SPRING 09 Volume 10, Issue 1

Tracker News

Microwave Telemetry, Inc.

A New Era in Satellite Telemetry: More Than Just Migration

Dear Customers and Friends,

New Yorkers watched with bated breath as Captain Sullenberger safely brought down his US Airways Airbus A320 into the Hudson River on a clear January afternoon. It was a miracle that all 155 passengers and crew on board survived. The video of this water landing, watched around the world, brought home the possible danger of an encounter between bird and jet aircraft. We thought that our readers would like to read about a current study on this very subject. We thank Brian Washburn for his article on his study of bird-strike risks of migrating and breeding Ospreys.

The last few years have seen the use of satellite telemetry in studies we never thought possible when we started in 1991; researchers then were just trying to find long range migration paths. We are delighted to spotlight in this newsletter various other ways that satellite telemetry is now being used: to study possible placement of wind farms, the day to day management of relocated California condors and last but not least, the fine scale habitat use of sage-grouse. We wish to thank Larry Griffin, Mike Wallace and Bryan Bedrosian, respectively, for their excellent articles.

At the recent MTI Bird & Fish Tracking Conference in March, Eric Hoffmayer's presentation included an interesting suggestion that two of his tagged silky sharks had been predated. We would like to thank him for sharing this with our readers.

Our conference in March was deemed a success by all who attended. We thank all of the attendees, especially all presenters; the talks were very informative and interesting. Attendees were given a glimpse of the next generation of PTTs and fish tags as we introduced future products now in development. Abstracts of the presentations have now been posted on our website.

We thank our customers for the opportunity to work closely with them; it is a privilege that we appreciate. We hope to be part of their professional journey for many years to come. Have a safe and productive field season.

Sincerely,
Paul and the staff at MTI

Photo by Mike Wallace/San Diego Zoo

Above:
Juvenile condor in flight with 50g Patagial GPS transmitter.

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Using Satellite Telemetry to Reduce Risk of Osprey Collisions with Military Aircraft

Brian Washburn, U.S. Department of Agriculture, Animal Plant Health Inspection Service, Wildlife Services, National Wildlife Research Center in Sandusky, Ohio

A true conservation success story, Osprey (*Pandion haliaetus*) populations in North America have staged a dramatic recovery during the past few decades. Expanding Osprey populations are the direct result of the banning of harmful pesticides (most notably DDT), conservation efforts that provided suitable nesting structures, and the implementation of successful translocation and hacking programs.

However, with conservation success comes new challenges. Osprey exhibit a remarkable tolerance to humans and adapt well to urban environments. Breeding populations of Osprey adjacent to military airbases and civil airports increase the risk of collisions between Osprey and aircraft. As North American Osprey migrate to their wintering areas in central and South America, they traverse numerous military airspace use areas. The risks to human safety and damage to aircraft associated with Osprey-aircraft collisions are a serious flight safety concern, highlighting the need for research and management efforts designed to mitigate such risk.

Supported by the U.S. Department of Defense's Legacy Natural Resources Management Program, a collaborative multi-agency research effort was initiated in 2006. The goal of this research project is to incorporate satellite telemetry technologies and geo-spatial referencing to quantify bird-strike risk of migrating and breeding Osprey from the Mid-Atlantic Chesapeake Bay Region.

The study area is located in the Back River of the Chesapeake Bay adjacent to Langley Air Force Base (AFB) in Virginia. During the 2006 and 2007 nesting seasons, we captured 13 adult Osprey (5 males and 8 females) using carpet-noose traps at their nests. Amongst this group, we successfully captured and satellite-tagged three breeding pairs.

Each Osprey was fitted with unique color and U.S. Fish and Wildlife Service leg bands, tagged with a 30g Argos/GPS PTT-100, and released at the nest site. We attached the transmitters in a backpack configuration using a Teflon tape harness. The satellite transmitters were programmed to collect location and movement information 10 times each day (at 2 hour intervals).

Using the fine-scale GPS location data, we are gaining new insights into Osprey breeding ecology. This information will provide us with a better understanding of the movements, activity patterns, and habitat use of male and female adult Osprey during their breeding season. We have learned that adult Osprey are active relatively equally during daylight hours.

