

# Tracker News



## Microwave Telemetry, Inc.

### Myth or Fact...

Dear Customers and Friends,

One of the most well known myths in history, that the Earth was flat, was eventually dispelled by Aristotle in the third century BC. It took a long time through several periods of history for this myth to be busted. Fortunately for present day biologists, satellite telemetry has helped to rewrite our science textbooks at a much faster rate. As we celebrate 30 years of the Argos system this year, we note that data from the last three decades have separated myth from fact. Some popular myths propagated before satellite telemetry: all birds instinctively know how to migrate, individuals from the same area migrate to the same place, and waterfowl are only found in wetlands.

We are delighted to feature four myth busting stories in this newsletter. Contrary to popular belief, we discover that ducks are found in the desert; that some juveniles don't automatically know in which direction to set off for their migration; that not all birds from the same population migrate to the same place. We also "dismiss dogma" with recent discoveries from tracking dogfish.

We especially wish to thank: Stephen Murphy for his fascinating article on English Hen Harriers, Kyle Spragens and Eric Palm for sharing their unusual findings on the Ruddy Shelduck, Roy Dennis for his article on Osprey and Honey Buzzards' amazing migrations from Scotland, and James Sulikowski for sharing the journey of his tagged Spiny Dogfish with us. We also thank Amanda Higgs for her amusing story of the recovery of her Atlantic sturgeon's Pop-up Tag.

Last, but not least, we thank Tannis Thorlakson for her update on her studies. We are always encouraged when we hear that our contribution, however small it is, could have had an impact on students' interest in science and satellite telemetry.

We thank you for the opportunity to serve you, our customers, over the last eighteen years and look forward to many more years together. We wish you happiness, health and joy in 2010.

Sincerely,  
Paul and the staff at MTI



Photo by Roy Dennis

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Above:  
Morven and Talisman – both now tagged – the male  
winters in Guinea Bissau, the female in Mauritania.

# Surprising Dispersal Ecology of Hen Harriers in England

Stephen Murphy is an ornithologist with Natural England and a PhD student at John Moores University in Liverpool, England. [stephen.murphy@naturalengland.org.uk](mailto:stephen.murphy@naturalengland.org.uk)



The hen harrier *Circus cyaneus* is a vulnerable and declining breeding species in England. A highly productive, but isolated population in the Bowland Fells, Lancashire, England is not consolidating, or providing immigrants to an ailing and almost extinct subpopulation spread out across northern England.

In February 2002, I started my dream job with the Hen Harrier Recovery Project for Natural England. The focus of my research was to find and monitor nests, assess productivity and then examine post-natal dispersal strategies using radio telemetry and wing tags. It soon became apparent that we were attempting to study a quite amazing, ultra-mobile, unpredictable and opportunistic raptor. The methods at our disposal were fraught with researcher/observer biases and the collected data, based on radio tracking and wing tag observations, although very valuable, were mainly from areas we could access using vehicles and from coastal areas where most people watch birds in the UK outside of the spring and summer months.



Photo by Les Steele

The intrepid male 73584 age 10 months.

The dispersal ecology of the hen harrier in England had not been previously studied, primarily due to its rarity, wide-ranging partial migratory traits and high mobility. After 5 years of intensive fieldwork, we concluded that productivity was high enough to maintain a viable and expanding population, but this was not happening. It was therefore critical to increase the knowledge by undertaking detailed examination of the post breeding, first winter and return to breeding ground periods as this largely unknown part of their lives is where the key limits to population growth will exist. To compound the naturally occurring limiting factors, the species is persecuted by gamekeepers as it is a predator of gamebirds including red grouse *Lagopus lagopus*, “Blue Riband” quarry species in the UK.

A more accurate and continuous representation of hen harrier dispersal was required. It would be possible to locate the areas where the birds frequent at different times of the year and then focus our resources in these areas. The radio tracking data was hinting that the modal dispersal direction was to the east and northeast of the study site; this was not expected, as this was a continuation of the upland landscape in which they breed.

In 2007, I read about 9.5g MTI PTTs that were helping to provide unprecedented knowledge of the dispersal ecology of hobby *Falco subbuteo* and woodcock *Scolopax rusticola*. Funding was made available for 15 PTT 100's. I fitted these in June and July 2007 using modified Teflon backpack harnesses to point-of-fledge juveniles. This was repeated in 2008 and 2009.

