SPRING 2015 Volume 16, Issue 1

Tracker News

Microwave Telemetry, Inc.

Understanding Migration and Habitat Use: Skimming the Surface

Dear Customers and Friends,

We, at MTI, are consistently amazed and humbled by the work of researchers using our devices. Our semiannual publication of Tracker News highlights only a few of the many noteworthy projects. It's sometimes very difficult to choose which projects make the final cut. Next year will mark our 25th anniversary manufacturing animal tracking devices. As most of you know, many of the discoveries made during this time period have been groundbreaking. However, new breakthroughs continue to emerge, proof that we have only skimmed the surface of understanding what, when, where, why, and how animals move.

We are so grateful for our authors' willingness to share their results, many of which are yet to be published. Simon Cherriman informs us of his wedge-tailed eagle study; his documentary is not to be missed. Kate Goodenough provides an update on her work with black skimmers in Peru. In a multispecies study, Theunis Piersma describes his work on global flyways. In an effort to understand spawning in tropical eels, Robert Schabetsberger relays the results of his study in Vanuatu. Marla Steele, using GSM/GPS transmitters, reveals preliminary results on the migration patterns and never-before-seen behaviors of Pallas's fish eagles tagged in Mongolia. Thanks very much to the contributors for putting forth such great effort in presenting their work.

We realize that this issue was finished a few weeks later than usual, but better late than never. We hope you enjoy the articles and have a great summer (or winter)!

Sincerely,

Lance and the Team at MTI

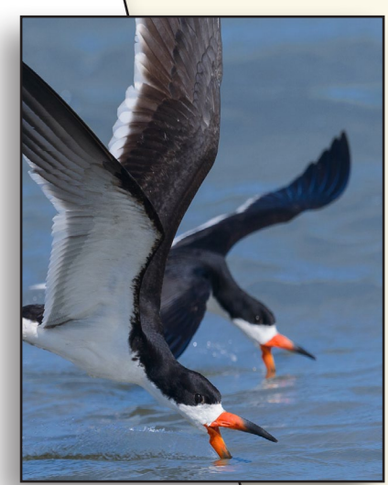

Photo by Bruno Enríquez Struck

Above: Pair of black skimmers search the water's surface for food.

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Tracking Bottlenecks in the Annual Cycles of Long-Distance Migrating Shorebirds

Theunis Piersma is driven by endless fascination for the small birds linking the wetlands of the world. As Chair in Global Flyway Ecology at the University of Groningen, research scientist at the NIOZ Royal Institute for Sea Research (Texel), and coordinator of the Global Flyway Network (an international research consortium for studies on the conservation demography of shorebirds), he spearheads 15 long-term demography programs worldwide.

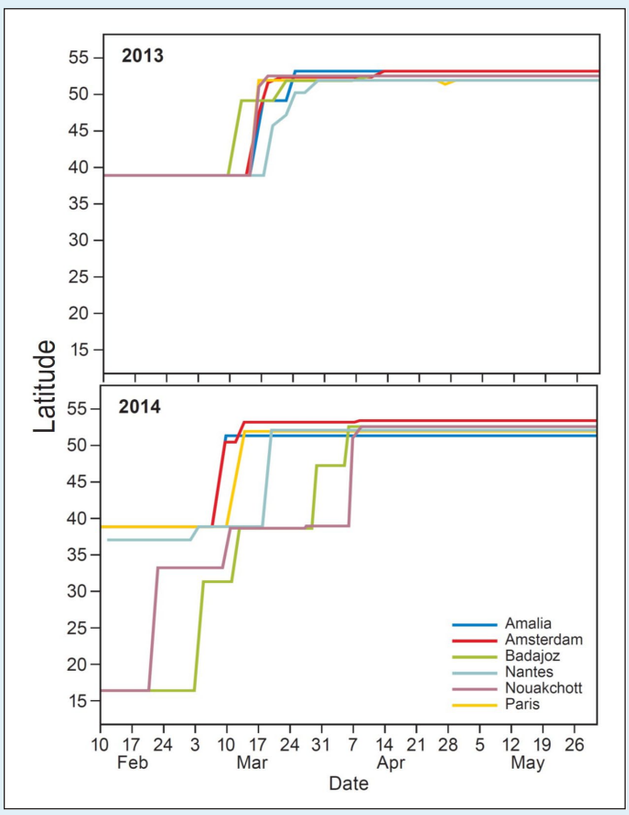
Because they are habitat specialists and because suitable habitats are often rare and far between, shorebirds have 'punctuated occurrences' in both space and time. Individuals use sequences of sites where they either feed and breed, or try to survive and prepare for the next breeding season (usually in the Far North). Such preparations may include fuelling (i.e., feeding, food processing and fat storage) for what are the longest nonstop flights known. The use of ever-smaller tracking devices has demonstrated that migration flights between 2000 and 5000 km are routine, and that nonstop flights as long as 11,000 km (such as the ones by bar-tailed godwits crossing the Pacific) are possible.

Photo by Jan van de Kam

Released black-tailed godwit in Spain.

