

Tracker News

MICROWAVE TELEMETRY, INC.



Saving Life with Science

Dear Customers and Friends,

As 2017 draws to a close, it has been inspiring to learn of the progress of last year's winners of the Christiane Howey Rising Scholar Award. I'm sure that we will be revealing some of their findings here in future issues.

In these unbelievable times of institutionalized disbelief of scientific findings and diminished funding of research, it has been heartening to receive a record number of proposals for studies of fish and birds ranging from the whale shark to the diminutive Aleutian tern, from obviously enthusiastic young researchers. The quality of these proposals has made it very difficult to choose a winner, so we have again decided to make two awards this year. Congratulations to you both.

In this issue, the work of Phil Whitfield and Alan Fielding together with their many collaborators revealed the illegal persecution of the golden eagles in Scotland, after having to overcome many challenges to their interpretation of the data. The official report on this study¹ must be among the most extensive analyses of data collected from PTTs that we have seen, a truly amazing report detailing the validation of the collected data.

The work of Lukas Müller on great hammerhead sharks and that of Jayson Ibanez, telling the story of a single Philippine eagle, are equally impressive. Thanks to all for sharing your studies with us.

We continue to work on several new devices that we hope to bring to you over the next year. Our new website should become live in the new year with up-to-date information on all of our products.

Thank you for allowing us to provide equipment to you for your research projects; we understand how critical it is for you to have faith in the reliability of your equipment.

May 2018 be a good year for you,
From all of us at MTI – HAPPY NEW YEAR

Sincerely,
Paul and the Team at MTI

¹ Whitfield, D.P. & Fielding, A.H. (2017) Analyses of the fates of satellite tracked golden eagles in Scotland. Scottish Natural Heritage Commissioned Report No 982.



Photo by FES

A young tagged golden eagle "captured" by a trail camera at a bait site during its dispersal phase. Read more on Page 2.

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Satellite Tagging of Golden Eagles in Scotland: Revealing Illegal Persecution

Phil Whitfield is Managing Director of Natural Research Ltd, an independent research charity involved in several projects on raptors. Alan Fielding is a long-time collaborator with an extensive research history. Our long-term golden eagle research invariably and gratefully involves many additional collaborators.

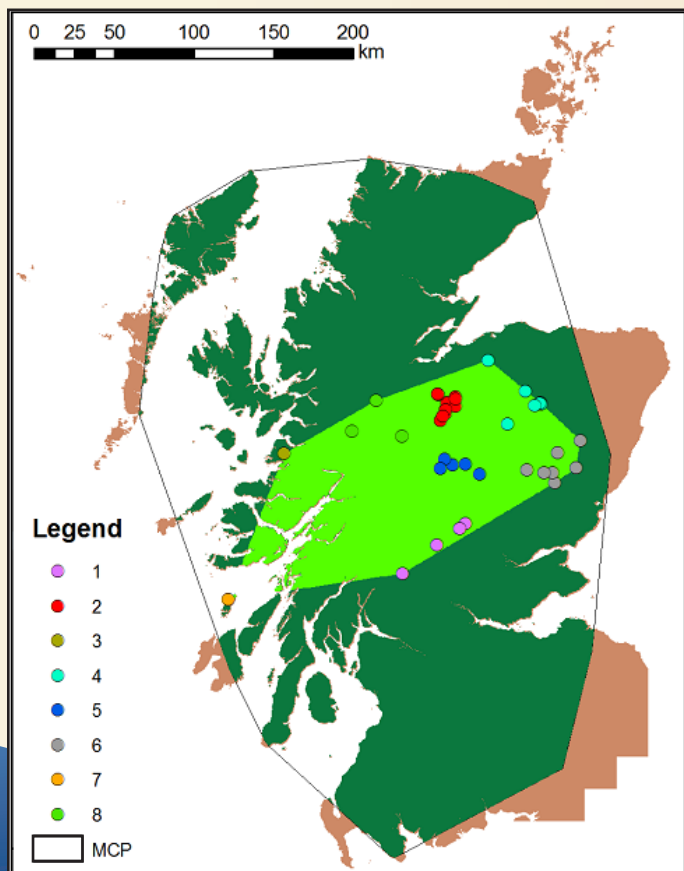


As documented by the late Jeff Watson's seminal monograph, the golden eagle (*Aquila chrysaetos*) has an extensive Holarctic distribution and has consequently received much research attention. In Scotland, Jeff's home, we and others have been satellite tagging golden eagles since 2004 to examine and illuminate many aspects of their behavior and ecology that could not be discovered by other methods. Up to mid-January 2017, 131 young eagles had been tagged as large nestlings to study their post-fledging dependency period, subsequent dispersal from natal territories and, hopefully, their settlement on a breeding territory.