Much of the older and some of the more recent literature infer that hen harriers breed in the uplands and then disperse (usually south) to lower altitudes

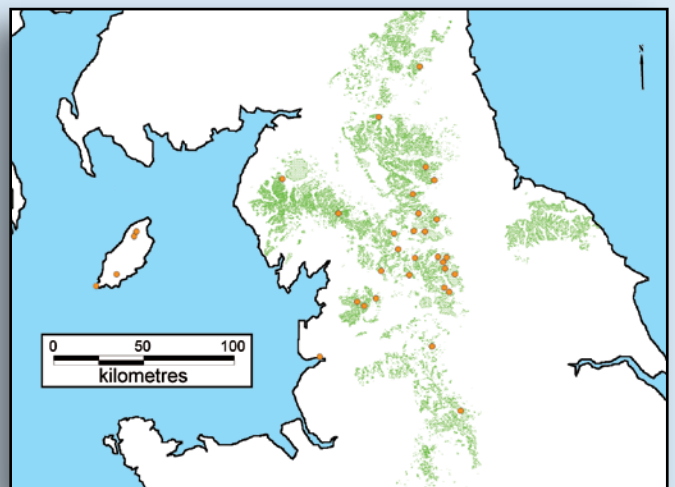
and coastal areas outside of the breeding season. The development of lightweight PTTs has allowed this to be tested and provided valuable data on the birds' utilisation of the landscape.

It is now apparent that the English Hen Harriers have complex dispersal strategies; there are notable differences between sexes, age groups and individuals. Approximately 86% of the year's juveniles of both sexes disperse away from their natal areas, utilising the Pennine mountain range as dispersal corridors to access areas used for game management, particularly driven red grouse shooting.

Some individuals, usually females, become quite sedentary staying in their upland natal areas; others, especially males, are more mobile. For example, male 73584 covered at least 14,420 km<sup>2</sup> between June 2008 and May 2009, tracked 186 km to the south and 140 km to the north of his natal area, and utilised land from sea level to 2500 ft. In contrast female 73587 displayed typical dispersal behaviour and covered only approximately 760 km<sup>2</sup> during the same period, not located beyond 40 km of her natal area and always above 800 ft asl. During the non breeding season males used an average of 15 km<sup>2</sup> per day to forage, considerably more than females (5.5 km<sup>2</sup>).

It is now evident that certain areas in the English uplands regularly attract hen harriers. Interestingly, birds from different provenances have visited these discrete locations almost synchronously. Some siblings may wander many kilometres away from each other during dispersal and then reconvene at these important areas to the north and east of the study site. These are predominantly upland habitats, previously unknown to the conservation organisations as important dispersal corridors and winter foraging areas for hen harriers.

Birds fitted with transmitters in 2007 are still providing data in 2009. Birds have been tracked back to their natal areas and become successful parents, allowing me the opportunity to fit satellite tags to offspring of tagged birds to test for sociality during dispersal. We now know considerably more about hen harrier's spatio-temporal use of the landscape but there is still much to learn. The next stage is to find out exactly what is causing the extraordinarily high first winter mortality rates. Satellite data has shown that the majority of hen harriers from England breed and winter in the uplands in inland locations and helped to identify the locations of approximately 12 communal roosts and 10 important areas for hen harriers in the uplands of northern England.

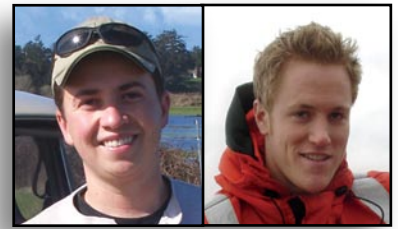


During the non-breeding season birds generally avoid the coasts and stay faithful to the uplands (green). Orange spots show the harmonic mean locations of study birds between August and February 2007 – 2009.



# Desert Ducks: Unusual Movements of Ruddy Shelduck in China

Kyle Spragens, a wildlife biologist, and Eric Palm, a current MSc candidate at Simon Fraser University, have worked with Dr. John Takekawa on migration studies of Eurasian waterfowl in relation to Avian Influenza.



For years, our office has used satellite telemetry to map migration routes of waterfowl species all over the world. This research has increased our understanding of migration chronology, habitat use and connectivity between sites. In addition to identifying important wintering and breeding areas, we have identified countless stopover sites that birds use along the way. As we describe below, some of these sites are located in the most unexpected places.