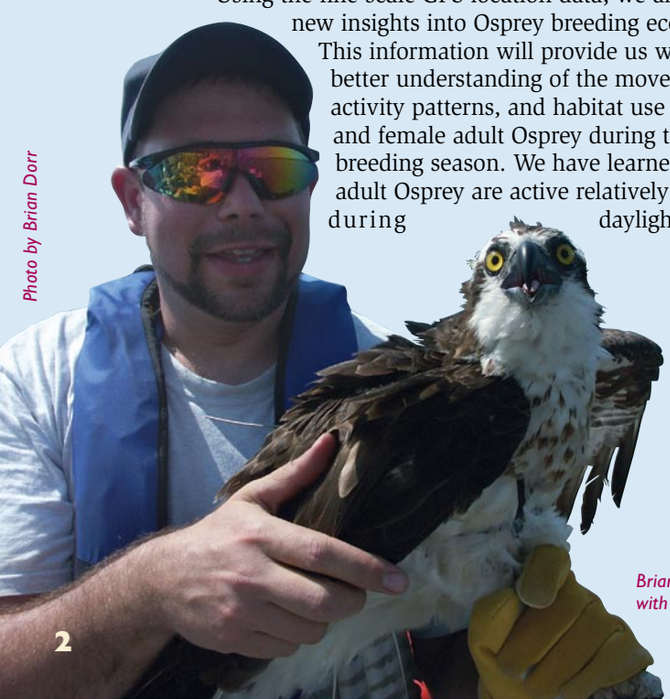


Photo by Brian Dorr

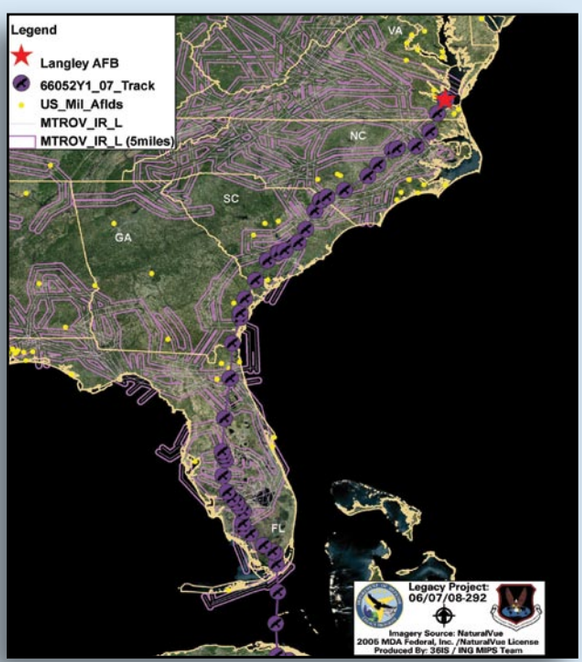
Brian Washburn with tagged Osprey.

We found that female Osprey that breed in Virginia began their fall migrations in August; males typically began migrating in September. Breeding pairs of Osprey do not migrate or winter together. Osprey migrated during daylight hours and roosted at night. Seven Osprey completed their fall migration to their wintering grounds in the Caribbean or in South America, traveling an average distance of 4,600 km. We lost contact with six Osprey during their fall migration; the fate of these birds is unknown. All 13 Osprey utilized similar migration routes along the eastern coast of the U.S. and traveled from Florida to Cuba. With a better understanding of Osprey migration patterns and stopover habitats, conservation and management efforts for this species can be enhanced.

From breeding season data, we are constructing spatial and temporal models of how breeding Osprey utilize areas within their nesting territories. These models will be analyzed to determine whether predictive relationships exist among Osprey movement patterns, the occurrence of Ospreys on Langley AFB, and the critical airspaces used by military aircraft during flight operations. In addition, movement and activity patterns of breeding Osprey will be used to identify locations where nesting Osprey present the greatest risk to aircraft operations.

Spatial and temporal patterns of Osprey migration, including specific migratory routes, will be mapped and summarized using information provided by the GPS PTTs. Flight characteristics and geographic routes of migrating Osprey will be compared with airfields and military flight operation areas along the Atlantic seaboard to determine periods of increased risk of Osprey military aircraft collisions. Ultimately, using information provided by this research effort, the timing and routing of military training flights might be scheduled to reduce the risk of Osprey aircraft collisions.

