Winter 2001
Volume 2, Issue 2

Microwave Telemetry, Inc.

Thank you...

Dear Customers and Friends,

United We Stand

September 11, 2001 will be forever etched in our memories. We huddled around the television and, with sadness and disbelief, watched as nearly four thousand lives were extinguished. Our hearts and prayers go to the families and friends of the victims of this evil act. We do know that in this battle between good and evil, good will prevail.

We were touched by the many messages of sympathy our company received from our international friends. We thank you for your support and patience. You graciously accepted delays in shipments due to the FAA stand-down.

We thank you too for your good wishes as our tenth anniversary celebration comes to a close on December 7. The drawing for two free transmitters will be held at our Holiday Party on that date. We will post the names of the winners on our website within twenty-four hours of the drawing.

Finally, we thank Tommy King, Brian Dorr, Scott Werner and Andrew Radomski for their interesting article on the movements of Double-crested Cormorants. We also wish to thank Mike Meyer, Ryan Johnson, Herman Oosthuizen, Michael Scholl, Stefan Swanson, Mike Patterson and Deon Kotze for their article on tracking great white sharks off the coast of South Africa.

We wish you joy, peace and happiness this holiday season and throughout the coming year, and we look forward to continuing to work with you.

Sincerely,
Paul and the staff at MTI

Product Update

70gram Argos/GPS PTT

Earlier this year, we at last started to ship the long-awaited Argos/GPS PTTs. Configured as a solar powered backpack, these units are suitable for tracking birds in the 1.5 kg and heavier range with GPS accuracy. The units include a miniature twelve channel GPS receiver and the standard temperature and activity sensors; so, as well as sensing latitude and longitude, they also record altitude, heading and speed together with temperature and activity. They are normally set up to record data every hour, on the hour, if there is sufficient charge in the batteries. Stored data is then transmitted to Argos every third day on an SiV™ schedule.

Because of the extra power drain of the GPS receiver, it is essential that these units get sufficient exposure to the sun. Hence, they will not be suitable for all species. ❖

Photo courtesy of USGS

The USGS is conducting its first research project with the PTT-100 70 gram Argos/GPS transmitter on a vulnerable subspecies of greater white-fronted goose known as the tule goose (Anser albifrons gambeli).The tule goose population consists of <8000 individuals, and the research will focus on the habitat needs of this vulnerable population on the Pacific coast of North America through the migration and wintering periods.

Well into their first semester, our two scholarship award winners took time from their busy schedules to write to us about their experiences.

From the Dorms...

Lauren Wilde at Wake Forest

Lauren and her parents at a recent Wake Forest football game.

Wake Forest has exceeded all of my expectations. To begin with, classes are fast paced and require a lot of out-of-class work. While the amount of reading needed can be overwhelming, it's balanced out by the wonderful professors. The teachers here are intelligent, funny and genuinely want to teach and want you as their student to succeed.

Outside of the classroom, Wake has impressed me as well. The students are outgoing, friendly and highly motivated. It's nearly impossible to walk the length of the quad and not have someone say hello to you or wave.

My only complaints thus far include college eating and sleeping habits. Your food choices are pretty limited, but a trip to get some off-campus dining can always raise your spirits. As for sleeping, well, it's pretty difficult to get your body's required hours, but I've already grown accustomed to naps.

Wake Forest life has been amazing. I feel challenged, independent, and most importantly, at home.

Lauren Wilde

Joe, second from the right, with his friends at the University of Virginia.

Joe crosses the finish line first in the Pepsi 10K run.

Joe Nuffer at the University of Virginia

I have enjoyed the University of Virginia immensely. My courses haven't been too difficult, but the variation in course difficulty is obvious. Freshman Chemistry is easy, while Single Variable Calculus has been time consuming and difficult.

Introductory Engineering and English have been between the two extremes of difficulty. My college English course contrasts from my high school courses since we focus on writing in a professional setting and write memos and abstracts. Our first major assignment was a technical description of a toy that had a complex mechanism. I described the super soaker and the flow-actuated pulsator that expels the water. The work has been fun so far.

