

## SIXTH MEETING OF THE WESTERN HEMISPHERE SHOREBIRD GROUP, 12–16 SEPTEMBER 2015, CHINCOTEAGUE BAY FIELD STATION, WALLOPS ISLAND, VIRGINIA, USA

James Fraser & Shannon Ritter

The Sixth Western Hemisphere Shorebird Group (WHSG) Meeting was held at Chincoteague Bay Field Station, Wallops Island, Virginia, USA, during 12–16 September 2016. The WHSG meets biennially with previous meetings held in Boulder, Colorado, USA (2006), Maturin, Venezuela (2007), Mazatlán, Mexico (2009), Vancouver, British Columbia (2011), and Santa Marta, Columbia (2013). The Virginia meeting had 175 participants from 16 countries.

The WHSG meeting is specifically designed to foster interchange and collaboration among shorebird scientists and conservationists in North, Central, and South America — regions that share the same migrating shorebirds across wintering, migrating, and breeding seasons. To optimize the impact of conservation efforts, it is essential that conservation and management be conducted throughout a species annual cycle and range. Thus our meetings include biologists from virtually every country within the Western Hemisphere and, as such, many partnerships are initiated and fostered during this international opportunity for collaboration. The Seventh WHSG meeting will be held in Paracas, Peru, during 10–14 November 2017. Eveling Tavera Fernandez is the local Chair ([etavera@corbidi.org](mailto:etavera@corbidi.org)). This venue was chosen after a close competition with La Paz, Mexico and Valdivia, Chile. It is hoped all of you will join us at the upcoming meeting.

The meeting venue on the Chincoteague Bay Field Station (CBFS) campus provided ample time and space for ongoing discussions and socializing. It is located very near the Chincoteague National Wildlife Refuge, which was the setting for the plenary speaker session and field trips. Over the course of four days, the meeting included over 100 oral presentations, 23 posters, 6 symposia/workshops, and the Pacific Americas Shorebird Conservation Strategy side meeting led by Brad Andres. Simultaneous translations of presentations and discussions into English and Spanish were provided by Arturo May and Nicholas Gibler.

At the business meeting and via subsequent listserv notification, members approved a Terms of Reference that will help organize and operate the Western Hemisphere Shorebird Group into the future. The group has a listserv (go to: <https://www.fws.gov/lists/listinfo/whsg> to enroll) to post and receive messages, as well as a Facebook page. We encourage all to be active in the group.

**Awards** were presented to students for Best Oral Presentation and Best Poster. The prize committee was organized by Sara Zeigler. The Best Oral Presentation was awarded to Kelsi Hunt for her presentation titled “Let the good times roll: Piping Plover demographic response to historic flooding on the Missouri River”. Best Poster Award went to Natalia Martínez-Curci for her poster titled “Relaciones en la dieta de aves playeras migratorias nearcticas y neotropicales in un humedal costero clave de sudamerica /

Dietary relationships among nearctic and neotropical migratory shorebirds in a key coastal wetland of South America”. Back by popular demand was the Cutest Shorebird Chick Photo contest, won by Katie Walker for a staggeringly cute photo of a Killdeer chick.

Several awards were given in recognition of contributions to shorebird conservation work. Jeannine Parvin was recognized for her work with developing and organizing band resightings via *BandedBirds.org*. Ron Porter was also recognized for his great contributions on Red Knot studies and geolocation analysis. Joelle Buffa received an award for the best presentation from a Western Hemisphere Shorebird Reserve Network (WHSRN) site.

The Western Hemisphere Shorebird Group also recognized Barry Truitt for a lifetime of significant achievement in shorebird and coastal research and conservation. Barry moved to the Eastern Shore of Virginia in 1972 after completing his education at Old Dominion University in 1971. He began working for The Nature Conservancy (TNC) in 1976 as the Assistant Preserve Director, at about the time that TNC was forming the Virginia Coast Reserve, their collection of Virginia barrier islands. While Barry had various titles during his more than 40 years with TNC, the title that best describes his work over four decades was Chief Conservation Scientist where he directed a landscape-scale program focused on migratory birds, barrier islands, and marine restoration. Barry led or collaborated with partners in projects such as management of colonial waterbirds, Red Knot and Whimbrel studies, shorebird aerial surveys, radar ornithology studies with NASA, effects of experimental predator removal on Piping Plovers and other shorebirds, and restoration of eel grass and oysters in the coastal bays of Virginia. Barry is the resident expert on all things ecological in the Virginia Coast Reserve. He also is well schooled in the history of the Eastern Shore of Virginia, and coauthored a book called *Seashore Chronicles: three centuries of the Virginia Barrier Islands*, which describes the history of the islands from 1650 forward. His recollection of events of the last 40 years is encyclopedic, and those who know him recognize him as a superb storyteller.

**Pablo Canevari Award** – In honor of the WHSRN’s 30<sup>th</sup> Anniversary, Manomet’s Shorebird Recovery Program issued a special edition of the Pablo Canevari Award to Dr Eduardo Palacios Castro. This award honors Pablo Canevari for his visionary leadership of WHSRN, by providing a USD \$2000 award to an individual or organization from Latin America that has demonstrated an outstanding commitment to shorebird conservation. Dr Palacios is a Senior Researcher at Ensenada Center for Scientific Research and Higher Education (CICESE) in La Paz, Baja California Sur, Mexico. For more than 25 years, he has been an active and innovative member of the shorebird conservation community, particularly in Mexico and especially throughout its Northwest region.