Only through science-based research can we identify specific hazards and evaluate the risk that breeding and migrating Osprey pose to military flight operations. This research also has applications for measuring the effectiveness of current Osprey-conflict management practices and for developing long-term management strategies that would allow Osprey and military aircraft to co-exist in a safer flying environment.



Fall migration route of M52, an adult male Osprey, from Langley Air Force Base, Virginia in 2007. He passed by several military airfields (yellow dots) and through numerous military training routes (lines and 5 mile buffers).

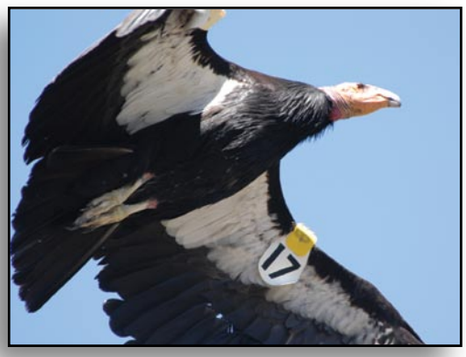
Re-establishing the California Condor

Mike Wallace, San Diego Zoo, San Diego, California

The California condor has never been an abundant species. There were likely only a few thousand existing during the time of the Lewis and Clark expedition when the birds ranged from British Columbia to northern Baja California. They have declined in population since then due to shooting, lead poisoning from spent bullets in the hunter game animals that they feed on, and from habitat loss. By the 1960s only about 60 birds were restricted to a small horseshoe shaped range 50 miles north of Los Angeles. In early 1980 permission was granted to trap some of the remaining condors and attach ID wing tags that incorporated radio transmitters that I had developed and tested on Andean condors in Peru, South America. The technology helped us to discover that there were about 22 condors remaining in the wild. Realizing how fast the population was declining, permission was granted to capture the last birds and place them into the protective custody of the Los Angles and San Diego zoos. With only 27 birds in the program in 1987, captive breeding was successful and by 1992 the first progeny were released to the wild in Hopper Canyon in southern California. Since then, releases have been successful in the Grand Canyon in Arizona, Big Sur and Pinnacles National Monument in California, and in Northern Baja California, Mexico. Today we have over 320 condors in the world with more than 175 in the wild. Tracking with radio telemetry has been an integral part of the management of our released condors but it is only effective with line of sight to the birds making management quite labor intensive. During the mid 1990s I collaborated with Paul Howey to develop a wing mounted satellite transmitter using our captive California condors and Andean condors I was helping to release in Argentina with Luis Jacome of the Buenos Aires Zoo. These prototypes worked well and we began using them in the California condor program in the U.S. The Argos based satellite transmitter has been immensely helpful in studies of large bird migration and other large scale movement patterns but because of limited accuracy and resolution at the kilometer scale, they were quite costly for the limited value in managing the released condors in the wild. The addition of GPS capability over the last decade brought location accuracy to within a few meters. The improved technology has helped the recovery and study of California condors in several ways. In day to day management of the condors we rely on the accuracy of the GPS transmitters to predict where the best feeding site should be in relation to where the birds roosted and fed last. As young birds take their first tentative flights from the release zone they occasionally cannot find their way back to the safety of the release site and the other condors 20 or 200 km away. We need to locate their exact position and sometimes mount a rescue. The transmitter speed feature allows us to deduce important activities and their locations such as nighttime roosting (when the speed is "0" after dark or a possible carcass discovery and feeding site when the "0" speed is mid-day. As the condors range along the Sierras toward the U.S. border and other more distant places we can track their exact progress as they gradually expand their range. We are currently relying on the transmitters to help us locate their breeding caves as they mature and begin the reproductive phase of the project. By correlating wind speed and direction from our 6 weather stations positioned at key sites within the study area with the movements of the tagged birds we are in the process of studying just how the condors make decisions on how high, fast and how far to fly throughout the day. It would not be inaccurate to say that without the GPS satellite transmitter our goal to re-establish the California condor in the wild would be impossible to accomplish.

A GPS satellite transmitter on the wing of a California condor.

