TRANSCRIPT (WRITTEN ESSAY)
INTERVIEWEE: Charles Wax Caillouet, Jr.
INTERVIEWER: David Todd
DATE: December 3, 2021
LOCATION: Montgomery**,** Texas, remotely recorded
TRANSCRIBER: Trint, David Todd
SOURCE MEDIA: MP3 audio file
REEL: 4084
FILE:
KempsRidleySeaTurtle_Caillouet_Charles_MontgomeryTX_3December2021_Reel4084_WrittenEssay

Q. Would you please provide a brief overview describing your background and career, as a segue to this script that you submitted for inclusion in the Kemp's ridley sea turtle | Texas Fauna Project?

A. I am a retired marine fisheries biologist. My German middle name was my paternal grandmother's maiden surname, perhaps originally spelled Wachs. My French surname is pronounced "kah-you-wet" and means "pebbly place."

My wife of 44 years, Nancy Laird Caillouet, and I were both born in Baton Rouge, East Baton Rouge Parish, Louisiana and grew up in Baker, about 39 km north of Baton Rouge, but we are Texans by choice. We received Bachelor and Master degrees from Louisiana State University and Agricultural and Mechanical College (LSU), the Land Grant university in Baton Rouge. Nancy is a retired public school teacher. We lived in Galveston until we moved to Montgomery, north of Houston in 2001.

I received a PhD in Fishery Biology from Iowa State University in 1964. During 1964-1967, I was an Assistant Professor, in the Department of Biology, University of Southwestern Louisiana (now University of Louisiana at Lafayette, ULL).

During 1967-1972, I was an Associate Professor in the Division of Fisheries and Applied Estuarine Ecology, Rosenstiel School of Marine and Atmospheric Science (RSMAS), University of Miami, Florida, a Sea Grant university.

During 1972-1998, I was a Supervisory Fishery Biologist (Research) at the Galveston Laboratory of the U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS).

After retirement, I remained engaged in research and publication related to recovery of the endangered Kemp's ridley sea turtle (*Lepidochelys kempii*) population and management of fisheries for brown shrimp (*Farfantepenaeus aztecus*), pink shrimp (*Farfantepenaeus duorarum*) and white shrimp (*Litopenaeus setiferus*).

During 2000-2004, I served on Texas Parks and Wildlife Department's Shrimp Advisory Committee. In 2006, I was a member of the Ad Hoc Shrimp Effort Working Group, Gulf of Mexico Fishery Management Council, Tampa, Florida. During 2000-2015, I served on the Texas Sea Grant Advisory Committee.

I am a member of the Marine Turtle Specialist Group of the International Union for Conservation of Nature (IUCN), a member of the International Sea Turtle Society (ISTS), and a Fellow Emeritus of the American Institute of Fisheries Research Biologists (AIFRB).

My four grown children are Suzanne R. Caillouet, Theresa E. Caillouet, Michelle M. Caillouet Bailey, and C. Christopher Caillouet.

Additional biographical information is accessible via Gulfbase (Resource Database for Gulf of Mexico Research), Researchgate and Google Scholar websites.

Upbringing

Q. Please tell about your childhood, and if there might have been any people who were a big influence in your interest in working with animals, and sea turtles in particular.

A. Of course my parents, Charles Wax Caillouet, Sr. and Elida P. Millet, were my earliest mentors. They married in Baton Rouge in 1933, during the Great Depression preceding WWII. I was born in 1937, after my sister Marilyn in 1935, and before my sister Camille in 1940. We lived across Scenic Highway (US 190) from the ESSO (Standard Oil of New Jersey) refinery in Baton Rouge, where my father was employed until he retired. He did not finish high school. Decades later, while still employed, he attended night school and received a high school equivalency diploma. He also had carpentry and mechanical skills and experience. In 1924, my mother received certification to teach in public schools, after 2 years of study at Southwestern Louisiana Institute (SLI) in Lafayette, Louisiana (later USL, then ULL). During 1924-1935, she taught elementary grades, first at Frisco School (on the East bank of the Mississippi River, St. John the Baptist Parish), about 80 km southeast of Baton Rouge, and later at Baker School.

My parents emphasized the importance of education. They raised chickens in the back yard of our home on Scenic Highway, and my mother enjoyed flower gardening. I developed an early interest in airplanes from movie "news reels" of the war in Europe. I attended Kindergarten through 2nd grade at St. Anthony School in Baton Rouge. My mother's youngest brother, Dr. Donald Joseph Millet Sr., Professor of History at McNeese State University in Lake Charles, Louisiana, was my Godfather and also an important mentor.

For 1 year during WWII, our family and that of one of my mother's sisters (Honorine A. Millet Daniels, who was my Godmother), her husband Paul Landry Daniels, and their two daughters, Carolyn and Paula) rented a Holstein dairy farm and shared the on Plank Road near Harding Airfield, the metropolitan airport leased to the U.S. Army by the city of Baton Rouge. Our two families operated the dairy, raised chickens and maintained a large vegetable garden. My first encounters with crawfish (*Procambarus* sp.) and a water snake (*Nerodia* sp.) occurred in a pasture ditch on that farm, and left lasting impressions. We hand-picked potato beetles off Irish potato plants. I also began drawing and constructed a stick-and-tissue model airplane while on the farm.

Following that dairy farming "adventure", the Daniels moved to Baker and our family returned to live across Scenic Highway from the ESSO refinery. In the summer of 1945, our family moved to Baker. We first lived in a small house on property owned by the Daniels, across Groom Road from Baker School. Mother resumed teaching there as a substitute. Decades later she was Editor of the bicentennial book entitled *Baker The First 200 Years, 1776-1976*, published by the City of Baker. She also authored the book, *Lions On The River: A Potpourri*, published in 1989.