A montage of participants in the sixth meeting of the Western Hemisphere Shorebird Group, which included 175 people from 16 countries, and some of the entries for the Cutest Shorebird Chick Photo award.

**New Awards** – At WHSG6, we endorsed two new biennial awards to be presented during WHSG meetings, starting in 2017. These awards are in honor of the advances in shorebird conservation (Allan Baker) and research (Lewis Oring) that each personally made as well as fostered through their students and colleagues. Award recipients, chosen for making similar contributions during their careers, will receive a plaque, monetary award, and be invited to give a plenary talk at the following WHSG meeting. We will accept nominations for the awards in early 2017. Contributions for each of the awards can be made by contacting Rick Lanctot ([Richard\\_lanctot@fws.gov](mailto:Richard_lanctot@fws.gov)).

### **Financial Support**

The ability of this meeting to foster collaboration and encourage student involvement would not have been possible without the financial support of many organizations, agencies and individuals. Jim Chu with the International Programs for the US Forestry Service was the first to offer up a donation and he continued to negotiate for more funds as planning continued. The US Fish and Wildlife Service Regions 2, 3, 5, 7, and Headquarters generously

contributed funds to the meeting. Special thanks go to Rick Lanctot, Scott Johnston and Brad Andres for these efforts. Additional support for travel awards came from National Audubon Society (Stan Senner), Manomet (Stephen Brown), The Nature Conservancy (Alex Wilke), Virginia Department of Game and Inland Fisheries (Ruth Boettcher), Virginia Tech College of Natural Resources and Environment (Jim Fraser), and individuals Carmen Espoz, David Lank, and Jim Fraser. This generous support allowed the Travel Awards Committee to provide funds to 44 people.

The Silent Auction was also hugely successful in raising travel funds for the next meeting. So many people contributed items ranging from beautiful to practical to just plain quirky. The lively event had people responding generously, whole-heartedly purchasing items and contributing to the success of the fundraiser.

No WHSG banquet would be complete without a song. Meredith Gutowski Morehouse and Laura Chamberlin, both with Manomet, composed a new anthem for the meeting. Meredith, accompanied by the band The Bumper Jacksons, led the crowd in a rousing chorus of *You Are My Mudflat* (sung to the tune of *You Are My Sunshine*).

**You Are My Mudflat**

*“You are my mudflat / My only mudflat;  
You make me happy / When I find prey.  
You’ll never know, dear / How much I love it here;  
Please don’t take my mudflat away...”*

*Tu eres mi marisma / Mi única marisma;  
Te me haces feliz / Encuentro presas.  
Nunca sabrás, querido / Qué tanto me gusto aquí;  
Por favor, no te lleves mi marisma...”*

**Plenary Lecture**

Ted Simons, Professor and Assistant Unit Leader in the USGS Cooperative Fish and Wildlife Research Unit, at North Carolina State University, delivered the plenary lecture on the ecology of the American Oystercatcher. The talk focused on patterns of nest success and failure, and chick survival. Raccoons were primary nest predators. Populations in North Carolina have been declining over the past decade. Beach driving and habitat succession threaten the population, while habitat renewal and predator removal by hurricanes can be beneficial.

**Symposia and Workshops****Piping Plover Life Cycle Linkages: Integrating knowledge from breeding and nonbreeding seasons to direct conservation efforts.**

Organized by Melissa Bimbi (*melissa\_bimbi@fws.gov*)

Piping Plover researchers meet in alternating years to discuss breeding and nonbreeding portions of the species’ lifecycle. In an effort to integrate data from both the breeding and nonbreeding areas, a meeting was held immediately prior to the Sixth WHSG. The meeting consisted of presentations and facilitated discussion. Much of the discussion was focused on ecological traps, band resightings, and migration.

It was decided that the cumulative impacts of ecological traps to Piping Plovers, particularly the Great Lakes population, and habitat modifications should be evaluated rangewide. We currently have the opportunity to evaluate this based on the number of marked birds and Tracy Rice’s work on the repeatability of habitat modifications. The next step should be to develop a proposal and secure funding for this analysis.

There is a great deal of interest in streamlining reporting and receiving information on band resightings. Much of this discussion focused on having a centralized database. Streamlining the reporting of band resightings, especially

**ALLAN BAKER LIFETIME ACHIEVEMENT AWARD FOR SHOREBIRD CONSERVATION**

Allan Baker was one of the world’s outstanding minds in shorebird conservation and genetics. The shorebird community misses him greatly following his passing on 20 November 2014.

Born in Westport, New Zealand on 9 July 1943, Allan grew up on a small farm on the South Island. Likely inspired by the wildlife of the beaches that accompanied his childhood, he obtained a PhD on the ecology and evolutionary history of the world’s oystercatchers at the University of Canterbury in Christchurch in 1972. He then moved to Toronto, Canada, where he became the ornithology curator at the Royal Ontario Museum (ROM); he soon became a leader in evolutionary genetics with a particular interest in understanding the evolution of shorebirds. He taught molecular evolution at the Department of Ecology and Evolution at the University of Toronto and he directed a DNA laboratory at the ROM. He subsequently became the Senior Curator of Ornithology and Head of the Department of Natural History at this institution.

Allan became deeply involved in the conservation of migratory shorebirds when large declines were being documented throughout the flyways of the world in the late 1990s. Along with Professor Theunis Piersma of the University of Groningen in the Netherlands, he co-founded the Global Flyway Network; this group of international researchers focuses on identifying migratory shorebirds at risk, the reasons behind their population declines, and the implementation of conservation initiatives.

