differentially affected by ongoing changing climatic conditions in the Arctic. Ultimately, this information will allow for a better identification of the relative vulnerability of Arctic-breeding vertebrates to global warming.

30. Integration of Inuit Traditional Knowledge and Western Science in Wildlife Management: The Case of Avian Cholera among Common Eider Ducks

Dominique Henri[1] and H. Grant Gilchrist[2]

[1] Department of Environmental Change and Management, Oxford University, Oxford, England
[2] Environment Canada, Science and Technology, National Wildlife Research Centre, Carleton University, Ottawa, Ontario, K1A0H3; e-mail: grant.gilchrist@ec.gc.ca

In the last decades, Inuit traditional ecological knowledge (TEK) has gained considerable importance in wildlife and resource management in the Canadian north and Greenland. This study aims to critically examine the contribution that Inuit TEK may offer to contemporary wildlife management in the context of recent avian cholera outbreaks among Common Eider ducks (*Somateria mollissima*) in the west Hudson Strait and north James Bay area. A survey of Inuit TEK of the Common Eider was conducted in the communities of Kimmirut, Cape Dorset and Coral Harbour, Nunavut, Canada. It is suggested that Inuit TEK of that species provides a reliable foundation for its integration with Western scientific perspectives into various aspects of eider management, such as the provision of historical baseline data, the assessment of population trends and sustainable harvest levels, the implementation of effective monitoring strategies, the creation of culturally-adapted harvesting recommendations and regulations, as well as the identification of areas for further investigation and research. Moreover, from the analysis of gathered TEK data and existing scientific literature, the authors infer that avian cholera has only recently migrated into the west Hudson Strait and north James Bay area, rather than being a cyclical phenomenon in that region. Finally, the examination of the validity and reliability of TEK information through a definition of TEK holders' expertise is proposed to ensure its meaningful integration into environmental decision-making.

31. Research Handling Time Increases the Probability of Death among Breeding Common Eiders (*Somateria mollissima*) During an Avian Cholera Epidemic

E. Isabel Buttler[1] and H. Grant Gilchrist[2]

[1] Biology Department, Carleton University, 1125 Colonel By Drive, Ottawa, Ontario, Canada K1S 5B6; e-mail: ibuttler@connect.carleton.ca
[2] Environment Canada, Science and Technology, 1125 Colonel By Drive, Ottawa, Ontario, Canada K1A 0H3

Most demographic and experimental studies of wildlife populations require the temporary handling, restraint and/or marking of individuals. Handling of animals has the potential to generate stress, which in turn may interfere with immunocompetence. Under such circumstances the stress experienced during handling may influence long term survival, but studies that have the potential to quantify this are rare. Avian cholera has occurred annually since 2005 at a Common Eider duck breeding colony at East Bay, Southampton Island, Nunavut. We examined how the handling time of female eiders during banding (just prior to laying) influenced the subsequent probability that they died from avian cholera during the incubation period. Among breeding hens (n=132), there was a strong positive relationship between restraint duration (range 24-158 minutes) and their probability of death due to avian cholera. In addition, tarsus length was also positively correlated to the probability of death, but for unknown reasons. Tarsus length may be related to eider race and/or age. Overall, our findings emphasize the importance of minimizing the duration that wild birds are held during research activities as the long term cost to the bird may be high.

32. Can Innate Immunity Predict Survivorship to Avian Cholera in Female Common Eider Ducks?

Lisha L. Berzins[1], H. Grant Gilchrist[2] and Gary Burness[3]

[1] Environmental and Life Sciences Graduate Program, Trent University, Peterborough, Ontario, Canada, K9J 7B8; e-mail: lishaberzins@trentu.ca
[2] Environment Canada, Science and Technology Branch, National Wildlife Research Centre, Carleton University, Ottawa Ontario, Canada, K1A 0H3
[3] Department of Biology, Trent University, Peterborough, Ontario, Canada, K9J 7B8

There are many spectacular examples of natural selection acting on morphological traits. In contrast, demonstration of selection events at the physiological level has proved challenging. The outbreak of avian cholera at the Common Eider (*Somateria mollissima*) duck colony from 2006 to 2008 on East Bay Island, Nunavut, may provide a unique opportunity to study the links between physiological condition and survival. The objective of our research is to examine whether indices of innate immunity can predict survivorship of female Common Eider ducks. Innate immunity, the first line of defense against disease, can be examined in birds by measuring levels of: natural antibodies, complement and haptoglobin (a protein involved in the acute phase response), as well as, measuring the overall bacteria killing ability of immune cells in plasma. We have collected blood samples at the start of the breeding season to measure innate immunity and monitored survivorship of individually marked female Common Eiders to avian cholera during the breeding season. We predict that female that died during the avian cholera outbreak will have reduced indices of innate immunity prior to the outbreak of avian cholera. Ultimately, our research may provide the opportunity to directly link variation in innate immunity and survival.