During summers of our first 5 years in Baker, I dip-netted hatchling mud turtles, snapping turtles and red-eared terrapins, schooling catfish fingerlings, *Gambusia* minnows, tadpoles and frogs from nearby ditches, and observed them in glass jars containing water. The Daniels had a pond surrounded by a levee

in their back yard, where I fished with bamboo poles, caught frogs and observed water snakes and red-eared terrapins. My father introduced me to freshwater recreational fishing with bamboo fly rod in oxbow lakes, as well as crabbing for blue crabs (*Callinectes sapidus*) in brackish water bayous southwest of Baton Rouge.

As time and resources permitted, my father and helpers constructed our concrete block-stucco home on Groom Road, a block to the East from where we were living. I occasionally assisted in various stages of its construction. In 1950, we moved in before the home was finished. It took my father more than a decade thereafter to finish it, while employed full-time at the refinery. This provided an important and unique advantage for me, because I was able to conduct various biology and arts and crafts projects in my large bedroom without damaging the concrete block walls or concrete floor. My parents intermittently refinanced this home to support their children's studies toward bachelor degrees at LSU.

For short periods, I was allowed to keep an American alligator (*Alligator mississippiensis*) less than 0.6 m long, and a 1.5 m long Columbian boa constrictor, in outside cages. Intermittently, I maintained aquaria containing native or tropical fishes in my bedroom, as well as terraria containing amphibians.

As soon as I was old enough, I joined Boy Scout Troop 25, led by Scoutmaster, Albert "Bert" Nelson Robinson, Jr. Bert formed The Baker Natural History Society and introduced a group of my teenaged contemporaries and me to field trips in the pastures, woodlands, streams and ponds around Baker. He showed us how to collect, identify, handle, preserve and label herpetological specimens. Bert held meetings with our group and encouraged discussions. I learned from Bert how to safely handle the venomous cottonmouth moccasin (*Agkistrodon piscivorus*), and about federal laws protecting migratory birds.

In my early teens, I began working during summers as a Nature Lore Counselor at Boy Scout Camp Istrouma, Greenwell Springs, Louisiana, and continued this summer job intermittently thereafter, including at least one summer after beginning studies at LSU. My interests in camping and fishing, as well as observing, collecting, preserving and displaying biota, continued in Baker High School, through participation in 4-H Club. Biology was among my favorite subjects. At age 16, I was awarded Eagle Scout rank while in Baker Explorer Post 25, under Bert's leadership. I, at age 14, was among four Explorer Scouts who ushered at Bert's wedding to Muriel Maxine Hess. Bert was indeed a very important mentor, who no doubt influenced my later choices of study and career.

My parents encouraged my early interest in arts and crafts, which included airplane modeling, oil and tempera painting, wood sculpting, making Plaster of Paris molds from plasticine clay models and casting replicas, and creating and performing *Caillouët Musical Marionettes*. Mrs. Elsa Agnes Fenety Blom, librarian of the Baker Branch of the East Baton Rouge Parish Library, provided me with books on constructing and performing marionettes. I began playing tenor trombone in 6th grade, continuing through high school and in various LSU bands (Air Force ROTC, Tiger, Varsity and Concert) through first semester of my sophomore year. I also took courses in drawing and photography at LSU.

While in Florida (at RSMAS), I dabbled in ceramics and painting with acrylics on driftwood. At Galveston Community College, I took courses in drawling, oil and acrylic painting, and ceramics. After moving to Montgomery, I took courses in ceramics and sculpture at Lone Star Community College in Conroe, Texas.

I gave one of my ceramic sculptures (≈ 35 cm tall) to Dr. Donna J. Shaver. Entitled *Booted*; it was a juvenile Kemp's ridley with a cowboy boot on top of its carapace (signifying commercial use of sea turtle

leather). I gave another (≈ 90 cm tall) to Dr. Pamela T. Plotkin for Texas A&M University (TAMU; a Land Grant University) College Station, entitled *Caught In The Middle* (a totem with a shrimp trawler on top, a proportionally larger but juvenile Kemp's ridley in the middle, and a proportionally oversized shrimp on the bottom). I also created a Kemp's ridley marionette, and a booklet on how to construct it:

Caillouet, C.W., Jr. 1991. Kempy The Kemp's Ridley Sea Turtle Marionette. HEART (Help Endangered Animals-Ridley Turtles), Houston, Texas. 29 pp. (https://books.google.com/books/about/Kempy_the_Kemp_s_Ridley_Sea_Turtle_Mario.html?id=CqfmBQAAQBAJ)

Decades later, I shared a copy of this booklet and pre-cut wooden parts for constructing a second Kempy marionette with Dr. Matthew D. Ramirez, University of Rhode Island.

Education

Q. You received a B.S. in Forestry and a M.S. Game Management from Louisiana State, and later a Ph.D. in Fishery Biology from Iowa State University. Can you please tell about the lessons you learned or the colleagues and mentors you met there that might have led you to your career?

A. At age 17, I began studies at LSU in the summer session of 1955. Because of my interests in arts and crafts, my parents suggested that I major in Architectural Engineering. I did, but that did not work out well, so in second semester of my sophomore year, I switched major to Forestry in the LSU School of Forestry, College of Agriculture. That turned out to be a much better match. During that semester, I worked part-time as a field and laboratory technician for Dr. Edmon Jacob Kantack (https://www.findagrave.com/memorial/97995174/edmon-jacob-kantack), an entomologist in the LSU Department of Entomology, who was conducting research on pests of sweet potatoes and strawberries.