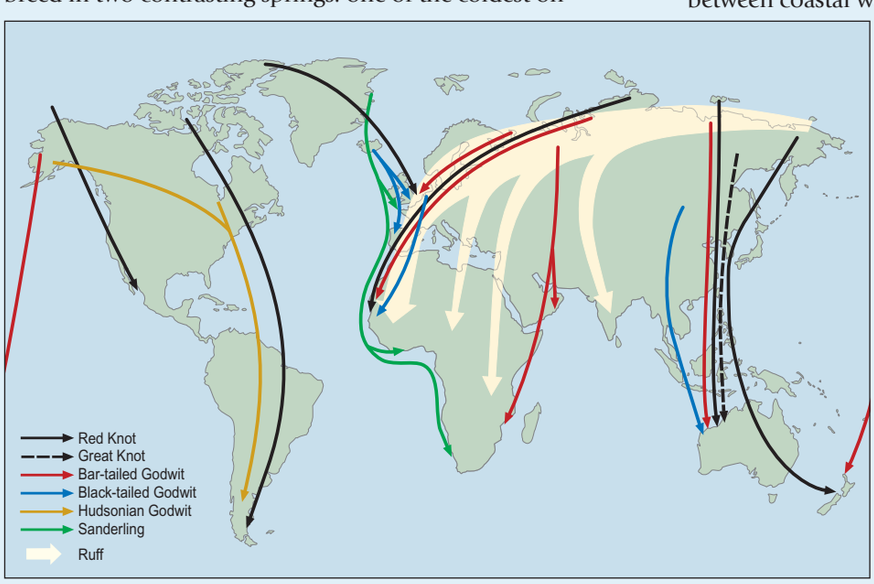
In a world of fast and widespread losses and changes of habitat, migrating shorebirds increasingly have to 'fly the tightrope'. However, their reliance on wetlands (where humans concentrate too) and their punctuated occurrences make shorebird systems relatively tractable and their study relevant for conservation. To investigate if, when, and where populations are bottlenecked, demographic studies are underway in 15 populations of shorebirds across the world. In all these projects, we try to measure annual survival and recruitment but aim to additionally partition annual survival into as brief seasonal segments as possible. We also try to study details of ecological context wherever possible, usually with an emphasis on food availability. Knowledge about the times and the places where populations run into trouble, especially if we can also interpret such reductions in survival with reference to habitat change, provides us with in-depth knowledge on population processes. At the same time, this provides conservation organizations with strong suggestions for improved management.

The tracking of several species and populations of godwits and knots by the Global Flyway Network consortium over the last eight years, rather than to describe their migratory movements (which are generally well-known), serves to pin-down any bottlenecks in annual cycles. We relate the use of sites with subsequent performance (i.e., timing of migration, breeding success, survival, and physical state based on visual observations). This approach is illustrated by our study on black-tailed godwits tracked during the last leg of their northward migration between the nonbreeding area in West Africa and the Dutch meadows where they breed in two contrasting springs: one of the coldest on record (in 2013) and one of the warmest (in 2014). As it happens, black-tailed godwits were able to fully behaviorally cope with the challenges imposed by atypical snow-cover and frozen ground in 2013. They interrupted their migrations and made return movements even after arrival on breeding territories. Such capacity for compensation is unlikely in situations where birds are faced with dwindling staging habitats during northward migration. This is the case for the red and great knots and the bar-tailed godwits that rely on the Yellow Sea shoreline as they migrate between coastal wetlands in Australia and New Zealand and the Siberian and Alaskan tundra breeding areas.



Northward migration timing of six black-tailed godwits (named after towns on their flyway) tracked with PTTs in both 2013 and 2014. Birds were tagged in Extremadura, Spain in February 2013. In the cold spring of 2013 (compared with the warm spring of 2014), individuals departed somewhat earlier (-5 d), made more (+1) but shorter stops (-4 d), and spent more time in transit between Spain and the Dutch breeding sites (+7 d), thus arriving marginally later (+2 d).*

*Adapted from: Senner, N.R., M.A. Verhoeven, J.M. Abad-Gómez, J.S. Gutiérrez, J.C.E.W. Hooijmeijer, R. Kentie, J.A. Masero, T.L. Tibbitts & T. Piersma (2015) When Siberia came to The Netherlands: the response of continental black-tailed godwits to a rare spring weather event. Journal of Animal Ecology, in press.



Parallel flyways in seven shorebird species, the majority of which are studied in intense demography and tracking programs by the Global Flyway Network consortium.

The availability of small 5g solar PTTs means that we can now also ask questions on how individual itineraries develop in individuals as they grow up. This year we begin an ambitious program of observation and experimentation on young black-tailed godwits born in The Netherlands to establish whether places used later in life represent subsets of places encountered during the first migrations. How do birds learn about seasonal sequences of places, and can we infer criteria as to why some sites are visited again whereas others are skipped? We hope that this developmental angle to the use of sequences of sites in the course of the year will also illuminate the degrees of flexibility helping shorebirds to survive rapid global change.

Where Do Wedgies Dare?

Simon Cherriman is an award-winning environmental scientist, educator, wildlife filmmaker, and enthusiastic advocate for the unique Australian bush and its creatures. He spreads his passion for the environment through his small business, iNSiGHT Ornithology, which specializes in bird-related research and environmental education.

When you have an adult Wedge-tailed Eagle tucked under your arm, it's really important to keep hold of those legs. The skin-tearing talons on the end of each toe, together with several tonnes of crushing power per foot, make them a formidable weapon. Just ask any kangaroo who has watched her joey get carried off into the sky by our largest bird of prey.

"Why on earth might I be holding one?" you might ask. Having just fitted a satellite transmitter to the eagle using a specially designed harness, I was ready to let it go. I placed it down on the ground, pinning the wings with one hand and gripping the tarsi firmly with the other. Then, I quickly let go and stepped back…

Seeing a 'wedgie' soaring effortlessly above the landscape is an iconic image of the Australian outback. It is a vision I had many times as a young boy on family holidays around Western Australia (WA). Studying and photographing eagle biology while at university and for years afterward further fuelled my quest to find out more about these majestic birds. Eagles became 'my thing', and I was hooked.

In late 2011, I began researching Wedge-tailed Eagle ecology at Lorna Glen, a conservation reserve in the middle of WA. This study site provided an ideal location to track birds, especially because detailed information on habitat use in relation to reintroduced threatened mammal populations was part of the research.

Photo by Simon Cherriman

Gidjee feeds Kuyurnpa a freshly killed rabbit. Both eagles have solar PTTs attached to their backs.