33. Long-tailed Duck Recovered in Russia from an Eastern Canadian Banding

Stephen Wendt[1], Dale Caswell[2] and **Kathryn Dickson**[3]

[1] RR2, North Gower, ON K0A 2T0
[2] Canadian Wildlife Service, 123 Main St. Suite 150, Winnipeg, MB R3C 4W2
[3] Canadian Wildlife service, 351 St. Joseph Blvd., Gatineau, QC K1A 0H3
e-mail: Kathy.Dickson@ec.gc.ca

A Long-tailed Duck (*Clangula* hyemalis) banded in 2000 in western Baffin Island, Canada, was recovered five years later, in October, near Petrozavodsk, Russia. The displacement from banding to recovery is over 4,000 km. This was one of six in the only brood of young Long-tailed Ducks we banded in the area and none of the others have been recovered elsewhere. This is the first known recovery of a Long-tailed Duck in Europe from a Canadian breeding area; however this is a likely result of scant banding of the species in the right places to detect such movements. It has not been generally assumed that the species moves between eastern Canada and Europe. Long-tailed Ducks are believed to be widespread and numerous, yet population surveys only sparsely sample the species and writers coming up with totals have assumed for example that European wintering ducks all represent Palearctic breeding ducks. Interchanges such as we have demonstrated mean that population estimates could include double-counting of significant numbers of Long-tailed Ducks. As has been found for the parallel western situation, migrations of Long-tailed Ducks between the eastern Nearctic and Palearctic may have to be taken into consideration in the foundation for population management. The other species of sea duck that we banded in the same area also exhibits a west-east migration, in that all the recoveries of King Eider we have received to date have been from Greenland.

34. Variation in Breeding Season Survival of Adult Female Harlequin Ducks

Jeanine C. Bond[1], Samuel A. Iverson[2], N. Beth MacCallum[3], Cyndi M. Smith[4], Howard J. Bruner[5] and Daniel Esler[6]

[1] Centre for Wildlife Ecology, Simon Fraser University, 8888 University Drive, Burnaby, BC, V5A 1S6 Canada; e-mail: jbond@alumni.sfu.ca
[2] Centre for Wildlife Ecology, Simon Fraser University, 8888 University Drive, Burnaby, BC, V5A 1S6 Canada
[3] Bighorn Wildlife Technologies Ltd., 176 Moberly Drive, Hinton, AB, T7V 1Z1 Canada
[4] Centre for Wildlife Ecology, Simon Fraser University, 8888 University Drive, Burnaby, BC, V5A 1S6 Canada
[5] Department of Forest Science, Oregon State University, Forestry Sciences Lab 020, Corvallis, OR 97331 USA
[6] Centre for Wildlife Ecology, Simon Fraser University, 5421 Robertson Road, Delta, BC, V4K 3N2 Canada

Quantifying survival rates at specific annual cycle stages and in different locations provides insight on the timing and sources of mortality and thus, identifies potential constraints on populations and areas for directing conservation. We analyzed radio telemetry survival data using the known fates modeling procedure in Program MARK for adult female Harlequin Ducks (*Histrionicus histrionicus*) from four breeding areas in western North America. We considered the influence of two factors, geographic location and breeding stage, when ranking competing models. Our results indicated that cumulative survival probability (± SE) during the breeding season was lower in the Rocky Mountains of Alberta (0.757 ± 0.101) than in the Coast Mountains of British Columbia (0.867 ± 0.080) and the Cascade Mountains of Oregon (0.878 ± 0.083). AIC scores and model weights suggest breeding stage was not a strong predictor of survival rate, although survival was slightly lower during incubation than during laying or brood rearing in all regions. Our overall estimate of breeding season survival across all areas was 0.81 (± 0.05). These results indicate that a large portion of annual mortality of adult female Harlequin Ducks occurs on breeding areas and that rates of mortality vary geographically. Given the sensitivity of Harlequin Duck population dynamics to variation in adult female survival, management actions that increase female survival on breeding streams would have meaningful benefits.

35. Trace Element Concentrations and Body Condition Relationships in Wintering Common Goldeneyes from the Great Salt Lake, Utah

Josh L. Vest[1], Michael R. Conover[1], Clay Perschon[2] and John Luft[2]

[1] Department of Wildland Resources, Utah State University, Logan, Utah, 84322, USA; e-mail: jlvest@cc.usu.edu
[2] Utah Division of Wildlife Resources, Salt Lake City, Utah, 84114

The Great Salt Lake (GSL) is an important region for millions of migratory waterbirds and Common Goldeneyes (*Bucephala clangula*; COGO) are an important winter resident capable of utilizing the unique saline food resources of the GSL. However, high concentrations of some trace elements, such as mercury (Hg) and selenium (Se), have been detected within the GSL and ecotoxicology data are needed. We evaluated trace element concentrations in liver tissues from COGO collected during winters (November–April) 2004-05 and 2005-06. We found Hg concentrations increased nearly threefold during winter and were among or exceeded the highest levels reported for COGO in the published literature. During late winter, 100% and 5% of females contained elevated [≥ 1.0 μg/g wet weight (ww)] and potentially harmful [≥ 30.0 μg/g ww] concentrations of Hg, respectively. Thus, females depart the GSL system in late winter with concerning concentrations of Hg and may be at risk of carrying excess Hg into the breeding season. Se concentrations increased approximately 140% through winter and 88% of female samples in late winter contained elevated [≥ 3.0 μg/g ww] concentrations. We detected a weak negative relationship (r^2 = 0.11) between spleen mass and Hg concentrations in females and pancreas mass was negatively related to both Se (r^2 = 0.05) and Hg (r^2 = 0.06) concentrations in males. However, we detected positive relationships between Se and lipid levels in both females (r^2 = 0.04) and males (r^2 = 0.12). Hg and Se may bind to form biologically inert complexes in COGO and therefore potentially reduce the harmful effects of either element. COGO body condition during winter does not appear to be greatly influenced by the range of contaminant concentrations we observed.