While working for Dr. Kantack, I met Charles McGhee Fugler, Jr. (https://data.library.amnh.org/archives/repositories/3/archival_objects/4704) who was also working part-time for the Department of Entomology. Decades later, I learned that he received his Master of Science degree in herpetology from LSU in 1953. Fugler's 1957 paper with Robert G. Webb reported his purchase of 4 Kemp's ridley hatchlings on the coast of Veracruz in July 1955:

Fugler, C.M. and R.G. Webb. 1957. Some noteworthy reptiles and amphibians from the States of Oaxaca and Veracruz. Herpetologica 13: 103-108. (https://www.jstor.org/stable/3890080)

VertNet (Vertnet.org) records confirmed the month and year of his purchases of those Kemp's ridley hatchlings. I and two others, Philip Alan Sandberg (a Geology major at LSU and Eagle Scout friend of mine; https://www.tributearchive.com/obituaries/3733332/Dr-Philip-Sandberg) and a Baton Rouge pet shop owner whose name I cannot recall, accompanied Fugler on a 2-week herpetological specimen collecting trip in Mexico. We traveled by car (towing a stake-bodied trailer full of equipment, cages, preservatives and specimen containers) from Baton Rouge through Texas to Veracruz and back in summer 1957. On part of this trip, we stayed for a few days at the home of Dyfrig McHattie Forbes (http://portal.vertnet.org/search?q=dyfrig+mchattie+forbes).

The switch to Forestry provided my first exposure to courses in renewable living resource ecology, conservation and management, as well as introductory statistics and technical writing. During one summer, as an upperclassman, I participated as a part-time Louisiana Wildlife and Fisheries Commission technician in a study of mourning dove (*Zenaida macroura*) reproductive output in Roselawn Cemetery, Baton Rouge. During the summer of 1959, I participated part-time as a technician in an LSU Veterinary

Science Department study of Leptospirosis, a lethal bacterial disease of nursing calves. I assisted in capturing intermediate hosts of *Leptospira* bacteria (including racoons, skunks and opossums) in cattle pastures at night, and in associated serological experiments in the laboratory. I received a B.S. in Forestry in August 1959, then worked for 2 weeks for Frank W. Bennett & Associates Consulting Foresters (based in Baton Rouge), cruising timber in the Big Thicket near Silsbee, Texas.

In Fall Semester 1959, I began graduate studies in Game (=Wildlife) Management within the LSU School of Forestry, supported by a graduate research assistantship. Dr. Leslie Lloyd Glasgow (https://www.lsuagcenter.com/portals/our_offices/departments/renewable-natural-resources/alumni/hall_of_fame/leslie-l-glasgow) was chairman of my graduate committee. He later served as Director of the Louisiana Wildlife and Fisheries Commission (1966-1969) and as Assistant Secretary for Fish, Wildlife, Parks, and Marine Resources, U.S. Department of the Interior (1969-1970). In addition to courses related to wildlife management, I took courses in herpetology and mammalogy, taught by ornithologist Dr. George Hines Lowery, Jr., Professor of Zoology and Director of the LSU Museum of Natural Science (https://sora.unm.edu/sites/default/files/journals/auk/v098n01/p0159-p0166.pdf). Herpetological and mammalian specimens that I collected and preserved during those courses are in the museum's collections, as documented in VertNet. I also participated with others in collecting avian specimens at Avery Island, Louisiana, for the museum's dioramas created by artist P. Ambrose Daigre, who was curator of collections (https://www.lsureveille.com/daily/lsu-home-to-more-than-a-couple-hidden-gems/article_595847f6-fa14-11e6-9f4a-5fd3c3a5412b.html)(https://www.lsu.edu/mns/about/about-mission.php). My thesis topic was nutrient contents of natural foods of Louisiana wildlife.

Dr. Robert Jess Muncy joined the School of Forestry faculty in November 1959, to teach fisheries-related courses and organize fisheries research. He received his Ph.D. in 1957 from Iowa State University, the Land Grant university in Ames, Iowa. Dr. Kenneth Dixon Carlander (https://www.aifrb.org/founding-fellows) (http://findingaids.lib.iastate.edu/spcl/arch/rgrp/9-10-52.html) was his major professor and later mine. I took Muncy's fisheries-related courses. He served on my graduate committee and helped me acquire a graduate research assistantship funded by the Cooperative Wildlife and Fisheries Research Unit at Iowa State University.

During 1960-1964 at Iowa State, I took Carlander's fisheries-related courses, as well as a variety of zoology courses in the Department of Zoology and Entomology, and courses related to my minors in statistics and physiology. For one quarter during the 1960-1961 academic year, I was a laboratory instructor (freshman zoology), supported by a graduate teaching assistantship. For another quarter in 1961 I taught herpetology as an instructor. In years 1962-1964, I received support from a Predoctoral Fellowship provided by the Division of General Medical Sciences, National Institutes of Health, U.S. Public Health Service, for research entitled "Factors affecting blood lactic acid concentration in channel catfish." I received the Ph.D. in Fishery Biology in February 1964. My dissertation was entitled "Effect of forced activity on blood lactic acid in channel catfish, *Ictalurus punctatus* (Rafinesque)."

Drs. Muncy and Carlander were major mentors.

Career

Q. You worked at the National Marine Fisheries Service facility in Galveston, and were involved in Kemp's ridley sea turtle work while there, in addition to other duties. Would you please tell about how you came to work there, and describe your Kemp's ridley work while there?

