Western Hemisphere Shorebird Group: Fifth Meeting, 17–21 September 2013, Santa Marta, Colombia

Carlos Ruiz-Guerra & Richard Johnston-González

The Western Hemisphere Shorebird Group (WHSG) held its Fifth Meeting in Santa Marta, Colombia, during 17–21 September 2013, following previous meetings in Boulder, Colorado (2006), Venezuela (2007), Mazatlan, Mexico (2009) and Vancouver, British Colombia (2011). The Fifth Meeting attracted 137 attendees from 15 countries who enjoyed different options for a field trip, from the lowlands in Isla Salamanca, Ciénaga Grande and Tayrona National Parks up to the Minca, the gate of Sierra Nevada de Santa Marta.

The meeting had a full program with four plenary speakers, 108 oral presentations including those in six symposia and six workshops, 21 posters and two associated meetings of the Western Hemisphere Shorebird Reserve Network (WHSRN) and the Waterbirds Council. Courses on Scientific Writing and Methods of Trophic Ecology of Shorebirds were held on 15–16 September. After the scientific program the attendees were welcomed to meet and chat and conduct shorebird business in the pool. The full meeting program and the abstracts are available online at *http://calidris.org.co/WHSG/programa.html*.

We had very interesting talks from four plenary speakers. Ron Ydenberg discussed predator effects on shorebirds, José Masero reviewed his long-term studies on shorebirds occurring in rice-fields in Spain, Mark Colwell described the challenges of managing the Snowy Plover, and Lourdes Mugica took the audience to Cuba to learn about shorebirds and habitats in that country.

A student prize committee chaired by Bob Gill awarded the Best Oral Paper Award to Willow English for her talk entitled 'Weather and the consequences of extended incubation in a uniparental Arctic-breeding shorebird, the Red-necked Phalarope (*Phalaropus lobatus*)', with Kirsten Grond as runner-up speaking on '*Campylobacter* and the gastro-intestinal microbiota of shorebirds staging in Delaware Bay'. The Best Poster Award went to Natalia Martinez Curci for her poster entitled 'Confirmation of Eastern (*Tringa semipalmata semipalmata*) and Western (*T. s. inornata*) Willets in Southeastern South America'. The Cutest Baby Shorebird Picture went to Brad Winn for a picture of a one-day-old Red Knot. The WHSG paid tribute to Charles Duncan and Richard Lanctot for their continuous commitment with Western Hemisphere Shorebird Science and conservation.

Throughout the meeting, Auturo May and Nicholas Gibler provided simultaneous translation into Spanish or English. Such translations were made possible thanks to Garry Donaldson and Cynthia Pekarik of the Canadian Wildlife Service and Lee Tibbitts of the US Geological Survey.

This meeting was possible thanks to the interest and support of a big group of people and organizations. At a national level, we want to highlight the support from the very beginning of the National Parks of the Caribbean Region of Colombia, especially from our colleague and friend Rebeca Franke-Ante. We also want to express our gratitude to Dr Luz Elvira Angarita, director of Territorial Caribe National Parks, and to the Vía Parque Isla de Salamanca Road Park and Flora and Fauna Sanctuary of Cienaga Grande de Santa Marta managers: Patricia Saldaña and Alejandro Bastidas. We appreciate the support of Conservation International – Colombia, especially thanks to José Vicente Rodríguez and Maria Claudia Diazgranados, who believed in the meeting and whose financial support guaranteed the participation of several Latin American participants.

Thank you so much to Captain Francisco Arias the Director of INVEMAR, as well as to biologists David Alonso and Luis Chasqui for providing institutional facilities to hold one of the courses prior to the meeting. We want to highlight as well all the contributions of Carol Lively, of the International Programs of the US Forest Service, who raised the first funds for the meeting. Greg Butcher and Jim Chu, also from International Programs, maintained interest and support for bringing the meeting to fruition. The US Fish & Wildlife Service Regions 5 and 7 contributed funds for the meeting: thanks to Scott Johnston, Rick Lanctot and Jennifer Wheeler for their commitment with this task. In addition, the meeting benefited from travel award funds acquired by or provided personally by a number of people, including Bonnie S. Bowen, Brad Andres, David Lank, David Mizrahi, Gwen Brewer, Ian Semple, James Fraser, Jim Chu, Jim Johnson, Lee Tibbitts, Rick Lanctot, Rob Butler from Pacific WildLife Foundation, Ron Ydenberg, Scott W. Gillihan, Susan Haig and Susan Skagen. This support allowed the Travel Award Committee to provide funds to 43 people.