Photo by Mike Wallace/San Diego Zoo

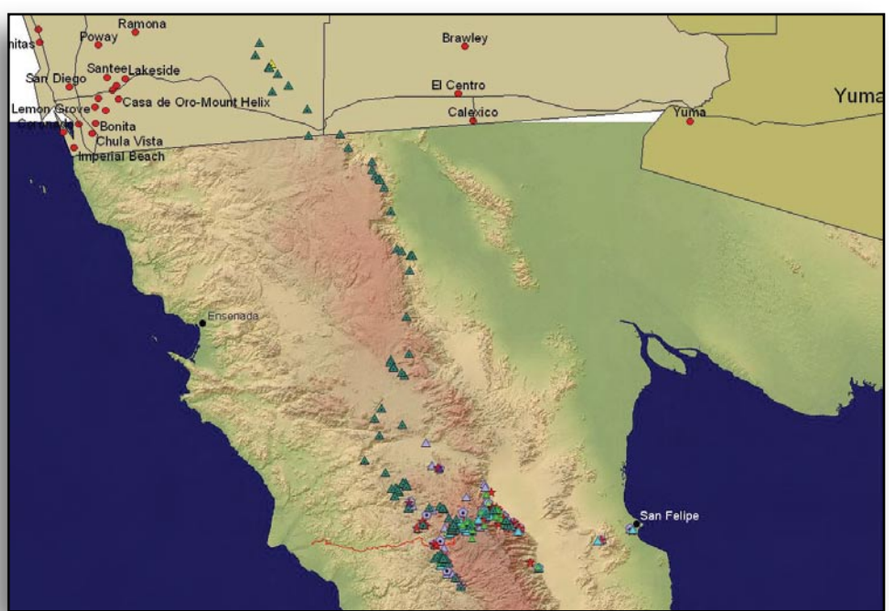


Under side of GPS transmitter on condor in flight.

Photo by Mike Wallace/San Diego Zoo

A GPS patagial (wing) transmitter on the wing of a juvenile condor.

Photo by Mike Wallace/San Diego Zoo



One day's flight by condor 321 of over 145 miles from the release site in the south to the Anza-Borrego Desert in San Diego County, California to the north. She returned a day later.

Tracking Fine-scale Movements and Behavior of Greater Sage-Grouse with Solar GPS PTTs

Bryan Bedrosian, Avian Program Coordinator, Craighead Beringia South, Kelly, WY 83011

Greater Sage-Grouse (*Centrocercus urophasianus*) populations across western North America have been declining for many years, leading to multiple ESA listing attempts. Several potential causes for decline have been infrastructure development, overgrazing and long-term drought conditions, among others. Sage-grouse have not only been declining in areas of high human use, such as the oil and gas fields of Wyoming and Montana, but also in pristine, protected areas such as Grand Teton National Park in northwestern Wyoming. The sage-grouse located in and around Grand Teton National Park make up a small (ca. 500 individuals), non-migratory, isolated, high-altitude population that is at high risk of extirpation in the near future. Several studies, including ours at Craighead Beringia South, have tried to obtain critical habitat use, landscape dynamics, predator-prey interactions, breeding ecology and survival of this population using

Photo by Bryan Bedrosian

Adult female Greater Sage-Grouse released with a 30g solar GPS/PTT.

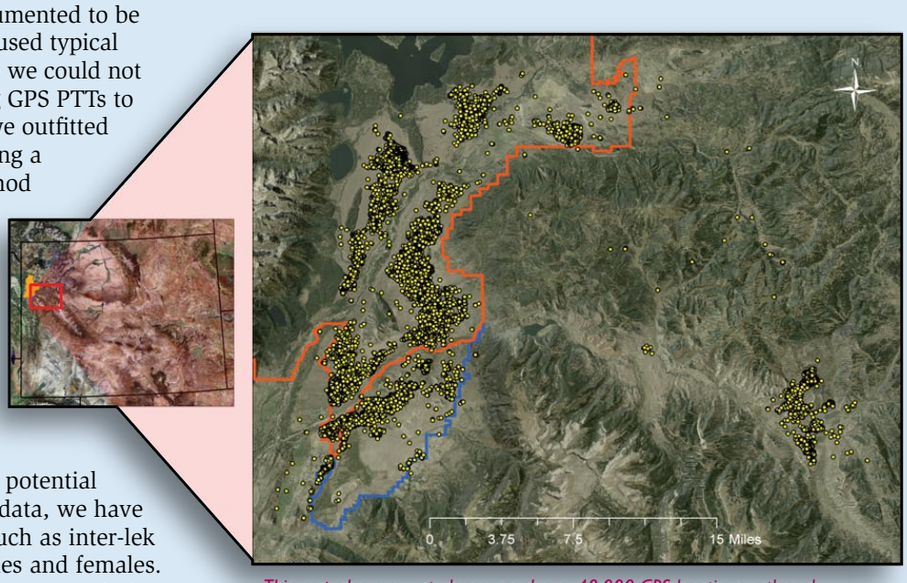
conventional VHF collars. However, it became clear that many of the questions addressed could not be adequately answered with only one re-location every day or every other day. It became increasingly apparent that all aspects of our study would be greatly enhanced by using GPS PTTs. To complicate things, survival in several species of grouse has been documented to be negatively impacted when researchers used typical "backpack" mounts for transmitters, so we could not use this traditional method of attaching GPS PTTs to sage-grouse. As a pilot study in 2007, we outfitted the first sage-grouse with GPS PTTs using a modified rump-mount attachment method that we developed. Following the successful deployment of four 30g solar GPS PTTs on breeding hens, we continued with the project and have currently outfitted 22 sage-grouse over the past two years with GPS PTTs.