A. I knew before leaving Ames that I wanted to return to the South, so I wrote a letter to Dr. Gordon Pennington Gunter (https://aquila.usm.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=1305&context=gcr), Director of the Gulf Coast Research Laboratory in Ocean Springs, Mississippi. No position was available there, but he kindly referred me to Dr. Lewis Tejada Graham, Chairman of the Department of Biology at University of Southwestern Louisiana (USL; formerly SLI where Mother received her teaching certification; later ULL). An Assistant Professorship was available at USL. I applied for it, was accepted, and joined the faculty in March 1964. I replaced Dr. Carroll Raymond Norden, an ichthyologist, who in 1963 initiated a study of abundance and distribution of post-larval Penaeid shrimp in Vermilion and West Cote Blanche Bays south of Lafayette, under contract with the Bureau of Commercial Fisheries, U.S. Fish and Wildlife Service Laboratory in Galveston, Texas (which later became the NMFS laboratory). My contact at the Galveston Laboratory was Assistant Director, Dr. Joseph Henry Kutkuhn (https://www.sorensonlockwood.com/obituary/joseph-kutkuhn), who received his M.S. (1954) and Ph.D. (1956) under Dr. Carlander at Iowa State University. I continued this post-larval shrimp study, taught senior and graduate level fisheries-related courses as well as statistics, chaired M.S. committees of Bennie J. Fontenot, Jr., Ronald H. Kilgen and William S. "Corky" Perret, and participated as a member of Robert E. Druilhet's M.S. committee. I took introductory courses in computer science, taught by Dr. James Russell Oliver, and learned to write computer programs in FORTRAN on punched cards, which were fed into mainframe computers to analyze my data.

In 1967, I applied for and accepted an Associate Professorship in the Fisheries Division (later the Division of Fisheries and Applied Estuarine Ecology) at the Institute of Marine Science, University of Miami, Florida (which later became RSMAS). I began work in June 1967. Dr. Clarence Purvis Idyll (https://www.aifrb.org/founding-fellows) was Chairman of the Division. There I assisted in teaching graduate level courses in fisheries resources, biometrics, and population dynamics. I chaired M.S. committees of Chaloemwilai Chuensri, Purwito Martosubroto, and Nicholas Chitty, served on the MS committee of Anton Teytaud and the PhD committee of William Gehring. With James Booth Higman (https://www.ingentaconnect.com/content/umrsmas/bullmar/2010/00000086/00000001/art00001), I assisted in establishing a commercial marine fisheries statistics collection program for the Commonwealth Department of Agriculture of Puerto Rico, conducted statistical analyses and evaluation of recreational catch rates of fishes in Everglades National Park, directed the Sea Grant institutional aquaculture program and conducted research on pink shrimp in captivity, including feeding experiments and inducing ovarian maturation by eyestalk ablation. I continued using FORTRAN to analyze data on mainframe computers. While heading the Sea Grant aquaculture program, I was privileged to meet Athelstan Frederick Spilhaus, Jr. (https://en.wikipedia.org/wiki/Athelstan_Spilhaus) who was visiting the Director of RSMAS, Frederick George Walton Smith (Founding Years (miami.edu)). Spilhaus is credited with proposing the establishment of Sea Grant colleges. He did this at a 1963 meeting of the American Fisheries Society.

After Dr. Idyll left RSMAS, I applied for the position of Supervisory Fishery Biologist (Research) at the NOAA NMFS Galveston Laboratory and was accepted. Over the years, I served as Chief of various Divisions and Branches that engaged in research related to biology and population dynamics of Penaeid shrimp, offshore environmental impacts of petroleum exploration and production, offshore environmental impacts of Strategic Petroleum Reserve salt dome brine disposal, and impacts of explosive removal of offshore petroleum-related platforms on marine mammals and sea turtles, head-starting of loggerhead (*Caretta caretta*) and Kemp's ridley sea turtles, and the Sea Turtle Stranding and Salvage Network. One of the first things I initiated after joining the Galveston Laboratory staff was conversion of historical shrimp fisheries data from paper data sheets to computer-compatible media for analysis by

computer (https://spo.nmfs.noaa.gov/sites/default/files/pdf-content/MFR/mfr353-4/mfr353-49.pdf). The U.S. Army Corps of Engineers in Galveston conducted the analyses of these data on its mainframe computer, until the Galveston Laboratory gained remote access to mainframe computers at the Miami Laboratory, and later when the Galveston Laboratory acquired personal computers. I took courses in SAS (Statistical Analysis System) for mainframe and personal computers at TAMUG, and used SAS for data analyses. I also served intermittently on graduate student committees at University of Miami, University of Houston, University of Texas Medical Branch (Galveston), and TAMU. I was a part-time Lecturer at Texas A&M University Galveston (TAMUG) during 1982-1988, teaching courses in Fisheries Conservation and Management and Biostatistics.