The Scientific Committee chaired by Guillermo Fernandez and composed of Bob Gill, Jim Johnson and Rob Clay carefully read, selected and organized both posters and paper presentations. Mark Colwell, José A. Masero, Lourdes Mugica and Ron Ydenberg provided major support to the program by presenting plenary lectures. Similarly, Abby Powell, Rick Lanctot and Luis Bala coordinated and designed the courses and workshops before the meeting. Lastly, this event was enhanced by the participation of many friends and acquaintances from a great variety of places who

The Cutest Baby Shorebird Picture winner: one-day old Red Knot by Brad Winn.

Local organizing committee from Asociacion Calidris (left to right): Richard Johnston, Luis Fernando Castillo, Luz Adriana Marquez, Jessica Suarez, Carlos Ruiz-Guerra, Patricia Falk, Vianey Ramírez, Diana Eusse and Yanira Cifuentes-Sarmiento (photo: Karl Kaufmann).

cooperated in many ways with the Vth WHSG meeting. Many thanks!

Shorebirders: please remember to join the flock in September 2015 when the VIth meeting of the WHSG will be held at Wallops Island, Virginia, USA. The overall organizer of the meeting will be Jim Fraser *(fraser@vt.edu)*.

PLENARY LECTURES

The influences of predators on shorebird behavior, from local-to-continental and daily-to-decadal scales

Ronald C. Ydenberg
Simon Fraser University, Burnaby, British Colombia, Canada

Predators and predation danger have historically played a generally minor role in thought about shorebird ecology and behavior. Over the past two decades ecologists have learnt that predators exert strong effects on many taxa and in many systems, and a symposium at WHSG IV in 2011 considered whether these effects also extend to shorebirds. In this talk I continue that theme, using work that I and many colleagues in the Centre for Wildlife Ecology have carried out on the Western Sandpiper *Calidris mauri*. I will illustrate just what predation danger is, and how we measure risk avoidance. I will show how the behavioral adjustments prey make to reduce the risk posed by predators extend beyond local effects on stopover site choice and fat load, and are profound influences on parental care, migration timing, non-breeding distributions, and perhaps even mating systems – all topics beloved by shorebird afficiandos, but never considered in a predation risk framework. I consider in particular so-called 'differential migration', the contrasting temporal and spatial migration patterns shown by males and females of many shorebird species. Understanding the varied impacts of predation danger not only gives insight into the evolution of the diversity of shorebird behavior, but is essential to survey design, to conservation work, and even to applied projects like coastal development.

Integrating information from a variety of studies to help understand the impact of global change on shorebirds

José A. Masero
Department of Anatomy, Cell Biology & Zoology, Faculty of Sciences. University of Extremadura, Badajoz, Spain

The vulnerability of shorebirds to global change, as in any other group of species, depends on the their exposure and sensitivity to environmental change, their resilience to perturbations and their potential to adapt to change. Management and conservation strategies for migratory shorebirds need adequate vulnerability criteria, and behavioural, physiological and genetic data are essential for the development of such criteria. Several of our studies have examined the role of some anthropogenic habitats as buffer areas against the impact of natural wetland loss, the effects of shellfishing practices on foraging individuals, feeding mechanisms to take prey items from the water or how shorebirds cope with salinity or simultaneous physiological challenges. Here, I summarize the main findings of these studies and address future challenges in the context of global change and its impact on shorebirds.

Challenges of managing a threatened species: the Snowy Plover

Mark A. Colwell
Wildlife Department, Humboldt State University, Arcata, California, USA

In 1993, the US Government listed the Pacific coast population of the Snowy Plover *Charadrius nivosus* as threatened under the Endangered Species Act. I have monitored the species since 2000 with the goal of increasing the population

by directing and evaluating management practices that address factors (e.g. predation, disturbance, invasive species) that limit population growth. Here, I summarize evidence to show that: 1) most (62%) of Snowy Plovers occur in S California; 2) population size varies annually but has been 'stable' since 2005 and remains below ~2,000; and 3) management has largely focused on increasing breeding productivity, with less done to positively affect survivorship. The principal factor limiting reproductive success is predation of eggs and chicks by introduced and native vertebrates, especially corvids (e.g. Common Raven *Corvus corax*). Across the Snowy Plover's range, managers: 1) use non-lethal (e.g. exclosures around nests) and lethal methods to reduce the impact of predators, with varying degrees of success; 2) reduce human activity around breeding sites, but there is less evidence that this impacts productivity; and 3) restore habitat to increase its availability and quality, although evidence suggests that suitable habitat remains unoccupied. Despite federal protection, the outlook for recovery (i.e. 3,000 breeding adults) of the listed population segment is compromised by its distribution in recreationally valued habitats in close proximity to high human populations. In some cases, challenges to recovery stem from public perception and morally challenging issues such as lethal predator control.