Beginning in 1995, he partnered with Patricia M. González from Argentina and other colleagues to promote and build ties among the people living at the main sites used by the *rufa* Red Knot throughout the Western Atlantic Flyway. During his many international banding expeditions in South America, Allan taught local students, rangers and volunteers about shorebird ecology and conservation. This team fosters scientific knowledge at sites throughout the flyway that can be translated into local conservation measures. Among the more than 180 papers published by him and his students/collaborators, one of his best cited papers is an investigation into the fitness consequences of decreased refueling rates and late arrival of Red Knots in Delaware Bay that was published in the Proceedings of the Royal Society B in 2004. His inspiration is alive through the work of his former students and colleagues, but also within the citizens of the many communities that feel the pride of receiving and protecting shorebirds along the flyway.

for people not familiar with banding schemes, while still maintaining data ownership are options that need to be explored.

Another topic of discussion was exploring ways to better understand Piping Plover migration patterns. One possibility is the use of technology such as nanotags. Discussion focused on examining nanotag retention as well as current and future tower locations.

### Buff-breasted Sandpiper Working Group Meeting

Organized by Richard Lanctot (*Richard\_lanctot@fws.gov*)

The second Buff-breasted Sandpiper Working Group meeting was held the day before the formal WHSG meeting at Wallops Island, Virginia. The first meeting was held in Boulder, Colorado in 2006, where talks were given on the natural history, status, distribution, and threats facing the species. The group identified a number of key areas to focus future research and conservation efforts that led to numerous studies and ultimately led to the development of the species conservation plan published in January 2010. During this second meeting we learned

about studies occurring on the wintering grounds and on migration, the status of the species, updated some of the range-wide action items within the 2010 conservation plan, and discussed the next round of research/conservation projects.

The meeting began with a round of introductions and then Rick Lanctot gave a short overview of the day's desired outcomes. David Wege then gave an informal presentation on the Southern Cone Grasslands Alliance, which through collaboration with local ranchers, tries to develop best practices for the management of natural grasslands to conserve the unique biodiversity of grasslands through livestock ranching. Much of the work is focused on pilot sites, including Laguna de Rocha, a key Buff-breasted Sandpiper wintering area.

The next talk was given by Diego Luna who described the development and components of the newly released Buff-breasted Sandpiper wintering grounds plan. This plan was developed during two regional workshops and involved managers, directors, owners, livestock producers, researchers and technicians working with the species and the grassland

### LEWIS W. ORING LIFETIME ACHIEVEMENT AWARD FOR SHOREBIRD RESEARCH

In honor of advances made by Professor Lewis Oring and fostered through his students, the Western Hemisphere Shorebird Group wishes to present The Lewis W. Oring Lifetime Achievement Award for Shorebird Research at each biennial meeting to an individual who has made similar contributions. The award recipient will receive a plaque, a monetary award, and be invited to give a plenary talk at the following Western Hemisphere Shorebird Group meeting.

Lew Oring is a world-renowned behavioral ecologist who dedicated his life to understanding full life cycle biology and mating systems in shorebirds of North America, Scandinavia, and Australia. Lew received his training in ornithology at the University of Oklahoma (1960–1966) where he worked with Dr George M. Sutton studying molt in Gadwall (*Anas strepera*), but also began a study of the Buff-breasted Sandpiper (*Calidris subruficollis*). After receiving his Ph.D. he undertook two postdoctoral positions: one in Denmark with Dr Hans Lind, at the University of Copenhagen, studying Green Sandpipers (*Tringa ochropus*); the other with Dr Frank McKinney at the University of Minnesota, studying Solitary Sandpipers (*T. solitaria*) in Alberta, Canada.

Lew was a professor at the University of North Dakota for 22 years, where he sponsored three Post-doctoral Fellows, five Ph.D. students, and 13 M.S. students. There he began his long-term behavioral ecology study of the Spotted Sandpiper (*Actitis macularius*). Assisted by graduate and post-graduate students, he unraveled many mysteries associated with the polyandrous mating system of this species. In 1991, Lew moved to the University of Nevada, Reno, where he mentored an additional four Post-doctoral Fellows, five Ph.D. students, and two M.S. students. In total, all seven Post-doctoral Fellows, seven of the 10 Ph.D.s, and four of the 15 M.S. students focused on the behavioral ecology of shorebirds. He retired in 2006 from the University of Nevada, Reno, where currently he is a Professor Emeritus. Lew remains active in local conservation efforts and advising shorebird researchers. Many of Lew's students occupy leading positions in academia and government in the U.S. and Canada where they continue their focus on shorebird ecology.

During his career, Lew and his students/collaborators published 159 papers. Lew intensely studied the breeding biology of 12 shorebird species, with a large focus on Spotted Sandpipers, American Avocets (*Recurvirostra americana*) and Killdeer (*Charadrius vociferous*). Landmark papers include a *Science Citation Classic* co-authored with Stephen T. Emlen entitled "Ecology, sexual selection, and the evolution of mating systems"; a *Nature Classic* entitled "Cuckoldry through stored sperm in the sequentially polyandrous Spotted Sandpiper" (later popularized in *Natural History* as "The early bird gives the sperm"); an *Avian Biology* monograph entitled "Avian Mating Systems;" and white papers entitled "National Shorebird Research Needs" prepared as part of the U.S. Shorebird Conservation Plan and "Guidelines for Use of Wild Birds in Research" with Toby Gaunt, which is the standard metric for all bird research.

habitats it occupies. The major objectives of the plan are to build capacity for winter site management, exchange information and experience managing lands for the species, involve stakeholders so they recognize the importance of the species and the habitats, and monitor populations to see how they respond to management.