In 1981, I was assigned and additional position as Chief of the Aquaculture Research and Technology Division, previously held by Dr. James P. McVey. This division was phasing out of research related to Penaeid shrimp aquaculture and into head-starting sea turtles, which it had been engaged in since 1978:

Caillouet, C.W., Jr. 2000. Sea turtle culture: Kemp's ridley and loggerhead turtles. Pp. 786-798 in R.R. Stickney (Editor), Encyclopedia of Aquaculture, John Wiley & Sons, Inc., New York, 1063 pp. (https://openlibrary.org/books/OL7614710M/Encyclopedia_of_Aquaculture)

In 1982, Carole Hoover Allen founded Help Endangered Animals-Ridley Turtles (HEART), a committee of the Piney Woods Wildlife Society (https://www.pineywoodswildlifesociety.org) based in Houston:

Allen, C.H. and A.L. Barr. 1989. Promoting conservation of Kemp's ridley sea turtle through public education. Pp. 22-24 in Caillouet, C.W., Jr. and A.M. Landry, Jr. (Editors). Proceedings of the First International Symposium on Kemp's Ridley Sea Turtle Biology, Conservation and Management. TAMU-SG-89-105, 260 pp. (https://drive.google.com/file/d/1HdjuTGqp9s9KxJ_xsjfXbo7itLPwQtlE/view)

Mrs. Allen and HEART helped support the Kemp's ridley head-start experiment, and promoted implementation of NMFS regulations requiring turtle excluder devices (TEDs) in shrimp trawls. In 1987, Mrs. Pamela Phillips traveled from Christchurch, New Zealand to Houston with her husband, Leon Francis Phillips, Professor of Chemistry at University of Canterbury, who was on sabbatical as a Visiting Scholar at Rice University. Mrs. Phillips met Mrs. Allen and decided to write a book about Kemp's ridley after visiting the NMFS Galveston Laboratory during a NOAA-HEART open house at the Kemp's ridley rearing facilities. Mrs. Phillips then met Mrs. Katherine Lowe, the mother of a young artist, Janie Lowe, at a luncheon in Lubbock, Texas. At that luncheon, Mrs. Phillips mentioned that she was thinking about writing a book and needed an illustrator. Mrs. Lowe replied that she knew one, her daughter, Janie! Janie was living in Vail, Colorado at the time. Janie had received a Bachelor of Fine Arts degree in illustration in 1986, from Texas Tech University in Lubbock. In 1987, Janie returned to her parents' home in Idalou, Texas near Lubbock and created the illustrations for the following book:

Pamela Phillips (author) and Janie Lowe (illustrator). 1989. The Great Ridley Rescue. Mountain Press Publishing Company, Missoula, Montana.

180 pp. (http://www.seaturtle.org/mtn/archives/mtn44/mtn44p14.shtml)

As a consequence, in 1989 Janie was awarded a scholarship from the School of Visual Arts in New York City, where she received her Master of Fine Arts degree in 1991 (https://www.janielowepaintings.com).

In 1985, I and Dr. André Myrton Landry, Jr. chaired the first international symposium on Kemp's ridley sea turtle biology, conservation and management, held at TAMUG, and edited its proceedings:

Caillouet, C.W., Jr. and A.M. Landry, Jr. (Editors). 1989. Proceedings of the First International Symposium on Kemp's Ridley Sea Turtle Biology, Conservation and Management. Texas Sea Grant Program TAMU-SG-89-105, 260 pp. (https://drive.google.com/file/d/1HdjuTGqp9s9KxJ_xsjfXbo7itLPwQtlE/view).

My interest in airplanes and flying led eventually to my using Microsoft's and other computer flight simulators until my colleague Dennis Brian Koi suggested that if I liked flying so much, I should take flying lessons. I began taking flying lessons beginning in April 1989, at Scholes Airfield in Galveston. For the most part, I trained in Cessna 150s and 152s, but also in Cessna 172s, and in one flight in a Cessna 177. While I was a student pilot, the pilot-in-command of a U.S. Coast Guard (USCG) Dolphin Aerospatiale helicopter allowed me to occupy the co-pilot (left) seat and maintain heading and altitude during part of a flight from Rancho Nuevo to Corpus Christi, Texas. Later on, the pilot-in-command of a USCG Falcon Jet allowed me to sit in the co-pilot right seat and maintain heading and altitude during part of a flight from Corpus Christi to Galveston. Of course, those two pilots-in-command controlled airspeed and did not allow me to take off or land those aircraft! I received my private pilot certificate in September 1992, limited to single-engine land airplanes, Day Visual Flight Rules only. Nancy was my first passenger. On three separate occasions, I piloted flights related to sea turtle research on the Texas coast. Consecutively, my passengers on these flights were Drs. Landry, Peter Sheridan, and Roger J. Zimmerman, the latter of whom was Director of the NOAA NMFS Galveston Laboratory. I quit piloting airplanes in March 1995.

In November 1995, my staff and I received the Department of Commerce's Bronze Metal Award for Superior Federal Service associated with developing techniques in sea turtle husbandry, head-starting, tagging, submergence physiology and support of the sea turtle stranding and salvage network.

During 1995-1998, I was a member of NMFS' Turtle Expert Working Group (TEWG, and participated in following assessment:

Turtle Expert Working Group. 1998. An assessment of the Kemp's ridley (*Lepidochelys kempii*) and loggerhead (*Caretta caretta*) sea turtle populations in the western North Atlantic. NOAA Technical Memorandum NMFS-SEFSC-409, 96 pp. (https://repository.library.noaa.gov/view/noaa/3050)

Shortly thereafter, I retired from the Galveston Laboratory.