In 2012, I set out to fulfill a boyhood dream and track the movements of adult Wedge-tails, being lucky enough to successfully obtain a WA Dept. Parks and Wildlife Community Grant to cover the costs of three 70g solar Argos/GPS PTTs and an Australian Geographic seed grant to aid with logistics and the production of a community education website about the project. In June 2013, after months of preparation, my team and I headed to the remote outback of WA to attempt adult eagle capture.

How do you catch a wild wedgie? Along with "how tall are you?" (I'm 6'8") and "do you play basketball?" (No), this had become a popular daily question since people found out about my mission. Seeking the wisdom of retired eagle experts, Michael Ridpath and Michael Brooker, from WA, lent me insights into the methods they used during research in the 1970s. A giant 'chook pen' cage trap with an open roof, built beneath a dead perch tree, would prevent eagles from having their usual 'runway' needed to get airborne, once lured inside with a piece of carrion. Wedgies find it hard to resist a 'roo, and, in mid June 2013, I was thrilled when we captured two adults in two days of trapping. An adult male (who I decided to name 'Wallu', after the local Aboriginal word for eagle, 'Wallu-wurru') and an adult female, named 'Gidjee' (an alternative spelling of the name for the eagles' favoured nest tree in the area), both birds were paired breeding adults living in separate territories.

Four months later, I found myself clinging to the side of an eagle nest, face to face with Gidjee's beautiful, healthy 9 week-old chick. A 7-week incubation period that only a patient mother could sit out, together with regular delivery of food by her mate, had produced a pretty young girl. I removed 'Kuyurnpa' (a Martu word meaning 'little girl') from the nest, fitted the third PTT, then placed her back. She was almost ready to fledge—only a week or so longer. Then, after all that flapping practice on the nest, it would be time to use those massive, feathered appendages for the first time, and take me, via a virtual satellite connection, along for the ride.

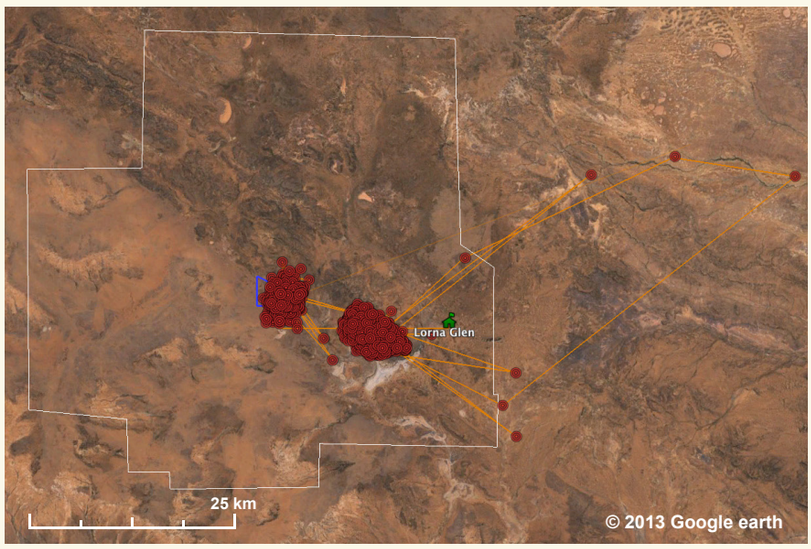


Figure 1. Home range of two adult Wedge-tailed Eagles at Lorna Glen: Gidjee (left) and Wallu (right).

After eleven months, Wallu and Gidjee had remained in relatively small fixed home ranges of approximately 45 km^2 and 25 km^2 in size, respectively (Figure 1). The one exception was a 'Wallu walkabout' where he travelled 60 km to the edge of a desert salt lake and back in a day. Altitude data (accurate to ±22 m) showed Wedge-tails are capable of soaring incredibly high, reaching the maximum height of about 6900 m above sea level (Figure 2)! This can probably be explained by thermal air currents (which peak during late spring and summer) carrying the eagles very high as they soar above the landscape. While these heights are exceptional, most of an eagle's daily routine occurs between ground level and about 1500 m above sea level. Sadly, in May 2014, Gidjee unexpectedly left her home range, travelled 200 km north and died in a remote part of the desert. The cause of death is unknown, but I suspected she was expelled by a rival adult female. Wallu is still being tracked, and after nearly 2 years of data collection, he still remains within the same home range at Lorna Glen.

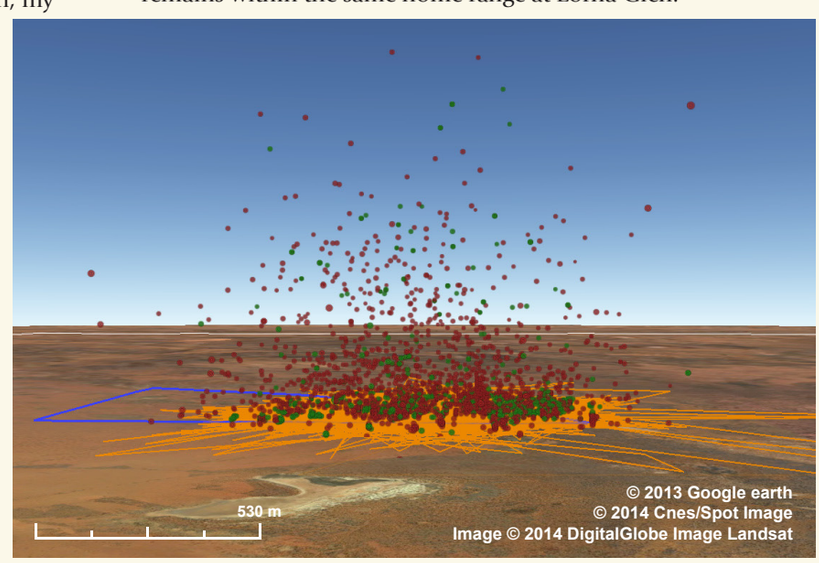


Figure 2. A 3D picture of Gidjee and Kuyurnpa's movements in March 2014 showing altitudes of about 3500 m above sea level. The maximum height recorded was 6900 m above sea level!