36. Incubation Behaviour of White-winged Scoters at Redberry Lake, Saskatchewan

Joshua J. Traylor[1], Dana K. Kellett[2] and **Ray T. Alisauskas**[1,2]

[1] Department of biology, University of Saskatchewan, 112 Science Place, Saskatoon, Saskatchewan, S7N 5E2, Canada
[2] Environment Canada, Science and Technology, 115 Perimeter Road, Saskatoon, Saskatchewan, S7N 0X4, Canada; e-mail: Ray.Alisauskas@ec.gc.ca

Studies of incubation ecology in waterfowl are generally descriptive and have focused on effects of meteorological and body condition on incubation behaviour, whereas few studies have examined the influence of nest attributes (i.e. concealment) or disturbance to nesting females. Using sham eggs with temperature-sensitive probes attached to Hobo data loggers (Hobo Temp XT, Onset Computer Co., Pocasset, Massachusetts), we examined incubation behaviour of White-winged Scoters (*Melanitta fusca*, hereafter Scoter) nesting at Redberry Lake, Saskatchewan in 29 females in 2000 and 28 in 2001. Previously, Traylor et al. (2004) found that female Scoters nesting in denser cover enjoyed a lower risk of predation than those in sparse cover. We tested whether selection of dense nesting cover and higher nest success were related to higher incubation constancy. Furthermore, Scoter nests at Redberry Lake frequently contained high densities of ants (*Formica* spp), which aggravate females with the potential to disrupt incubation. Thus we also test the hypothesis that ant densities influenced incubation constancy and possibly may have had negative effects on nest success. We used general linear models and the information theoretic approach of model selection to estimate relationships between incubation behaviour and nest habitat structure, ant density, body condition, rate of mass loss and nest initiation date. Results suggest incubation constancy was negatively related to nest initiation date with weak positive effects of distance to water and body condition. Nest attributes such as concealment and ant densities were deemed not important. Scoter incubation constancy decreased over the incubation period but displayed a cubic relationship; mean incubation constancy was 86.6%. Mean time of incubation breaks was 16:12 hours and mean recess duration was 151.0 minutes. Ultimately, Scoter incubation behaviour may be influenced by predation pressure and egg cooling rates, both of which are influenced by habitat.

37. Breeding Biology and Population Dynamics of White-winged Scoters at Redberry Lake, Saskatchewan

Joshua J. Traylor[1], **Ray T. Alisauskas**[1,2] and F. Patrick Kehoe[3]

[1] Department of biology, University of Saskatchewan, 112 Science Place, Saskatoon, Saskatchewan, S7N 5E2, Canada
[2] Environment Canada, Science and Technology, 115 Perimeter Road, Saskatoon, Saskatchewan, S7N 0X4, Canada; e-mail: Ray.Alisauskas@ec.gc.ca
[3] Ducks Unlimited Canada, #200 10720-178 Street, Edmonton, Alberta, T5S 1J3, Canada

The breeding range of the White-winged Scoter (hereafter Scoter) has become retracted and populations throughout most of the present range are in decline. Reasons for this remain unclear. Obviously a better understanding of the factors influencing the population dynamics of this species is needed if we are to effectively conserve this sea duck. We initiated this long term population biology study in 2000 to begin to understand the reasons for decline. Redberry Lake, Saskatchewan has the highest known local breeding population of Scoters in North America and the population has been studied intensively in the past (from 1976 to 1985). Specific objectives were to document changes in numbers of breeding pairs, nest initiation date, clutch size, nest success, adult female survival and duckling recruitment. We also collected feathers for stable isotope analysis to link wintering and breeding areas and took blood samples for blood contaminant loads (cadmium, lead, mercury and selenium). Results suggest this population was in serious decline until ~2001, but appears to be slowly increasing in recent years. Mean nest initiation date and clutch size remain unchanged from historic estimates. However, there appears to be a recent decrease in egg hatchability (% of eggs hatching in successful nests) to 55% from the long term average of 80%. The presence of mammalian predators on nesting islands in some years significantly decreases the number of nests found (range 51 to 172 nests) with concomitant decreases in nesting success (range 30 to 57%). Thirty ducklings out of 2757 have recruited into the breeding population. Ultimately, results underscore the importance of the 'boom or bust' cycle in Scoters. These results should further the knowledge base on the breeding biology of Scoters and allow for comparison with on-going studies in the boreal forest regions of Alaska and Canada.