With its brilliant rust-orange plumage, the Ruddy Shelduck (*Tadorna ferruginea*) is a visually striking duck found throughout Eurasia. Of all the waterfowl species we have marked, Ruddy Shelducks are perhaps the biggest success story. In 2007 and 2008, our team marked 26 shelducks at Qinghai Lake, China

of vegetation. However, unlike other deserts, the region contains over 100 permanent spring-fed lakes located among the tallest dunes. These lakes range from freshwater to hypersaline, and provide oases for several species of vegetation and wildlife. The little existing literature on Badain Jaran's lakes documents the presence of brine shrimp, a known Ruddy Shelduck food item.



Ruddy Shelduck in flight with 30g solar GPS PTT.

Photo by Nyambayar Batbayar

Our two marked shelducks not only stopped at these isolated lakes, but stayed for extended periods of time. Fall 2009 marked the second year that female 82117 used lakes within the Badain Jaran, having spent two months there in 2008. During its southward migration from Mongolia, male 74810 stayed for nearly a month.



Aerial photo of Lake Badain Jaran.

Photo by Z. Dong et al. Geomorphology, 2004

with 30g solar GPS PTTs to help understand their annual movements within the Central Asian Flyway. A majority of these transmitters lasted well over a year, yielding complete migration paths between breeding and wintering areas. During their fall migrations, most marked shelducks followed a similar route south to known wintering regions in India, Bangladesh, Myanmar, and the Tibetan plateau. However, two shelducks (74810 and 82117) stopped approximately 500 kilometers northeast of Qinghai Lake in a desert known for having the tallest sand dunes on Earth! After assuming the worst, we learned that the shelducks were alive, and had stopped at an extremely isolated yet reliable water source.

Located in the Inner Mongolia Province of northern China, the Badain Jaran Desert covers approximately 50,000 km<sup>2</sup>. The desert is home to the largest stationary sand dunes in the world, reaching nearly 500 meters in height, and is almost completely devoid

All told, the two birds have used ten different lakes in the southeast portion of this fascinating desert. Because the lakes represent a reliable water source in the extremely arid region between Central Mongolia and Qinghai Lake, they may be a stopover site not only for shelduck, but many other waterbird species during fall migration. These findings are another example of how satellite telemetry often reveals fascinating information about habitat use during migration that would otherwise be overlooked.

For more information about this collaborative project between the U.S. Geological Survey (Western Ecological Research Center, Patuxent Wildlife Research Center, and Alaska Science Center), United Nations-FAO, the Chinese Academy of Sciences, and Qinghai Lakes National Nature Reserve, please visit: <http://www.werc.usgs.gov/sattrack/index.html>

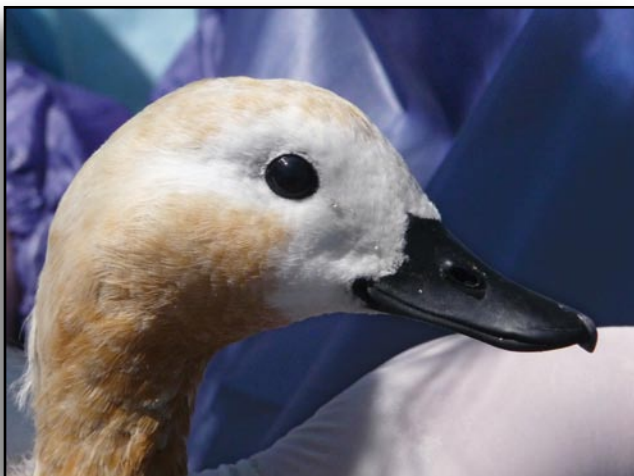
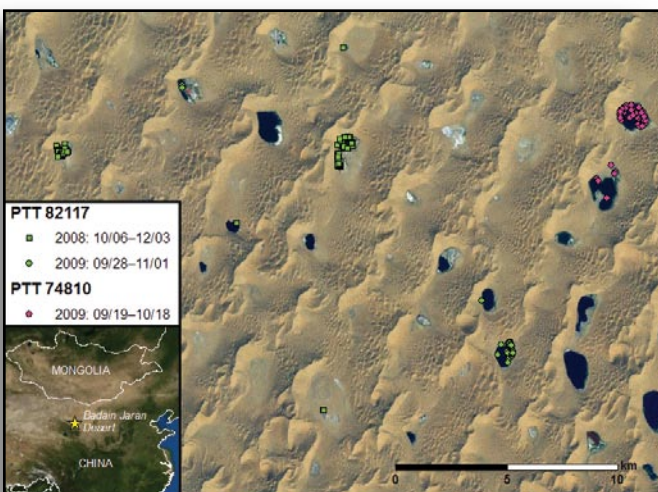


Photo by Kyle Spragens

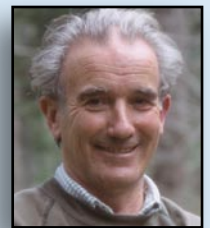
Female Ruddy Shelduck (82117) marked at Qinghai Lake, China in 2008.



