

AMERICAN TURTLE OBSERVATORY

2016 YEAR-END REPORT



Board of Directors

Liz Willey, Ph.D. (Executive Director & Secretary) serves on the faculty in the Environmental Studies Department at Antioch University New England in Keene, New Hampshire. Liz has worked with over a dozen species of freshwater turtle in eastern North America.

Mike Jones, Ph.D. (Treasurer and President) is the Massachusetts state herpetologist with the Division of Fisheries and Wildlife (MassWildlife). Mike has coordinated studies of turtles in Mexico and the USA.

Jonathan Mays is a research biologist with the Florida Fish and Wildlife Conservation Commission in Gainesville, Florida, where he studies spotted turtles, Barbour's map turtles, alligator snapping turtles, box turtles, and Florida Keys striped mud turtles, among many other species of amphibian and reptile.

Tom Akre, Ph.D. is an ecologist with the Smithsonian Conservation Biology Institute in Front Royal, Virginia. Tom has coordinated studies of freshwater turtles in the United States and Venezuela.

Marlissa Briggett has been practicing law since 1991, and has been involved in city government in Cambridge and Arlington, Massachusetts. Marlissa has served as an attorney-advisor to the United States Commission on Human Rights.

New Advisory Board Members



Advisory Board

Brian Zarate is a biologist with the New Jersey Endangered and Nongame Species Program in **Clinton, New Jersey**.

Derek Yorks is a wildlife biologist with the Maine Department of Inland Fisheries and Wildlife in **Bangor, Maine**, where he coordinates field studies of rare turtles, snakes, and invertebrates.

Jorge H. Valdez Villavicencio is a Project Coordinator at *Conservación de Fauna del Noroeste* in **Ensenada, Baja California**, México. He is also an Associate Curator of the Herpetological collection at the *Universidad Autónoma de Baja California* (UABC).

Paul Sievert, Ph.D. is a Research Professor with the Department of Environmental Conservation at the University of Massachusetts.

Will Selman, Ph.D. is an assistant professor of biology at Millsaps College in **Jackson, Mississippi**. Will has published numerous papers on the ecology of sawbacks and terrapins.

Ed Thompson is a biologist for the Maryland Department of Natural Resources. He leads studies of hellbenders and wood turtles.

Angelena Ross is a wildlife biologist with the New York State Department of Environmental Conservation, where she leads conservation programs for Blanding's turtle.

Peter A. Rosenbaum, Ph.D. is a Professor of Biological Sciences at the State University of New York at Oswego where he coordinates long term studies of bog and spotted turtles, and teaches evolutionary biology and genetics.

Dr. Rodrigo Macip Ríos is an Assistant Professor at the *Universidad Nacional Autónoma de México* (UNAM); in **Morelia, Michoacán**, México, where he studies the ecology of kinosternid (mud) turtles.

Alan M. Richmond, Ph.D. teaches herpetology and comparative vertebrate anatomy at the University of Massachusetts in **Amherst, Massachusetts**; Al is editor of the Geographic Distribution section of *Herpetological Review*.

Trevor Persons conducts studies of amphibians and reptiles for the USGS Colorado Plateau Research Station and the Maine Department of Inland Fisheries and Wildlife.

Betty Mobbs supervises a seventeen-year study of eastern painted turtles in eastern Massachusetts.

J.D. Kleopfer is a herpetologist with the Virginia Department of Game and Inland Fisheries in **Charles City, Virginia**.

Mckenzie Jones is the sustainability specialist for the city of **Flagstaff, Arizona**, where she works on land conservation projects.

Glenn Johnson, Ph.D. is the Chair of the Biology Department at the State University of New York in **Potsdam, New York**. Glenn coordinates turtle studies throughout northern New York.

Charles Innis, VMD is the lead veterinarian for the New England Aquarium in **Boston, Massachusetts**.

Erika Gonzalez is a botanist and ecologist with the Smithsonian Conservation Biology Institute.

Luis Díaz Gamboa is executive director of *Red para la Conservación de los Anfibios y Reptiles de Yucatán*. Curator of the Regional Collection of Herpetology of the UNAM; Yucatán Academic Unit.

Lori Erb is a bog turtle program manager for the Mid-Atlantic Center for Herpetology and Conservation.

Phillip deMaynadier, Ph.D. is a biologist for the Maine Department of Inland Fisheries and Wildlife in **Bangor, Maine**, where he serves as leader for the Reptile, Amphibian, and Invertebrate Group.

Noah Charney, Ph.D. is a wildlife biologist and landscape ecologist at Bryn Mawr University in **Bryn Mawr, Pennsylvania**. Noah applies novel analytical methods to ecological datasets.

David M. Carroll is an artist and naturalist from **Warner, New Hampshire**, and is the author of four nationally-acclaimed natural history books including *The Year of the Turtle*.

Scott Angus is a biologist with diverse experience studying birds, snakes, and turtles in the mid-Atlantic region. Scott served as the co-chair of NEPARC from 2011 to 2013.

Florida Box Turtle, *Terrapene bauri*.
Adult female in Collier County, FL.
Photo: Mike Jones / ATO



American Turtle Observatory’s First Full Year

AMERICAN TURTLE OBSERVATORY is first and foremost a land conservation organization, albeit a very small one! We approach every one of our projects through the lens of landscape conservation and ecology: why are there turtle populations in a particular river system, canyon, valley, or mountain range? What geological processes or long-running landuse practices have allowed turtle populations to persist in a given site, decade after decade? How can we—as managers—facilitate, protect, or buffer these processes so that turtle populations persist for generations?

Large populations of certain turtle species—because of their extremely long lives, delayed maturity, and low reproductive output—are unique indicators of exceptional landscape integrity. When was the last time you spent a day amongst dozens of Box Turtles, Wood Turtles, Spotted Turtles, Bog Turtles, Diamondback Terrapins, Alligator Snapping Turtles, or tortoises? These species and many others naturally reach large, robust, and resilient population levels only where the landscape provides suitable habitat and protection from collection, predation, and road mortality.

So, it’s a premise of the work we do that large, unfragmented landscapes with minimal infrastructure are the essential component of successful freshwater turtle conservation efforts. In some cases, the Federal Lands of the United States provide some of the best remaining habitats for important turtle populations—think of the Everglades National Park, Big Cypress Preserve, Cape Cod National Seashore (managed by the Park Service), the National Forests of Northern California, the Ozarks, and the Appalachian Mountains, among so many others. But the

momentum behind new federal land protection in the lower 48 states has largely diminished, and it’s left to us to remember the significance of what remains, to be good stewards, and to applaud the recent gains, such as new national monuments in Maine and California.

Just as important, though, is to dedicate renewed energy to partnerships with private landowners: timber companies in the North Woods, ranchers in Baja California and Yucatán, who own wetlands and forests critical to the conservation of North American turtles. They should be applauded for good stewardship of key landscapes. While 2017 holds uncertainty with regard to how U.S. federal public lands are protected and managed—and how much effort is devoted to science and climate change research at the federal level—there are still many ways we can continue to pursue conservation at the local level. We will work creatively and constructively on these fronts in 2017 and beyond.