38. Preliminary Assessment of Mortality of Sea Ducks with Implanted Transmitters

Margaret R. Petersen[1], Daniel H. Rosenberg[2] and Daniel M. Mulcahy[1]

[1] U.S. Geological Survey, Alaska Science Center, 4210 University Drive, Anchorage, Alaska 99508, USA; e-mail: mrpetersen@usgs.gov
[2] Alaska Department of Fish and Game, 525 W. 67th Ave., Anchorage, AK 99518

The development of surgical techniques to implant transmitters with percutaneous antenna combined with the development of small (<45 gm) satellite transmitters revolutionized our ability to track sea ducks in remote, hostile environments. This marking technique has been used in studies involving 11 of 15 common sea ducks in North America. Here we summarize information on surgical and immediate post-surgical (1-14 days) mortality and annual survival. Small sample size is the primary limitation preventing meaningful statistical analyses. The number of birds implanted in most studies is the minimum necessary to address other objectives and is often mediated by cost. The resulting sample is generally too low to develop reliable estimates of surgical and post-surgical mortality or annual survival. Depending on the transmitter life and sample size, estimates of annual survival can vary dramatically. Although estimates of survival from studies with small sample sizes are interesting, larger sample sizes are required to derive meaningful results. What appears to be an unacceptably high mortality rate can be within the norm when put in context of a larger sample. Mortality attributed to surgery or during the post surgical period during 1993–1996 and 2000–2007 likely differs, in part, due to changes in surgical and post-surgical procedures. We expect mortality rates will continue to decline as methods are further refined, although it should never be expected to be zero. We recognize that although comparisons of species are useful, the reaction of one species or species group to capture and surgery is not always indicative of the effects on others. It is tempting to combine data from various studies to increase sample sizes; however, capture and surgical methods, seasons and years frequently differ and results are rarely comparable.

39. Biochemical and Clinical Responses of Common Eiders to Implanted Satellite Transmitters

Christopher J. Latty[1], Tuula E. Hollmén[2,3], Margaret R. Petersen[4], Abby N. Powell[5] and Russel D. Andrews[2,3]

[1] University of Alaska Fairbanks, Department of Biology and Wildlife, 211 Irving I Bldg., University of Alaska Fairbanks, Fairbanks, AK 99775 USA, e-mail: chrislatty@gmail.com
[2] Alaska SeaLife Center, PO Box 1329, Seward, AK 99664 USA
[3] University of Alaska Fairbanks, School of Fisheries and Ocean Sciences, PO Box 1329, Seward, AK 99664 USA
[4] U.S. Geological Survey, Alaska Science Center, 4210 University Drive, Anchorage, AK 99508 USA
[5] U.S. Geological Survey, Alaska Cooperative Fish & Wildlife Research Unit, Department of Biology and Wildlife, 209 Irving I Bldg., University of Alaska Fairbanks, Fairbanks, AK 99775 USA

Small implantable platform transmitter terminals (PTTs) have been used widely to delineate populations and identify movement patterns of sea ducks, but their physiological effects remain largely undocumented. To address this, we measured biomarker responses and characterized clinical responses of benthic foraging sea ducks implanted with PTTs and discuss how these responses could affect the validity of derived information. We trained six Common Eiders (*Somateria mollissima*) to dive to the bottom of a 4.9 m deep column for their food, allowed them to acclimate to this dive depth and implanted them with 38–47 g PTTs with percutaneous antennas. We collected behavioural, biochemical and clinical data before surgery to establish baselines and for 3.5 months post-surgery. The first feeding dive took place 22 h post-surgery with five of six birds diving to the bottom within 35 h of surgery. We found differences between baseline and ≥1 of 3 post-surgery periods (2–14, 20–28 and 55–105 days) in all primary biomarkers (creatine kinase, fecal glucocorticoid metabolites, albumin:globulin ratio and packed cell volume) and 6 of 9 additional biomarkers (aspartate aminotransferase, heterophil:lymphocyte ratio, β_1-, β_2- and γ-globulins and albumin). Our findings show Common Eiders physiologically responded to PTTs for up to 2–3.5 months post-implantation, with the greatest response occurring within 14 days of implantation. These responses support the need for post-surgery data censor periods and should be given consideration when designing studies and analyzing information from PTTs in Common Eiders and perhaps other sea ducks.

40. Prevalence of Avian Influenza Viruses in Sea Ducks Sampled in Alaska, 2006-2008

J. Christian Franson[1], Paul L. Flint[2], Margaret R. Petersen[2], Deborah A. Rocque[3,4], Kimberly A. Trust[3], Timothy D. Bowman[3] and Hon S. Ip[1]

[1]U.S. Geological Survey, National Wildlife Health Center, 6006 Schroeder Road, Madison, Wisconsin 53711, USA; e-mail: jfranson@usgs.gov
[2]U.S. Geological Survey, Alaska Science Center, 4210 University Drive, Anchorage, Alaska 99508, USA
[3]U.S. Fish and Wildlife Service, 1011 E. Tudor Road, Anchorage, Alaska 99503, USA
[4]Current address: U.S. Fish and Wildlife Service, 101 12th Avenue, Fairbanks, Alaska 99701, USA