One of the most exciting parts of the eagle tracking project was watching Kuyurnpa, the first ever juvenile Wedge-tailed Eagle to be tracked during dispersal, leave Lorna Glen. She spent her first night 'away from home' on 29 March 2014, roosting about 60 km south of her natal nest. Then she

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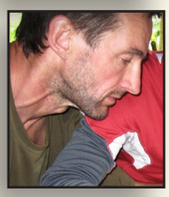
Oceanic Migrations of Tropical Pacific Eels




Robert Schabetsberger is a biologist at the University of Salzburg, Austria and started to work on tropical eels in 2012. Finn Økland is a fish telemetry specialist based at the Norwegian Institute of Nature Research, Trondheim and has tagged fish in 20 different countries. Ursula Sichrowsky is a Ph.D. Student from the University of Innsbruck, Austria working on the limnology of tropical lakes in Oceania. Meelis Tambets from Wildlife Estonia has worked with Finn on numerous tagging projects. Kim Aarestrup from Denmark Technical University has pioneered tagging of European eels with satellite tags.

Some tropical eels live in paradise. Among them are our eels living in Lake Letas, in the archipelago of Vanuatu. The Lake, sacred to locals, is a 100 m deep crater-lake in the middle of the tropical South Pacific island of Gaua, constantly fertilized by an active volcano and full of tasty shrimp. The only downside is the spawning migration back to their spawning grounds in the ocean. To accomplish this, they have to migrate through a gauntlet of difficulties. First, a header down a 120 m waterfall, then past fishermen hooking and dragging them ashore, on to hungry sharks ambushing them in the reef, and finally a 1000 km exhausting journey in the deep blue ocean, all of this without feeding. Finally, after spawning they die. Their eggs hatch within days and their weird looking, leaf-shaped larvae will drift back with the South Equatorial Current and develop into transparent glass eels. Some will smell the river running from the lake, swim up the river, and crawl up on vertical mossy cliffs alongside the waterfall, before they reach the Letas to grow for decades like their ancestors.

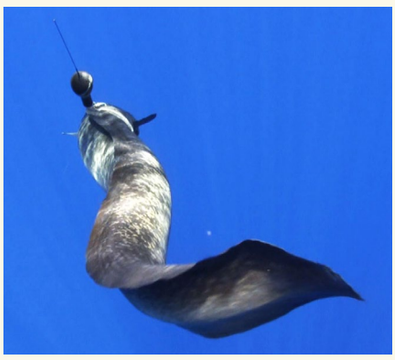


Photo by Robert Schabetsberger

A tagged eel diving into the deep blue ocean near Vanuatu.

Anguillid eels have captured the imagination of scientists and the general public because of their mysterious migrations to mostly unknown spawning areas. Fresh-water eels (Genus *Anguilla*) are major ecological components across the islands of the western South Pacific region and have been important mythical creatures for human societies for centuries. Yet, very little is known about their biology. The threatened status of the stocks of economically important temperate eel species, such as European (*Anguilla anguilla*), American (*A. rostrata*), or Japanese (*A. japonica*) eels has prompted a number of protective measures causing increases in harvesting of unprotected tropical anguillid species in some areas such as Indonesia, and this may be rapidly expanding.

So far, no adult eel has ever been tracked all the way to its spawning area. In 2012 and 2013, we tagged 3 different species with X-Tags to follow their ocean migrations. The fish were caught by local fishermen snorkeling in the torrent outflow (20 m^3s^{-1}) of Lake Letas. Once released in the ocean, the migrating eels exhibited pronounced diel vertical migration descending at dawn from a nighttime depth around 200 m to a daytime depth around 750 m and ascending again at dusk, much like the pattern observed in other *Anguilla* species. However, the corresponding temperature change experienced by the eels was an astonishing 22 – 6 °C on the approximately one hour long descent. Twelve hours later, the reverse temperature change was experienced on ascent, all together an impressive temperature tolerance over such a short period (Figure 1).

Another interesting feature is that the lunar cycle affected the upper limit of migration depths in two species, *A. marmorata* and *A. megastoma*. At full moon, the eels descended approximately 100 m deeper than at new moon (full moon ~250 m, new moon ~150 m) (Figure 2). We interpret this as predator avoidance, since sharks and swordfish have been shown to also extend their diving depths during full moon. Three eels (2 *A. marmorata*, 1 *A. megastoma*) exhibited long-distance migrations with their tags surfacing 634 – 874 km northeast of Gaua in an area (8°S – 11°S, 170°E – 175°E) at the border of the South Equatorial Current and the South Equatorial Countercurrent. Some of the smallest leptocephali collected so far were located close to the pop-up locations, indicating that the spawning area is located nearby. Additionally, a distinct salinity maximum at the pop-up locations coinciding to the thermocline and the upper nighttime eel migration depths was identified (discovered by Giorgio Dall'Olmo from Plymouth Marine Laboratory), potentially serving as a seamark for this potential spawning area. This is further supported because 15% of all eels sampled on Gaua were hybrids between *A. marmorata* and *A. megastoma* (discovered by Robert Jehle and his team from the University of Salford) implying that they must spawn at the same location.

For the European and Japanese eels, expensive research cruises over two decades had been necessary to hunt down the small eel larvae and find the spawning areas. With a grant from the Austrian Academy of Sciences and the help of many colleagues, a spawning area of Pacific eels was narrowed down within only 3 years. This accomplishment will hopefully allow for better conservation efforts.