Liz Willey
Executive Director


Mike Jones
Board President

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Wood Turtle, *Glyptemys insculpta*.
Adult female in northern New England.
Photo: Mike Jones / ATO

A Regional Conservation Plan for Wood Turtles

**Patrick Roberts, Mike Jones, Liz Willey, Tom Akre, Mike Marchand, Derek Yorks,
Brian Zarate, JD Kleopfer, Ed Thompson**

With 2016 nearly behind us, we are pleased to report that ATO, in partnership with the Northeast Wood Turtle Working Group, has made major strides in the development of a regional conservation plan for wood turtles in the Northeast.

A mild winter and warm spring meant that wood turtle surveys got off to an early start throughout many of the eight partnering states. Biologists in association with ATO, UMass Amherst, the Smithsonian Conservation Biology Institute, and several federal and state agencies, conducted over 500 surveys for wood turtles from Virginia to northern Maine. Information from these surveys will contribute to a wood turtle occurrence database that will be used to inform our understanding of the status, population trends, and conservation needs of this elusive and increasingly rare species.

With the understanding that we cannot conserve threatened turtle species without the assistance of private landowners, ATO has also developed a series of public outreach materials that aim to educate and inform people about land management for wood turtles. Our first finished product in this effort is an anti-poaching card that will be distributed to major sporting outlets and outdoor apparel stores. This card is meant to educate outdoorspeople of the harmful effects of collecting wood turtles from the wild. Two additional products that are currently in development will be geared toward management for wood turtles, including recommendations for nesting area creation and land use guidelines.

One major highlight of 2016 was the completion of an extensive two-year genetic sample collection effort, which has yielded over 1,800 samples from across the species' range! These hard-fought samples, which are the product of thousands of hours in the field, will contribute to a broad-scale genetic analysis of wood turtle populations across the Northeast—a key part of this conservation plan. This analysis, led by the University of Montana, will provide critical insight into the genetic structure of the species and help identify genetically distinct populations, which can be targeted for future conservation efforts. Another very exciting prospect of this project is the potential ability to identify the geographic origin of wood turtles that have been confiscated from illegal poachers. This may allow law enforcement agencies to confidently return turtles to the states from which they were taken.

In addition to monitoring a network of 18 rivers from Massachusetts to northern Maine, ATO has been busy designing a framework for a region-wide Wood Turtle Conservation Area Network. Using habitat suitability models, GIS-based landscape integrity assessments, and newly acquired genetic information, this framework will facilitate the identification of areas across the Northeast that not only represent the most important wood turtle populations, but also the landscapes that are most likely to support healthy populations into the future.

Stay tuned for a finalized Wood Turtle Conservation Plan in 2017!

Wood Turtle, *Glyptemys insculpta*.
Scenes from field surveys in the
Northeastern USA in 2016. Photos:
Mike Jones and Patrick Roberts / ATO



Regional Conservation Planning



Implementing a Conservation Plan for Blanding's Turtles

Liz Willey, Mike Marchand, Mike Jones, Glenn Johnson, Derek Yorks, Kathy Gipe

Outstanding news! This year, ATO together with partners from the Northeast Blanding's Turtle Working Group in Maine, New Hampshire, Massachusetts, New York, and Pennsylvania received a \$500,000 Competitive State Wildlife Grant from the U.S. Fish and Wildlife Service to implement high-priority actions that were identified in the Conservation Plan that the team completed in 2014. Although primarily a species of the Great Lakes and midwestern prairies, Blanding's Turtle populations in the Northeast are small, isolated, and ecologically unique.

With these funds, the Blanding's Turtle working group will develop site-specific management plans for 18 of the highest priority Blanding's turtle sites in the region and will implement those plans in collaboration with federal and state agencies, local municipalities, landowners, and NGOs. Various teams across the region will also use radiotelemetry,

capture-recapture, and other techniques to study important populations.

This year, Blanding's Turtle was identified (along with Wood and Spotted Turtle) as a focal species in the Northeast Turtle Initiative of the USDA Natural Resource Conservation Service's Working Lands for Wildlife Program. The goal of the initiative is to help reverse the decline of these three turtle species by increasing available high-quality habitat to support recovery through land protection as well as restoration and enhancement of habitat. All three species are of regional conservation concern and are listed as Endangered on the IUCN Red List.

There's still a lot of work to do, but together, these efforts will go a long way toward conserving the best habitats for Blanding's Turtles in the Northeast Region, helping to preserve them in wetlands and forests for future generations.



Blanding's & Wood Turtle Conservation Symposium

Held in Massachusetts

Patrick Roberts, Liz Willey, Mike Jones, Ellery Ruther, Tom Akre, Jess Meck, and Glenn Johnson

On October 3, 2016, turtle conservationists from across the eastern half of the United States and Canada convened at the Massachusetts Division of Fisheries and Wildlife in Westborough, MA for the first Blanding's & Wood Turtle Conservation Symposium. This unprecedented event served as an invaluable opportunity for Blanding's & Wood Turtle experts to gather under one roof to build partnerships and share knowledge—an experience that will undoubtedly lead to a more united front in the range-wide conservation of these two species.

With 44 speakers across two days, it was a whirlwind of a symposium, but a tremendous success! Each day was devoted to one species and broad themes for presentations covered topics such as regional coordination efforts (in the Midwest/ Great Lakes, Northeast, and Canada), population assessment techniques, improving law enforcement, habitat and population management, and genetics. The first day was topped off by an inspiring keynote presentation from the esteemed Dr. Justin Congdon of the University of Georgia.

In addition to presentations, breakout sessions scheduled throughout each day provided an informal stage for attendees to put their heads together and brainstorm methods for tackling the problems most pertinent to the conservation of these species. Discussion topics included the potential for inter-region collaboration, methods for countering poaching, the role of genetics in turtle conservation, turtle-oriented land conservation, and managing habitats and populations. Keep your eye out for a summary of these productive sessions as well as the symposium proceedings in the coming months!

Conferences are commonplace in the scientific world, but rarely do so many scientists and conservationists come together to solely focus their attention on a couple of species of concern. We believe that we will see the fruits of this symposium in the form of novel partnerships and exciting new conservation initiatives!



Symposium participants gather in Massachusetts. Photo: Andrea Chaloux / New York Natural Heritage Program

Proceedings available from americanturtles.org/symposium

Regional Conservation Planning



Spotted Turtle, *Clemmys guttata*. Adult males from Massachusetts (top) and Florida (bottom)
Photos: Mike Jones / MassWildlife & ATO

Laying the Groundwork for a Spotted Turtle Conservation Plan

Liz Willey, Mike Jones, Jonathan Mays, J.D. Kleopfer, Thomas Akre, Derek Yorks, Trevor Persons, Lori Erb, Charles Innis, Dirk Stevenson, Mike Marchand, Ellery Ruther

THE SPOTTED TURTLE (*Clemmys guttata*) is a small, wetland-dependent, semi-terrestrial species that occurs throughout temperate eastern North America. In 1840, Storer called the spotted turtle the most common turtle species in Massachusetts, and in 1919 Babcock noted that it “with perhaps the exception of the Painted Turtle, is the commonest Chelonian in New England.” Although still wide-ranging, the IUCN estimates that populations may have declined by 50% over the last century due to wetland habitat loss and other factors that affect related species: collection for the pet trade, road and agricultural mortality, and subsidized predators. Today the species is listed as Endangered by the IUCN and has been petitioned for federal listing under the Endangered Species Act.