Introduction

Q. Would you please give us a quick summary of the life history of the Kemp's ridley sea turtle?

A. I refer readers to the excellent book edited by Dr. Pamela T. Plotkin, Texas Sea Grant Director at TAMU:

Plotkin, P.T. (Editor). 2007. Biology and Conservation of Ridley Sea Turtles. The Johns Hopkins University Press. Baltimore, Maryland. 356 pp. (https://jhupbooks.press.jhu.edu/title/biology-and-conservation-ridley-sea-turtles)

Additional information on Kemp's ridley life history can be obtained from the following sources:

Marquez-M, R. (compiler). 1994. Synopsis of Biological Data on the Kemp's Ridley Turtle, *Lepidochelys kempi* (Garman, 1880). NOAA Technical Memorandum NMFS-SEFSC-343, 91 pp. (https://repository.library.noaa.gov/view/noaa/6184)

NMFS, USFWS, and SEMARNAT. 2011. Bi-National Recovery Plan for the Kemp's Ridley Sea Turtle (*Lepidochelys kempii*), Second Revision. NMFS. Silver Spring, Maryland. 156 pp. + appendices. (https://www.fws.gov/kempsridley/Finals/kempsridley_revision2.pdf)

NMFS and USFWS. 2015. Kemp's Ridley Sea Turtle (*Lepidochelys kempii*) 5-Year Review: Summary and Evaluation. NMFS, Office of Protected Resources, Silver Spring, Maryland and USFWS, Southwest Region, Albuquerque, New Mexico. 62 pp. (https://repository.library.noaa.gov/view/noaa/17048)

Wibbels, T. and Bevan, E. 2019. *Lepidochelys kempii* (errata version published in 2019). *The IUCN Red List of Threatened Species* 2019: e.T11533A155057916. (https://dx.doi.org/10.2305/IUCN.UK.2019-2.RLTS.T11533A155057916.en)

Burchfield, P.M., C.H. Adams and J.L. Dávila Guerrero. 2020. Mexico/United States of America binational population restoration program: U.S. 2020 report for the Kemp's ridley sea turtle, *Lepidochelys kempii*, on the coast of Tamaulipas, Mexico. Gladys Porter Zoo, Brownsville, Texas. 58 pp. (possibly available Patrick Burchfield, Director, Gladys Porter Zoo, Brownsville, Texas).

Caillouet, C.W., Jr. and B.J. Gallaway. 2020. Kemp's ridley sea turtle emigration and immigration between the Gulf of Mexico and North Atlantic Ocean should not be ignored in age-structured population modeling. Marine Turtle Newsletter 161:9-14. (http://www.seaturtle.org/mtn/archives/mtn161/mtn161-2.shtml)

Incidentally, in June 2021, NOAA NMFS announced initiation of the next 5-year review for Kemp's ridley:

Endangered and Threatened Species; Notice of Initiation of a 5-Year Review of the Kemp's Ridley Sea Turtle. (https://www.regulations.gov/document/NOAA-NMFS-2021-0063-0001)

Mexican nesting beaches

Q. As a starting point, please describe the arribada on Rancho Nuevo, as recorded by Andres Herrera in 1947.

A. Arribada is a Spanish word meaning arrival. An arribada is a synchronized reproductive aggregation of adult female and male ridley sea turtles in coastal waters where they mate, and where the females ascend adjoining nesting beaches, excavate nest cavities, lay eggs, cover their nests with sand and return to the water, thereby abandoning their clutches to whatever threats may befall them. Arribadas are the biogeographically normal reproductive behavior exhibited by the two ridley species, olive ridley (*Lepidochelys olivacea*), the most abundant of the sea turtle species in the world, and Kemp's ridley, the least abundant.

The primary Kemp's ridley nesting beach is located near Rancho Nuevo, Municipality of Aldama, on the Gulf of Mexico coast of the State of Tamaulipas, Mexico. It was discovered by Andrés Carlos Herrera Casasús, an engineer and private pilot from Tampico, Mexico, who filmed a movie of the largest ever recorded single-day arribada of adult female Kemp's ridleys on 18 June 1947. In 1961, Herrera lent his film to Dr. Henry Herman Hildebrand III, who made copies, one of which he shared with Dr. Archie Fairly Carr, Jr. who had searched 18 years for the primary site where Kemp's ridleys nested, but failed to locate a single authentic nesting emergence. Hildebrand screened the movie at the 41st annual meeting of the American Society of Ichthyologists and Herpetologists in Austin, Texas in 1961. Dr. Carr was among those who attended and viewed the movie, which inspired him to write the following paper:

Carr, A. 1963. Panspecific reproductive convergence in *Lepidochelys kempi*. Ergebnisse der Biologie 26:298-303. (https://link.springer.com/chapter/10.1007/978-3-642-99872-0_25)

Carr (1963) cited Hildebrand's (1963) paper as *in press*, although the title mentioned by Carr (1963) was different from that of Hildebrand (1963):

Hildebrand, H.H. 1963. 1963. Hallazgo del area de anidacion de la tortuga marina, "lora", *Lepidochelys kempi* (Garman) en la costa occidental del Golfo de Mexico. Ciencia, México 22(4):105-112.

In 2010, with permission, I transcribed Hildebrand's (1963) Spanish text and translated it to English:

Caillouet, C.W., Jr. 2010. Hildebrand (1963): a transcription and translation. Marine Turtle Newsletter Archives, 38 pp. (http://www.seaturtle.org/PDF/CaillouetCW_2010_Hildebrand1963ATranscriptionandTran.pdf)

From Herrera's movie, Hildebrand (1963) estimated there were 40,000 adult females in the 1947 arribada. Carr agreed with that estimate in his 1963 paper and 1967 book:

Carr, A. 1967. So Excellent a Fishe: A Natural History of Sea Turtles. The American Museum of Natural History, The Natural History Press, Garden City, New York. 248 pp. (https://upf.com/book.asp?id=9780813037981)

Carr (1967) also surmised that 4 million hatchlings must have entered the Gulf of Mexico bordering the Rancho Nuevo beach 2 months after the 1947 arribada. This estimate is enormous and noteworthy by comparison with only 1,025,027 hatchlings released from all nesting beaches in Tamaulipas over an entire nesting season in 2009, which was the highest number since Tamaulipas beach protection began in 1966. If Carr's (1967) estimate of hatchlings entering the Gulf of Mexico represented, for the most part, only those resulting from the single-day arribada in 1947, then the season's total for that year must have been millions more!