Badain Jaran Desert lakes used by two Ruddy Shelduck marked at Qinghai Lake, China. Dates of stopover for each bird are denoted in legend.



# Could They Really Fly So Far Over the Atlantic Ocean?



Roy Dennis, Director of the Highland Foundation for Wildlife, has worked as a field ornithologist in Scotland since 1959, principally on the conservation and reintroduction of rare species. Other projects include tracking a Eurasian woodcock to its breeding site in northern Russia, and a Eurasian curlew to Finland. [www.roydennis.org](http://www.roydennis.org)

The osprey is one of the biggest conservation success stories in the British Isles, with the population increasing from just one pair in the 1950s to more than 230 pairs in 2009. While celebrating this increase, we recognised that, when compared with other populations, it was slower than we might have expected from the number of chicks raised every year. What was going on? There were all sorts of guesses. Were young birds shot on migration? Were they failing to find enough fish, or getting lost in the Sahara Desert?



Photo by Roy Dennis

Nimrod – male osprey caught for satellite tagging.

It was only with the advent of suitable transmitters, in 1999, that we were able to solve the mystery of the missing ospreys.

Following satellite-tagged birds as they set off on their autumn migration, we soon saw that experienced adults, when leaving Scotland, flew south through the British Isles and crossed the English Channel into mainland Europe, while more young birds than expected headed west of south and into great danger. One of the earliest chicks we tagged, the first to demonstrate the dangers of long-distance flights over oceans, flew to Ireland to find itself faced with a 1000 km direct flight over the Atlantic to northern Spain. Another chick ran into a low pressure system south of the British Isles, was carried out over the Atlantic and finally blown ashore in Portugal after an epic 60 hour, 3000 km non-stop flight over the sea (see map). And these chicks had only been flying for six weeks. The first made it safely to Africa, while the other stayed in Portugal and was found nesting in Scotland three years later. A few



Osprey SSK's dramatic 3000 km 60 hour migration autumn 2002.

ringed ospreys had rested on fishing boats but we never realised that big ocean journeys were more common than we thought, and that so many must be lost at sea.

I wondered if the same autumn migration hazards faced another long-distance migrant – the honey buzzard – which, like the osprey, has recolonised Scotland after being exterminated in the raptor killing era of the nineteenth century. Its population in Scotland is very

small, and in the last thirty years has increased extremely slowly, despite the fact that pairs regularly rear two young. We supposed that they were getting lost on migration but as the honey buzzard is known for its use of very short sea crossings from Europe to Africa, something didn't quite add up. Starting in 2003, we tagged a small number, including one adult in 2004. The tagging of father and son revealed a dramatic difference in their migration patterns. The adult male migrated down the eastern side of the UK to make the short sea crossing to France and continue safely to Gabon. His chick, meanwhile, headed off down the western side of the UK and was swept out by easterly winds into the open Atlantic. Flying the wrong side of the Azores, he was blown south-east towards Madeira but landed in the sea well short of the island and died. It had been a 108 hour, 6000 km non-stop journey over the ocean, an incredible but hopeless flight. But we now know they regularly cross the Bay of Biscay.



Male honey buzzard's track (yellow) from Scotland to Gabon; tragic migration of juvenile - 6000 km in 108 hours before dying in the North Atlantic.

These two species have, we think, recolonised Scotland principally from Scandinavian migrants, which, on their way north in the spring, were drifted across the North Sea by bad weather and stayed to breed in Scotland. Experienced adults have learnt to use short crossings of the English Channel to France, but the young, using just their inherent genetic migratory information, tend to head west of south, as they would have done from Sweden to Spain and on to West Africa. Some, of course, are lucky and get back on track with the help of westerly winds, while others take the right path to begin with. Many, sadly, do not.