ATO is working with partners from Maine to Florida to study the species and develop a standardized monitoring program and broad-scale Conservation Plan. Lead by Virginia’s Department of Game and Inland Fisheries, the team of federal and state agencies, universities, and NGOs plan to apply for funds through the US. Fish and Wildlife Service’s Competitive State Wildlife Grants program to support the effort. Using previous regional collaborations with Blanding’s and Wood Turtles as models, the project would assess the scope and causes of Spotted Turtle decline, identify the highest priority sites for conservation range-wide, and begin to implement on-the-ground conservation actions to improve the outlook for this species. Stayed tuned for updates about this exciting collaboration!





Western Pond Turtle, *Actinemys pallida*.
Adult female (top) and field team (bottom)
Photos: Liz Willey / ATO

Ecology of an Intact Population of the Baja California Pond Turtle

Mike Jones, Jorge Valdez Villavicencio, Anny Peralta Garcia, Liz Willey,
Rodrigo Macip-Rios, Tom Akre, Erika Gonzalez

The ecology and conservation of Western Pond Turtles (*Actinemys pallida*) in Baja California—the southern edge of the species’ distribution—has (until recently; see p. 15) received little attention. Fortunately, Anny Peralta Garcia and Jorge Valdez Villavicencio of *Conservacion de Fauna del Noroeste* (CFN) a nonprofit based in Ensenada, Baja California, have turned their attention to understanding the distribution, conservation, and regional extent of range contraction of this unusual little turtle confined to streams and ponds in the Pacific drainages of California and northern Baja California (a summary of their surveys across the state is provided on p. 15 of this report).

Anny and Jorge’s recent work indicates that the species has suffered a major range contraction away from coastal and urban areas in Baja California since the 1980s, with numerous small populations disappearing, apparently in response to reduced water availability. In July 2016, ATO partnered with biologists from CFN, the Mexican National University in Morelia, and Terra Peninsular (a land conservancy group) to study one of Baja California’s most intact, remote, and extensive populations of Western

Pond Turtles. A six-person team traveled on foot, assisted by mules, into the remote river system, located on private land, in July and established a small base camp. From there, we conducted trapping, snorkel surveys, and visual encounter surveys for four days in order to document the current population size and structure of this isolated, remote, and unfragmented population.

Over the course of four days, we estimated the population size. We also observed several Red-legged Frogs and some of the southernmost occurrences of Coast Live Oak and Jeffrey Pine. Also noteworthy, we observed no invasive fish or plants, which are present further downstream in the watershed. Our results build on earlier surveys in this watershed by CFN and ATO. The data gathered during this collaborative study will provide a useful baseline of Western Pond Turtles in unfragmented, high-integrity rivers in the northern mountains of Baja California. However, many threats are evident: we found 10 dead turtles recently killed and eaten by a small carnivore (possibly raccoons), and there are signs that the canyon may be developed in the future as a source of water to supply downstream farms.



Conservation of the Gulf Coast Box Turtle

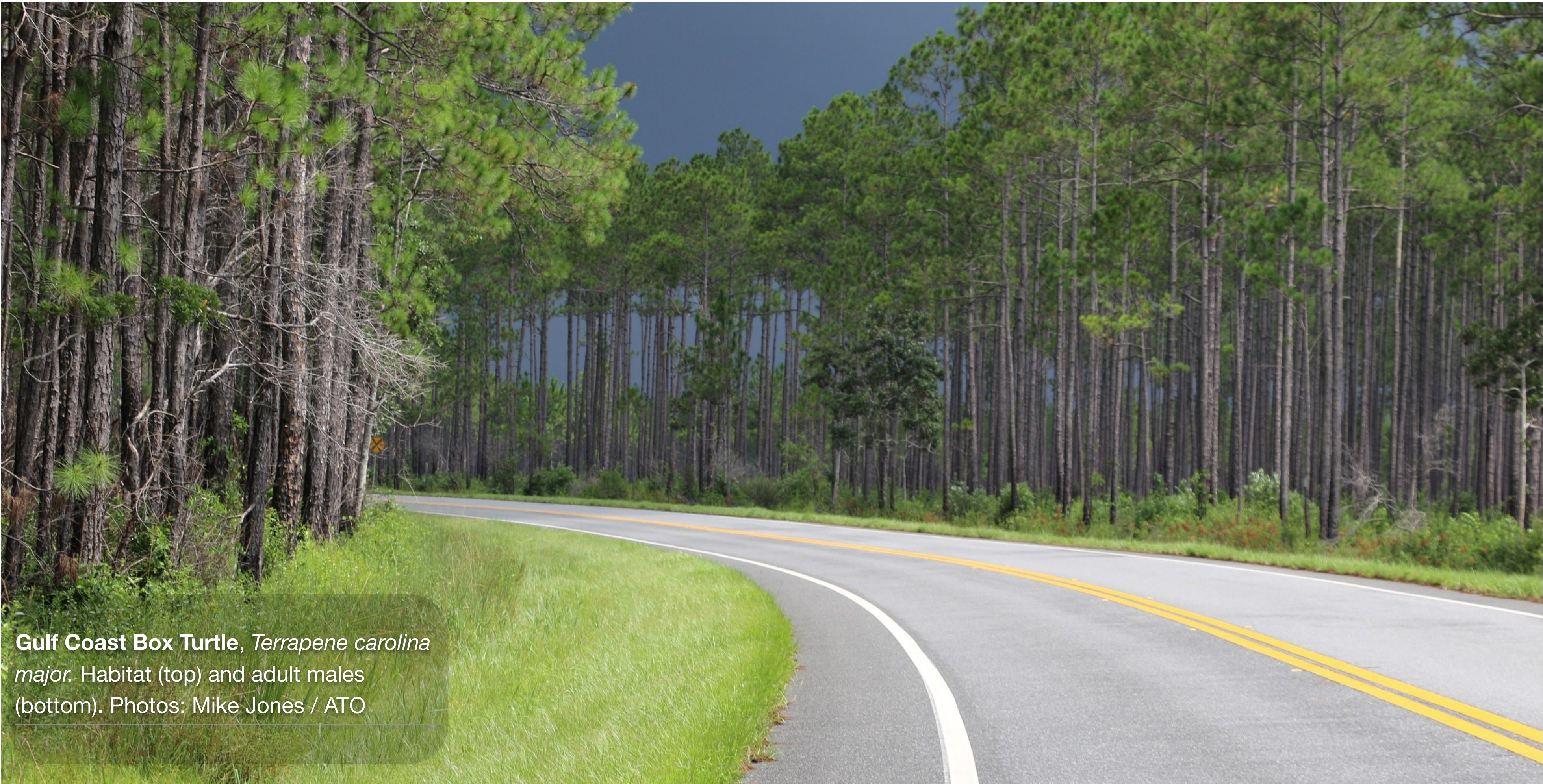
Jess Meck, Mike Jones, Liz Willey, Jonathan Mays, Ross Kiester, Bradley Smith