By successfully obtaining hourly locations on each sage-grouse over the entire year, we quickly realized the potential analyses possible. Using the fine-scale data, we have been able to easily answer questions such as inter-lek (breeding site) movements of both males and females. This proves important because sage-grouse population estimates are almost always made based on the maximum male count at known leks. Our data has begun to show us that both sexes visit multiple leks over the course of the breeding season, which may artificially inflate population estimates. We have been able to gather detailed data on landscape use and clearly define used habitat with over 40,000 re-locations across our study area in just two years. We have been able to document clear seasonal habitat use and needs by gathering detailed habitat information at GPS re-locations for each individual. We have defined both daily and seasonal movement patterns based on gender. By setting the duty cycles to gather locations post-dusk, we have defined roosting site characteristics and measured the distance traveled to and from diurnal use areas. We have also been able to gather data on nest initiation, foraging activities while incubating, and habitat use after hatching. Further, by simultaneously outfitting both nesting sage-grouse and Common Ravens with hourly GPS PTTs, we have started investigating habitat overlap and differentiation of these two species. Such data are proving useful in areas with high predation pressure and in areas experiencing increasing raven densities.

Photo by Ross Crandall

Adult hen sage-grouse with a 30g solar GPS PTT.

The use of Microwave Telemetry's 30g solar GPS PTTs on sage-grouse has enabled us to gather more detailed, fine-scale data than ever before possible to help the management efforts with this sensitive species. While initial costs associated with GPS PTTs are higher than conventional VHF transmitters, we have found significant cost savings over the course of study and have gathered magnitudes more data than possible with VHF units and field technicians. We have been able to gather the most comprehensive and detailed movement data set currently available for a population of Greater Sage-Grouse with the use of these GPS PTTs. As such, our data set has already been used in management plans for habitat restoration efforts, fire planning, mitigation, and preservation efforts. Further, many sage-grouse re-location studies often utilize the technique of flushing marked individuals to gather accurate re-location data or travel near the individual or nest, potentially causing disturbance. GPS PTTs allow researchers to gather more re-location data than thought possible with absolutely no disturbance after outfitting with the transmitter. Such efforts will continue to be needed with this sensitive, declining species and others like it.



This map shows our study area and over 40,000 GPS locations gathered from the GPS PTTs over 2 years.

Migration Routes of Birds in Relation to Current and Proposed UK Wind Farm Sites.

Larry Griffin, Wildfowl & Wetlands Trust, Slimbridge, Gloucester, UK, GL2 7BT (larry.griffin@wwt.org.uk)

The Wildfowl & Wetlands Trust (WWT) has been using conventional PTTs and, more recently, GPS PTTs to describe the migration routes and flight patterns of migratory waterbirds for more than a decade. Early work, undertaken in collaboration with Prof. Colin Pennycuick at the University of Bristol in the mid 1990s, tracked Whooper Swan migration between Scotland and Iceland to assess the flight performance of a large bird making a long overseas crossing. More recently, satellite transmitters have been used to describe the migration phenology, key staging sites, breeding distribution and fine-grained use of wintering sites for the east Canadian Light-bellied Brent Goose *Branta bernicla* population (since 2002), the Svalbard and Greenland Barnacle Goose *Branta leucopsis* populations (since 2006 and 2008 respectively) and the Greenland White-fronted Goose *Anser albifrons flavirostris* (in 2008) (see www.wwt.org.uk/research/tracking/maps.asp for more details).