Arne Lesterhuis then spoke about the impact of habitat loss on the abundance of migrating Buff-breasted Sandpipers during their southbound migration in Paraguay. He told us that the construction of a road across Asunción Bay had essentially removed any suitable habitat for the species and that the number of birds using the area had plummeted in recent years. He did offer hope that the birds were still using other parts of Paraguay, particularly the sandbars along the Paraguay River and other tributaries. This seems possible given recent light-level geolocation data indicating birds had stopped in Paraguay during the 2013 southbound migration.

Next Bennett Hennessey spoke about use of the Beni Savannas in Bolivia as an important southbound stopover site for the Buff-breasted Sandpiper. He spoke about efforts to (1) develop partnerships with private landowners and stewards of public lands to actively promote land management practices that provide appropriate habitat conditions for the species, (2) educate policy makers, managers and landowners about the unique habitat requirements and threats facing the species in Bolivia, and (3) assess the timing and numbers of Buff-breasted Sandpipers in the Beni Savanna. Bennett noted that invading fires from ranches outside the savanna were particularly problematic as large areas could become inhospitable to the birds each year. He also spoke of efforts to test alternative habitat management techniques. Finally, the population monitoring conducted in the area has resulted in the recent acceptance of the Barba Azul Nature Reserve as a Western Hemisphere Shorebird Reserve Network (WHSRN) site of Regional Importance due to the number of Buff-breasted Sandpipers using the area.

Carlos Ruiz gave the next talk on the use of the alluvial overflow plain savannas of the Colombian Llanos by Buff-breasted Sandpipers during north and southbound migration. The Llanos is one of the world's richest tropical grasslands, occupying large areas of Colombia and Venezuela. He described how their team documented habitats used by the species, and confirmed the regular occurrence of the species in several sites in both 2013 and 2015. Their work led to the designation of five Important Bird Areas (IBA) in the Llanos province, and that collectively three IBAs would qualify as a WHSRN site. Finally, Carlos warned that the Llanos was under threat due to agricultural conversion of lands for food and biofuel production, and petroleum exploration.

Next, David Newstead, standing in for Brent Ortego, provided a summary of all of the eBird data for Texas dating back to 1951. A total of 2,375 reports were available for the northbound (6 Mar–1 Jun) and southbound (18 Jul–23 Oct) periods, comprising 61,370 birds from 88 counties. Eighty-one percent of reports had habitat information;

of these 25% were from turf grass fields (*ca.* 76% of the birds), followed by agricultural fields (7% of the birds), inland lakes (6%), rice fields (5%) and other lesser used areas. Bird numbers peaked around 23 Apr and 24 Aug, and peak observation sites were near Houston. The top location was Calallen, which had 2.4% of the reports and about 18,000 birds (29%). A more focused study conducted during 2015 also found turf farms to be the most frequented habitat.

Finally, LaReesa Wolfenbarger spoke about monitoring Buff-breasted Sandpipers during northbound migration through the eastern portion of the Rainwater Basin. Distance sampling analyses revealed lower densities of Buff-breasted Sandpipers during 2012–2014 than during 2004–2005 (Jorgensen *et al.* 2008). Because the region is one of the few places where repeated surveys have been conducted over a period of time, we are unable to distinguish whether these are regional or global declines. Compared to 2004–2005, Buff-breasted Sandpipers demonstrated an even stronger association with fields where soybeans had been harvested the previous fall compared to fields with corn (Jorgensen *et al.* 2007).

Following the completion of talks, the group focused on updating the range-wide priority issues for the species. It was noted that great progress had been made on many of the items but that much remained to be done. Much of the work in South America was accomplished through grants from the Neotropical Migratory Bird Conservation Act. Participants noted that extra effort was needed to conduct outreach to the general public and land managers about the special habitat needs of this species. This was particularly true at Lagoa do Peixe National Park in Brazil where successful litigation might require the removal of cattle from areas historically used by the species. Here people noted the importance of holding workshops on grassland best management practices, as well as good governance so that buy-in from all participants was obtained. Working Group participants also expressed a continued need for information on the migration routes, timing, turnover rates, and habitat use of the species as it traveled through the Midwestern United States and Latin America. A lengthy discussion at the end of the meeting focused on the optimal use of tracking devices to obtain such information. Finally, the group discussed the potential to work together on an upcoming Neotropical Migratory Bird Conservation Act proposal to fund tracking and ground-based conservation studies in South America.