A multiagency strategy was developed in 2006 to monitor for the introduction of highly pathogenic avian influenza (HPAI) into North America by migratory birds. In Alaska, a surveillance plan was developed based on migratory bird distribution and ecology and information on the epizootiology of HPAI. The 26 species of migratory birds identified as high priority for sampling in Alaska included five sea ducks: Steller's Eider (*Polysticta stelleri*), Spectacled Eider (*Somateria fischeri*), King Eider (*S. spectabilis*), Common Eider (*S. mollissima*) and Long-tailed Duck (*Clangula hyemalis*). These species accounted for the majority of more than 3,000 sea ducks sampled in Alaska through early 2008, although samples also were collected from nine additional species of Tribe *Mergini*. Samples (cloacal and oral-pharhyngeal swabs) were collected from sea ducks primarily on Alaska's North Slope, the Yukon-Kuskokwim Delta and the Alaska Peninsula. Samples from all sea ducks were screened for avian influenza viruses by real-time reverse transcriptase polymerase chain reaction. No HPAI viruses were found, but low pathogenic avian influenza (LPAI) viruses were detected in eight species of sea ducks. The frequency (approximately 1%) of LPAI in sea ducks was similar to or lower in comparison with most other waterfowl sampled in Alaska in 2006 (e.g. *Cygnini* = 1.18%, *Anserini* = 1.67% and *Anatini* = 6.99%). Among sea duck species from which ≥100 samples were collected through early 2008, Steller's Eider had the greatest frequency of low pathogenic influenza viruses at 1.4%, while Common Eider had the lowest at 0.2%. Waterfowl play a key role in the epizootiology of influenza viruses and data on the frequencies of avian influenza in sea ducks are needed to develop predictive models of the intercontinental movement of influenza viruses.

41. Mercury Concentrations in Blood of Moulting and Wintering Harlequin Ducks from Alaska

Lucas Savoy[1], Paul L. Flint[2], Jason L. Schamber[2], Denny Zwiefelhofer[3], Bart Hoskins[4], Heather Brant[5], Christopher Perkins[6], Robert Taylor[7], Oksana Lane[1] and Kimberly A. Trust[8]

[1]Biodiversity Research Institute, 19 Flaggy Meadow Road, Gorham, Maine 04038, USA; e-mail: lucas.savoy@briloon.org
[2] U.S. Geological Survey, Alaska Science Center, 4210 University Drive, Anchorage, Alaska 99503, USA
[3]USFWS, Kodiak Island National Wildlife Refuge, 1390 Buckskin River Road, Kodiak, Alaska 99615, USA
[4]U.S. Environmental Protection Agency, 11 Technology Drive, North Chelmsford, Massachusetts 01863, USA
[5]Savannah River Ecology Laboratory, University of Georgia, Aiken, South Carolina 29802, USA
[6]Center for Environmental Sciences and Engineering, University of Connecticut, 3107 Horsebarn Hill Road, Storrs, Connecticut 06269, USA
[7]Trace Element Research Laboratory, Texas A&M University, College Station, Texas 77840, USA
[8]USFWS, Environmental Contaminants Program, 605 West 4th Avenue, Anchorage, Alaska 99503, USA

Determining mercury concentrations in sea ducks by analysis of whole blood is important in understanding contaminant accumulation through consumption of local food sources and is rarely studied in most sea duck species. Mercury is a persistent contaminant and readily available to most fish and wildlife through atmospheric deposition and localized industrial point sources. Levels of methylmercury, the organic and highly toxic form of mercury, is bio-magnified through marine and freshwater food chains and at certain levels can be harmful to wildlife. Exposure to dietary mercury can be highly variable among species of sea ducks due to prey selection, foraging strategies and the proximity of wintering and breeding locations to contaminated areas. Archived whole blood samples collected from live trapped Harlequin Ducks (*Histrionicus histrionicus*) on their wintering and summer moulting areas from two coastal locations in Alaska were analyzed for total mercury. A total of 111 samples were collected from harlequins wintering within four sites at Unalaska Island and 20 samples from moulting birds from three locations at Kodiak Island. Preliminary results indicate mercury levels in harlequin blood were significantly more concentrated at Unalaska Island than Kodiak Island. Mercury levels varied among age, sex and specific sampling locations. Mercury concentrations from harlequins at Kodiak Island contained minimal variation among specific sampling sites while levels in harlequins from Unalaska Island varied greatly between sampling sites.