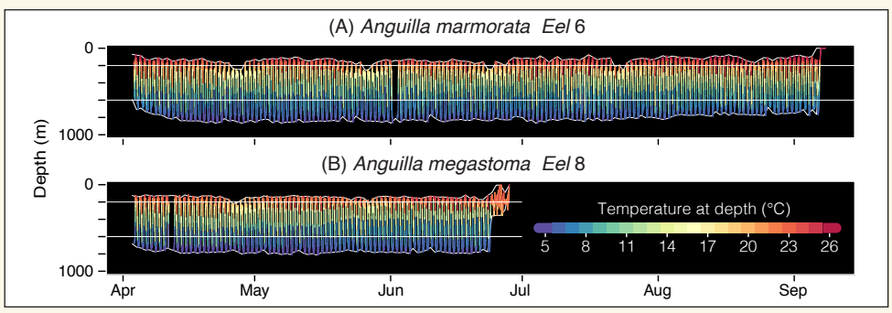


Figure 1. Time series depth profiles colored by temperature indicating diel vertical migration from Anguilla marmorata Eel 6 (A) and Anguilla megastoma Eel 8 (B).*

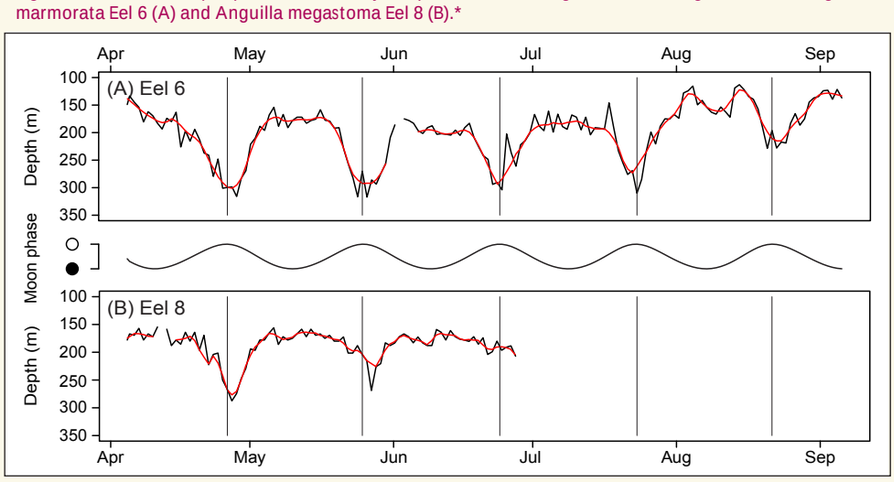


Figure 2. Nighttime mean depth (black) with smoothed nighttime mean depth (red) for Anguilla marmorata Eel 6 (A) and Anguilla megastoma Eel 8 (B). Corresponding moon phase indicated in center panel.*

*Figures courtesy of the Inter-Research's Marine Ecology Progress Series: SCHABETSBERGER, R., F. ØKLAND, D. KALFATAK, U. SICHROWSKY, M. TAMBETS, K. AARESTRUP, C. GUBILI, J. SARGINSON, B. BOUFANA, R. JEHLE, G. DALL'OLMO, M.J. MILLER, A. SCHECK, R. KAISER & G. QUARTLY (2015): Genetic and migratory evidence for sympatric spawning of tropical Pacific eels from Vanuatu. Mar. Ecol. Prog. Ser., 521: 171-187.

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Tracking Inter-tropical Migratory Movements of Waterbirds Breeding In the Peruvian Amazon

Katharine Goodenough is an ecologist with the San Diego Waterbird Research Group. Torbjørn Haugaasen is an associate professor in the Department of Ecology and Natural Resource Management at the Norwegian University of Life Sciences. Lisa Davenport is a research associate with the Duke University Center for Tropical Research.

In South America, seasonal flooding of the Amazon influences many breeding birds to undertake annual migrations. Yet, the destinations and routes are relatively unknown for many intra-tropical migrants, especially waterbirds. Bird migration studies in South America have generally concentrated on north-temperate forest species

Photo by Kate Goodenough

Black Skimmer pair with chick roosting along a riverine sandbar in Manu National Park, Peru in August 2014.

with much of the research focusing on short-range seasonal movements of birds at specific locations primarily because the environment of the Amazon Basin limits the ability of researchers to document long-range movements for many species.

Migratory connectivity is a key focus in migration research because it is becoming more and more evident that cross-seasonal effects are important drivers of population demographics. What occurs during the non-breeding season can have profound influences upon successive breeding seasons; without understanding these potential cross-seasonal effects linking these stages of the lifecycle, this gap in our knowledge limits our ability to understand how migrant species may respond to changes locally and across the landscape. Our research aims to gather critical knowledge of the connectedness of the Amazon system at the continent-wide scale from the perspective of migratory waterbirds. Two of our goals for this tracking project are to develop linkages between breeding and non-breeding locations for targeted waterbird species and to explore how waterbirds respond locally to patterns of riverine flooding within the Amazon Basin, inter- and intra-annually.

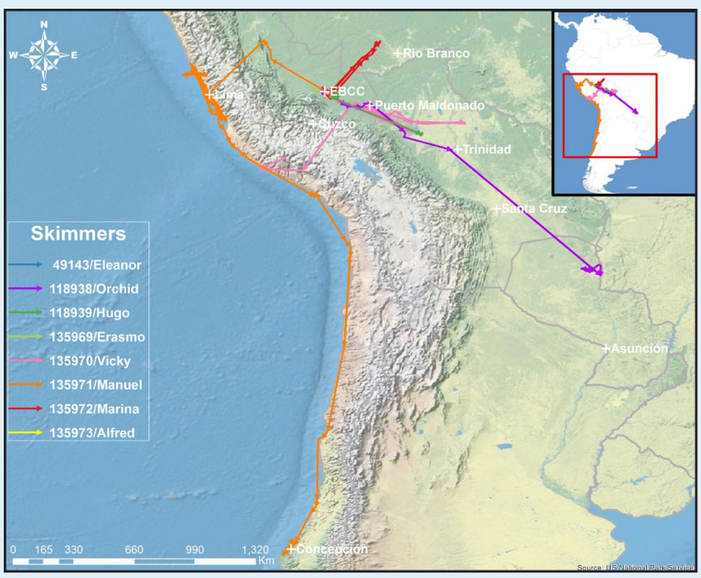
Skimmers are piscivorous waterbirds from the Americas, India, and Africa, which are recognized for their specialized bill and flight mechanics that allow them to skim across the water and catch fish within the top six inches of the water's surface. Tropical skimmers are predominantly riverine species which breed on sandbars during low-water periods; after breeding, they leave interior regions and form large non-breeding aggregations along both the Pacific and Atlantic coasts of South America. There are two subspecies which are morphologically distinct with *Rynchops niger cinerescens* distributed along northern and western South America and *Rynchops niger intercedens* from eastern Brazil to northeastern Argentina. Few sightings of *R. n. cincerescens* (our Peruvian skimmers) have occurred along the Atlantic Coast so there has been some suggestion that Manu skimmers may be crossing to the Pacific Coast during the non-breeding season. This habitat switch would mean that at some point skimmers need to cross the Andes Mountain range which is thought to be a geographical barrier for many species. From our main fieldsite at the Cocha Cashu Biological Station (EBCC) in Manu National Park, the Pacific Coast is a mere 500 km distance (plus an Andean crossing) to travel, whereas a move to north of the Equator would require a minimum of 1300 km travel, and travel to the Atlantic at least 2900 km.