#### **North American Banding Council: Shorebird Bander Training and Certification Workshop**

Organized by Cheri Gratto-Trevor (*Cheri.Gratto-trevor@ec.gc.ca*) & Lesley Howes (*Lesley.Howes@ec.gc.ca*)

The first North American Banding Council (NABC) shorebird certification workshop was held on 12 Sep 2015 in conjunction with the Sixth WHSG meeting at Wallops Island, VA. NABC's mission is to promote sound and ethical banding principles and techniques. This class-work-only session was chaired by Lesley Howes (Canadian

Bird Banding Office), Cheri Gratto-Trevor (Environment Canada) and Eveling Tavera Fernandez (Simon Fraser University). Topics presented included: an overview of NABC and the certification process, bands and equipment, and use of nanotags (Stu Mackenzie); legal responsibilities, health and safety, data management and sharing (Bruce Peterjohn); ethical and scientific standards, auxiliary markers, and the Pan American Shorebird Program (Lesley Howes); shorebird capture (Jennie Rausch, Eveling Fernandez, Patricia Gonzalez); use of geolocators and feathers/blood collection (David Mizrahi); use of satellite transmitters (Lee Tibbitts); and shorebird identification, moult, aging, sexing and standard measurements (Cheri Gratto-Trevor). Including presenters, 38 people from ten countries attended the workshop. Sixteen participants wrote the NABC shorebird certification exam. Fifteen people passed the exam and will qualify for certification at assistant, bander or trainer level once they have met all certification criteria in terms of practical experience for their level.

### **Pacific Red Knot (*Calidris canutus roselaari*): Future Coordination, Research, and Conservation**

Organized by Vanessa Loverti ([Vanessa\\_loverti@fws.gov](mailto:Vanessa_loverti@fws.gov)), Jim Johnson ([jim\\_a\\_johnson@fws.gov](mailto:jim_a_johnson@fws.gov)) & Joe Buchanan ([Joseph.Buchanan@dfw.wa.gov](mailto:Joseph.Buchanan@dfw.wa.gov))

Participants met to discuss threats to the sustainability or resiliency of *roselaari* Red Knot populations along the western Pacific Coast throughout its range, and evaluate and prioritize potential actions to reduce these threats. Initial breakout sessions focused on identifying the greatest threats for three geographic groups: Arctic (breeding/non-breeding), including W Alaska/Wrangell Island (tundra, alpine, coastal wetlands); North Temperate non-breeding (passage), including San Francisco Bay to Cook Inlet (coastal wetlands in maritime forest matrix); and Tropical (wintering), including S California to N Peru (coastal desert wetlands and mangroves).

**Identifying Threats** – Principal threats identified in the Arctic region were oil and gas drilling (including spills), subsistence hunting, industrial and military effluents (including toxic runoff), and climate change (sea-level rise,

**Table 1.** Threats to Pacific Red Knots in North Temperate region by site (south to north).

Threat	San Diego	Morrow Bay	San Francisco Bay	Humboldt Bay	Bandon	Willapa Bay	Grays Harbor	Salton Sea	Yakutat	Copper River Delta
Residential & commercial development	X	X	X	X	X	X	X	X		
Marine & fresh water aquaculture				X			X			
Energy production & mining					X			X		X
Transportation & service corridors			X							
Shipping lanes	X		X	X		X	X			
Logging & wood harvest							X			
Human disturbance	X	X	X	X	X	X	X	X		
Natural systems modification (general)			X							
Dams & water management use			X					X		
Other ecosystem modifications	X	X	X	X	X	X	X			
Invasive non-native/alien species (plant or animal)	X	X	X	X	X	X	X			
Problematic native plants or animals	X <sup>1</sup>	X	X	X	X	X	X	X	X	X
Pathogens & microbes	X <sup>2</sup>	X	X	X	X	X	X			
Pollution (general)								X		
Industrial & military effluents	X	X	X	X	X	X	X		X <sup>3</sup>	X
Agriculture & forestry effluents			X					X <sup>4</sup>		
Climate change (general)	X	X	X	X	X	X	X	X	X	X

<sup>1</sup>Peregrine Falcon; <sup>2</sup>Avian influenza & red tide; <sup>3</sup>Shipping; <sup>4</sup>Pathogens.

ocean acidification, vegetation and precipitation changes). The North Temperate non-breeding regions identified principal threats from residential and commercial development, agriculture and aquaculture, energy production (including wind, oil and gas, tidal and geothermal) and mining, shipping lanes and dredging, human intrusion and disturbance, and the natural systems modifications which occur from these threats, as well as from water use management, coastal engineering, alien species and pathogens. A breakdown of the threats identified in the North Temperate region is presented in Table 1. Major threats identified in the Tropical regions affecting wintering grounds include tourism and recreation areas, sand mining on beaches, windfarms, harvest of fish/spawn and bivalves, beach disturbance (including recreational use, roads, and beach cleaning), agriculture and aquaculture (including water management through irrigation, channelization and dams), red tide and invasive/non-native species, and pollution from urban waste and sewage, agriculture effluent, and solid waste.

Participants from all three regional breakout groups voted on the top threats in their areas. The overall top threats to *roselaari* populations were determined to be pollution, natural system modification, and disturbance. However, each region had other specific, significant threats which the groups felt should be addressed. For instance, subsistence hunting in the Arctic (Yukon-Kuskokwim Delta), saltmarsh reclamation in the North Temperate region, and beach cleaning (wrack loss) and household, agriculture, and solid waste (and industrial waste in Panama) in Tropical regions were noted as warranting conservation actions.

**Actions** – Breakout sessions focused on identifying specific actions which would need to be implemented to mitigate major threats from pollution, natural system modification, and disturbance. The groups identified specific classes of actions to reduce population stress, invoke behavioral change, and enable conditions for conservation actions to succeed.