The ecology and life history of the Gulf Coast Box Turtle (*Terrapene carolina major*) are poorly known. The past decade has seen a renewed focus on understanding the complex relationships of *T. c. major*, particularly its apparent relationship to the extinct Giant Box Turtle (*T. c. putnami*) that roamed the southern Coastal Plain during the Pleisocene. Butler et al. (2011) suggested that *T. c. major* may not represent a distinct evolutionary trajectory separate from other box turtles in the Florida Panhandle. A subsequent study by Martin et al. (2013) concluded that *T. c. major* is the result of introgression between *T. c. putnami* and the Eastern box turtle (*T. c. carolina*). Although genetic evidence is conflicting, other characteristics of the Gulf Coast Box Turtle appear to be unique. For example, it is the largest of the living box turtles (to over eight inches carapace length), frequently utilizes aquatic microenvironments, and is an adept swimmer.

ATO launched the first intensive radiotelemetry study of *T. c. major* in March 2016 in the Florida Panhandle with the objective of documenting the

species’ home range structure, seasonal behavior, and habitat use. A total of 20 adult *T. c. major* (11 male, 9 female) were followed twice a week across five of ATO’s longterm study sites in the region. Data analysis this winter will quantify the home range size of both males and females, habitat use and selection, factors influencing roadkill rates, and management needs of this species on federal and state land. Other correlations such as turtle activity and weather events will be examined.

Our preliminary results indicate that females use much larger home range areas than males, most likely attributed to upland nesting movements. The common habitat preferences of both males and females included floodplain tupelo swamps, mesic hardwood forests, and mixed forests. To date we’ve collected only one season of data, leaving much to be discovered and understood about the subspecies’ ecology. Nevertheless, the first season was successful, and we plan to continue monitoring these significant populations over the next several years to gain more insight about the seasonal and yearly behaviors of this unique American box turtle.



Gulf Coast Box Turtle, *Terrapene carolina major*. Habitat (top) and adult males (bottom). Photos: Mike Jones / ATO



Box Turtles



Gulf Coast Box Turtle, *Terrapene carolina major*. Photos from the 2016 field season. Photos: Jess Meck, Mike Jones, Betty Mobbs / ATO



Box Turtles

Radiotelemetry Studies of Florida Box Turtles (*Terrapene bauri*) in the Ten Thousand Islands, Florida

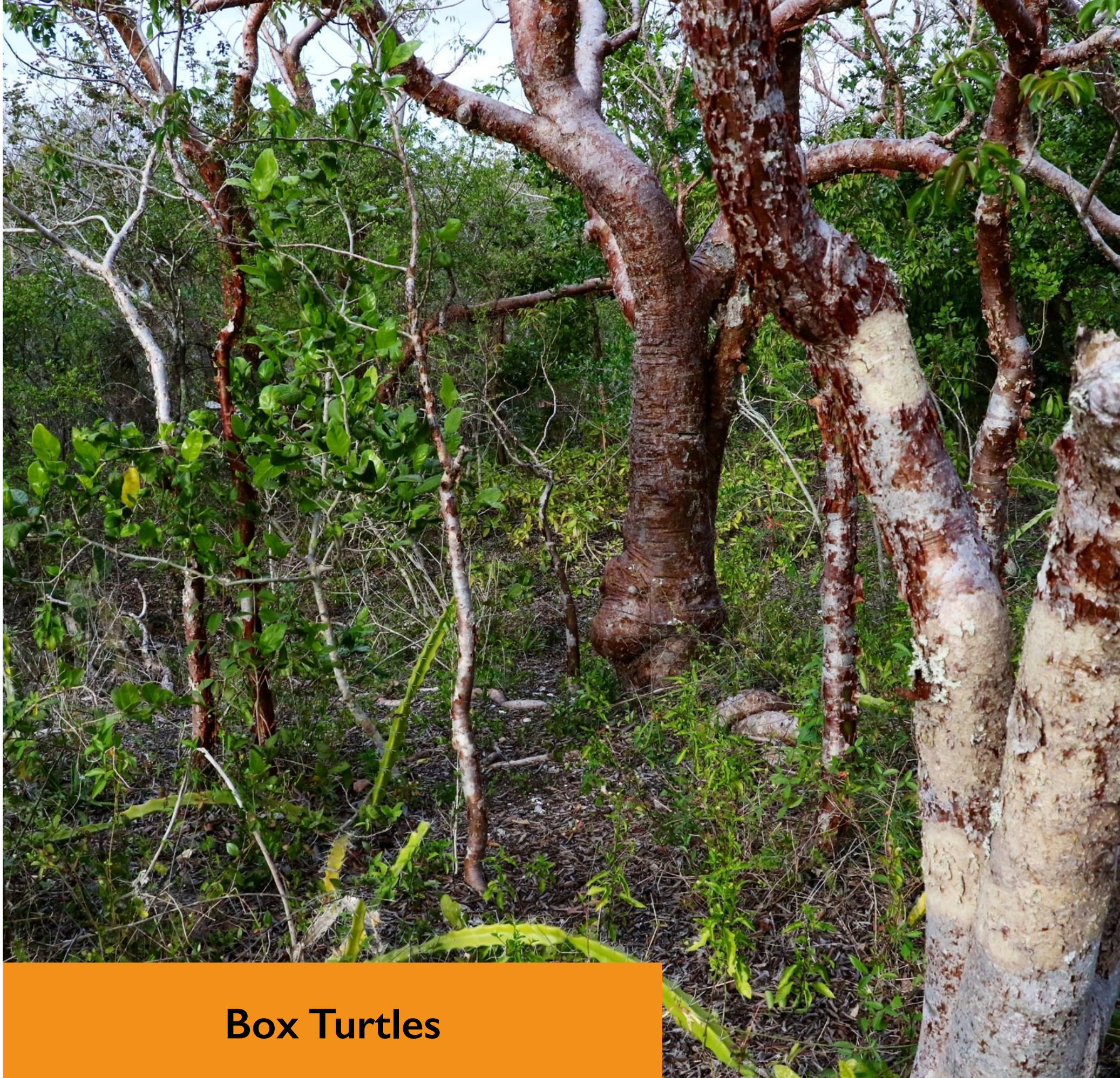
Liz Willey, Jared Franklin, Matt Grassi, Mike Jones, Mark Danaher, Ashlee O'Connor

This year ATO partnered with biologists from the U.S. Fish and Wildlife Service to use radiotelemetry to study the movements of Florida Box Turtles (*Terrapene bauri*) on an ancient Calusa shell mound in southwestern Florida.