With all the work I have in college, I am surprised by the amount of free time I still have. I run with the Cavalier Road Runners, a club team for runners. I won the Pepsi 10K last Saturday, the first race our team competed in. The Charlottesville Track Club sponsored the race and I received a pewter cup and won a Virginia Lacrosse cap as a grab bag prize. I also won the Apple Pie 5K and received a delicious apple pie. I am going to Chapel Hill at the end of October for a cross-country race against other college club teams. After discovering how much free time I have, I want to run for the UVA track team in the winter and spring.

Joe Nuffer

Fourth in a series of ***Feature Articles***
(Printed with permission)

Regional and Continental Movements of Double-crested Cormorants (*Phalacrocorax auritus*) Captured Near Southeastern Aquaculture Facilities

Tommy King[1], Brian Dorr[1], Scott Werner[1], Andrew Radomski[2]

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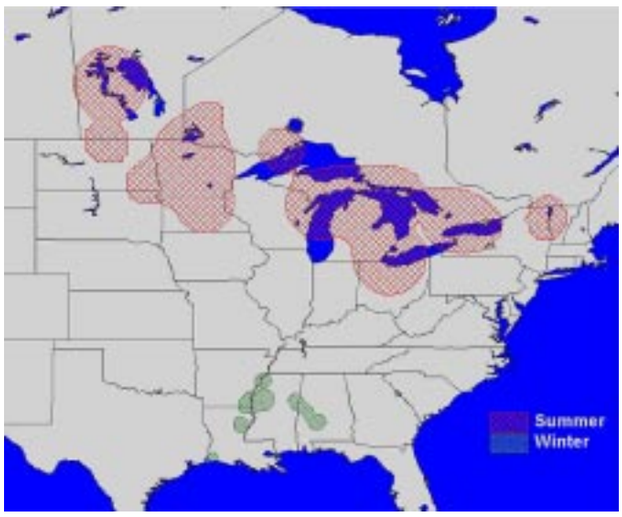
The Interior population of Double-crested Cormorants (*Phalacrocorax auritus*) has increased dramatically since the late 1970's. Within the last decade, the number of cormorants wintering in the delta region of Mississippi has nearly tripled. During the last 25 years, aquaculture production (primarily channel catfish, *Ictalurus punctatus*) in Alabama, Arkansas, Louisiana and Mississippi has also dramatically increased. Cormorants, and several other fish-eating birds, take advantage of this abundant and readily accessible food source.

The U.S. Fish and Wildlife Service is currently developing a national management plan to mitigate cormorant impacts to natural and cultural resources, including southeastern aquaculture. Prior to implementing a plan to minimize cormorant impacts to these resources, researchers must address several questions. For example, since one of the objectives of the management plan is to minimize cormorant impacts to southeastern aquaculture, will management actions be most efficient in northern breeding or southern wintering habitats?

To answer the above question, as well as others, it is necessary to identify and understand the regional and continental movements of cormorants. Therefore, we initiated a multi-year study to monitor the movement patterns of cormorants captured near catfish production areas in the southeastern United States. From October through March 1999-2001, we equipped 55 Double-crested Cormorants with 45 gram (n = 29 in 1999-2000) or 30 gram SiV (n = 26 in 2000-2001) Microwave PTT-100 transmitters in Alabama, Arkansas, Louisiana and Mississippi. Although this study is ongoing, some preliminary analyses have been completed.

During spring and fall migration, it was not unusual for these birds to travel >400 km in 48 hr. In general, the summer ranges of these cormorants encompassed the Great Lakes and portions of Minnesota, New York, North Dakota and Vermont in the United States, and Manitoba, Ontario and Québec in Canada. The summer ranges of cormorants captured in Alabama were from the Great Lakes eastward to Lake Champlain. Cormorants captured in Arkansas, Louisiana and Mississippi spent their summers in the Great Lakes, Manitoba, Minnesota, North Dakota and Ontario. These data show that Double-crested Cormorants that winter near southeastern aquaculture have a broad summer and breeding distribution. These data also indicate that cormorants remained near areas of intensive aquaculture during the winter months. ❖

Interactive maps of this satellite tracking study can be found at http://cofcs68.aphis.usda.gov/website/homepage/cormorant/proj_desc.htm



Ninety-five percent Kernel winter (green hatching) and summer (red hatching) ranges of Double-crested Cormorants captured near aquaculture facilities in the southeastern United States.