The group addressing threats from pollution identified actions for land and water management. Primary actions include management of household waste, bioremediation, strengthening law enforcement at sea, the need for criminal penalties, and the need for industrial-wide enforcement. Several different ideas focused on social change and utilizing outreach to change behaviors about pollution threats. They noted the need to share new experience through citizen science programs. Specific actions identified included pipeline maintenance, managing household waste, bioremediation, stronger regulations on heavy metals pollution and sewage, recycling and use of reusable bags, using market forces/tax incentives and moral values/religious arguments to change behavior, site area protection and easements for specific areas (Colorado River, Baja, Western H<sub>2</sub>O), increased monitoring for pollution, and alliance and partnership development.

Discussion participants addressing natural system modifications felt there was a need to fill knowledge gaps at the flyway scale before prioritizing actions. Tagging more birds in the flyway is seen as a vital step to complete the picture. Determining factors influencing site selection and fidelity (such as *roselaari* roosting in salt ponds in

**Table 2.** For Pacific Red Knots, exercise to rank level of 'use', degree of 'threats', whether there were 'actionable' tasks present at a site to address threats, and whether there was 'capacity' (i.e., sufficient staff or partners in place to implement the tasks; Y = top priority, y = up and coming priority). H = High; M = Medium; L = Low.

Sites	Use	Threats	Actionable	Capacity	Rank/Priority
Yukon-Kuskokwim Delta	H	L	L	–	–
Copper River Delta	H	L	L	–	–
Yakutat	M	L	L	–	–
Grays Harbor/Willapa Bay	H	H	H	Y	H6 / H1 <sup>st</sup>
Humboldt Bay	M	M	H	Y	4 / 3 <sup>rd</sup>
San Francisco Bay	H	M	H	y	5 / 2 <sup>nd</sup>
San Diego	M	M	H	y	4 / 3 <sup>rd</sup>
Alto Golfo	H	H	H	y	H6 / H1 <sup>st</sup>
Guerrero Negro	H	M	M/H	y	4.5 / H2 <sup>nd</sup>
Marismas	M	M	M	y	3 / 3 <sup>rd</sup>
Bahia Santa Maria	M	M	M	y	3 / 3 <sup>rd</sup>
Panama Bay	M	H	H	Y	5 / 3 <sup>rd</sup>

Guerrero Negro or responding to grunion (fish) runs), as well as identifying important additional stopover areas (such as wintering birds in Panama) will improve the selection and success of any planned actions. The specific actions developed will necessarily be site-specific, not one-size-fits-all.

Participants completed an exercise to rank sites affected by natural system modifications by their level of use, degree of threats, whether currently action can be taken at the site, and the capacity to act (Table 2). Results from this exercise identified Grays Harbor, Willapa Bay and Alto Golfo to be first priority for action.

Actions identified to address disturbance included site protection, litigation/policy, outreach and using market mechanisms to change behavior and attitudes, law enforcement (detection and arrest), and non-criminal compliance enforcement. The group discussed the range of actions available to protect sites, from legally-designated areas to securing habitat. It was noted that managing disturbance is a large component of site protection. This can be aided by having good policy in place and engaging outreach which is geared at giving the public a good reason why they should protect sites. As with addressing other threats, additional basic research focused on capacity, how much threat there really is at a specific site, and effectiveness monitoring is needed before prioritizing specific actions. Proposed activities to accomplish this include determining baseline demographic information and range and key locations used during annual cycle, describing patterns of use at key concentration areas, including habitat use, timing, and length of stay, and coordinating stewardship at key sites.

**Future Coordination** – We would like to work together to fill knowledge gaps and to collaborate for conservation of this species. River Gates volunteered to put something together to accommodate this need (technical working group, list serve, etc.). Information from this workshop will be used and incorporated into the Pacific Americas Shorebird Conservation Business Planning Process.

### Arctic Shorebird Demographics Network

Organized by Richard Lanctot ([Richard\\_lanctot@fws.gov](mailto:Richard_lanctot@fws.gov)), Stephen Brown ([sbrown@manomet.org](mailto:sbrown@manomet.org)) & Brett Sandercock ([bsanderc@ksu.edu](mailto:bsanderc@ksu.edu))

Declines in shorebird numbers in the early 2000s prompted biologists to form the Arctic Shorebird Demographics Network (ASDN). This five-year research program began in 2010 and involved 16 field sites distributed across Russia, Alaska, and Canada. Biologists collected demographic data to determine what factors were limiting population growth (i.e., adult survival, nest survival, and brood survival). Understanding at what stage populations were limited would allow targeted research and conservation at appropriate life history stages (e.g., breeding, migration, wintering). After completing the field component of this project in 2014, it was rewarding to host an all-day symposium at the WHSG meeting to highlight some results from the study.

Rick Lanctot began the day by giving an overview of the ASDN. He described the creation of a Memorandum of Understanding that guided efforts to study and publish data from the 17 organization partners, a standardized protocol to collect data, the selection of 6 focal species on which research efforts were focused, and the demographic and environmental variables collected. Rick reported that over the 5-year study >9,000 nests from 34 species were located and monitored, and >5,000 adults and >5,500 chicks belonging to 25 species were banded. He concluded by describing some of the >20 side-project studies that have been initiated using data collected by ASDN biologists. Many other side projects, as well as core objectives, will be described in the following summaries.