In 2007, we started to use the new GPS Argos transmitters from Microwave Telemetry, and are now really refining our knowledge of raptor migration. They allow us to understand the use and importance of stopover and wintering sites, crucial to the year-round conservation of ospreys, while flight and altitude data give us an extraordinary insight into bird behaviour. An osprey named Logie migrated over Wales at her normal altitude of about 150 metres, but climbed to seven times that height to cross a big estuary swarming with gulls. A male named Nimrod gave a thirty hour master class in migration, flying non-stop through France and Spain, including an all-night flight by full moon, heading out into the Atlantic to avoid the Atlas Mountains and coming ashore in southern Morocco after an amazing 2300 km. Last spring, on his way north over the Bay of Biscay, he climbed to 1500 metres to pick up strong tail winds which pushed him north at close to 100 km/hour.

The new satellite transmitters and Google Earth mapping allows us to map virtual migrations on our website ([www.roydennis.org](http://www.roydennis.org)), so that people can nearly fly with them and fully appreciate the wonders of migration and the hazards they face. It's sad to watch the hopeless migrations of some young heading out into the ocean; you wish you could just say 'Left a bit!' to get them back on track. But the more we know, the better we can address the many threats to their future survival.

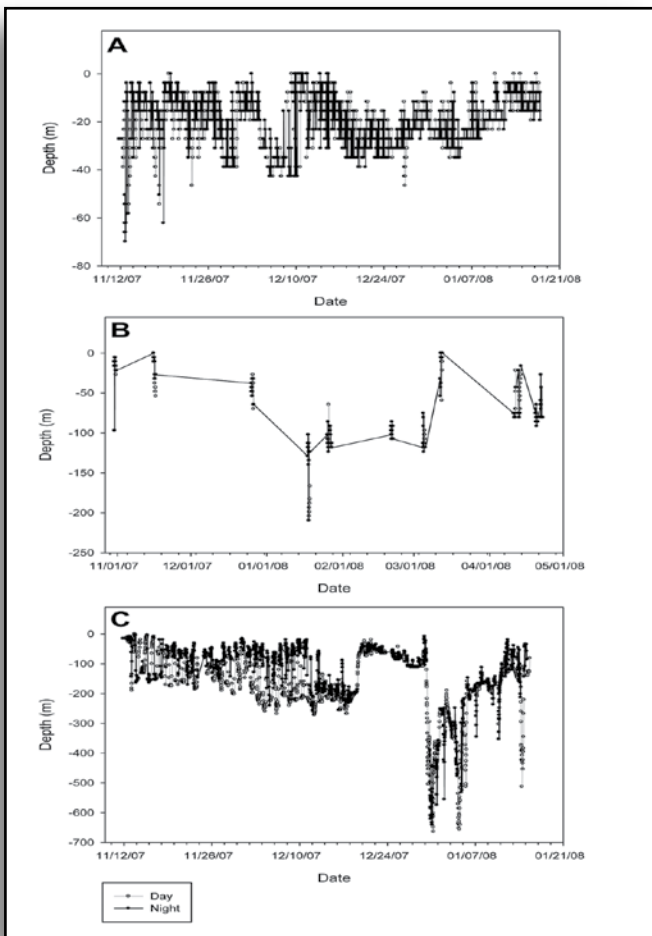


# Dismissing Dogma: The Surprising Movement Patterns of Spiny Dogfish, In the North Atlantic

Dr. James Sulikowski is an Assistant Professor at the University of New England. His research focuses on biology and physiology of fish, specifically, aspects of fisheries biology such as reproduction, maturity, age and growth and how these parameters influence the composition, movements, and spatial/temporal distribution of elasmobranchs.