Florida Box Turtles are a peninsular endemic species threatened by habitat loss throughout much of the state, and in the southern part of their range, they are exposed to some of the hottest summer conditions of any North American turtle species. USFWS Biological Science Aids Matt Grassi and Jared Franklin and Supervisory Wildlife Biologist Mark Danaher braved the heat, mosquitoes,

sandflies, and cacti to check on the ten transmitting turtles each week. In this part of Florida, box turtles appear to have small annual home ranges (moving 200 m or less, straight-line, throughout the course of the summer) and utilize hardwood hammocks, scrub thickets, shell barrens, and mangrove habitats.

We also affixed ibuttons (temperature data loggers) to their shells and found that during the heat of the summer, Florida box turtles experience temperatures as high as 40°C (104°F), close to their critical thermal maximum. The study will continue into 2017 and results will be used to inform management for this species.



Box Turtles

Conservation of the Yucatán Box Turtle

Liz Willey, Mike Jones, Eddie Nahuat, Rodrigo Macip, Tom Akre, Erika Gonzalez, Luis Díaz Gamboa

2016 REPRESENTED ATO’s 4th year working to conserve and study the Yucatán Box Turtle in Southeastern Mexico. This unusual species faces many of the same threats we see in most North American turtle species: primarily habitat loss and fragmentation but also collection for the pet trade—the latter (poaching) sometimes even by people in a delusional attempt to save the species. Because of its restricted range and thermally stressed condition, these threats are outsized and this species may be one of the most endangered on the continent.

Prior to broad surveys across the peninsula and the radio-telemetry study that ATO began with local partners in 2013, little was known about the distribution or behavior of this enigmatic creature. Eddie Nahuat, ATO’s field manager in Yucatán, has been tirelessly tracking 16 adults for several years and has documented important habitats and behaviors. As a terrestrial turtle with temperate origins (its closest relatives range throughout the eastern continental USA), this species faces relatively extreme conditions in Yucatán. Temperature data loggers reveal that like their relatives in Florida (see p. 11), their shells experience temperatures as high as 41°C or 105.8°F! We are still learning what local adaptations they may have developed in response to the extreme environment, but their shells appear much thicker and heavier than their relatives to the north and they spend a large part of their year underground in tiny caves and cracks in the karst landscape.

Climate change models suggest that the Yucatan peninsula is likely to experience rapid changes in temperature and moisture conditions, leading to a novel climatic regime over the next century, potentially exacerbating an already extreme environment.

This year has also seen an increase in landuse change and collection of this species. Mayan family and community farmers traditionally work on *milpas*, practicing small-scale, sustainable agriculture in this hot, arid climate. These traditional farming practices provide a mosaic of forest and fields in which the Yucatán box turtle has likely thrived for centuries. As globalization takes its toll on local communities, *milpas* are giving way to large-scale, arid-adapted cattle grazing, leaving large swaths of the landscape drier and devoid of vegetation. At the same time, the illegal pet trade in freshwater turtles continues to grow, and specimens of Yucatán Box Turtle have been reported in alarming numbers in southeast Asia. The pressure from foreign markets (and collectors in the USA) adds to traditionally strong local collection pressure for pet, food, and medicinal uses. Because this animal is so rare and the landscape is changing so rapidly, these harvest numbers appear unsustainable and may lead to local population collapse. As we redouble our efforts toward conservation of freshwater turtles in functioning landscapes across North American in 2017, ATO will continue to work with local community members to study and conserve this imperiled species.



Yucatán Box Turtle, *Terrapene yucatana*. Adult male #44 from one of ATO’s long-term study sites on the Yucatán Peninsula. Photo © M.T. Jones / ATO

Box Turtles

Ecology and Conservation of Arizona Mud Turtles

Trevor Persons, Mike Jones, Liz Willey, Cristina Jones, Rodrigo Macip Rios,
John Iverson, Jonathan Mays

The Arizona Mud Turtle (*Kinosternon arizonense*) is found in tanks, manmade seasonal ponds, roadside ditches, and washes, and ranges from extreme south-central Arizona, USA to south-central Sonora, Mexico. Despite its restricted range and association with xeric landscapes in an area undergoing a consistent drying trend, the Arizona Mud Turtle is locally abundant. The species is primarily active during the summer monsoon season in July and August, and although known to make overland movements, its dispersal behaviors are poorly documented and metapopulation dynamics have not been studied. Formerly treated as a subspecies of the Yellow Mud Turtle (*K. flavescens*), the Arizona Mud Turtle is one of the least-studied freshwater turtles of North America.

In the summer of 2016 ATO and a network of partners in both the USA and Mexico initiated a long-term ecological study of the Arizona Mud Turtle in southern Arizona, located about an hour southwest of Tucson. In late July, prior to significant monsoon rainfall, we surveyed a nearly-dry earthen cattle tank where the species had been found previously. This tank is located within mesquite grassland habitat less than half a kilometer from the Mexican border. Over the course of two days we captured 15 Arizona Mud Turtles, some by muddling (in the truest sense of the technique—see photo), some by trapping, and some during visual surveys of adjacent uplands. A few of those captured in uplands were found within entrance burrows of Banner-tailed Kangaroo Rat mounds. These impressive structures, which can be as much as a meter high and five meters across with up to a dozen large entrances, may be an important habitat feature for Arizona Mud Turtles at this site. Of the turtles captured in July, six were equipped with radio transmitters. In early September we returned to the site, after the tank had re-filled from monsoon rainfall. Five of the six radio-equipped turtles were in the tank, and one was in the uplands, within the same kangaroo rat mound where it was last seen in July. We also captured six more turtles, and outfitted four of them with radios, bringing the total number of study animals to ten. Two of these were from the same tank, but two were captured in a smaller tank about half a kilometer away.

In 2017 we will opportunistically obtain locations of radio-equipped turtles about once a month through the winter and spring, and an Antioch University graduate student will then conduct intensive fieldwork through the summer. As a result of the long-term (at least 5–10 year) timeframe of this study we expect to obtain valuable information on the dispersal behavior and metapopulation dynamics of a potentially vulnerable, desert-adapted freshwater turtle. We also will coordinate radiotracking in response to rare weather events (e.g., heavy rainfall) at all seasons, as we expect such events might be an important aspect of the dispersal ecology of this species. This study will compliment ongoing long-term ecological studies by ATO and its partners of Creaser's Mud Turtle (*K. creaseri*), Scorpion Mud Turtle (*K. scorpiodes*), and Rough-footed Mud Turtle (*K. hirtipes*), each of which exploit seasonal and temporary aquatic habitats in Mexico.