Photo by David Hickson

Whooper Swans in flight.

These studies have enabled WWT staff to develop considerable expertise in the fitting of satellite tags, with the welfare of the birds being of paramount importance. However, none of these projects have been on the scale of that currently being undertaken. In winter 2008/09, forty solar powered 70g GPS PTTs were deployed on Whooper Swans across three WWT Wetland Centres: at Welney in southeast England (15 tags), at Martin Mere in northwest England (20 tags), and at Caerlaverock in southwest Scotland (5 tags). A further 10 birds are scheduled to be fitted with satellite transmitters in Iceland in August 2009, as part of the same study. Since the tags are solar powered, they should yield information on the swans' migration in autumn as well as in spring. An engineer was commissioned and asked to use WWT designs to produce a special plastic base-plate, within which the 70g units were mounted. This had the dual benefit of maximising the battery recharge rate (by ensuring that the solar panels were not covered by the swans' plumage) and, more importantly, of improving the fitting of the transmitter to the swans and thus ensuring the welfare of the birds.

The main aim of the current project, which is being funded by COWRIE (Collaborative Offshore Wind Research into the Environment), is to describe the flight paths of Whooper Swans migrating through Britain, including over its estuaries and coastal waters. In particular, it aims to determine the extent to which the swans pass within areas already containing, or proposed to contain, offshore wind farm developments and the extent to which time of day and weather conditions affect these routes. Because geese and swans tend to fly at less than 100m above ground or sea level, even during migration, it is thought that they could be at risk of collisions with wind turbines, especially in conditions of poor visibility such as at night or in rain and fog. The large sample size, which is unusual for a satellite tracking project, should give us confidence in our conclusions and in extending them to the population as a whole (~26,000 birds in 2008). The project pushes the abilities of the solar powered tags to their limit at this latitude in the UK in winter, with fixes being obtained every hour from 18:00 through the night to 11:00 the next day, from 8 March to 16 May inclusive, in order to cover the spring migration in as much spatial and temporal resolution as possible. As swans often travel between 80–110 kph, longer time intervals between fixes could result in a lack of data for key stages of the migration. At least two birds crossed from northern Scotland to Iceland in just under 12 hours.

By the end of April 2009, 90% of the tagged swans had completed their migration from Britain to Iceland. The transmitters not only provided frequent and accurate data on the swans' migration routes, which will be analysed over the summer, but also illustrated a general division in the migration routes and potential breeding sites used by the swans wintering in different parts of the UK. The highly detailed GPS data will also allow the home range characteristics, particularly movements between feeding and roosting sites, to be analysed for individual swans at their wintering grounds and spring staging sites. As with previous tracking projects, WWT has encouraged local schools to get involved by championing the swans and following their progress online at www.wwt.org.uk/flywiththeswans.