42. How important are Body Reserves for King Eider Egg Formation in Northern Alaska?

Steffen Oppel[1] and Abby N. Powell[2]

[1] Department of Biology and Wildlife, 211 Irving 1, University of Alaska, Fairbanks, AK 99775-6100, USA, e-mail: steffen.oppel@gmail.com
[2] U.S. Geological Survey, Alaska Cooperative Fish & Wildlife Research Unit and Institute of Arctic Biology, 209 Irving I., University of Alaska, Fairbanks, AK 99775-7020, USA

Birds breeding at high latitudes can use stored nutrients for egg production to overcome limited food supplies in early spring. It is presently unknown to what extent Arctic-nesting sea ducks rely on stored nutrients for egg production. We analyzed stable carbon isotope ratios in 138 King Eider (*Somateria spectabilis*) eggs collected on the North Slope of Alaska from 2005-2007 to quantify the contribution of endogenous and exogenous nutrients separately for yolk protein and albumen. We used a single-isotope dual-source mixing model with isotopic signatures of red blood cells and eggshell membranes as endpoints for endogenous and exogenous nutrients, respectively. Although body reserves contributed on average very little to egg components (yolk: 11 ± 19%, albumen 4 ± 9%), there was substantial variation among individuals. Endogenous nutrient allocation ranged from 0-100% for yolk protein and 0-60% for albumen across individual eggs. These results demonstrate that food obtained in nesting areas is essential for sea duck reproduction even in the Arctic. The large variation in nutrient allocation suggests that King Eiders may be able to compensate for environmental fluctuations on breeding grounds by using some body reserves for egg formation.

43. Assigning Sea Ducks to Wintering Regions in the Bering Sea Using Stable Isotopes of Feathers

Steffen Oppel[1] and Abby N. Powell[2]

[1] Department of Biology and Wildlife, 211 Irving 1, University of Alaska, Fairbanks, AK 99775-6100, USA, e-mail: steffen.oppel@gmail.com
[2] U.S. Geological Survey, Alaska Cooperative Fish & Wildlife Research Unit and Institute of Arctic Biology, 209 Irving I., University of Alaska, Fairbanks, AK 99775-7020, USA

Tracking the seasonal movements of sea ducks to remote off-shore areas is a challenge for many ecological studies. Sea ducks can be captured relatively easily at breeding locations and methods are required to obtain information on spatial distribution and habitat use from outside the breeding season. In this study we present a technique to assign King Eiders (*Somateria spectabilis*) captured on breeding grounds in northern Alaska to wintering regions in the Bering Sea using stable carbon and nitrogen isotopes from head feathers. We used discriminant function analysis of 32 head feathers from birds tracked with satellite transmitters to delineate isotopic ranges for each of three regions: the Northern Bering Sea, SW Alaska and the coast of Kamchatka. We were able to accurately assign 88% of feathers to the region in which they were grown. We then applied the model to head feathers from 84 birds of unknown origin and found that similar proportions of birds wintered in each of the three regions in the Bering Sea. This result is in close agreement with data on wintering locations from satellite telemetry and shows that stable isotope signatures of body parts offer an affordable and reliable technique to assign sea ducks to geographic regions in the Bering Sea. Data presented here extent previous approaches using a single isotopic dimension and will be useful for researchers and managers of sea ducks.

44. Occurrence of Sea Ducks on Major Estuaries – A Good Reason for Aggressive Monitoring and Protection of Boreal Watersheds

William W. Larned[1]

[1] U.S. Fish and Wildlife Service, 43655 KBeach Rd., Soldotna, Alaska 99669, USA

Waterfowl experience periods of high nutritional demands during their annual cycle in response to physiological stress from inclement weather, migration, breeding and feather moult. In particular, sea ducks (tribe *Mergini*) often travel hundreds or even thousands of kilometers from nesting and wintering areas to traditional sites that best provide for their nutritional needs during spring migration and the post-nuptial moult. In Alaska aerial surveys, in conjunction with radiotelemetry studies, have documented some of the largest such aggregations near the mouths of major rivers. These waters and underlying alluvial deposits are enriched by millions of decomposing salmon, leached minerals and other nutrients and support dense populations of bivalves and other benthic invertebrate prey. Some of the associated watersheds have pending permit applications for hard rock mining and other industrial projects with potential for chronic or episodic discharge of toxic materials. Downstream effects could include bio-magnification of these substances, putting sea ducks at risk, along with other vertebrates, including humans. Sea duck populations have suffered chronic declines and two in Alaska are currently listed as "threatened" under the Endangered Species Act. We present survey and telemetry data which documents examples of these associations in southwestern Alaska and make a case for careful evaluation of potential downstream effects of major commercial developments on sea ducks and other macrobiota, which depend on a benthic fauna regularly nourished by nutrients derived mostly from anadromous fish and untainted by toxic discharges.

45. Occurrence and Characteristics of Adenoviruses in Sea Ducks (*Mergini*) in Alaska

Ann E. Riddle[1] and Tuula E. Hollmén[1,2]

[1] Alaska SeaLife Center, P.O. Box 1329, Seward, Alaska 99664, USA; e-mail: ann_riddle@alaskasealife.org
[2] University of Alaska Fairbanks, School of Fisheries and Ocean Sciences, P.O. Box 730, Seward, Alaska 99664, USA