Whilst researching these objectives, it was noticed that several tagged young eagles 'disappeared' suddenly in apparently concentrated locations. All transmissions had stopped, without prior warning signs of failure from tag engineering data, and searches at the last known locations failed to find any sign of birds or tags. This was unlike the end fate of several other tags where a dropped tag or a dead bird had been recovered on a search around the final fix location. Or, from transmitted data, showing a tag had likely reached its inherent lifespan or had prematurely stopped transmitting because of, notably, a terminal irrecoverable drain on the battery.

The suspicion of human intervention led the Scottish Government to commission analyses to investigate the final locations of these 'stop-no-malfunction' tag fates. The commission addressed a basic question: is there a pattern of suspicious activity surrounding the 'disappearance' of many satellite-tagged golden eagles?

Subsidiary analyses were required to investigate this question thoroughly. This involved examining over half a million location records and other data provided from over 13 years' tagging data. We made several independent checks on the tags' engineering data to ensure we had not inappropriately classified tags as having 'failed' unexpectedly because some transmitted sign of imminent failure was missed. This included forwarding engineering data to MTI experts. This was a 'blind' test since our own separate conclusions were not forwarded to MTI. All our checks agreed.



As well as many suspicious tag fates, a handful of illegally killed tagged birds were recovered. This bird had been poisoned. Photo by Ewan Weston

A simple cluster analysis revealed that final fixes from most 'stop-no-malfunction' tags were usually clustered. More sophisticated distance-based analyses randomly sampled 'virtual final fixes' and showed that 'suspicious' (mostly 'stop-no-malfunction') end points were closely associated at several spatial scales and significantly different to random expectations. Moreover, and importantly, repeating this analysis with the final fixes of 'non-suspicious' tags (e.g., natural deaths, dropped tags, failed tags, still-transmitting) found no difference from random expectations.

Hence, there was a pattern of suspicious activity surrounding the 'disappearance' of many satellite-tagged golden eagles. Alarming, such suspicious disappearances amounted to almost a third of our tagged birds (41 of 131). Such disappearances when equated to fatalities have a demonstrably marked detrimental

effect on golden eagle population dynamics and in reducing the capacity for a population to be in favourable conservation status.

We found no evidence that tagging caused physical, behavioural, or demographic problems. Notably, the survival of tagged birds with non-suspicious fates was high compared to other studies. Inherent tag reliability was also extremely high and no different to other researchers' findings. Our most frequently used tags were MTI GPS PTT models which had a similarly low malfunction rate to a large sample from the USA – only 2%. Our 'stop-no-malfunction' rate was 25 times higher than the USA sample. 'Suspicious' tags on Scottish golden eagles unusually, also suddenly, ceased transmitting well before their expected manufactured longevity.

Several lines of evidence indicated that many tagged young eagles were killed, and their tags and bodies removed and destroyed before discovery. The killing of tagged birds was concentrated in four parts of the Highlands of Scotland. The final locations of the suspicious final fixes were also significantly associated with the locations of confirmed illegal persecution records from an independent dataset.

Wind farms were examined as a source of potential lethality through collision with turbine blades. No dead golden eagles or any suspicious final fixes were near a wind farm, and only a tiny proportion of location records were near a wind farm; young golden eagles appeared to actively avoid wind farms.

The analytical finger for those largely responsible for illegally killing the tagged golden eagles pointed to people managing some moors for driven shooting of red grouse (*Lagopus lagopus scoticus*). Golden eagles eat red grouse and can disrupt the shooting of these gamebirds which are 'driven' by beaters across moors to be shot in large numbers by clients stationed in set locations or 'butts'. This is a practice unique to Scotland and England and requires intensive management of large tracts of uplands to generate the required high densities of grouse. Previous research highlighted managers of grouse moors to be persecutors of golden eagles in Scotland on a wider scale. The golden eagle continues to be absent from the grouse moors of England.