Herrera's movie showed that adult females were so abundant and aggregated on the beach that some of the eggs already laid were dug up and exposed to predators by later nesters excavating their nest cavities. Herrera's film also showed that large quantities of eggs were being harvested by hueveros during that arribada. Hildebrand (1963) recommended promulgation of conservation measures to prevent extinction of arribadas which had declined after 1947.

In Chapter 1 of Pamela Plotkin's book published in 2007 (cited above), Peter Charles Howard Pritchard explained that arribada nesting apparently overwhelms natural predators with an ephemeral overabundance of eggs, leaving the rest to incubate and hatch in comparative safety. Arribada nesting apparently evolved as a strategy that assured survival of the two ridley species prior to human exploitation nesters and eggs on nesting beaches and incidental bycatch of neritic life stages at sea. In addition to losses of eggs during arribadas, eggs can thereafter be destroyed by predators, parasites, roots of vegetation, cattle, tides and other natural and anthropogenic threats while incubating on the beach. When eggs in a clutch hatch, the hatchlings burst forth from the nest in a frenzy and crawl to the surf, during which time they are exposed to mammalian, avian and crustacean predators. Hatchlings that reach the surf are then exposed to predation by numerous species of marine fishes during their frenzied swim to favorable offshore habitat, characterized by presence of floating Sargassum seaweed that is dispersed with the hatchlings by surface circulation. A series of papers by Dr. Nathan F. Putman and his colleagues suggest that the location of the primary nesting beach at Rancho Nuevo was influenced by surface currents off that beach which carried hatchlings most quickly to favorable offshore habitats. As the small turtles grow offshore, most remain within the Gulf of Mexico, but some are carried by surface currents through the Florida Straits into the Northwest Atlantic Ocean where they are then carried

northward by the Gulf Stream, which distributes them along the East coast of North America. Some are then carried eastward to European waters by the North Atlantic Gyre. After 2-3 years in this oceanic (surface pelagic) stage, Kemp's ridleys that survive the oceanic stage enter neritic habitat along the coasts of the Gulf of Mexico and Northwest Atlantic ocean. Questions remain concerning whether those in the Atlantic contribute significantly to the main population in the Gulf of Mexico, or are "lost waifs" as Archie Carr referred to them.

Decline

Q. I have read that between 27,000 and 40,000 nesting Kemp's ridley Sea Turtles were witnessed at Rancho Nuevo on a single day in 1947, but by 1966 the number of nests had dropped to 5991, and then to 740 by 1985. I believe that the Kemp's ridley is now the world's most endangered sea turtle species. I have read that the severe decline in Kemp's ridleys might have been linked to egg theft on nesting beaches, bycatch in shrimp trawls, artificial lighting, oil spills, or other factors (including natural predators, like coyotes, sand crabs, blackbirds, vultures, and at sea, the white sea bass and yellow jack. What do you think the major problems have been?

A. The largest proportion of the Kemp's ridley population is restricted to the Gulf of Mexico, while a much smaller proportion occurs in the North Atlantic Ocean, likely because most Kemp's ridley nesting occurs on western Gulf of Mexico beaches. Annual reproductive output (i.e., hatchlings) along the coast of Tamaulipas is the predominant source of Kemp's ridleys, followed by much lower reproductive output on the coasts of Veracruz, Mexico and Texas (most of which occurs at Padre Island National Seashore, PAIS). The latter nesting colony was restored through cooperative efforts among agencies of Mexico and the U.S., as described by:

Caillouet, C.W., Jr., D.J. Shaver and A.M. Landry, Jr. 2015. Kemp's ridley sea turtle (*Lepidochelys kempii*) head-start and reintroduction to Padre Island National Seashore, Texas. Herpetological Conservation and Biology 10(Symposium):309-377. (http://www.herpconbio.org/Volume_10/Symposium/Caillouet_etal_2015.pdf)

Shaver, D.J. and C.W. Caillouet, Jr. 2015. Reintroduction of Kemp's ridley (*Lepidochelys kempii*) sea turtle to Padre Island National Seashore, Texas and its connection to head-starting. Herpetological Conservation and Biology 10(Symposium):378-435. (http://herpconbio.org/Volume_10/Symposium/Shaver_Caillouet_2015.pdf)

When Hildebrand (1963) was published, the Kemp's ridley population and arribada sizes were declining. Fortunately, in 1966, Mexico's federal government initiated highly manipulative, annually recurring conservation interventions on the primary nesting beach near Rancho Nuevo, which substantially reduced exploitation of eggs and nesters, and protected nesters, eggs and hatchlings from natural and human threats during nesting seasons. Carr (1977) observed that numbers of Kemp's ridleys nesting annually near Rancho Nuevo were still declining despite the positive effects of Mexico's early interventions, and he attributed this to continued unintentional bycatch of Kemp's ridleys in shrimp trawls:

Carr. A. 1977. Crisis for the Atlantic ridley. Marine Turtle Newsletter 4:2-3. (http://www.seaturtle.org/mtn/archives/mtn4/mtn4p2.shtml)

The 1984 recovery plan for marine turtles mentioned Hildebrand's (1963) estimate of 40,000 adult Kemp's ridley females in the 1947 arribada:

Hopkins, S.R. and J.I. Richardson (Eds.). 1984. Recovery plan for marine turtles. Prepared by The Marine Turtle Recovery Team. 363 pp. (https://www.fws.gov/oregonfwo/documents/RecoveryPlans/Marine_Turtles_RP.pdf)

The Kemp's ridley portion of this recovery plan was on pages 227-250; on page 236 was a statement of objective. Paraphrasing that statement, the objective was to restore the Kemp's ridley population to a level comparable to that based on the 1947 arribada.