Photo by Bruno Enríquez Struck

A Black Skimmer uses its specialized bill to catch fish.

Summer 2014 was our first field season, and, thanks to the Christiane Howey grant provided by Microwave Telemetry to Katharine Goodenough (in addition to transmitters purchased privately), we were able to deploy seven 5g solar PTTs on Black Skimmers. Much to our delight, we documented not only an Andean route to the Pacific Coast but also a potential differential migration strategy with some skimmers going west to the Pacific Coast and others heading east to the Atlantic Coast.

Two skimmers provided confirmation of a trans-Andes migration route, crossing the Andes to the Pacific Coast of Peru, while one individual took a southeastern route towards the Atlantic Coast. The two trans-Andes migrants used quite different routes to the Pacific Coast. Manuel moved northwest from the Manu River into the Ucayali drainage before crossing the Andes to Isla San Lorenzo (see map). Vicky crossed the



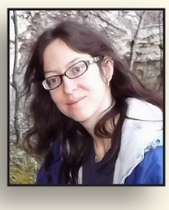
Manuel's [orange] and Vicky's [pink] routes over the Andean Mountain range of Peru and Orchid's route [purple] southwest into Paraguay. Note Manuel's track south along the Pacific Coast to southern Chile.

Andes arriving 3.8° south of where Manuel arrived. No intermediate points within the Andes were obtained from Manuel, but his start and end locations suggest he could have used passes near Ticlio (4818 m) or Abra de la Viuda (4817 m) in a narrow section of the Andes. From Vicky, we received three Andean locations that indicated she crossed over one of the widest sections and higher elevations of the Peruvian Altiplano (5800 m) (see map). Orchid travelled over 1800 km from the Manu River to the Paraguay River in eastern Paraguay before transmission halted (see map). If Orchid continued her travels, she could have reached the Atlantic Coast near Mar Chiquita, Argentina, which is a site of significant non-breeding concentrations of *R. n. intercedens*.

Another unexpected feature of the Manu skimmer migration was also uncovered by this study that illustrates how little we know about migratory connectivity of bird populations within South America. Manuel (after transiting the Andes) began a southern movement from Lima to Concepcion, Chile. The long southerly migration demonstrated by Manuel is close to the maximum latitudinal shift known for any Neotropical austral migrant. Future tracking studies are planned to continue to document these fascinating continental-scale movements.

Where in the World Are Pallas's Fish Eagles?

The World's First Comprehensive Study of *Haliaeetus leucoryphus* Seasonal Movements and Habitat Ecology with GSM/GPS Technology



Marla Steele is a Ph.D. student majoring in Biology at the University of Arkansas. She is currently working with the National University of Mongolia, the Mongolian Ornithological Society, and the Bombay Natural History Society to research the habitat and movement ecology of Pallas's Fish Eagles.

A journey of over 2000 miles, for human and eagle alike, started with a single home range map covered in question marks, an irresistible challenge to a graduate student starting her Ph.D. program at the University of Arkansas. The species in question, Pallas's Fish Eagle (*Haliaeetus leucoryphus*), has an extensive historical range of over 1,000,000 km^2, and virtually no information concerning its seasonal movements or non-breeding habitat ecology is known. Extensive literature review into the species' ecology revealed conflicting records and observations that described a large fishing eagle that could be observed in fairly high densities along all major freshwater sources within its expansive range with a cryptic life history prior to the 1900s. Historical records provide vague observations of breeding individuals within the Indian subcontinent that disappear with the coming of monsoon rains, while others argue that the eagles remain sedentary within the area year-round. In the northern extent of the range, around Mongolia and Kazakhstan, the records agree that the birds disappear by September/October and re-appear around May. Despite contradicting records and a significant lack of knowledge on Pallas's Fish Eagle life history overall, there is one somber truth that appears to be supported by all countries within the past fifty years: Pallas's Fish Eagles are disappearing.

Photo by Marla Steele

Chinggis with the transmitter.

Conservation efforts are hampered by a lack of knowledge in the birds' seasonal movements and habitat ecology. In order to provide an effective conservation strategy, habitat ecology and global connectivity must be understood, and communication across political borders must be maintained. In an effort to provide baseline information and address this gap in knowledge, I approached the Mongolian Ornithological Society, National University of Mongolia, and Bombay Natural History Society with a proposal to team up and fit Pallas's Fish Eagles with 70g solar-powered, GSM/GPS transmitters in their respective countries. Together, we began the world's first study of Pallas's Fish Eagle migration and habitat ecology with GSM/GPS technology.