Left: Cluster map of the final locations of the potentially and known suspicious tag fates. The dark green area shows the minimum convex polygon (MCP) enclosing all tag location records and the light green polygon shows the MCP enclosing the final locations of the potentially and known suspicious tag fates.

Studying Great Hammerheads in a Single Breath of Air

Lukas Müller is an experienced freediver and photographer, and is currently finishing his master's degree in Marine Resources Management at Wageningen University. Twenty years after his first shark encounter, he hopes to contribute to the protection of sharks by studying their movement ecology and translating his findings into engaging media. His work with great hammerhead sharks is in collaboration with The Watermen Project and Bimini Biological Field Station.



The dorsal fin slices through the water like the blade of a sword. I can feel her power as she passes by me. The blue eyes at the end of her hammer-shaped head are staring at me with confident curiosity. With ease, she circles around me, just close enough for her to see, hear, smell, and feel what I am. This great hammerhead shark is none other than Nemesis, 3.5 meters long and one of the most magnificent creatures I have ever seen underwater. She is named after the Greek goddess who dealt out retribution to those who succumb to arrogance.



The 12-foot female great hammerhead shark named "Nemesis," wearing an X-Tag next to the dorsal fin. Photo © William Winram

Four months earlier, I am sitting at my desk, glaring at the bright screen of my computer. The dozens of tables that I am reading through are squintingly small and full of technical specifications. I am tasked with finding the right pop-up satellite tag for my upcoming field work in The Bahamas. As a master's student in Marine Resources Management, animal telemetry is not a core focus of my studies. It seems like every new piece of information about satellite tags raises even more questions: What tag size? What battery life? What sampling rate? What deployment period? What anchor method? What deployment method? Eventually, I was introduced to Microwave Telemetry, and shortly thereafter these questions seemed rather straightforward. The goal of my master's project is to investigate the habitat use of highly mobile great hammerheads in South Bimini, The Bahamas.



Photo © Lukas Müller

Dr. Tristan Guttridge and William Winram preparing the non-invasive freedive tagging equipment.

This charismatic shark species is classified as endangered by the IUCN. It's an extremely agile predator capable of incredible burst speed swimming. Recently, it has been discovered that these sharks can migrate long distances of over 1500 km. Due to their naturally low abundance and elusive nature, we know very little about the movement ecology of great hammerhead sharks. In addition to their expertise in satellite telemetry, Lucy Howey and Lance Jordan of MTI have invaluable experience in the field and have previously worked on great hammerhead studies. They understand the challenges this specific species poses in not only placing the tags successfully, but ensuring that they stay on and transmit the data reliably. Thus, I could not have asked for a better partnership for this project!

With half a dozen X-Tags and confidence in my equipment, I am departing the plane at South Bimini, together with William Winram, founder of The Watermen Project which funds and supports the project. We are greeted by Dr. Tristan Guttridge, lab director and chief scientist of the renowned Bimini Sharklab. After a short evening briefing and some final

transmission tests on the tags, the field work finally begins the next morning. As we leave the protected mangrove-filled inlet on the back of the renowned field station, the air smells like pure excitement. For me, this is the second time working in Bimini, so while the setting feels familiar, freediving with great hammerhead sharks always wakes up every cell in one's body.

Suit? Check. Mask, fins, snorkel? Check. Tagging gun? Check. X-Tag ready to go? Check. As we enter the water, we are immediately surrounded by two dozen nurse

sharks trying to suck pieces of dead fish out of the baitbox.

During these two particular weeks, our approach is to use freediving and a tagging gun to place the X-Tags on free-swimming great hammerheads. As sharks are wild animals roaming the sea, it's their decision to show up or not show up. However, the stunningly clear waters and sandy bottoms of Bimini's waters are welcoming us for warm-up dives, and make time fly by fast.