Arizona Mud Turtle, *Kinosternon arizonense*. Adult female from Arizona. Photo © T. Persons / ATO



United States-Mexico border fence at ATO's Arizona mud turtle study site. Photo © T. Persons / ATO



Mud Turtles



2016 Grant Update: Southwestern Pond Turtle Surveys at Historical Locations in Baja California, Mexico

Jorge Valdez Villavicencio and Anny Peralta Garcia

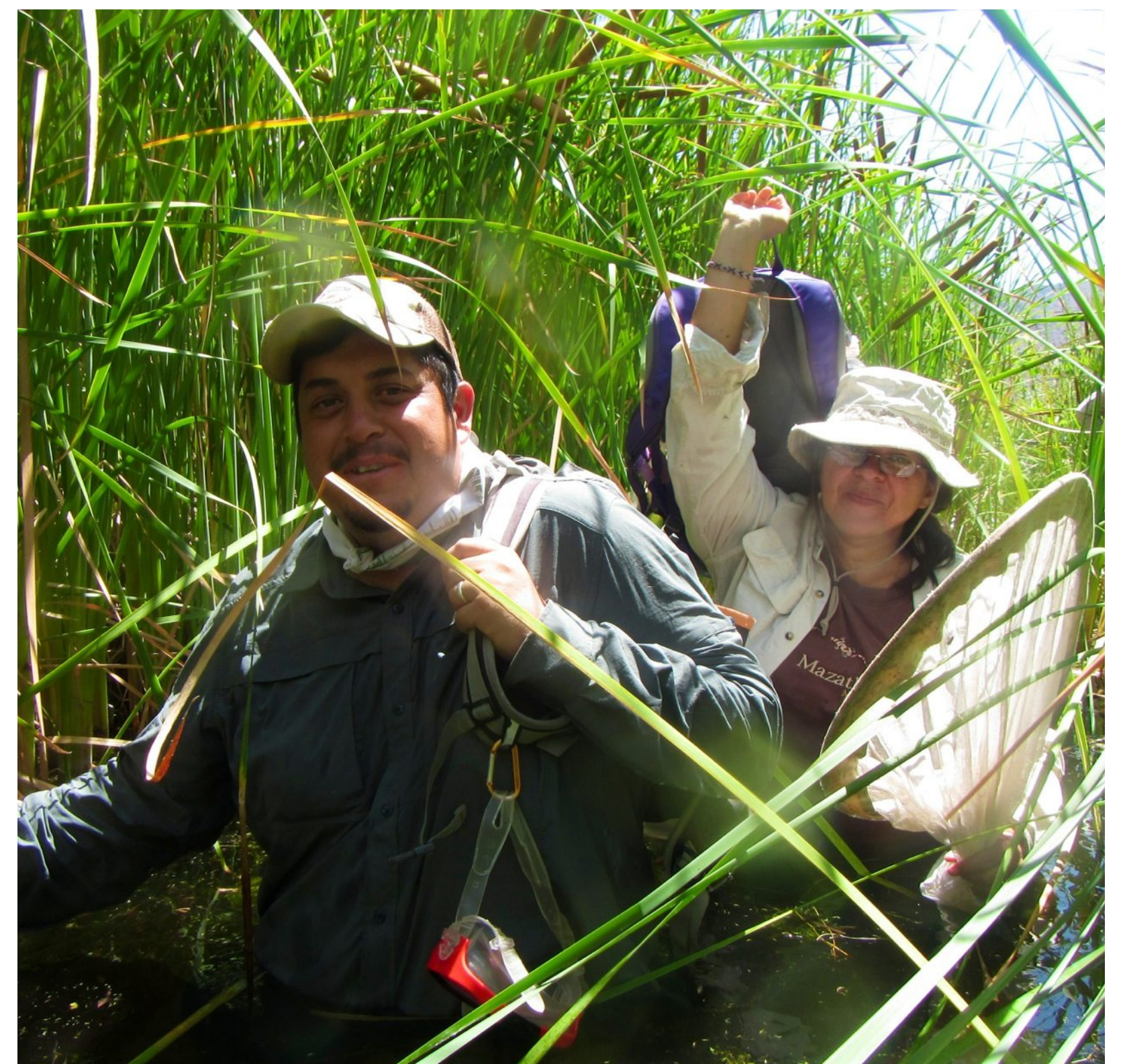
Conservacion de Fauna del Noroeste, Ensenada, Baja California, Mexico

The Southwestern Pond Turtle (*Actinemys pallida*) is one of three emydid species native to western North America, and the only freshwater turtle native to the state of Baja California. In the United States, this species has suffered a decline of ~ 60% of its range, but no study of the status of this species has been undertaken in Baja California. As part of an ongoing project to evaluate the conservation status of *Actinemys pallida* in northern Baja California, we conducted visual habitat assessments to determine its presence and relative abundance along with conservation threats at historical locations based on museum voucher specimens and literature. With ATO's small grant support we had the opportunity to visit four additional historical localities of the Southwestern Pond Turtle to continue our work on this turtle species, thus completing surveys of 67% of historical localities of the species.

Unfortunately pond turtles were only found at a single site in low abundance at a locality described by Jim Buskirk in 1984. At this site there was no running water and there were the remnants of a large (but dry) pond. We walked two kilometers down stream and found a stretch of 500 m with running

water and small ponds at a ranch called El Chaco. In two days of trapping we captured only two adult turtles, and available habitat was heavily impacted by livestock waste that is thrown into the stream by a nearby ranch. About 55 km SE of Ensenada, we visited Las Cruces, but we could not obtain access, so we moved to a nearby ranch about 6.5 km away. Here we were told by local ranchers that there used to be turtles, but the arroyo has been dry about five years, and they haven't seen turtles in that time. They showed us a pond turtle they'd kept in captivity at the ranch for several years, which came from a nearby arroyo.

Other historical localities searched included Bocana Santo Tomas and Arroyo Tecate, but we were not able to find turtles at these locations. Threats observed at these sites indicate that habitat loss by drought, over-extraction of water, and exotic plant species are diminishing the abundance of pond turtles specially in coastal areas, and at sites near urban areas. It appears that 50% of the historical sites have been lost (8 of the 16 surveyed sites).



2016 Grant Update: Population Genetics of the Razorback Musk Turtle (*Sternotherus carinatus*) and Implications for Conservation

Grover Brown, University of Southern Mississippi, Hattiesburg, MS

The Razorback Musk Turtle (*Sternotherus carinatus*) is considered one of the top-ten least studied turtle species in the United States.¹ The species has seemingly been treated as by-catch by biologists studying some of its larger or perhaps more charismatic riverine cohabitants, such as the impressive alligator snapping turtles (*Macrochelys temminckii*) or the ornately patterned map turtle species (*Graptemys* spp.). While it may, in fact, be smaller and less vibrant, the razorback musk turtle shares a similar ecology to *Macrochelys* and *Graptemys* in that it is highly aquatic and very much tied to the same riverine habitats. But while significant genetic variation worthy of taxonomic recognition has been found in these other riverine turtles across Gulf Coast drainages,^{2,3} no studies have yet investigated the population genetics of the razorback musk turtle across the same Gulf Coast drainages.

In 2016, with the help of a seed grant from American Turtle Observatory, we genotyped 50 *S. carinatus* from populations in Mississippi and Texas across 10 microsatellite loci to determine levels of genetic variation in the species. The results of this corroborate other studies of genetic variation in river turtles, and our preliminary findings suggest that there are distinct

populations of *S. carinatus* across the Gulf Coastal drainages. With increased range-wide sampling this field season, additional samples from across the remaining major river drainages will provide a higher resolution account of the full extent of genetic structure of the species, and whether there are any evolutionarily significant units (ESUs) that might require special attention.