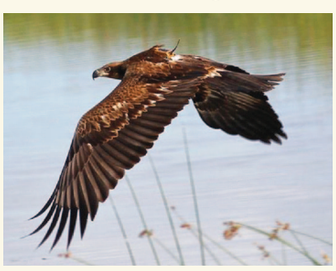


Photo by L. Jargal

Pallas's Fish Eagle.

The incorporation of GSM technology could be likened to art. Historical records, observations, and field journals create a basic black and white sketch describing the bird. Observation-based field studies, including radio telemetry, population surveys, and community-wide interaction studies, provide a rich color-palette that allows for a significantly improved comprehension of a species' general ecology as a whole. Yet, the use of GSM transmitters takes research a step further; it shifts a two-dimensional image to a three-dimensional sculpture with detailed data, allowing one to physically perceive shape, size, color, and even texture. GSM/GPS transmitters have an incredible potential to collect detailed fine-scale observations with GPS coordinates at a measure that would have been impossible two decades ago. A single transmitter has the capability to collect over 22,000 coordinates, not including errors and outliers, in a single month. With such an extensive dataset and the assistance of global climate and topographic data, the project has the potential to not only identify Pallas's Fish Eagle habitat and seasonal movements, but also model flight timing and strategies on a three-dimensional level, in accordance to large- and fine-scale climate and topographic factors. In the face of global climate change and the potential onset of an El Niño event for 2015, the results could prove invaluable to conservation efforts.

However, the reward of such a detailed, groundbreaking study is not without its fair share of risks and uncertainties. The first challenge that any biologist must face when fitting an animal with a transmitter is the initial capture of the study animal. Pallas's Fish Eagles can be extremely difficult to observe. Furthermore, there has never been a previously described attempt to capture and tag the species; my colleagues and I were forced to embark on a long process of trial-and-errors. Trapping efforts began in Mongolia in 2012; that first summer, we walked away without capturing a single Pallas's Fish Eagle. The following year, we caught our first juvenile Pallas's Fish Eagle on July 4, 2013 by a single toe with padded leg traps. He was christened as "Chinggis" in honor of Mongolia's revered hero, Chinggis Khan. The grins of the team were blinding, and eyes were suspiciously moist. Chinggis was promptly fitted with his 70g GSM/GPS transmitter and released back to the Mongolian steppe. We watched him fly away with a combination of elation and trepidation in anticipation of the second risk.

The second danger of GSM/GPS technology is the strict dependence of GSM cell towers for data transfer. It is important to note that cell reception is extremely limited in regions of the world where human populations are small or landscape is rugged and desolate. In the event that cell reception is unavailable, the GSM/GPS transmitter serves as a data logger. However, the tagged animal must eventually move into cell reception or the transmitter is useless, except in the event of an unlikely recapture. Mongolia has a considerably small human population and a significant portion remain tied to their nomadic roots. As such, cell reception is extremely limited in rural areas. Upon Chinggis's release, our team watched the result of two years worth of fundraising and months of exhaustive fieldwork fly away with no guarantee of results. Yet, luck remained on our side; the next day, we made a special trip to the local soum center, the area's only internet source within a day's drive, to see if Chinggis had checked in.

Data began streaming immediately, and the results were beautiful. While transmission times were occasionally sporadic depending on the area, the collected GPS coordinates clearly illustrated Chinggis's daily movements with a precision of every 1-3 minutes during the day. With the fine-scale data, I was able to begin calculating habitat utilization probability densities and locate clear examples of thermal-soaring behavior (see figure, page 7). These results are barely the tip of the iceberg in terms of what can be discovered in the coming years. After several months of traveling along Mongolia's river systems, the moment of truth arrived. One day, Chinggis left his current foraging territory, ironically beside the Chinggis Khan International Airport, and flew south, never looking back. From there, a

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Where Do Wedgies Dare?

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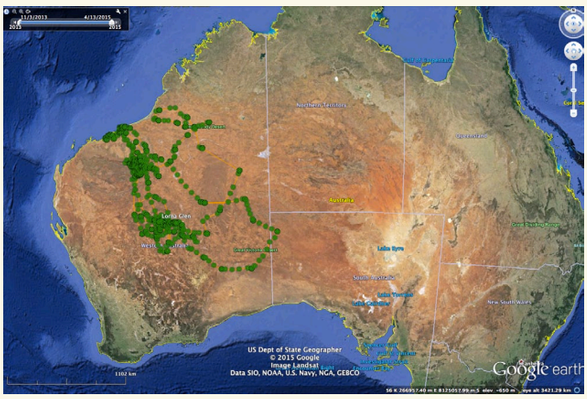

Figure 3. Kuyurnpa's dispersal journey from April 2014 – April 2015.

flew in an outward spiral, crossing two large deserts in the northern part of WA. On 15 April she saw the ocean, roosting on the coast 760 km (as the crow flies, not the eagle!) north of her nest. In the 12 months that followed, Kuyurnpa covered about 20% of WA's 2.5 million km^2 area, and clocked up over 15,000 km on her 'odometer' (Figure 3). In February 2015 she 'settled' in a 'territory' of about 1000 km^2; it will be very interesting to see if she remains here to breed later this year.

More information, including a trailer to the documentary film about this Wedge-tailed Eagle tracking project, can be found here:

http://www.wedge-tailedeagletracking.blogspot.com.au

MTI Employee Spotlight

We have decided to feature one of our employees in each of our future issues, so you can meet the team behind the transmitters. This issue, we are introducing you to one of our veteran members:

Kevin Drum – Lead Production Engineer

Q: How long have you been here?

A: Since before I could drive. I started here when I was 15. Russell and I would come here in the summers to help out Paul, and I never really left.

Q: Did you ever think about doing something else?

A: I spent a lot of time in college switching between a bunch of different subjects, but none of them stuck, even after completing my degree. The whole time I was working here, and I liked it because I got to work with my hands.

Q: What is the best part about working at MTI?