State of knowledge of shorebirds in Cuba

Lourdes Mugica
Profesora de la Facultad de Biología de la Universidad de La Habana, Cuba

Cuba has 48% of the landmass of the Caribbean. If we consider the area it occupies, its geographical position and its long, narrow shape, it turns out to be a crucial link for shorebirds migrating between the temperate and tropical sites along parts of the West Atlantic and Mississippi Flyways. In this talk I provide information about the status of shorebird species that occur in Cuba and their main habitats, coastal wetlands and rice-fields, as well as advances in research and conservation related to this group. Ninety-five percent of shorebirds documented in Cuba are migratory species; of the 38 recorded species, only one has resident populations, the rest are migratory or have both resident and migratory populations. I have analyzed the importance of 12 Cuban wetlands, considering their use and conservation status; I have also considered the role of small wetlands for shorebirds. I provide information about shorebird use of rice-fields which are widespread in Cuba, and their role as an alternative habitat for foraging shorebirds. Finally, I will list the challenges facing the island of Cuba to ensure the future of research on shorebirds, which are so sensitive to upcoming changes in coastal wetlands.

WORKSHOP COURSES

Theoretical and practical course on 'Assessment and methods of study of benthic organisms and their trophic relationship with shorebirds'

Instructor: Luis Oscar Bala
CONICET, Centro Nacional Patagónico, Puerto Madryn, Argentina

This course is aimed at students and professionals, biologists, ecologists and related science graduates, officials of environment agencies and individuals interested in this topic. The objectives are: 1) to provide an overview of the ecological processes that occur in wetlands used by shorebirds as feeding grounds; and 2) to provide an integrated framework for assessing the benthic invertebrate communities that act as the food supply of shorebirds.

Scientific writing and publishing workshop

Instructors: Richard Lanctot & Abby Powell
US Fish & Wildlife Service, Anchorage, Alaska, USA
US Geological Survey, Fairbanks, Alaska, USA

This workshop is geared towards graduate students and early-career scientists with little or no experience of writing scientific journal articles. The goals of the workshop are: 1) to advise on how to write a well-structured and well-written scientific manuscript for submission to an academic journal; 2) to familiarize participants with the process of submitting a paper to a journal from first to last decision; and 3) to provide advice on responding to peer-reviews.

The workshop will include some lecture materials, in-class analysis of poorly- and well-written papers, and some short in-class writing exercises. Students should bring samples of scientific writing, if available. This will be a full-day, eight-hour workshop with English-Spanish translation.

Richard Lanctot and Abby Powell are wildlife biologists who have studied shorebirds in Alaska and elsewhere for over 20 years. As an associate professor at the University of Alaska, Fairbanks, Abby teaches a graduate-level class on Scientific Writing, Editing and Revising in the Biological Sciences. Both instructors have published extensively and have mentored many graduate students over the years.

SYMPOSIA AND WORKSHOPS

Conservation of migratory shorebirds in Brazil: progress and future challenges

Organized by Gislaine Disconzi *(cnaabrasil@gmail.com)*

Despite information gaps on the abundance and flyways of shorebirds in Brazil, there are enough results to assess the current status of migratory shorebirds and identify key aspects of their conservation. Shorebirds in Brazil use four main flyways, and mostly occur in the region of the Atlantic coast. Given the size of Brazil and its importance for migratory shorebirds, there is a need to obtain more detailed information of their occurrence, timing and spatial distribution and to identify their critical habitats. This is particularly important due to the loss and degradation of wetlands used as wintering sites or stopover places during migratory flights. This symposium comprised six presentations: on the brand new Brazilian Shorebird Plan (Danielle Paludo), on migratory shorebirds in the Pantanal (Alessando Nunes Pacheco), on the spatial and temporal distribution and abundance of shorebirds in the Lagoa do Peixe National Park (Gislaine Disconzi), on shorebird populations in aquaculture systems in NE Brazil (Bruno Almeida), on the wintering ecology of the Buff-breasted Sandpiper *Tryngites subruficollis* in S Brazil (Juliana Almeida), and on recent research on the migratory shorebirds of the Amapá, Pará and Maranhão coasts (David Mizrahi).

Workshop to assess the status of South American breeding shorebirds

Organized by Arne J. Lesterhuis
(arne.lesterhuis@birdlife.org)
& Rob P. Clay *(rob.clay@birdlife.org)*

Of the 79 shorebird species that occur in South America, 34 have breeding populations, of which 25 are restricted to South America. Although interest has increased in recent years regarding the conservation status of South American breeding shorebirds, much remains to be learnt. To start to address this, we undertook a preliminary assessment of the conservation status of the South American breeding species and populations using information from a series of national waterbird status reports (prepared through a Neotropical Migratory Bird Conservation Act funded project by the Waterbird Conservation Council) and the latest waterbird population and range estimates. The assessment was conducted following the methodology of Brown *et al.* (2000) for North America, though using slightly modified thresholds for several of the variables, and the initial results were presented at the IVth WHSG meeting in Vancouver, Canada, in 2011.