Shortly before I take my last breath for another freedive I have a weird inkling that something big is about to approach us. As I descend to the bottom, I can see a few rays quickly rushing towards the protection of a metal structure close to us. This is a clear sign of a large shark arriving at the scene. Kneeling on the sandy bottom, a giant shadow appears in the distant blue. The massive hammerhead is swimming straight towards me. Fittingly, Nemesis humbles every one of us as she explores the dive site. The contrast between her dark coloration and the white sands below her leaves us mesmerized and fully grounded in the moment. After capturing photo identification, William descends from the surface. With the tagging gun extending from his arm, he is trying to anticipate Nemesis' next move. That's when she boldly turns, in an effort to figure out what the object is that is swimming towards her. That provides an excellent opportunity. The gun triggers. The shaft flies through the water. Seconds later, Nemesis is swimming away with an X-Tag perfectly placed in the thick muscle tissue below the dorsal fin.

In the following days, we went on to place 5 more satellite tags. Luckily for us, Nemesis blessed us with her presence for many hours. Together with satellite tags placed by the Bimini Sharklab in previous years, we will hopefully enhance our understanding of great hammerheads, in particular their habitat use. Our goal is that sharks like Nemesis will roam the waters of The Bahamas and the USA and humble many more future generations.

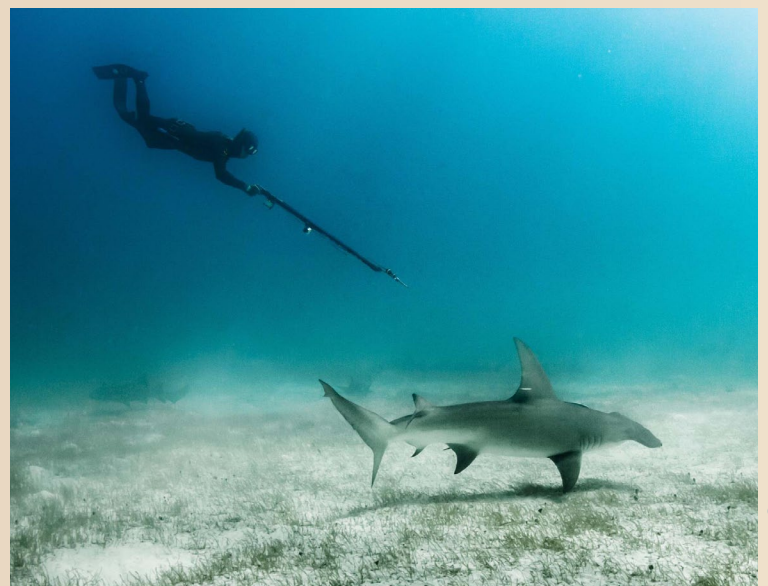


Photo © Lukas Müller

William Winram freediving towards a great hammerhead shark to place an X-Tag.

A Philippine Eagle's Tale

Jayson C. Ibanez is the Director for Research and Conservation of the Philippine Eagle Foundation. Apart from Mindanao Island, his team also works in three other islands where the eagles they study are only found — namely Luzon, Leyte, and Samar. No more than 400 breeding pairs are estimated for the Philippine eagle, and more than half of its global population is believed to be on Mindanao Island.



The IUCN “critically endangered” Philippine eagle (*Pithecophaga jefferyi*) population has declined due to two reasons — massive destruction of the Philippine tropical forests, and the hunting and shooting of its kind. Because every individual top forest predator is precious, the Philippine Eagle Foundation (PEF), an NGO helping to save the country’s national bird from extinction, rescues injured eagles and restores their health. Birds that recover are then released back to protected forests where they can potentially breed and add offspring to the already very small wild population.

On Mindanao Island, Southern Philippines, one female eaglet survived shooting and maltreatment by her human captor. Six years after her rehabilitation and release, she reached sexual maturity, paired with a mate, and bred.

This article is her story.

On March 20, 2008, a group of recreational bikers stumbled upon a young eagle held captive in a remote village. PEF and government staff verified the bikers’ report and found an injured, one-year-old bird inside the captor’s hut.

The eaglet was in bad shape. Its feathers were dirty and worn. She was thin and severely dehydrated. The

poor bird had bruises and swelling on her upper right chest, which x-rays showed was due to a broken collar bone. There was also an airgun pellet lodged inside the bird’s right ankle. The bird was given medical care at the Philippine Eagle Center (PEC) in Davao City. She was named “Kalabugao” after the village she was rescued from.

Kalabugao survived and recovered, and was very restless in captivity. On October 29, 2009, she was released inside Mt. Kitanglad Natural Park, a protected area about 50 km away from her capture site. Nearly three years old by then, Kalabugao was an immature eagle, driven to disperse by instinct. We tagged her with an LC4 GPS PTT along with a leg band, and monitored her movement remotely and from the ground.