A: Perpetual innovation. I enjoy building things, and that's a lot of what I get to do. I also like photography, so I get to take most of the production shots that are used for our promotional items. Even though the refurbished transmitters are a lot of work, they're interesting to see when they come back after they've been out in the field. They give me a better idea of how what we make is being used and making a difference.

Q: What is a fond memory you have from your time here?

A: Every once in a while, we have International Days. Everyone makes a recipe relating to a different country and we get to sample each of the dishes. Those days are delicious!

When he's not working, Kevin enjoys rock climbing and hiking with his wife. MTI is proud to have Kevin as a team member. Next time you open a box of new or refurbished transmitters, know that Kevin's commitment to excellence ensures that your devices are always functioning properly.

Where in the World Are Pallas's Fish Eagles?

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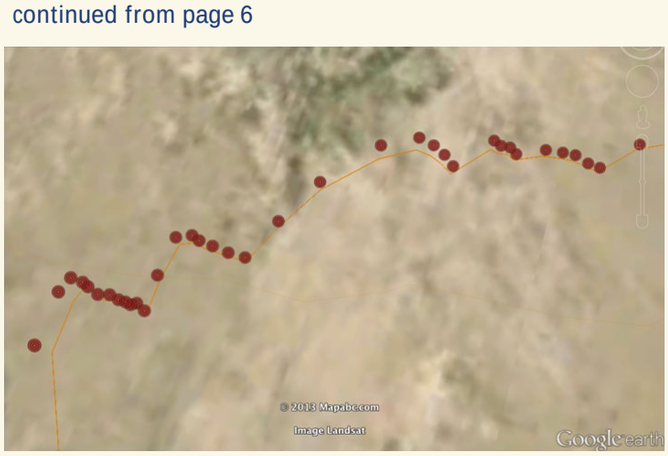

Flight strategies illustrated by Chinggis. Spacing between points is indicative of thermal soaring.

migration of over 2000 km began, and a painting became a sculpture. Chinggis represents the first success of a project that began in 2011 and continues to this day. Since then, two additional Pallas's Fish Eagles with 70g GSM/GPS transmitters were released in India, and five more will be deployed in Mongolia the summer of 2015 thanks to the generous support of Microwave Telemetry, Inc. with the Christiane Howey Rising Scholar Award. The overall goal of the project is to provide baseline information that will shed light on Pallas's Fish Eagle ecology by isolating risks to the population and creating effective conservation measures in the future. If the current gap in knowledge remains, there is a distinct possibility that, one day, Mongolia's Pallas's Fish Eagle population will fly away and never return.

Best Wishes to Bill

After 17 years at the helm, Bill Woodward changes course and steps down as CEO and President of CLS America

By Lucy Howey

Bill Woodward's tenure at CLS America has coincided with much change and growth for the American subsidiary of CLS, a French-owned company. The 17 years Bill has been with CLS have been vital in constructing the Argos system enjoyed by thousands of users today. This system now includes: two-way communication (or, "Argos 3"), a real-time ground antenna network, and Argos modules that are currently on 6 satellites; all these advancements are essential to continued development in wildlife tracking. Upon hearing the news that Bill would be stepping down as CEO, we stopped to reminisce about our shared experiences over the years. After all, he has witnessed MTI's evolution into the company we are today, as we are located a mere 30 miles from CLS America headquarters. We have shared many dinners, holiday parties and, of course, meetings. When I sat down for lunch with Bill a couple weeks ago, I asked him of which of his accomplishments at CLS he was particularly proud. Two of his fondest undertakings also happen to be some of the most recent. Bill addressed Congress in 2014 to campaign for federal funding for the Argos system and plans to do so again this year. Not new to government work, Bill worked for NOAA as an electrical engineer for 30 years before starting at a rapidly growing CLS and at the United States Naval Oceanographic Office's National Oceanographic Instrumentation Center before that. In a time when funding opportunities for science and technology are constantly shifting, Bill has been an ardent representative for Argos within the community and to the government. Additionally, he spearheaded the successful User Conference at the National Aquarium in Baltimore late last year. But perhaps his description of what he is taking away from his time at CLS is more overarching:"Being an active participant in this amazing global coalition that has contributed so much to environmental science on our planet has been the most rewarding part of my career." It is a sentiment that all who use the Argos system share and find reassurance in knowing that the manufacturers, users, and those who manage the system are working in tandem. When I asked Bill what he plans to do next, his answer was simple: he'd love to find time to play his 12-string guitar, a passion of his since his college days in Boston. But most importantly, and true to his tireless dedication to science, he's actively pursuing the next chapter of his career. We, at MTI, are glad to hear Bill is planning to stay in the satellite communication field because he is a key player we've come to know and respect over the years. Very best of luck, Bill!

2015 Christiane Howey Rising Scholar Award

In addition to granting many educational awards for transmitters over the years, Christiane Howey quietly found ways to help young researchers and start-up programs. To honor Chris, and to carry on in her spirit of generosity, we are proud to offer an annual award in Chris's name: the Christiane Howey Rising Scholar Award.

Proposals for the 2015 Christiane Howey Rising Scholar Award will be accepted before October 31, 2015 and reviewed prior to the publication of the Winter 2015 issue of *Tracker News*. The award recipient will be notified in late December to schedule a production slot. Proposals will be judged by an internal committee. Applicants are encouraged to include an educational component in their research, but this is not required. This award is intended to provide researchers who are starting out their careers with the means to get their projects off the ground. It will provide the recipient with five transmitters of his/her choice. Proposals should include an outline of the project indicating the scope and expected outcome. Please include a timeline and let us know what model of transmitter you are interested in using. We are looking for a maximum of 5 pages. The recipient will be responsible for any Argos (or GSM) data distribution costs and any duties/taxes. For more information, please email support@microwavetelemetry.com or visit our website.

Bits & Pieces

Remember to proofread your production forms before submitting them.

Remember to take lots of photos during transmitter deployment.

Please send us your 2015 publications so that we can add them to our online reference library.

Keep an eye out for our new website. Coming soon!