During the Vth WHSG meeting, a workshop was held to review the criteria thresholds, data used and results of the preliminary status assessment for each of the 34 breeding species. A total of 26 participants attended the workshop, representing nine countries, all but one from South America. Participants represented governmental organizations, NGOs and universities.

The workshop began with a presentation on South American breeding shorebirds (number of species, migration patterns, global conservation status and taxonomic uncertainties) and was followed by an overview of the methodology used for the status assessment and a summary of the results. A discussion was then held of the assessment methodology and in particular the criteria thresholds (for instance, the use of qualitative thresholds for the range size variables). Participants agreed that it made sense to use qualitative thresholds for this initial assessment, but to move toward qualitative thresholds as more data become available.

The review of the draft results of the status assessment led to a lot of enthusiastic discussion and valuable contributions regarding the status of the species under discussion. Due to limited time, discussions focused on those species believed to be of highest conservation concern. It was agreed to initiate a more formal review process after the workshop, with the draft results being circulated to all participants and other experts, and then compiled to produce a publication on the conservation status of South American breeding shorebird species and populations. A brief discussion was also held regarding the formation of a South American Shorebird Working Group and it was agreed that the participants of the workshop will form the basis of such a group.

Shorebird conservation in productive landscapes

Organized by Yanira Cifuentes-Sarmiento
*(ycifuentes@calidris.org.co)***, Isadora Angarita-Martínez**
*(isadora.angarita@birdlife.org)***, Susan K. Skagen**
(skagens@usgs.gov) **& Joaquin Aldabe**
(joaquin.aldabe@gmail.com)

Shorebird populations are greatly affected by ecosystem transformation and degradation, and especially by the loss of wetlands which constitute the preferred habitat for most shorebird species. Nonetheless, some productive landscapes, such as croplands, shrimp farms, rice-fields and salt pans, in addition to natural habitats such as grasslands, when managed appropriately can offer alternative shorebird habitat.

In recognition of the importance of these transformed landscapes for shorebird conservation, this symposium was held on 19 September 2013 as part of the Vth Meeting of the Western Hemisphere Shorebird Group. The symposium was an opportunity to share experiences and lessons learned, and to identify new ways of collaboration and future partnerships. It featured ten presentations on various issues and more than 30 attendees actively participated.

After a brief introduction, the symposium opened with a set of four presentations on the ecology of shorebirds in agricultural regions of midcontinental North America. Victoria Dreitz spoke about reproductive demography of Mountain Plovers, their habitats and threats to nesting in agricultural landscapes, and conservation partnerships with landowners.

Wolfenbarger *et al*. presented the population trends and aspects of the ecology of Buff-breasted Sandpipers in crop fields of central Nebraska and concluded that the conservation of this species during migration depends on agriculture and that changes in the type of crops cultivated could lead to unwanted consequences for this and other shorebird species.

Brett Sandercock described resource use by Upland Sandpipers in tall-grass prairie systems managed with prescribed fire and grazing. He illustrated several studies on the ecology of this species and concluded that Upland Sandpipers require heterogeneous grassland landscapes as they use recently burned and intensively grazed sites for foraging, yet nest survival is highest in unburned and ungrazed sites.

Skagen *et al.* (presented by Khara Strum) closed this group of presentations with an overview of past and ongoing research on *en route* migrant shorebirds that cross the vast Great Plains region of North America.

In the second group of presentations, Iglecia *et al*. and Cifuentes-Sarmiento spoke of the conservation of shorebirds in rice production systems, incorporating research, threat mitigation and participation of local communities. This section presented conservation experiences from the USA and Colombia, concluding that to achieve conservation, local communities must be involved, only happening when local people identify themselves with the conservation objectives.

The last group of presentations focused on research and conservation alliances that are carried out in Ecuador and the Southern Cone (Argentina, Brazil, Paraguay and Uruguay), in habitats such as saltmarshes, grasslands and rice-fields. Agreda presented the results on shorebird research in the salt flats of Ecuasal (salt production company) in Ecuador. Clay and Angarita-Martinez pointed out the scope and progress of the Grasslands Alliance in the Southern Cone, while Lesterhuis presented the experience from Guyra Paraguay in coordinating actions for the conservation of shorebirds in rice fields.

Following the ten presentations, an energetic discussion yielded several conclusions regarding the symposium topic. Firstly, several productive systems are important for the conservation of shorebirds, and any change to these systems could impact these species negatively. Secondly, conservation

requires the participation of private property owners and local people. And finally, by combining education, research and exchange of experiences, progress is made, not only in building up a network, but demonstrating that conservation can be made while producing.