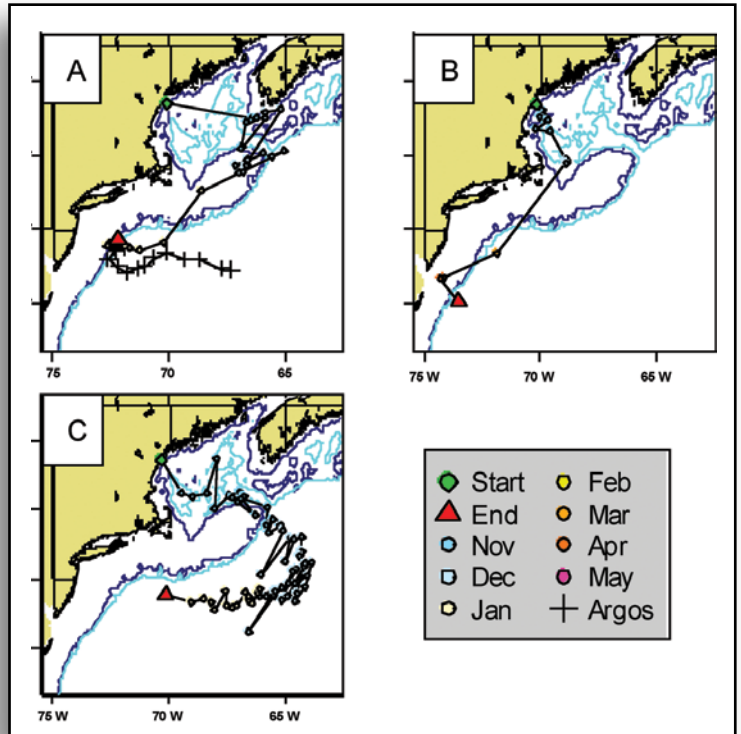
The spiny dogfish, *Squalus acanthias*, is a relatively small species of shark (< 130 cm TL) distributed in the Northwest Atlantic from Greenland to Florida. Despite this wide distribution, information regarding the coordinated movement patterns and habitat preferences are lacking. The limited knowledge that does exist for this shark only suggests that a seasonal, inshore north-south movement occurs. Thus, the caveats surrounding the ecology of this shark make it an ideal candidate for not only examining the efficacy of using the PTT-100 Archival Pop-up X-Tags in tracking movements of small elasmobranchs, but also aiding in the responsible management of this species.



Differential time at depth patterns for spiny dogfish 78183 (panel A), 78184 (panel B) and 78185 (panel C). Spiny dogfish 78183 displayed a strong preference for depths less than 50 meters, while fish 78184 and 78185 displayed preferences of 80 to 130 m and over 200 m, respectively. Depth data analyzed by Walter Bubley; University of New Hampshire, Department of Molecular, Cellular and Biomedical Sciences, Kendall Hall, 129 Main Street, Durham, NH 03824, USA.

Research at the University of New England (funded by the Northeast Consortium) has begun to elucidate the activity patterns of this shark. In 2007, three X-Tags (one on October 31st and two on November 12th) were placed on mature (average fork length 82 cm) female dogfish 6 km off the coast of Portland, Maine USA. Two of the tags collected information on dogfish for over two months while the third recorded data for almost six months. Horizontal movement patterns were determined with the use of a state space Kalman filter that included SST and bathymetry data in the model. Preliminary results from these tags have provided compelling evidence that this shark species is much more vertically and horizontally mobile than once thought. After tagging, all three sharks appeared to move quickly offshore. Of particular interest are the movements of two specimens, as filtered data suggests that they ventured over 500 km east of the tagging location before heading south into

waters off the coast of New Jersey, USA. Diel depth patterns also yielded fascinating information in that each shark appeared to be equally active during both the day and night. Another interesting component of the depth data is the broad



Final estimated tracks of spiny dogfish 78183 (panel A), 78184 (panel B) and 78185 (panel C) tagged off the coast of Northern New England with Archival Pop-up X-Tags in November 2007. These specimens were at liberty for 89, 189 and 65 days respectively. Geolocation data filtered by Ben Galuardi; Large Pelagics Research Lab, 177 Spaulding Hall, University of New Hampshire, Durham, NH 03824, USA.

differences in depth profiles exhibited by each shark over the course of their estimated horizontal movement patterns. While each shark moved in the same general horizontal pattern, the depths each occupied during this movement varied considerably from as little as 2 m to almost 700 m below the sea surface. The amount of time spent at the shallower depths is intriguing as this data is in contrast to traditional paradigms which considers this species to be more benthic in nature. The preliminary findings generated from the X-Tags have generated excitement and funding (from NOAA Fisheries) for 20 additional X-Tags to be placed on spiny dogfish in hopes of better understanding these and other surprising behavioral anomalies that may exist.



James Sulikowski wishing his fish good luck!

Photo by Angela Cica

## Battery Assist Option

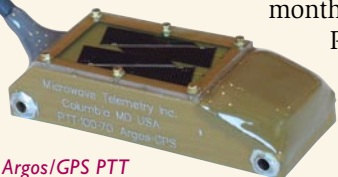
Biologists worldwide are collecting huge amounts of valuable location data from our solar GPS PTTs. However, those tracking birds that remain far north year-round have asked if there is anything we can do to allow them to continue to gather data throughout the winter, when there is little sunlight. To address this need we are now offering a Battery Assist option for our 70g solar Argos/GPS PTT.