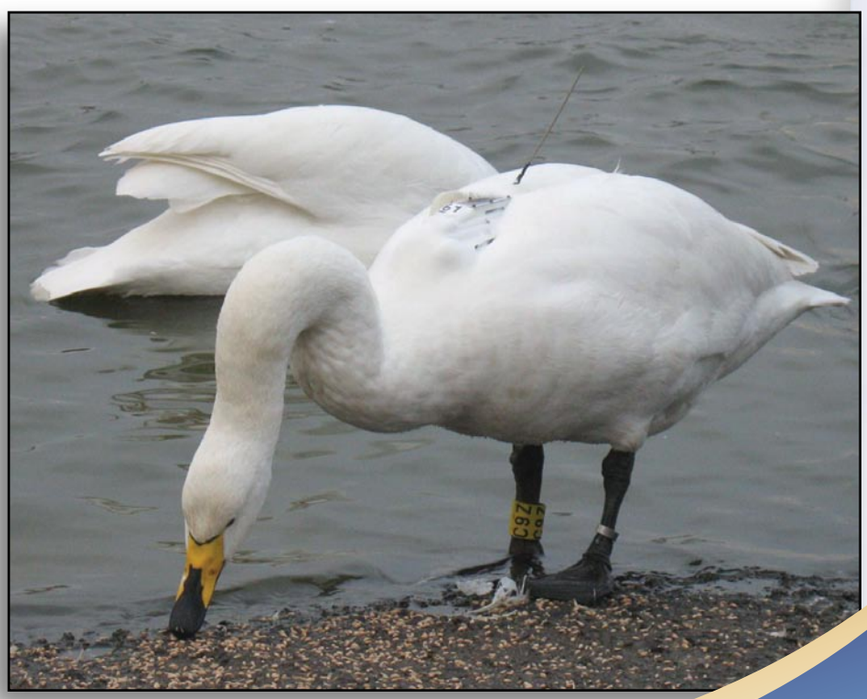


Photo by WWT

Whooper Swans with PTT.

MTI Bird and Fish Tracking Conference 2009

Successfully Tracking Wildlife from Soaring Heights to the Depths of the Sea

Thank You to all those who attended the MTI Bird & Fish tracking conference, held in Ellicott City, Maryland from March 24-26, 2009. We had about 60 attendees from 15 countries: Germany, France, England, Portugal, Spain and the Basque Country, Sweden, Norway, Denmark, Switzerland, United Arab Emirates, South Africa, Israel, Canada and the USA.

The three day event featured presentations ranging from the preservation of vultures in South Africa to avian influenza vectors, to tracking the bluefin tuna. All of the abstracts have now been posted on our website. The packed schedule featured several technical sessions including the introduction of our new products.

The conference was informative and a huge success. We have already been asked when the next one will be! We will keep you posted.

Paul & the MTI Staff

Our thanks to Bernd Meyburg of the WWGBP for his keynote address, as well as presentations on Hobby Falcon and Black Kite tracking.

Thanks to the staff at the Turf Valley Spa and Resort for their help in making our conference a success. Special thanks to Gloria and Cheryl.

Bernd Meyburg, Dave Johnson, Lee Tibbitts and Bob Gill at the reception dinner.

Aline Duplaa of CLS France and Paul Howey enjoying a coffee break.

Our thanks to Debbie Stakem of CLS America for her presentation on the Argos system.

Scholarship student recipients Pascual Lopez (University of Alicante, Spain) and Sarah Trefry (University of New Brunswick, Canada).

Conference attendees enjoyed the dinner reception.

Conference attendees and MTI staff pose at our front door after a tour of our facility.

Future Products Introduced at the Conference

Bringing the 5g solar PTT into production was not easy. We had to expand our facility to accommodate the new machines necessary for handling the smaller class of components this tiny PTT requires. Using the techniques we have developed for building the 5g solar PTT, we are now working on the next generation of fish tags and GPS PTTs. Coming soon: the new "E-Tag" and 15g solar Argos/GPS PTT.

E-Tag, X-Tag and Archival Pop-up Tag

5g solar PTT

15g solar Argos/GPS PTT

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Predation of Silky Sharks in the Northern Gulf of Mexico

Eric Hoffmayer, Gulf Coast Research Laboratory, University of Southern Mississippi

The silky shark (*Carcharhinus falciformis*) is a common pelagic species found in the northern Gulf of Mexico and is considered circumglobal, epipelagic, and highly migratory. Recent assessments of silky sharks in this region demonstrated a sharp decline in numbers over the past 30 years. This decline, in conjunction with their slow growth, late age of maturity, and low fecundity rates, has raised concerns about the silky shark's status. In turn, National Oceanographic and Atmospheric Administration (NOAA) Fisheries has designated silky sharks in the south Atlantic region as a 'prohibited' species.