Two areas of work were identified for action: 1) the technical side: for better results, census methods should be standardized (Juliana Almeida would share this information); and 2) identify new and strengthen in-place incentives to producers to encourage them to keep their crops and not change to others that are not beneficial for shorebirds. The challenge for the next meeting of the Western Hemisphere Shorebird Group is to show that progress has been made in these two areas and to provide an overview of how production systems can favor the conservation of shorebirds and other waterbirds.

Global change threats to migrant shorebirds

Organized by Verónica L. D'Amico
(damico@cenpat.edu.ar)

There is growing concern about the effects of global change, natural and anthropic, on the environment and organisms. Migratory shorebirds are very sensitive to these changes being reflected at both individual and population levels. The long-distance migratory flights undertaken by shorebirds between breeding and non-breeding sites, which often exceed 14,000 km, require numerous adaptations, including metabolic adjustments, which affect foraging behavior, competition for resources, and the risk of predation; they also have to deal with unfavourable weather and exposure to parasites and pathogens. Successful migration implies that individuals are in optimal physical condition to enable them to meet these challenges, reach their nesting sites and ensure survival. Therefore, environmental perturbations, resulting from global change, such as loss or alteration of habitat, introduced species, pollution, contamination and increasing human activities on the sites used by birds, can affect the condition and health of individuals and the phenology of migration and breeding, threatening the survival of shorebird species.

This session comprised five talks that highlighted researches on how natural and anthropogenic factors can affect the sites used by shorebirds for nesting and during the non-breeding season, and how these impacts can have effects on the distribution and abundance of populations. First, Verónica D'Amico and colleagues described the systematic monitoring of a selected pathogen in Red Knots *Calidris canutus rufa* during their stopover at Bahía San Antonio in Patagonia, Argentina. They reported that during five consecutive seasons all individuals sampled (n=303) were negative for *Salmonella* sp., *Shigella* sp., enteropathogenic *Escherichia coli*, the viral agents responsible for avian influenza, St. Louis encephalitis and Newcastle disease; and the blood parasites responsible for avian malaria, *Plasmodium* sp. and *Haemoproteus* sp.

The second presentation by Toby St. Clair was about the sources and risks of metal exposure to Dunlin *Calidris alpina* in the Fraser River Delta, Canada. He analyzed ingested prey for cadmium, copper and zinc to investigate the input of metals from different prey and habitat types, and to assess toxicity risks. He concluded that some adverse effects from cadmium could be predicted in most Dunlin diets, with mud snail (*Batillaria attramentaria*) heavy diets presenting the greatest toxicity risks. Adverse effects were also predicted from copper and zinc exposure in some terrestrial diets of Dunlin from feeding sites close to Vancouver International Airport. He concluded that the risks of toxic exposure are likely to be mitigated to some degree by the Dunlin's tendency to feed in both estuarine and terrestrial habitats.

The third speaker was Kirsten Grond who presented a study of *Campylobacter* and the gastrointestinal microbiota of shorebirds in Delaware Bay, USA. Since Delaware Bay is a major staging site that is frequented by high densities of shorebirds, which could lead to bacterial transmission among birds through deposited faeces, she and her colleagues examined the gut bacterial diversity of Red Knots *Calidris canutus*, Ruddy Turnstones *Arenaria interpres* and Semipalmated Sandpipers *C. pusilla* from faecal samples. A total of 97 faecal pellets were collected and used to develop 16S rRNA gene clone libraries. The bacterial community found was mostly composed of populations closely related to the classes Bacilli (63.5%), Fusobacteria (12.7%), ε-Proteobacteria (6.5%) and Clostridia (5.8%), with large interspecific variation. *Campylobacter* sequences were identified as the known human pathogen *C. lari* (>99% sequence identity) in a subset of clone libraries in Ruddy Turnstone (38.4%), Red Knot (10.1%) and Semipalmated Sandpiper (26.0%). These results provide a first insight into the complexity of the gut microbial community of migratory shorebirds.

The following talk was presented by Allan Baker and his colleagues about how staging phenology and sex ratio at the Mingan Archipelago in Quebec provides evidence for improved recruitment in Red Knots *C. c. rufa* in response to climate amelioration in Arctic breeding sites. Their fieldwork has shown they can obtain an assessment of breeding season productivity by the numbers and sex-ratio of adults in two waves of migrants. The first wave is larger in number and includes both failed breeders and possibly some females that laid early clutches, as females leave after the eggs hatch whereas males stay 3–4 weeks longer to brood and protect the young. In good breeding seasons, the second wave, which occurs in early August, is larger than normal and is composed almost exclusively of males that raised young, but in poor breeding seasons the second wave has both sexes, probably indicating more late and failed breeders. Despite the decline in maximum counts of adults using the Mingan staging site in the last five years, recruitment has improved, especially in the 2010 and 2011 breeding seasons, judging from the numbers in the second wave of successful breeders and counts of juveniles. This higher level of recruitment and presumably higher adult survival is being aided by climate amelioration in Arctic breeding sites, and helps to explain the ongoing population recovery.