Battery Assist is the addition of a backup battery that can power the PTT when there is not enough sunlight to keep the solar rechargeable battery charged. When the rechargeable battery's voltage falls below the threshold necessary for GPS fix acquisition, the backup battery will provide the power necessary to take the fix. Battery Assist provides a back-up power supply for all the PTT functions: GPS fix acquisition, data transmission, and Ground

Track transmission. Alternatively, we can dedicate the back-up battery for Mortality Ground Track alone, insuring enough power to transmit the Ground Track signal for several months even if the

PTT's solar array is no longer exposed to light.

70g solar Argos/GPS PTT with Battery Assist option.



## Solar Assist Option

Our battery powered GPS PTTs, the LC4s, provide biologists with accurate location data from birds which cannot be tracked with solar powered PTTs because of the birds' behavior or habitat. We are frequently asked if there is anything we can do to extend the operational life of the LC4 PTT, or get more data from it. In answer to this request we've created a Solar Assist option for our



105g LC4 PTT with Solar Assist option.

105g LC4 PTT. The addition of a solar array to this PTT will allow it to run on solar power when its solar array is exposed to direct sunlight, thus conserving battery power and extending the operational life of the PTT. With Solar Assist a 105g LC4 could potentially run on solar power during the summer, and save its battery for the dark winter months.

*The choice of these options will add weight to the PTT. Please contact us for details.*

## Do You Remember?

*It has long been a goal of Microwave Telemetry, Inc. to promote satellite telemetry experience and interest for school children by sponsoring school projects. We hope to instill in the students a love of science and engagement in conservation.*

*In our issue of spring 2002, we donated transmitters to Liberty Bell High School to start a satellite tracking project. We often wonder what impact this experience had on the students.*

*We were delighted to hear from Tannis Thorlakson who participated in this project and has since graduated from Liberty Bell H.S. She was kind enough to give us the following update.*



**In** my third year at Harvard College I am completely engrossed in my concentration in Environmental Science and Public Policy. I'm taking classes in climate change and its projected impacts on biodiversity, the chemical cycles of ecosystem processes and the politics behind the environmental movement. But as I stop to reflect on

what initially sparked my passion and shaped my interest for environmental work, I immediately jump to my involvement with the Chelan Ridge Raptor Migration Project.

I was first exposed to the Chelan Ridge project on a seventh grade field trip, where I met my now long-term mentor Kent Woodruff. From our initial discussions blossomed an internship that I continued to work on for the following five years. During my tenure with the Chelan Ridge Project, I learned to identify, capture, band, and measure hawks as they migrated south. I had the opportunity to help release a number of birds equipped with

a satellite tracking system, and spent one winter tracking the movement of a Northern Harrier as she migrated south.

The experience I gained from my internship solidified my continued interest in the environment. Although my focus is no longer on raptor migration, I still turn to my time with the wildlife biologists on Chelan Ridge as a source of motivation for my studies. Through my experiences I've come to appreciate the beautiful diversity and importance of our environment and hope to do my part in ensuring its continued preservation.



Tannis releasing a juvenile male northern goshawk.

Photo by Kent Woodruff



## Happy Birthday Argos!

On October 7th, in Paris, dignitaries and scientists gathered to celebrate 30 years of the Argos System. It was fascinating to see how the system has improved over the years and how far animal tracking has come. We all look forward to further advancements to the system and to working closely with CLS. Thank you, CLS, for including our company in this celebration.

Paul



Paul giving his presentation.

Photo courtesy of CNES French Space Agency



Dr. Adrian Aebischer of the Musee d'histoire naturelle de Fribourg (right) and his assistant, attaching a 22g solar Argos/GPS PTT to a Red Kite.

Photo by Michel Guigue, CLS



Paul and Dr. Hiroyoshi Higuchi, Professor at the University of Tokyo, Japan.

Photo by Michel Guigue, CLS



Christophe Vassal, Président of CLS, Yannick D'Escatha, Président of the French Space Agency CNES, and Claudie Haigneré, Président of the Cité des Sciences et de l'Industrie, former Minister of Science and first French woman in the International Space Station.

Photo courtesy of CNES French Space Agency



Paul holding the Red Kite.