Not surprisingly, Kalabugao left her hack site barely three months after release. She was very wary of people. But instead of exploring the forest interiors, she began a slow, perilous journey outside of the protected area, along a narrow riverine forest across a sea of farmlands. The riparian forests carpeted deep and very steep ravines, and apparently hosted lowland-dwelling wildlife, including eagle prey.

February 15, 2010 marked the first time the team monitoring Kalabugao witnessed a successful hunt. The prey was a Samar cobra, *Naja samarensis*. The next day, she hunted a young Philippine long-tailed macaque, *Macaca fascicularis ssp. philippensis*. The forest corridor, it seems, offered food and safe passage.

At some point, the GPS transmitter was battered by Kalabugao and malfunctioned. On May 4, 2010, she was re-trapped and her LC4 transmitter replaced. To keep her safe, we released her again inside the protected area. But in no time, she was back trailing the forest corridor. We let her be, but closely followed her.

In two months, she reached the forest edge of Mt. Tago, a mountain range northeast of Mt. Kitanglad, and completed a gradual journey over human landscapes along the 40-km riparian (riverine) forests network of Mangima, Kulaman, and Tagaloan Rivers. This is the first scientific evidence



First photograph of eagle Kalabugao in the wild after she was seen killing a Samar cobra. Photo courtesy of PEF

of an immature Philippine eagle using forest corridors between two mountains as a dispersal route.

Unfortunately, the feisty Kalabugao battered her transmitter anew, and on January 10, 2011, the unit was found on the forest floor of Mt. Tago. The backpack harness was ripped off, and the unit had bite marks from Kalabugao’s formidable beak. Thereafter, we lost track of her.

Four years later, just before Christmas 2014, a farmer snared her. She had killed and ate a domestic pig, and the farmer

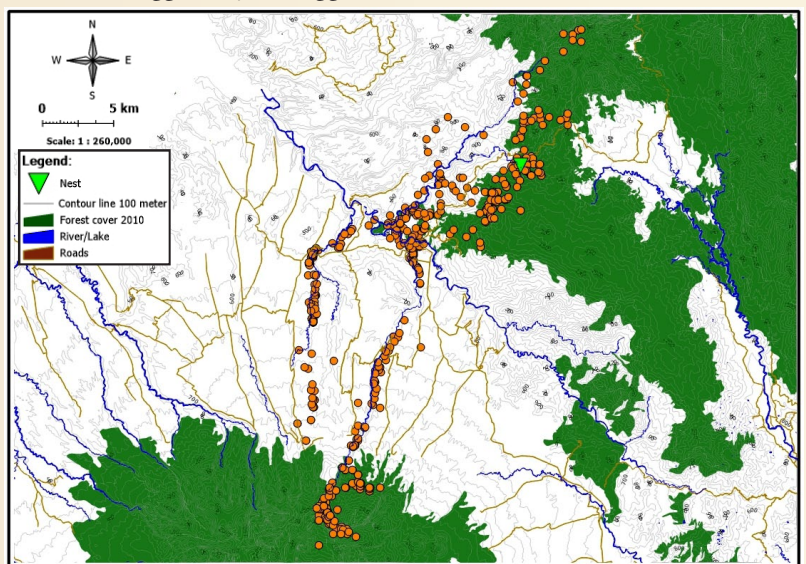
had retaliated by trapping her. But when the farmer saw her leg band, he realized that the bird was being monitored and reported the incident to authorities.

Luckily, Kalabugao was healthy and had no injuries. On March 31, 2015, she was released back to Mt. Tago after a brief rehabilitation at the PEC. She had a “brood patch,” suggesting that she is of breeding age. She was given a new GPS tag, and videographers from Cornell Lab of Ornithology covered her release. Her footage will soon appear in an international film about Philippine eagles (see <http://birdofpreymovie.com/>).

Tracking Kalabugao was made more exciting by the fact that she would nest soon. Two months after release, our field crew saw her with a wild eagle, and the couple showed successful pairing. By October 2016, GPS fixes from her transmitter clustered in one place, which continued for the next two months. In January 2017, our field crew saw Kalabugao sitting on her egg. Sadly, the egg failed to hatch.