The final talk, by Patricia González and collaborators, focused on the influence of climatic variables and reproduction in sex-specific survival of Red Knots *C. c. rufa*. She emphasized how the influence of global warming on climate patterns can modulate life history stages in the annual cycle of long-distance migrant shorebirds, and can have fitness consequences. During her 14-year study between 1998 and 2011, she investigated the apparent survival in the Red Knot population that migrates to Tierra del Fuego in relation to sex, climate covariates and an index of juvenile production using data on marked, sexed and resighted individuals. These data were used to build Cormack Jolly Seber capture-recapture/resighting models. Statistical model selection

showed that in good breeding seasons, which were indicated by higher numbers of juveniles in flocks, the average survival rate for females was higher than for males. In females, the average was higher in years when the Arctic Oscillation was positive in June during the nesting period than in years when it was negative. Other covariates (ENSO, Arctic Oscillation in July, number of hurricanes and tropical storms) were not selected statistically in alternative models.

In summary, the symposium's five presentations showed how several different global change factors affect shorebird populations.

Development of a Pacific Flyway shorebird business strategy

Organized by: Catherine Hickey *(chickey@prbo.org)*, **Eduardo Palacios** *(epalacio@cicese.mx)*, **Rob Clay** *(rob.clay@birdlife.org)* **& Brad Andres** *(brad_andres@fws.gov)*

To further develop its business plan, the Pacific Flyway Shorebird Group met in Colombia. The geographic scope is from W Alaska to Chiloe, Chile, and includes nine focal geographies. The breeding range of Marbled Godwit, Long-billed Curlew and Willet are also considered within a full annual cycle context. Nineteen focal species were identified as representative of specific habitats in the Pacific Flyway, and are populations of conservation concern or have species conservation plans in place. The main threat categories identified in Utah for breeding, wintering and passage shorebirds included: residential and commercial development; marine and freshwater aquaculture; energy production and mining; human intrusions and disturbance from recreation, work and other activities; natural system modifications (e.g. water use, re-vegetation, shoreline alteration); invasive and other problematic species; and climate change and severe weather. The purposes of this session was to share information of this plan and seek input from partners in Central and South America in: 1) identifying the most pressing shorebird conservation issues and needs; and 2) developing specific projects and funding/capacity requirements for the projects; and 3) designating partners willing to implement conservation projects if resources can be generated. We developed project ideas to mitigate threats such as development, disturbance and aquaculture to feed into a draft business plan.

The migratory shorebird project: connecting communities of the Americas through research for conservation

Organized by Matthew E. Reiter *(mreiter@pointblue.org)*

The Migratory Shorebird Project (*www.migratoryshorebirdproject.org*) was initiated in 2011 to establish a coordinated research and monitoring network throughout the non-breeding range of Pacific Dunlin *Calidris alpina pacifica* and Western Sandpiper *Calidris mauri*. This hypothesis-driven ten-year project will evaluate limiting factors for Dunlin and Western Sandpiper and provide the necessary information to guide conservation actions. To date, more than 40 organizations in ten countries are participating in the Migratory Shorebird Project, applying standardized survey protocols, and centralizing data through the California Avian Data Center (CADC).

A symposium at the Western Hemisphere Group Meeting in Santa Marta, Colombia, in September 2013 included ten presentations from nine countries. The presentations outlined this ambitious project, provided initial summaries of results and applications of the data from across a broad geographic landscape, and highlighted key challenges and next steps. In just two years, the Migratory Shorebird Project has collected data on >2.5 million shorebirds representing 36 species with the support of more than 500 partner biologists and volunteers from Canada to Peru. These data have been archived in CADC, integrated into decision-support tools, and used in analyses to investigate hypotheses of factors potentially limiting the distribution and abundance of shorebirds.

Understanding factors affecting shorebird population size in the Arctic

Organized by Richard Lanctot *(richard_lanctot@fws.gov)* **& Paul Smith** *(paul_smith@smitheco.ca)*

Apparent declines in the population size of North American shorebirds were reported in the early 2000s. The Shorebird Research Group of the Americas was subsequently formed and came up with seven major hypotheses to explain these declines. The goals of this symposium were to highlight recent and ongoing graduate student studies conducted on shorebirds in the Arctic that addressed some of these and other hypotheses, to assess the relative importance of various hypotheses, to discuss avenues for reversing any negative effects found, and to prioritize conservation actions to reverse declines.