Photo by Michel Guigue, CLS

## Bits & Pieces

A gentle reminder: our refurbishment policy calls for evaluation of the transmitter prior to any commitment to the work. Obsolete devices are not refurbishable.

Due to a steep increase in bank fees worldwide, regretfully, we have no choice but to add a fee for incoming international bank transfers to our invoices.

Our new facility is now online allowing us to increase production, cut lead time and accept orders for our newest PTT—the 5g solar PTT-100.

Argos will begin issuing 6 digit IDs. These will require an updated version of our GPS parser. Please contact us for download instructions.



## No Officer, It's Not a Bomb. (Or, A Day in the Life of the Adult Atlantic Sturgeon Project in the Hudson River Estuary.)

Amanda Higgs, NYS Department of Environmental Conservation, Hudson River Estuary Program

After a long day in the field this past July, I got a message from the Ocean City Maryland Bomb Squad. The gentleman said that they had recovered our satellite tag. Fearing he might destroy the tag and lose all the valuable data, I quickly called back and left a message explaining our project and what the tag was.

The next day I called Deputy Fire Marshal/Bomb Technician Cliff Christello and he explained what had happened. The prior day, someone swimming in the surf at Ocean City ran into an object in the water. The swimmer brought the object to the lifeguard on the shore. The lifeguard, unfamiliar with the object, immediately set up a perimeter around it and notified the bomb squad of possible military ordnance on the beach.

The Incident Action Report said the technicians "examined the object and found it to be a black cylinder with a round bulge at one end and what appeared to be a flexible rubber antenna attached to the bulge. It was apparent the object was in the ocean for some time due to the sea life that had attached itself to the outside of the object." Fortunately they were able to determine that the object was some sort of transmitter that did not pose a threat to the public.



Amanda Higgs, fisheries biologist, holding a male adult Atlantic sturgeon caught in the Hudson River Estuary in June of 2009.

After removing the debris attached to the object, the technicians located a phone number on the outside. They called the number and confirmed that the object belonged to the New York State Department of Environmental Conservation. By the time I talked

to them the next morning, they knew most of the particulars about the project from our website. The bomb squad graciously mailed the tag to Microwave Telemetry to extract all the data.

We deployed 20 MTI tags from May to July in 2007 and 2008 on adult Atlantic sturgeon. Four of these tags were deployed on adult females to learn more about where they go during their non-spawning years. Research has shown that adult female Atlantic sturgeon do not return to the Hudson River every



Photo by NYSDEC

This male fish, measuring 1.9 m and weighing 47.2 kg, was tagged in June of 2008 with a MTI tag. The tag stayed attached to the fish until the programmed pop off date of 12/15/2008.

year to spawn. The recovered tag came from a female sturgeon, 2.38 m in length, weighing 99 kg and tagged on June 11, 2008 near the spawning grounds in the Hudson River. The tag popped off on schedule and began to transmit just like all the other tags, but seemed to be floating off the coast of Maryland.

Our project was a three year project that was extended into a fourth year because we still had tags to deploy. There were two portions of the project: to learn more about their habitat use and congregation areas in the Hudson River Estuary, and to learn more about their migration patterns and congregation areas along the Atlantic coast. We were interested in the particulars of the sturgeon's journey, i.e., where do they go, how close to shore, and at what depths. Satellite telemetry is bringing us closer to our goal.

Project was funded by New York State Dept. of Environmental Conservation Hudson River Estuary Program, U.S. Fish and Wildlife Service, Atlantic States Marine Fisheries Commission, National Fish and Wildlife Foundation, Wildlife Conservation Society, and Pew Institute for Ocean Science.

### Recently Published Papers

Aarestrup, K. *et al.*, 2009. Oceanic spawning migration of the European Eel. *Science*, 325: 1660.

Chittenden *et al.*, 2009. A critical review of Pacific salmon marine research relating to climate. *ICES Journal of Marine Science*, 66: 2195-2204.

Oppel, S. and A. Powell. 2008. Assigning King eiders to wintering regions in the Bering Sea using stable isotopes of feathers and claws. *Marine Ecology Progress Series*, 373: 149-156.

Petersen, M. 2009. Multiple spring migration strategies in a population of Pacific common eiders. *The Condor*, 111 (1), 59-70.

Gill, R. *et al.*, 2009. Extreme endurance flights by landbirds crossing the Pacific Ocean: ecological corridor rather than barrier? *Proceedings of the Royal Society B* 276, 447-457.