These genetic data are important to the management of this species. Though not formerly listed as endangered, in recent years, the popularity of *Sternotherus* has apparently surged in the illegal pet trade of Southeast Asia. The genetic tools from this study can also help determine the source populations of wild-caught turtles from Southeast Asian markets or in any confiscations. If the bulk of the turtles are coming from a single population, or an evolutionarily significant population, these results can be used to advocate for stricter turtle-harvest laws across Southeastern states.

¹Ennen, J., & Lovich, J. (2013). A quantitative analysis of the state of knowledge of turtles of the United States and Canada. *Amphibia-Reptilia*, 11-23.

²Echelle, A. A., Hackler, J. C., Lack, J. B., Ballard, S. R., Roman, J., Fox, S. F., ... & Van Den Bussche, R. A. 2010. Conservation genetics of the alligator snapping turtle: cytonuclear evidence of range-wide bottleneck effects and unusually pronounced geographic structure. *Cons. Gen.*, 11, 1375-1387.

³Ennen, J., Lovich, J., Kreiser, B., Selman, W., & Qualls, C. 2010. Genetic and morphological variation between populations of the Pascagoula map turtle (*Graptemys gibbonsi*) in the Pearl and Pascagoula rivers with description of a new species. *Chel. Cons. & Bio.* 9: 98-113.



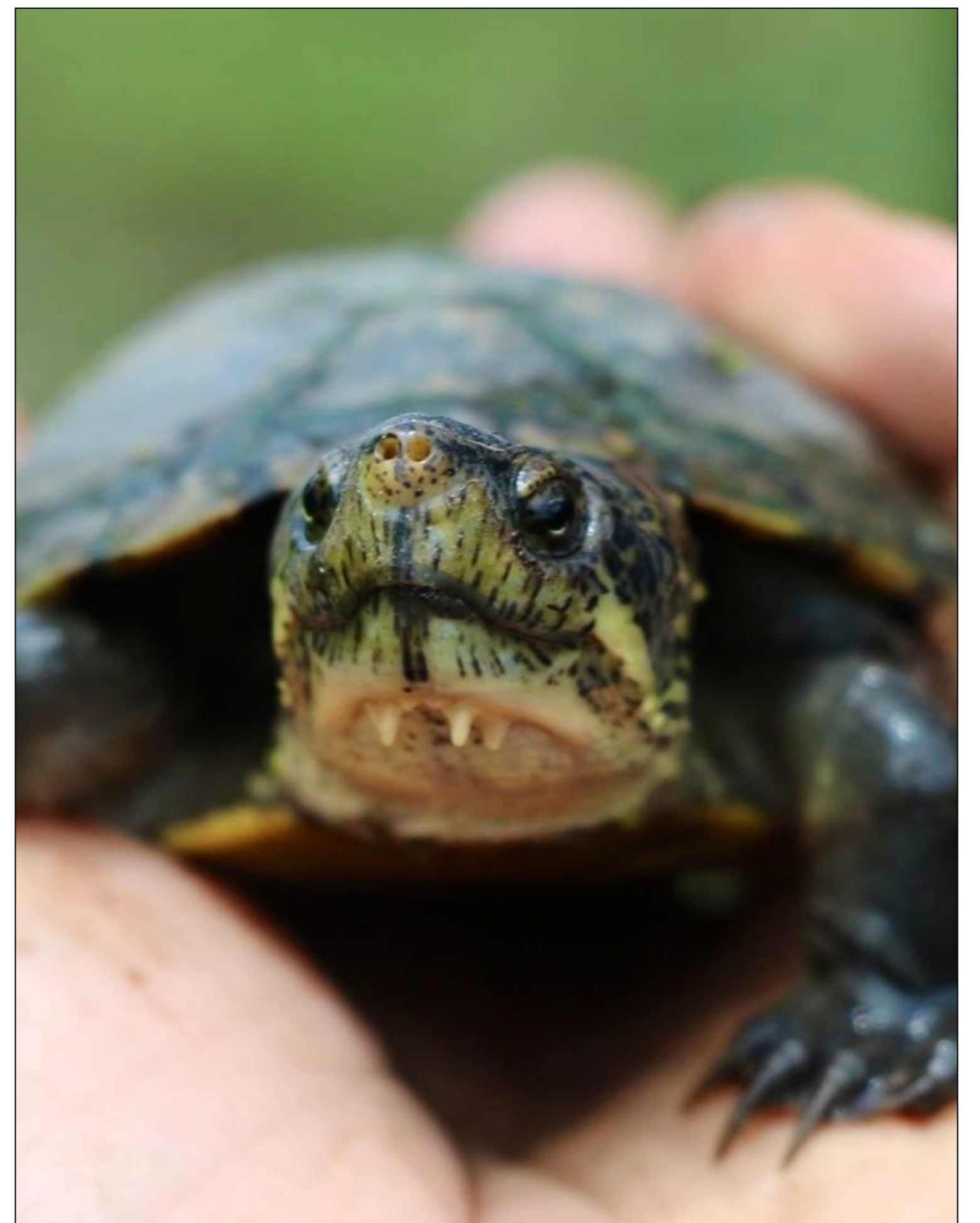
Razorback Musk Turtle, *Sternotherus carinatus*. Adult male. Photo © G. Brown / University of Southern Mississippi

2016 Small Grant Update: Wood Turtle Monitoring on the Ottawa National Forest, Michigan

Gary S. Casper, Ph.D., Great Lakes Ecological Services, Slinger, Wisconsin, USA



In 2016 we monitored Wood Turtle (*Glyptemys insculpta*) nesting populations for the 13th year in the Ottawa National Forest in western Upper Michigan. This year, 65 Wood Turtles were captured, of which 25 were new individuals, bringing the total 623 marked turtles. Exceptionally cool weather resulted in the latest nesting season we've yet seen, and high water restricted access to many survey sites. Several nesting areas have experienced changes that degrade nesting habitat suitability, with sand scoured away leaving hard cobble, while other beaches are being degraded by the establishment of dense (often invasive) vegetation. The two survey areas with the best populations now have 156 and 115 turtles marked, respectively, followed by 61, 57, 47, and 43 turtles marked at the next most robust survey areas. Mark-recapture results will be evaluated this winter for population trends.



Applied Telemetry Course in Morelia, Michoacán Rodrigo Macip Rios and Mike Jones

Biologists from American Turtle Observatory traveled to Morelia, Michoacán, Mexico in June to co-lead a telemetry workshop with ATO partner Rodrigo Macip Rios at ENES Unidad Morelia at the Mexican National University. The team deployed radios on adult rough-footed mud turtles (*Kinosternon hirtipes murrayi*, pictured at right)—one of the first radiotelemetry studies of this species in Mexico. ATO provided funds to cover the cost of radio transmitters for the study.