Audrey Taylor discussed whether observed changes in Arctic-breeding shorebird population parameters correlate with observed environmental changes that have occurred at Barrow between 1950 and the present. She made predictions of how shorebird frequency of occurrence and molt cycles would change given the increasing length and warmth of the frost-free season and the increase in shrubbiness observed during the past half-century in Arctic Alaska. As predicted, there was an increase in the occurrence of 'subarctic' species, as well as species that prefer denser vegetation. Similarly, she reported a decrease in species that prefer open, less densely vegetated habitat. She also reported that Dunlin significantly lengthened their overall molt duration by an average of 25 days between the 1960s and the 2000s, suggesting that shorebirds may be adapting to climate changes.

Eunbi Kwon then discussed her efforts to quantify the occurrence of a phenological mismatch between shorebird nest initiation and invertebrate emergence by evaluating information from a vast geographic network of sites and comparing and contrasting species that differ in a variety of life-history traits. She reported that preliminary analyses indicated that shorebird hatching preceded peak prey abundance at most sites, and that there was geographic and interspecific variation in the degree of this mismatch. She indicated future work would extend these analyses to more sites and investigate different ways of defining phenological mismatch, and ultimately to examine how climate-driven phenological changes might impact shorebird population dynamics.

Next, Jenny Cunningham described a shorebird nest site selection study conducted at Barrow between 2005 and 2012. Using a variety of habitat features and social factors, she found that nest site selection in Arctic-breeding shorebirds is not random, that habitat features are important in

nest site selection, and the characteristics of influential features differ among species. She also noted that social factors influence nest placement in some species. Finally, Jenny discussed how this selection information could be used to: 1) predict how climate change may influence individual shorebird distributions due to predictions of a wetter tundra environment; and 2) reduce or mitigate the impacts of future natural resource development on the Arctic Coastal Plain.

Jean-Francois Lamarre then evaluated the relationship between goose colonies, predator abundance and the distribution and abundance of American Golden Plovers on Bylot Island, and quantified the spatial variation in artificial nest predation risk relative to goose colonies. He reported that plovers were found in higher numbers where geese were absent, that there were more predators near goose colonies, and that there was lower predation risk away from goose colonies. His results suggest that plovers may be adapting to the overabundance of geese by avoiding colonies where predation risk is higher. This study emphasized that climate change may impact shorebirds indirectly through changes in other bird populations.

Willow English next described a mechanistic relationship between how changes in climate (i.e. temperature) may reduce Red-necked Phalarope breeding success by impacting food availability and indirectly causing incubating adults to spend more time on breaks, increasing incubation duration, and ultimately reducing egg viability and increasing predation rates. Her study, using temperature probes, showed large variation in incubation behavior that had not previously been documented.

Garry Donaldson, standing in for Paul Smith, gave the final talk in which he reported a new global analysis that investigated relationships between population trends of shorebirds and intrinsic characteristics of species and extrinsic threats faced by species. Garry reported that there was a negative relationship between species declines and coastal development, a positive relationship between species declines and distance migrated, and more declines among species making long over-ocean flights during migration. He ended by stating that these correlations should be used to test hypotheses with new data collection at survey sites, with a particular emphasis on understanding threats faced by species during migration.

Symposium talks were followed by a short discussion during which speakers and the audience agreed that there was ample evidence that shorebirds were being impacted by climate change and other human-related alterations. However, it was noted that environmental changes may have positive and negative effects on shorebirds, and it was not clear what factors were the most harmful to shorebirds. A broader discussion followed on whether shorebirds might adapt to climate change. It was agreed that future studies should focus on evaluating how adaptable shorebirds might be to climate change by conducting experimental studies that could discern cause/effect relationships.

The Whimbrel: addressing hemispheric-scale issues of biology, ecology and conservation

Organized by Bob Gill *(rgill@usgs.gov)*,
Chris Harwood *(cmharwood@alaska.edu)*,
Jim Johnson *(jim_a_johnson@fws.gov)*
& Richard Johnston-González *(richardj@sfu.ca)*

For decades the Whimbrel *Numenius phaeopus* has existed in seeming obscurity in the consciousness of shorebird biologists and conservationists worldwide – this despite the species' iconic presentation and hemispheric-wide distribution. Aware of this and coupled with several recently initiated studies of its ecology, we felt the time was ripe for a symposium that: 1) focused on topics that would allow us to update the status of the species, particularly for populations in the Western Hemisphere; and 2) assess these recent findings in term of critical information gaps identified for this hemisphere in the 2010 Conservation Plan for the Whimbrel.

This symposium featured nine oral presentations, spanning from the breeding grounds in Alaska and Canada, to stopover and staging sites in North and Central America, and non-breeding grounds in Colombia and Chile. Chris Harwood led off the symposium with an overview of the growing interest in Whimbrels, in their research, conservation and public consciousness, as well as some equivocal results from a reconnaissance of Whimbrel distribution in interior Alaska.