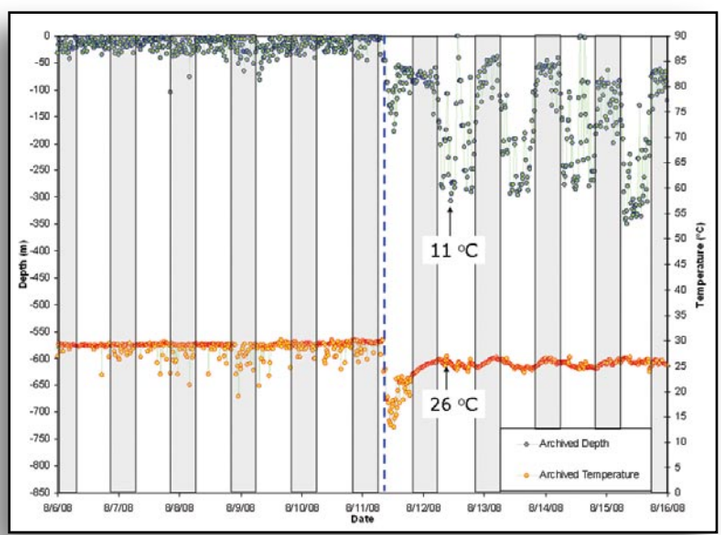
Photo by Jim Franks

Dr. Eric Hoffmayer tagging a silky shark in northern Gulf of Mexico waters.

Researchers at The University of Southern Mississippi's Gulf Coast Research Laboratory are conducting a study (funded by NOAA Fisheries) to investigate the movement patterns and habitat preferences of silky, as well as dusky sharks (*C. obscurus*, also listed as 'prohibited'), in the northern Gulf of Mexico. In 2008, pop-up satellite archival tags (PSATs) were deployed on six silky sharks (1.3-1.8 m, TL). Archived data revealed that these sharks typically spent the majority of their time (99%) in the top 50m of the water column and made a few rare dives below 50m.

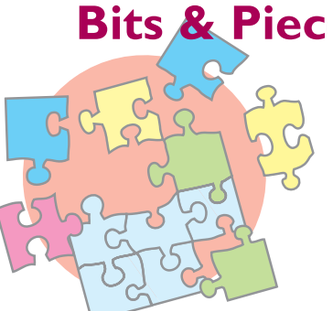
However, two of the tagged silky sharks exhibited a rather dramatic change in vertical behavioral patterns weeks after tagging (See Depth Profile). At this point only 5% of their time was spent above 50m and 95% of their time was spent between 50 and 300m. Additionally, each shark exhibited a strong diel pattern of excursions to nearly 300m during the day returning to within 50m at night. The temperature readings during these diving events surprisingly remained relatively constant, near 25˚C, changing only slightly (~1˚C) with the most drastic depth changes. Furthermore, the two PSATs recorded no times for sunrise or sunset. This altered behavior continued for 14 and 6 days for the two sharks, at which time each tag prematurely released and came to the surface.

Taken in total, these data suggest that the two silky sharks were consumed by a larger predator, most likely a shark. The lack of archived sunset/sunrise times indicates that each tag's light sensor was in complete darkness, possibly in the stomach of the predator. The tags were then regurgitated by the predator after the respective 14 and 6 days, and then floated to the surface where they transmitted within 4 days. The constant temperature and large thermal inertia reported by the PSATs at depth (~14-15˚C warmer than the temperature of the surrounding water) implies a large, endothermic predator. Only two shark species in the Gulf of Mexico exhibit this type of endothermy: shortfin mako (*Isurus oxyrhynchus*) and white (*Carcharodon carcharias*) sharks. Based on the extremely low abundance of white sharks in the Gulf of Mexico and the distinct diel vertical behavior (common to makos) recorded by the PSATs, it is believed that the silky sharks were preyed upon by large shortfin mako sharks.



A 10 day depth and temperature profile (tag ID 85217) that demonstrates a silky shark possibly being consumed by a shortfin mako shark. Gray bars indicate night. Blue dashed line indicates the point at which the predation event is thought to have occurred. The profile to the left of the dashed line describes the silky shark behavior, whereas the profile to the right of the dashed line describes the diel vertical behavior and stomach temperature of the mako shark. The two noted temperatures describe the temperature at 350m and the corresponding stomach temperature. The silky shark was tagged on 7/18/2008 and recorded data for 25 days before the predation event.

Bits & Pieces



Argos has updated its Location Class Accuracy definitions—check out the FAQs on their website (http://www.clsamerica.com/argos-system/faq.html) for details.

Have you upgraded to Google Earth™ 5.0? You'll need the latest version of our GPS parsing software. Please contact us for download instructions.

Microwave Telemetry, Inc. will be closed from July 3 through July 10 for our biennial retreat; we will reopen for business Monday July 13.

Abstracts of presentations at our conference are now posted on our website.

A gentle reminder to our customers: please follow up with your accounts payable colleagues, to eliminate the surprise when interest is added to overdue invoices.