Philippine eagle Kalabugao inside her captor’s hut in 2008.



Movement of eagle Kalabugao inferred from 531 GPS fixes (brown dots) from three LC4 GPS PTTs.

But although her first nesting attempt failed, Kalabugao’s story represents the first case of a rehabilitated juvenile Philippine eagle surviving to sexual maturity and breeding.

We continue to monitor Kalabugao’s movement through her GPS transmitter and data suggest she has re-nested. Hopefully, this year’s attempt will be successful.

Kalabugao’s case represents another triumphant pairing of human dedication and technology to help a “critically endangered” eagle survive the perils of living in a human-dominated world. Many animals are facing extinction. But Kalabugao’s story, and the care and concern of the people helping her adjust with a changing world, gives a reason for hope.

Photo courtesy of PEF

2017 Conference Sponsorships

In honor of last year's holiday season, we pledged to sponsor promising students to attend various movement ecology meetings around the world throughout 2017. Our goal was to support the careers of this next generation of biologists and connect them with the global scientific community. Here are some of their experiences:

David Villalobos Chaves, MS

Programa para la Conservación de los Murciélagos de Costa Rica
Theria. Asociación para el Estudio y la Conservación

I am a Costa Rican biologist interested in several aspects of mammalian biology. Attending the Biologging Symposium 6 (BLS6) was an incredible and enriching experience in my professional career; as it gave me the opportunity to get in touch with and learn from bright scientists working with diverse topics related to animal movement. Experience, new ideas, and new knowledge are what I bring back to Costa Rica. My goal is to use this motivation and knowledge to continue generating concise and robust information to elucidate intriguing questions of animals' behavior, as well as continuing to contribute to the understanding and resolution of conservation and management problems.



Gwendoline Traisnel, PhD Candidate

Nelson Mandela University, Port Elizabeth

I was eager to participate in the recent BLS6 in Konstanz, Germany so I could learn about new methods or technologies to apply to my research on the behavioural ecology of African penguins. My personal experience from BLS6 can be described in one word: intense. The venue and surroundings offered an idyllic environment to network and learn, and the presentations were of high quality. Personally, I gained much from my poster presentation. Not only did I receive several interesting inputs for future work, but I also shared my experience and could offer advice to other students attending the symposium. Additionally, I met another researcher who is also digging into foraging behaviour consistency of a seabird species. Discussions with this researcher resulted in a greater understanding about this specific subject and positively guided my thinking for future steps to take with my research. Overall, the symposium broadened my vision of biologging tools but also confirmed my wish for future work in this field, notably around information sharing between conspecifics and whether it focuses on decision making or communication.

Jayson Ibanez, PhD, Director for Research and Conservation of the PEF (featured on page 4), and 3 of his associates attended this year's Asian Raptor Research and Conservation Network Symposium (ARRCN) in the Philippines.

Jhonnell P. Villegas

Extension Unit Head, Compostela Valley State College

I would like to extend my deepest gratitude to MTI for giving me the opportunity to share knowledge, learn, and interact with fellow researchers during the ARRCN. As an early career researcher, the conference allowed me to share my research findings as well as validate them. Above all, I had the chance to be constructively corrected, hence helping me improve my research methodologies. I was also able to apply my learning to my current work as the Extension Unit Head of Compostela Valley State College. I feel very blessed and privileged to be a grantee of your scholarship.



Anthony, Jayson, and Jhonnell at the ARRCN

Anthony Pingoy, MS Student

Ateneo de Davao University

The ARRCN Conference 2017 was a golden opportunity for me as an aspiring raptor researcher. I am looking forward to proposing raptor research for my graduate thesis. This work will be about the preliminary scanning on the biology and ecological niche of Pinsker's Hawk-eagles on Mindanao Island. I am inspired by the dedication of our friends from Java, Indonesia who courageously explore the unknown about the *Nisaetus bartelsi*. I anticipate contributing scientific knowledge about the *Nisaetus pinskeri* and am ambitiously looking forward to present whatever I yield to ARRCN 2019. I love raptors and I love ARRCN. Thank you very much.