Johanna Perz followed with an investigation of adult survival on the breeding grounds in Churchill, Manitoba, Canada, in which she documented lower than expected survival rates in her study area. The next three talks then focused on movement ecology, beginning with Bob Gill's illustration of the annual-cycle movements of two Alaska-breeding populations vis-à-vis satellite telemetry and weather patterns along the Pacific Flyway. Andy Johnson next brought concrete evidence to the adage that a picture is worth a thousand words with his exquisitely produced videos of breeding Whimbrels (and research thereof) at Churchill, including probably the first ever footage of the species from the perspective of pipping eggs and an adult's drive to incubate the eggs! Fletcher Smith completed the talks on migration with a satellite telemetry-based analysis of annual-cycle movements of Atlantic Flyway populations. He highlighted birds breeding at both Canada's Mackenzie River Delta and Hudson Bay, migrations along the Atlantic and Gulf coasts of North America, and the use of non-breeding areas, primarily in north-eastern South America. The next three presentations focused on site use, largely on the non-breeding grounds.

Lee Tibbitts led off with a demonstration of high site-fidelity among Pacific Whimbrels, albeit with great flexibility in their use of stopover, staging, and wintering sites. These in turn were linked to the conservation landscape, particularly the level of protection currently afforded to sites. Richard Johnston-González then discussed possible explanations for the roosting of thousands (≥ 5% of the hemispheric population) of Whimbrels in an isolated location in the mangrove forests of Sanquianga National Park, Colombia.

Finally, Brad Andres, speaking on behalf of co-author Jim Johnson (not in attendance), completed the suite of presentations on site use. Brad's talk focused on Whimbrel foraging and roosting strategies at Chiloé Island, Chile, probably the most important wintering site for Pacific Whimbrels but also a site undergoing marked anthropogenic changes in land- and water-use patterns. Formal talks were immediately followed by a group discussion, including a short presentation by Ricardo Portillo on a census of Whimbrels wintering in El Salvador. The organizers then solicited immediate and future input from the symposium attendees (as well as those reading this summary) on the

direction(s) for future research, monitoring and on-the-ground conservation actions by a growing cadre of Whimbrel aficionados.

Revising the Pan-American Shorebird Program

Organized by Sophie Beraud *(sophie.beraud@ec.gc.ca)* **& Lesley Howes** *(lesley.howes@ec.gc.ca)*

International coordination of shorebird marking is essential to ensure reliable identification of individual shorebirds throughout their range. The Pan-American Shorebird Program (PASP) held a workshop at the Vth Western Hemisphere Shorebird Group meeting in Santa Marta, Colombia, where they presented a revised draft protocol for marking shorebirds in the Western Hemisphere.

The protocol is based on regional assignment of a single flag colour, thereby minimizing the risk of marking of smaller species that cannot safely wear two flags, promoting scientific integrity of results and reducing resighting errors in the field. The system is intended to be collaborative and adaptive to regional requirements as well as promote standards for marking, resighting and reporting.

Specifically:

- The Western Hemisphere would be divided into ten regions;
- Each region would be assigned a unique flag colour;
- Each country within a region would be assigned a unique band colour; and
- Each coloured flag would be engraved with a three-digit alphanumeric code using a standard set of 29 sans-serif font characters.

By marking shorebirds with one coded color flag and one plain color band, the region and country of banding origin can quickly be determined during resighting. Furthermore, using a set of 29 characters to code regionally coloured flags identifies the individual bird while allowing for 24,389 possible code combinations per species per region.

The workshop invited researchers who mark shorebirds in the Western Hemisphere to discuss the proposed marking protocol. Over 30 participants from ten different countries provided valuable feedback and input on the proposed changes. The response was generally positive: attendees saw this as an opportunity for collaboration and for new ways to become engaged. Challenges were identified, such as how to enforce the protocol, and how to ensure a sufficiently high level of coordination for the program to be effective.

A brief survey handed out as part of the workshop identified the importance of a coordinated marking protocol to ensure scientific integrity of results, given the interest in resighting data for birds marked in their own region as well as internationally. Not only did all respondents follow a resighting protocol for their own projects, they were actively resighting birds marked by others. However, the vast majority were using various combinations of flags and bands in marking their birds and not all researchers coordinated marking with others.

Although the PASP steering committee can provide guidance, set standards and protocols, and coordinate with other flyways, there is a great need for regional coordinators and species coordinators to take on an administrative role within each region. These indispensible volunteers would fulfill the crucial task of assigning and tracking coded flags, thereby acting as the relay between researchers and banding programs across all the countries in their region. The PASP needs your help to make the program as effective as possible. Please contact us if you are interested in volunteering or in being part of the consultation process as we draft a guidance document.