Adenoviruses have been associated with disease and mortality in multiple avian species. In sea ducks (Tribe Mergini), adenoviruses have recently been linked to mortality in Long-tailed Ducks (*Clangula hyemalis*) in the Beaufort Sea in northern Alaska and in Common Eiders (*Somateria mollissima*) in the Baltic Sea of northern Europe. However, relatively little is known about occurrence and health effects of this group of viruses in most sea duck populations. During 2003-2007, as part of a disease survey of seven sea duck species in Alaska, we screened cloacal swabs for presence of adenoviruses using standard cell culture methodologies. Over 800 samples have been tested to date and adenoviruses have been found in Steller's Eiders (*Polysticta stelleri*), Harlequin Ducks (*Histrionicus histrionicus*) and Black Scoters (*Melanitta nigra*). Our findings suggest that adenoviruses circulate in many sea duck populations and that virus shedding is relatively rare in apparently healthy live captured ducks. Since adenoviruses have previously been linked to disease and mortality in both free ranging sea ducks and under experimental conditions, the newly identified viruses may be pathogenic to these additional sea duck species. To compare isolates among species, a PCR (polymerase chain reaction) based assay was developed for molecular characterization and comparison of different isolates. Additional work to determine virulence characteristics and health effects of the newly isolated viruses is required before assessment of potential population level effects can be made.

46. Using Time-Lapse Cameras to Document Nest Predators and Behavioural Interactions at Spectacled Eider Nests

Julie P. Parrett[1], Charles B. (Rick) Johnson[1], Pamela E. Seiser[1] and Caryn L. Rea[2]

[1] ABR, inc—Environmental Research & Services, P.O. Box 80410, Fairbanks, AK 99708; e-mail: jparrett@abrinc.com
[2] ConocoPhillips Alaska, Incorporated, P.O. Box 100360, Anchorage, AK 99510-0360, USA

We used time-lapse cameras to investigate the effects of a new oilfield and associated human activity on nesting Spectacled Eiders (*Somateria fischeri*) on the Colville River delta, Alaska. The cameras also provided an opportunity to study predator and eider interactions. From 2005–2007, we monitored 31 nests with time-lapse cameras programmed to record one image every 32 s, producing over 744,000 images. In each image, we classified hen behaviour as on-nest (incubation, concealing and sitting alert while incubating, egg-turning, changing position and nest maintenance) or off-nest activities (incubation recess). Potential nest predators were identified to species and behaviour and distance from the nest were recorded. Apparent nest success averaged 52% (annual range = 50–54%) for camera monitored nests. Of the 15 nest failures, 10 were attributed to arctic fox (*Alopex lagopus*) and 2 to Parasitic Jaeger (*Stercorarius parasiticus*). Multiple predators likely caused the failure at the remaining three nests: arctic fox combined with Parasitic Jaegers at two nests and jaegers combined with a Glaucous Gull (*Larus hyperboreus*) at one nest. Hens were incubating normally or in a concealed posture prior to all fox predation events (n = 12). Foxes flushed the hen at each nest attacked and no hen attempted to defend a nest against foxes. No fox predation was witnessed at unattended nests; however, all avian predation (n = 5) occurred at unattended nests. All but one hen chased jaegers away from the nest; however, these nests eventually failed despite the efforts at defense. Although jaegers and gulls were observed hovering or standing next to incubating eiders, they did not flush eiders from nests. No cases of partial predation were recorded, but a few cases likely went undetected if they occurred between picture intervals.

47. Aerial Population Surveys of Common Eiders in Near Shore Waters and Along Barrier Islands of Western and Northern Alaska

Karen S. Bollinger[1] and Christian P. Dau[2]

[1] U.S. Fish and Wildlife Service, Migratory Bird Management, 1412 Airport Way, Fairbanks, Alaska 99701, USA; e-mail: karen_bollinger@fws.gov
[2] U.S. Fish and Wildlife Service, Migratory Bird Management, 1011 East Tudor Road, Anchorage, Alaska 99503, USA

Results of Common Eider (*Somateria mollissima*) surveys flown along the coastline of Alaska from the Yukon-Kuskokwim Delta of southwestern Alaska north and west to the Canadian border are presented. The northern area along the Arctic Coastal Plain from Omalik Lagoon along the Chukcki Sea to Point Barrow then east along the Beaufort Sea to the Canadian border has been surveyed for 10 consecutive years (1999-2008). The southern survey area extends from the Yukon-Kuskokwim Delta north to Omalik Lagoon. Although partial surveys of this southern area were flown in 2006 and 2007, 2008 was the first year that complete coverage of this area was flown. Survey goals are to estimate population size and trend; to present the demography and the distribution of the Alaska breeding population in core areas; and to index nesting habitat conditions. For the northern area, total birds seem to have fluctuated in response to migratory phenology of Canadian breeders. The trend for total birds has increased at 0.02/year, while that for indicated pair numbers has increased at 0.05/year. Indicated pair numbers have been more consistent than total birds among years.

48. Feather Abnormalities of Spectacled Eiders: Possible Indicators of Age Related Stress and Body Condition

Christian P. Dau[1]

[1] U.S. Fish and Wildlife Service, Office of Migratory Bird Management, 1011 E. Tudor Road, Anchorage, Alaska 99503; e-mail: christian_dau@fws.gov

Structural (fault bars) and colour (fundamental bars) abnormalities were found in scapular and tertial wing feathers and rectrices Spectacled Eiders (*Somateria fischeri*). Incidence of feather abnormalities was correlated with age and highest incidence was in subadult birds. I relate this in part to cumulative stress from behavioural and physiological factors occurring during transition from fresh-water to pelagic habitats where this species spends up to 10 months of the year. All subadults, completing their first winter at sea (<1 year old) and nearly half of those completing their second winter (>1< 2 years old), exhibited feather abnormalities while adults ($\geq$ 3 years old) did not, nor did juveniles prior to entering the marine environment. Body condition of subadults may be reduced by combined effects of physiological stresses encountered in nesting areas and those encountered during transition to marine habitats.