Rolly C. Urriza, MS Student

University of the Philippines, Los Baños, Laguna
National Museum of Natural History, Manila, Philippines

It is my first time attending the ARRCN and I am glad that our country was able to host the event, as it gave opportunities for locals (including me) to participate. My goal in attending the symposium was to find ideas that I may later apply to my research on investigating the threatened Philippine Eagle-owl and hopefully also to meet possible collaborators and local researchers on raptors. I am deeply grateful to the Philippine Eagle Foundation and MTI for providing this grant.

We understand that we are extremely fortunate to do everyday work that has a broad reach and the ability to elicit change and progress. To celebrate this holiday season, we are proudly donating to 3 organizations striving to make our planet a better place:

National Park Foundation, Every Kid in a Park

www.nationalparks.org/our-work/campaigns-initiatives/open-outdoors-kids/every-kid-park

Grassroots Crisis Intervention, Columbia, Maryland

www.grassrootscrisis.org

National Aquarium, Henry Hall Program, Baltimore, Maryland

aqua.org/learn/student-programs/henry-hall-program



2018

CHRISTIANE HOWEY RISING SCHOLAR AWARD

To honor the life of Christiane Howey, her incredible dedication to our company, and her passion for conservation and helping researchers worldwide, we created the Rising Scholar Award. This annual award is intended to foster career development in researchers starting on their professional journeys. This award has allowed previous recipients to make an impact with projects regarding conservation, anthropogenic implications, and community outreach.

Congratulations to our most recent awardees of the Christiane Howey Rising Scholar Award, **Alex Jahn** and **Jill Brooks**. Alex is a post-doctoral researcher at the Smithsonian Conservation Biology Institute, Migratory Bird Center in Washington, DC, and is planning to study the migrations of critically endangered Hooded Grebes in Patagonia with MTI Solar 9.5g PTTs. Jill is a PhD candidate at Carleton University in Ontario, Canada, and will be investigating post-release survivorship of great hammerhead sharks in Florida's recreational fisheries.



As always, the selection committee (over a dozen MTI employees weighed in on the decision) had a very difficult time choosing the winners; we had over twenty applications this year, and all had ambitious and worthy proposals. Both recipients demonstrated impressive written abilities in proposals that were well-planned and well-suited for satellite telemetry applications. Additionally, both winners included an educational outreach component and the potential for direct conservation implications, issues that were dear to Christiane.

Thank you to all of the applicants, and congratulations once again to our winners!



Interested in applying for the 2019 Rising Scholar Award?

See our upcoming Spring 2018 edition of Tracker News or visit www.microwavetelemetry.com for our call for proposals.

MTI Employee Spotlight

We have decided to feature one of our employees in each of our issues so that you can meet the team behind the transmitters. This issue, we introduce you to:

Hanh Le – Electronics Technician

Q: Hanh, you are approaching your 15-year anniversary here at MTI; what led you to your position here?

A: I taught physics for 8 years in my native Vietnam. When I moved to the United States, I worked for some large technology companies, where I learned to solder and first started working with circuit boards. When the last company I was working for shut down very suddenly, someone I knew told me that MTI was hiring. I came to the office for 3 interviews with Chris and Paul and was hired! It's quiet, clean, and has a good atmosphere, so I've been here ever since.

Q: Technology is quite different now compared to 15 years ago. How has your job changed in that time?

A: In the beginning, I made prototype circuit boards for new transmitters and put components on boards already in production by myself. I ran our first pick-and-place machine and placed some parts by hand; it meant I had to pay very close attention — there was no room for mistakes. I still have the same responsibilities, but our newest pick-and-place has really widened the possibilities and made the job easier. (The machine is also much quieter.)

Q: Do you have a favorite task?

A: Building solar arrays is my favorite part of my job because they're so small, delicate, and challenging. I like working with tiny details which is why sewing and embroidery are my hobbies.

Q: Do you have a favorite memory from your time here?

A: Oh, the holiday parties! I started working here a few days before the company party 15 years ago, so I didn't know most of the people there, but Chris always made everyone feel so welcome. Now I know everyone and look forward to them every year.



Bits & Pieces

*Our office
will be closed
25 December –
1 January. Happy
Holidays!*

*Reminder:
We cannot begin
building or refurbishing
your transmitters until
we have a completed
Production Form and
Purchase Order.*

*Please send us your
2017 publications
so that we can add
them to our online
Reference Library.*

*FUN FACT:
The first bird
tracked with our
original PTT was
a Bald Eagle!*