Double-crested Cormorants fitted with 30g PTTs and VHF transmitters.

Photos courtesy of Tommy King

You Need to Know...

- **New e-mail address for Pop-up tag data—PopUpData@aol.com**
  We have established a new e-mail address, PopUpData@aol.com, just for collecting pop-up data. If you receive your pop-up data via ADS from Service Argos please request that they also send the data to this address at four day intervals. This will insure that we get the data, and alert us that your tag has popped up. We can then process your data in a timely manner.

- **Reprogramming for Pop-up tags**
  Pop-up tags can be returned to us at any time for reprogramming. Although the reprogramming is free of charge, the return shipping is not. Please include your Federal Express account number when requesting reprogramming of your Pop-up tag.

- **Returning PTTs to us**
  We have noticed an improvement in utilization of the proper paperwork when returning PTTs to us. However, our international customers should always ship PTTs back via Federal Express. All other carriers charge a customs clearance fee that sometimes exceeds $200! We have no alternative but to add this fee to your invoice.

- **Two-page form**
  To make it easier for you to submit all the information we need to build your PTTs, we have a new version of our two-page form. This form is in Word format and will be sent to you as an email attachment. Make sure that the form is completely filled in and returned to us in a timely manner, preferably six weeks before delivery of your PTTs. Please contact us at microwt@aol.com if you have any questions.

New Packaging

Please Keep Your Boxes!

We are now shipping transmitters in our new packaging that is designed to better protect your PTTs during shipment. The antistatic foam provides perfect storage until your PTTs are deployed. After deployment, please save your original box to return your PTTs to us for refurbishment.

Always use the original boxes when returning PTTs to us.

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New Argos Frequencies—Argos II and SiV™

As many of you know, tiny low powered PTTs (less than 0.5w) face more competition in data reception in the European region than elsewhere in the world. This is due to a higher background noise level of unknown origins together with a high density of users. Earlier this year, Service Argos and Microwave Telemetry carried out a series of experiments to analyze this problem and find a way around it. The results are very clear in showing that we must move away from the "traditional" center frequency and take advantage of the Argos II systems on NOAA 15 and 16.

This might seem disadvantageous to those of you used to receiving data from up to five satellites. However, by employing our SiV™ (Satellite in View) technology along with an Argos II frequency PTT, the unit can be programmed to transmit for only a few hours each day during the best NOAA 15 and 16 overpasses. Initial results from a few PTTs configured like this have given performance in Europe equal to that in the USA.

Two new satellites are due to be launched in 2002 which will bring the Argos II constellation to four satellites. It seems clear that our European customers should request their PTTs be built to the Argos II specifications with the SiV™ option, which we will be offering to them at a discount.

20 gram PTT with Argos II specifications and SiV™

Initiating Pop-Up Satellite Tagging of White Sharks (*Carcharadon carcharias*) in South Africa

Mike Meyer[1], Ryan Johnson[2], Herman Oosthuizen[1], Michael Scholl[3], Stefan Swanson[2], Mike Patterson[1] and Deon Kotze[1]

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Following the protective legislation afforded to the white shark (*Carcharadon carcharias*) in 1991, South Africa initiated an intensive research program to establish data on the white shark. The objectives were to investigate the life history and population status of the white shark in South Africa, identify and manage threats to the white shark and produce effective and comprehensive conservation and management plans for this much-maligned species.

South Africa possibly represents the healthiest regional population of white sharks in the world. In a recent research expedition, 69 individual white sharks were observed during only five days of chumming, while our photographic identification program identified over 600 individual white sharks in its inaugural two years. Despite these positive findings, a number of real concerns still exist regarding the sustainability of this population locally and globally.

Satellite tagging of white sharks is one of the technological advances that would enable us to resolve a number of issues for management and conservation of this species. Recent genetic studies have indicated the possibility of migration of male white sharks between Australia and South Africa, while suggesting female are philopatric. If true, this discovery potentially necessitates multilateral management and conservation agreements between states regarding this species. A further issue that can be resolved using this technology is the comparative rarity of mature white sharks observed during research expeditions. Is this scarcity of mature white sharks a result of a young population, or is it due to observation of a nonrandom sample of the population?