DELEGATES

Alisauska	Ray T.
Allen	R. Bradford
Alison	Taber D.
Anderson	Betty A.
Ayotte	Catherine
Bélanger	Luc
Berlin	Alicia
Berlin	Thomas
Berzins	Lisha Lynn
Black	Amie
Blohm	Robert
Bollinger	Karen S.
Bond	Jeanine
Bordage	Daniel
Bowman	Timothy
Boyd	W. Sean
Breault	André
Brodhead	Katherine
Brook	Rod
Brown	Corrine
Burness	Gary
Buttler	Isabel
Chartier	Isabelle
Corr	Patrick O.
Coughlan	Andrew
Courchesne	Sarah J.
Craik	Shawn R.
Darveau	Marcel
Dau	Christian P.
Dave	Thomas
De La Cruz	Susan E.W.
Delorme	Mylène
Derksen	Dirk V.
Descamps	Sébastien
Dickson	Katryn
Dickson	Lynne
Dickson	Rian
Dion	André
Dion	France
Dwyer	Chris
Einarsson	Árni
Esler	Dan
Federer	Rebekka
Finney	Georges
Fischer	Julian B.
Fishman	David J.
Forsell	Doug
Franson	Christian J.
Gagné	Carole
Gendron	Michel
Gilchrist	Hugh Grant
Gilliland	Scott G.
Giroux	Jean-François
Gloutney	Mark
Goodale	Wing
Guénette	Jean-Sébastien
Guillemette	Magella
Hanssen	Sveinn Are
Heath	Joel P.
Henri	Dominique
Hollmén	Tuula
Hugues	Robert
Iverson	Samuel A.
Jaatinen	Kim
Johnson	Charles B.
Jónsson	Jón Einar
Kidwell	David
Kilpi	Mikael
Koneff	Mark
Koons	Dave N.
Labbé	Julie
Laing	Karen
Lair	Stéphane
Lance	Ellen
Lang	Le Duing
Lapointe	Stéphane
Larned	William W.
Larsson	Kjell
Latty	Chris
Lehikoinen	Aleksi
Lemelin	Louis-Vincent
Lepage	Christine
Lok	Erika
Lovvorn	Jim
Luebbert	Joanne
Lusignan	Alain
Lyon	Linda C.
Matusewic	Paul
McAuley	Daniel G.
Mehl	Katherine R.
Merkel	Flemming
Morneau	François
Mosbech	Anders
Nash	Patricia
Nilsson	Leif
Oates	Russ
O'Connor	Mark
Olsen	Glenn H.

Oppel	Steffen
Ortega	Jennifer
Osenkowski	Jay
Osenton	Peter C.
Öst	Markus
Ouellet	Jean-François
Ouellet D'Amours	Marie-Hélène
Ove Bustnes	Jan
Padding	Paul
Paradis	Sylvain
Parrett	Julie
Pearce	John M.
Pelletier	David
Perry	Matthew C.
Petersen	Ib Krag
Petersen	Margaret R.
Petrula	Michael
Powell	Abby N.
Pöysä	Hannu
Rea	Caryn
Richard	Vanessa
Richman	Samantha E.
Riddle	Ann
Rigou	Yves
Robert	Michel
Rockwell	Robert F.
Rönkä	Mia
Rosenberg	Dan
Safine	David
Sarrazin	Raymond
Savard	Jean-Pierre L.
Savoy	Lucas J.
Schafer	Allegra M.
Schamber	Jason L.
Séguin	Guylaine
Sénéchal	Édith
Sénéchal	Hélène
Sexson	Matthew G.
Sharpe	Jonathan
Silverman	Emily D.
Slattery	Stuart
Smith	Carey
Soulliere	Gregory
Steele	Benjamin
Takekawa	John Y.
Titman	Rodger
Traylor	Joshua J.
Turner	Bruce
Vaillancourt	Marie-Andrée
Vest	Josh L.
Wang	Shiway
Ward	David
Wells	Bruce C.
Wells	Linda M.
Wendt	Stephen
White	Timothy P.
Wilson	Heather M.
Zipkin	Elise F.
Zydelis	Ramunas

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Source écologique

Hydro-Québec produit 97 % de son électricité à partir de l'eau, une source d'énergie propre et renouvelable. L'hydroélectricité, développée en harmonie avec l'environnement, constitue une solution des plus efficaces au problème des émissions de gaz à effet de serre.

Environment-Friendly Source

Hydro-Québec generates 97% of its electricity from water, a clean and renewable source. Hydropower, developed in harmony with the environment, is a very effective solution to the problem of greenhouse gas emissions.

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