Emily Weiser next presented preliminary results on the drivers of adult survival of Arctic-breeding shorebirds. Her study focused on six species that had 90 to >250 individuals marked, and had a 10–50% resighting rate. She described the use of Bayesian Cormack-Jolly-Seber models to investigate how environmental and ecological covariates explained variation in adult survival among species and field sites. She found that apparent survival probabilities varied from 0.2 to 0.9, and that apparent survival was the highest for Semipalmated and Western Sandpipers, followed by Dunlin and Red-necked and Red Phalaropes, and finally American Golden-Plovers, suggesting differences in true survival or rates of emigration from the study areas. She found no effect of the Southern Oscillation Index on adult survival, but found some preliminary evidence for effects of temperature, timing of snowmelt, and predator abundance on apparent survival of some species. Additional work exploring the effects of predators, lemmings, and invertebrates on adult survival is continuing.

Eunbi Kwon gave the next presentation investigating how the intensity of phenological mismatch between invertebrate emergence and shorebird hatching varied by latitude and longitude using 10 ASDN field sites. She found that Pectoral Sandpiper hatch was most closely matched with the food peak, followed by Semipalmated Sandpipers, Red Phalaropes, Western Sandpipers, Dunlins, and Red-necked Phalaropes. At a population level, the shorebird hatch curve and the food availability curve overlapped as little as 2%, or as much as 77%. Using Structural Equation modeling, she found that the extent of phenological mismatch between shorebirds and their invertebrate prey was most affected by the phenology of each taxon, which was in turn most affected by the geographic location of each site. The dates of egg-laying and of food-peak were later at northerly and easterly sites, and a delay of food-peak led to a decrease in phenological mismatch while a delay in egg-laying led to an increase in the mismatch.

Next Rick Lanctot, standing in for Sarah Saalfeld, described conservative and opportunistic settlement strategies found in shorebirds breeding at Barrow, Alaska. ‘Conservative’ species were characterized by strong site-fidelity and territoriality, consistent population densities, relatively even spacing of individuals, and monogamous mating systems, while ‘opportunistic’ species exhibited opposite traits and



were polygamous. Using data collected over a 10-year period (2003–2012), they found that most species conformed to one of the two settlement strategies, while others exhibited traits of both strategies, and a few had settlement patterns inconsistent with that predicted for their mating system. They suggest that deviations from these strategies may occur depending on a bird's location within its breeding range, or perhaps the described settlement patterns may be too simplistic. Species with the same settlement strategy seem to respond similarly to environmental cues but differently than species with the alternative strategy. However, they were unable to determine a common environmental cue for species with the same settlement strategy, although lemming abundance, overall nest survival rate, and presence of conspecifics or heterospecifics did seem to influence settlement decisions in some species. Results from this study may have important consequences for implementing monitoring or conservation actions. See *Auk: Ornithological Advances* 132: 212–234.

Stephen Brown gave the next presentation on the migratory connectivity of Semipalmated Sandpipers. This is one of three side projects where light-level geolocators were used to track individual birds from breeding locations to their wintering grounds (other species include Dunlin and American Golden-Plover). Stephen indicated the species appeared to have declined based on surveys on the northern coasts of South America, and that these declines appeared to be more prominent in the eastern breeding population. Based on data from eight ASDN field sites, Stephen showed that individuals within the eastern population generally wintered further east and individuals from the western population generally wintered further west. Barrow appeared to be the dividing line, as individuals from this population wintered in eastern and western areas of South America. He also showed that the migratory connectivity patterns observed were similar to prior patterns identified through banding and morphometrics, that declines were likely in the eastern population, and that birds from the western population used other, previously unknown, wintering sites.

The next talk, given by Rick Lanctot filling in for Martin Bulla, focused on the incubation patterns of biparental shorebirds. Using geolocation data from the ASDN sites, as well as many other biologists throughout the world, Martin showed that biparental shorebirds (2 suborders, 10 genera, 31 species, 89 populations, and 703 nests) have a wide diversity of incubation patterns. Using the length of the female/male incubation cycle and the length of each incubation bout, Martin then tested how these response variables were related to the species' evolutionary history, energetic reserves, predatory strategies, and breeding latitude.

Emily Weiser gave her second talk of the symposium focused on the effects of geolocation devices on 14 species of migratory shorebirds ( $n = 1,108$  individuals). Like Martin, she used data collected by ASDN biologists and many other researchers around the world to determine if equipping shorebirds with geolocators affected nest success

and egg viability, return rates, nesting propensity in the following year, breeding dispersal between years, and body mass. Study species ranged in size from Semipalmated Sandpipers (26 g) to the Far Eastern Curlew (>1 kg), and were composed of sandpipers, plovers, turnstones, a godwit, and a curlew. Relative to individuals marked only with leg flags and color bands, she found that birds with geolocators showed lower nest success in one species (Semipalmated Sandpiper), lower egg hatchability in two species (Semipalmated Sandpiper and Western Sandpiper), and lower annual return rates in two species (Dunlin and Semipalmated Sandpiper). However, among-site variation in geocator effects was high. The presence of a geocator on a bird did not explain the variation in body mass of individuals between capture and return years, the probability that a nest was found in the return year, or inter-annual breeding dispersal at nesting sites.

The next talk of the symposium was by Megan Boldenow who investigated whether winter conditions were likely to be driving the population trends of Semipalmated Sandpipers. Megan described patterns of feather corticosterone (a measure of stress for birds during the winter season) among 41 Semipalmated Sandpipers tracked with geolocators from 5 ASDN breeding sites in Alaska. She found that winter stress levels varied non-significantly by breeding site, although birds captured at Barrow had the lowest stress levels and birds captured at Cape Krusenstern had the highest. Feather corticosterone values were more different when compared across wintering regions, with birds wintering on the Atlantic Coast of South America and Pacific Coast off of California having significantly higher stress levels than birds wintering along the Pacific Coast of South America or in the Caribbean and north coast of South America. Megan concluded that feather corticosterone levels were only partially explained by winter location, and that smaller geographic scale or individual characteristics might also be important. Additional work on more samples and how stress levels relate to breeding performance will be conducted in the future.