2017 Small Grant Awards

For the second year, ATO is excited to help support excellent freshwater turtle conservation and research projects through our small grants program. The grants program is dedicated to supporting projects that promote conservation and applied research efforts for North American freshwater turtles in their native habitats, with a particular emphasis on species of greatest conservation need with few other funding opportunities available to them. Thank you to all of this year's applicants! We are heartened and inspired to see the excellent work toward freshwater turtle conservation throughout the continent. Keep up the great work! And thank you to our 2016 donors who make the small grants program possible.

Hybridization and Introgression in the American Box Turtles (*Terrapene* spp.)

Bradley T. Martin, Marlis R. Douglas, and Michael E. Douglas; University of Arkansas; Fayetteville, AR

The North American Box Turtles (*Terrapene* spp.) are of conservation concern throughout their range. Their populations are in decline due, in part, to road-based mortality, loss and fragmentation of habitat, and invasive predators. Despite recent efforts to resolve box turtle classification using molecular phylogenetic data, some phylogenetic relationships have not been fully resolved, particularly regarding the four taxa inhabiting the southeastern United States. It has been suggested that the southeastern taxa, *T. carolina carolina*, *T. c. triunguis*, *T. c. major*, and *T. c. bauri*, might consist of at least two separate species and that introgression could be occurring. Given that many conservation efforts are focused at the species level, and often ignore subspecies, it is necessary to have an understanding of which taxa represent unique species. Furthermore, detecting introgression, or hybridization without introgression, allows managers to make more informed conservation decisions by identifying populations or areas that may need to be managed differently. Based on previous research, it is clear that a limited number of mitochondrial DNA genes or nuclear introns are not able to resolve the classification of these four taxa. Martin et al. will employ double digest restriction-associated DNA sequencing (ddRADseq), a reduced-representation next generation sequencing technique, in order to 1) disentangle the phylogenetic relationships of the four southeastern taxa, 2) assess whether hybridization or introgression is occurring between them, and 3) determine if introgression is an historic or recent occurrence.

Distribution and Abundance of the Alligator Snapping Turtle (*Macrochelys temminckii*) in the Pascagoula River Basin in Mississippi

Luke Pearson, Carl Qualls, Brian Kreiser, and Gabrielle Berry, University of Southern Mississippi; Hattiesburg, MS

Alligator Snapping Turtles are the largest freshwater turtle in North America, reaching carapace lengths of 80 cm and weighing up to 113 kg. Because of this size, Alligator Snapping Turtles were harvested for meat during the 1970s and 1980s. With this species' longevity, low reproductive output, and need for extremely high adult female survivorship to maintain stable populations, unregulated harvest caused drastic population declines. This species is protected in most states and is considered vulnerable by the IUCN. Recently, research has provided evidence that there are three species of alligator snapping turtles, with each species having a significantly smaller range, and thereby being possibly more imperiled, than previously thought. The U.S. Fish and Wildlife Service will reevaluate the status and distribution of alligator snapping turtles by 2020. However, there is a lack of geographical distribution and abundance data for this species in Mississippi, which comprises a substantial area within their range. By systematically trapping the large river basins, starting with the Pascagoula River and continuing to other basins (Mississippi floodplain, Tombigbee, Pearl, Black River, and Yazoo) within the coming years, Pearson and colleagues will assess the abundance and distribution, which will fill this knowledge gap and assist the U.S. Fish and Wildlife Service in assessing the status of the alligator snapping turtle.

Study of a Northern Wood Turtle Population

David Putnam, University of Maine; Fort Kent, ME

Dave Putnam and his students will work with Maine Inland Fisheries and Wildlife, ATO, and the Northeast Wood Turtle Working Group to employ an undergraduate student with experience in Wood Turtle field research to survey the entire 54 km length of a priority river in Aroostook County, Maine using standardized regional protocols. The study area is on remote, privately owned industrial woodland near the known northern limit of wood turtle range. This project will also expand the relationships between the Wood Turtle Working Group and private timber companies in this vast region.

Landscape Genetics of the Ornate Box Turtle on the Pine Ridge Reservation, South Dakota

Camille Griffith, Black Hills State University; Kyle, SD

The Ornate Box Turtle (*Terrapene ornata*) is considered a species of greatest conservation need in South Dakota. They are also a sacred species to the people of the Sioux Nation. In response, an ecological study on the ornate box turtle was conducted on the Pine Ridge Indian reservation in order to assist in developing a conservation plan for the state. Since 2012, more than 300 individuals have been identified. An important component of the project is landscape genetics. DNA from fingernail clippings is being used to identify gene flow, population structure, essential environmental predictors, and landscape barriers using next generation sequencing. The box turtle project is the first wildlife study to use genomics as a tool for the Oglala Lakota Community (Turtle Nation) and it is also being conducted by a geneticist member of the community. Results of the study will include knowledge on gene flow and population structure to assist in future conservation of ornate box turtles throughout the Nation.

AMERICAN TURTLE OBSERVATORY

www.americanturtles.org

Spread the Word

ATO is a small, new organization with a growing base of support. We hope to engage diverse audiences in the challenge of protecting North America's most important landscapes for turtles. Consider sharing a copy of our annual report, or sending our website to friends. We're also eager to hear creative ideas about how to reach new audiences. Connect with ATO on Facebook at facebook.com/americanturtles.

Support Turtle Conservation

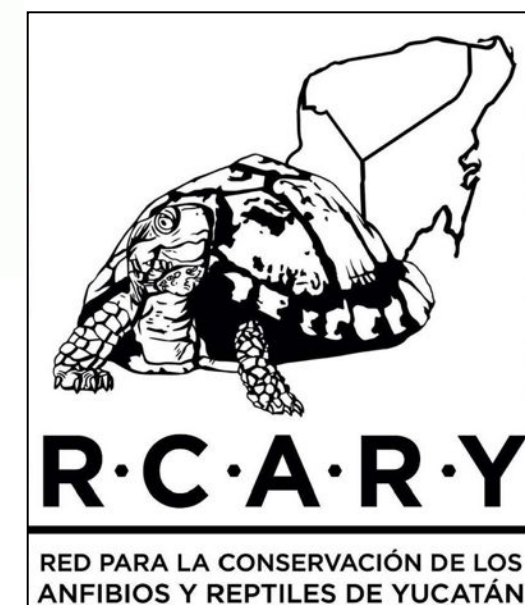
ATO is committed to identifying and conserving North America's most important habitats for freshwater turtles, but it's clear that many successful land conservation projects happen at the local level. Learn more about local turtle conservation efforts at americanturtles.org/local (contact us to let us know about other groups!). Consider supporting local and international conservation organizations that **protect large landscapes**, such as the Nature Conservancy. Stay tuned on Facebook for regional updates on conservation policy and land conservation opportunities.

Donate to ATO!

Every dollar received is spent directly on conservation efforts for North American turtles. Even a small amount helps. Your donation supports field studies of at-risk turtles and surveys to locate large populations, ATO's small grants program, conservation planning, and conservation action.

To donate, visit americanturtles.org/donate OR send a check to: **American Turtle Observatory**

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Thank you for
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ATO Partners in Northern New England.
Photo: Liz Willey / ATO