The world conservation union has identified fisheries (such as targeted bather protection nets and accidental capture in purse seine netting or on long lines) as potentially non-sustainable harvesting of the white shark stocks. This harvesting still exists in South Africa despite protection. Through satellite tagging, we can understand the spatial and temporal patterns in habitat utilization of white sharks. If areas where white sharks aggregate to breed, nurse or feed can be identified, then these areas can be afforded some protection from those identified fisheries.

Following protection in 1991, a white shark cage diving industry began in South Africa. The pop-up satellite tag technology, as part of an ongoing impact assessment of this industry, enables us to investigate the movement of white sharks between cage diving locations as well as to estimate the overall exposure of individual sharks to this industry.

The study of the movement and habitat utilization of the white shark presents a number of unique logistical

Continued on page 6

Photo courtesy of Michael Scholl

Due to concern over a strongly suspected decrease in numbers of white shark populations, South Africa was the first country to institute protective legislation for the white shark (1991).

Photo courtesy of Michael Scholl

The Pop-up tag is attached using a modified spear gun.

Photo by Euward Louw

Aerial picture of Mossel Bay, South Africa. The "X" marks the spot where the white shark was tagged on 24 July 2001. Just to the right is a recreational area where bathers and great whites swim!

For regular updates on the progress of this and other research programs we are conducting on the white shark in South Africa visit www.sharkresearch.org

White Sharks continued from page 5

difficulties. Capture and release of white sharks is very undesirable, not only due to ethical considerations, but also due to the unknown survival rate of white sharks following capture. Attachment and retrieval of instruments must be accomplished while the shark is free swimming. Furthermore, the white shark is elusive, creating the possibility that we will not re-encounter an individual following tagging. Pop-up satellite technology addresses these requirements in every way. Not only are we able to attach the tags on to free swimming animals, but retrieval of data does not require the animal to be located.

Archival Pop-up tags record the water temperature and depth as well as the time of sunrise and sunset each day. These times are transmitted back to the user via Argos after the tag pops up. They are subsequently used to calculate a daily location estimate and hence reconstruct the track of the fish.

The research team arrived in Mossel Bay on 23 July 2001, and boarded the sailing vessel *Infante* belonging to Roy and Jackie Portway (Shark Africa). Ryan Johnson, Michael Scholl, Mike Patterson and Stefan Swanson constituted the field team. On 24 July, the team finally observed a large female shark close to 450 cm in length, and shortly afterwards, the tag was successfully attached on the shark with a modified spear gun.

This Pop-up Tag will remain attached to the shark for a year. On 1 July 2002, the tag will detach itself automatically from the shark, and "pop-up" to the surface, where the tag will link to the Argos satellite system and download all the information archived over the year. During that one-year period, the tag will record water temperature and the depth at which the shark is swimming. Additionally, the tag will also record the amount of light surrounding the shark, and from that determine sunrise and sunset times. Knowing these two times, it will be possible to calculate the position of the shark on a map. This positioning system is not as precise as the position obtained with a GPS, but this system is more reliable as the shark does not have to break the surface and much more information about the whereabouts of the shark is stored. This is a first in South Africa, and most probably not the last!

Depending on the results of this first attempt, the project probably will deploy several more tags such as these Pop-up Satellite tags next year (2002). We are very optimistic and hopeful that this kind of technology will shed light on a number of mysteries concerning the white shark. ❖

And the winner is...!

The drawing for the winners of the 70 gram GPS PTT and 18 gram solar PTT will be made December 7 at our Tenth Anniversary Celebration and Holiday Party. The winners' names will be posted on our website immediately after the drawing on December 7, 2001.

The Microwave Telemetry, Inc. web page will be updated in January 2002. Be sure to check us at www.microwavetelemetry.com for new products and updated information.

School Projects Update

We are happy to report that the school projects we sponsored are in full swing. Look for articles in upcoming newsletters and links from our website to participating schools.

Inside...