Claudia Ganser talked next about the biogeography of transmission dynamics for a vector-borne pathogen (i.e., avian malaria) recently found in Arctic-breeding shorebirds. She first described a multi-year assessment of the prevalence of avian malaria in shorebird species sampled at 12 ASDN field sites between 2011 and 2013. Generally, she documented avian malaria in 1.1–2.6% of birds sampled each year. She next conducted a phylogeographic assessment of how avian malarial parasites may move along shorebird migratory routes and whether cross-species transmission events were occurring across the globe. This assessment failed to find patterns in prevalence that could be traced to the behavior of the species, the habitat use of the species, or the latitude at which they bred. However, there was some evidence that parasites were transmitted along flyways in the southern United States, Caribbean, and Central America.

The next talk was given by Marie Perkins who described mercury levels in the blood ( $n = 1,094$ ) and feathers ( $n =$

1,384) of 12 shorebird species sampled at 9 ASDN sites across Alaska and Canada in 2012 and 2013. Blood mercury levels, which reflect more recent exposure (likely from breeding grounds), ranged from 0.014 to 3.53 ug/g among individuals. Feather mercury levels, which reflect exposure during molt (from non-breeding grounds), varied from 0.067 to 12.14 ug/g among individuals. Blood samples for all shorebirds combined were significantly higher in 2013 compared to 2012, but no differences were found in feather samples. Across the 9 sites, birds sampled at Barrow, Alaska had consistently higher levels of mean blood mercury levels while Ikpikpuk, located not far away but inland, had the lowest. Feather mercury levels were generally higher in Ruddy Turnstone, Pectoral Sandpiper, and Western Sandpiper, but levels varied across sites. 7.6% of individuals from eight species had blood mercury levels that might have adverse effects, while 5.4% of individuals from nine species had feather mercury levels that might have adverse effects. Thus, most individuals had mercury levels below that which would raise concern but some individuals were high, particularly those sampled at Barrow.

The final talk of the symposium was given by Kirsten Grond who spoke about whether embryo guts of precocial shorebirds were sterile or not. Gut microbiota play a key role in maintaining organismal health through nutrient uptake and detoxification of digestive byproducts, and via close interactions with the host immune system. Mammals acquire their gut microbiota at parturition, but bird gastrointestinal tracts have been hypothesized to be sterile before hatching. Kirsten described her search for microbiota within the gut and yolk sacs in embryos from two Arctic-breeding shorebird species, Dunlins and Semipalmated Sandpipers. In an analysis of 27 Dunlin and 18 Semipalmated Sandpiper embryos, and a subset of embryonic yolk sacs, she failed to detect bacteria in conventional PCR assays. Bacterial abundances in quantitative PCR assays did not significantly differ from her negative controls, which also indicated negligible bacterial abundances. This study provides the first evidence that embryos of wild precocial birds are effectively sterile, and that gut microbiota must be acquired after hatching.

Information related to the ASDN can be downloaded at: <https://www.manomet.org/program/shorebird-recovery/arctic-shorebird-demographics-network-asdn>. This includes a map showing the location of the study sites, the most

recent protocol, data forms and electronic databases, and tools used to estimate incubation stage. Most of the data collected by the ASDN is archived in the ACADIS Gateway: An Arctic Data Repository (<https://www.aonacadis.org/dataset/ASDN.html>).

### **Pan American Shorebird Program (PASP)**

Organized by Lesley Howes ([Lesley.Howes@ec.gc.ca](mailto:Lesley.Howes@ec.gc.ca))

The Pan American Shorebird Program (PASP) provides a standardized and flexible framework for coordinating shorebird marking throughout the Western Hemisphere and allows collection of resighting data from throughout each species' range. The PASP protocol was revised in 2014 and the objective of the 2015 meeting was to review and discuss any challenges with the current protocol. Lesley Howes (Canadian Wildlife Service, Environment Canada) is the current Chair of PASP and chaired the session. Challenges discussed include some regions have not identified regional coordinators to help coordinate codes on flags. In this case, it is up to researchers to ensure that they are coordinating with each other. The Canadian Bird Banding Office developed a template for assigning codes which is available by contacting [BBO\\_CWS@ec.gc.ca](mailto:BBO_CWS@ec.gc.ca). The greatest challenge is acquisition of coded flags. A main supplier of coded flags has become unreliable and many did not receive their orders. CWS will look into other potential suppliers of coded flags. Other issues with some flags include deeper engravings can collect mud, some flags were not readable after one year, and some break in cold weather. It was emphasized that font, font size, character spacing and protocol characters need to be strictly adhered to in order to get accurate readings in the field. When closing and sealing flags it is important not to use too much glue. Excess glue can potentially affect the bird and it can smear the codes on the flag. The PASP protocol should be better promoted and promotional material developed to aid public reporting. The PASP protocol can be downloaded in French and English (Spanish to be available soon) from the WHSRN webpage at: <http://www.whsrn.org/news/article/pasp-finalizes-revised-shorebird-marking-protocol>.

**Abstracts** of the presented papers and posters can be found at: <http://www.cpe.vt.edu/whsg2015/program.html>. This site has a location to download a 'book of abstracts' from the meeting.