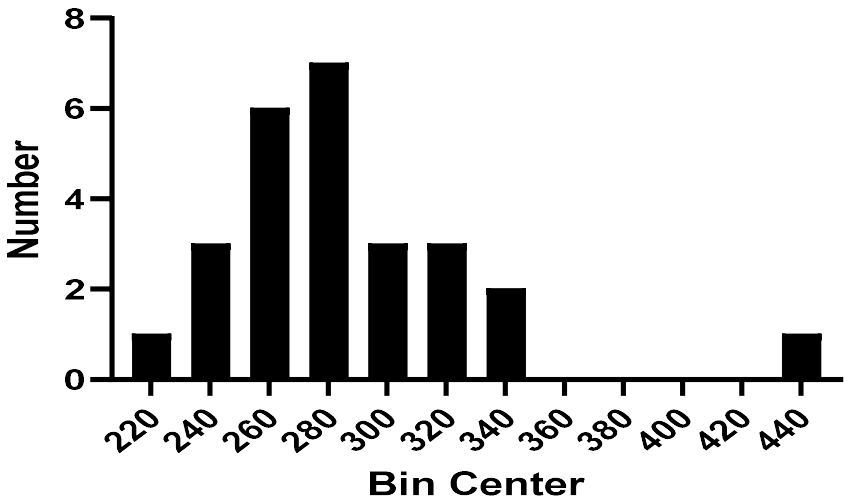
In the 2011 bi-national recovery plan (cited above), the downlisting threshold is 10,000 females nesting in a season (1/4 of Hildebrand's estimate of 40,000 nesting in a single day).

Bevan *et al*. (2016) revisited Herrera's movie of the single-day arribada in June 1947:

Bevan, E., T. Wibbels, B.M.Z. Najera, L. Sarti, F.I. Martinez, J.M. Cuevas, B.J. Gallaway, L.J. Pena and P.M. Burchfield. 2016. Estimating the historic size and current status of the Kemp's ridley sea turtle (*Lepidochelys kempii*) population. Ecosphere 7: e01244 (https://esajournals.onlinelibrary.wiley.com/doi/pdf/10.1002/ecs2.1244)

They estimated the mean (i.e., the arithmetic average) number of adult female Kemp's ridleys in the 1947 arribada to have been 26,916, and the mean number of adult female Kemp's ridleys during that entire nesting season to have been 48,607 (range of 33,006-83,981).

However, the frequency distribution of their 26 sample counts of adult female Kemp's ridleys in the 1947 arribada was not a normal, bell-shaped distribution. Instead, it was strongly positively skewed (i.e., skewed to the right):



That is not surprising, since frequency distributions of count data are typically skewed to the right:

Taylor, R.A.J. 2019. Taylor's Power Law: Order And Pattern In Nature. Academic Press, London, United Kingdom, 639 pp. (https://www.elsevier.com/books/taylors-power-law/taylor/978-0-12-810987-8)

A statistical re-analysis that accommodated positive skew of the 26 sample counts would likely produce estimates of mean counts of nesting females in the 1947 arribada and season that would be lower than those obtained by Bevan et al. (2016).

In any case, the message I take from Bevan et al. (2016) is that Hildebrand's estimate of 40,000 females nesting in the 1947 arribada was at least 49% too high. Obviously, the estimated size of the 1947 arribada is very important, because of its past and potential future use in deriving thresholds for downlisting as well as delisting Kemp's ridley (i.e., removal from the endangered species list). Perhaps this issue will be resolved by the new 5-year review, modification of the bi-national recovery plan, or both.

Despite the expansion of the shrimp trawling industry that took place in the Gulf of Mexico after 1947, Mexico's early conservation interventions on the beach near Rancho Nuevo allowed the declining residual population of adults to restore annual hatchling production and thereby reverse the population's decline by 1986 (Caillouet 2021, cited above).

In 1990, incidental capture in shrimp trawls was designated the most important human-associated source of mortality for sea turtle juveniles, subadults and breeders in coastal (i.e., neritic) waters, accounting for more deaths than all other human activities combined:

Committee On Sea Turtle Conservation, National Research Council. 1990. Decline of the Sea Turtles: Causes and Prevention. National Academy Press, Washington, D.C., 259 pp. (https://www.nap.edu/download/1536)

Kemp's ridley mortality has been greatly diminished by protection of nesters, eggs and hatchlings on nesting beaches, use of TEDs in shrimp trawls, and seasonal or permanent closers to shrimping of selected coastal waters of the Gulf of Mexico. All known natural and human threats to Kemp's ridleys have been identified and discussed in detail in the 2011 recovery plan and the 2015 5-year review (both cited above).

Determining the number of Kemp's ridleys in an arribada is a huge challenge, and so is counting solitary nestings. In the past, adult females were counted by observers on foot or on all-terrain vehicles. In the last few years, Dr. Thane Wibbels and his colleagues have been using unmanned aerial vehicles (UAVs) to obtain aerial photographs of adult males and females in waters adjoining the beach near Rancho Nuevo, as well as adult females and their tracks on the nesting beach. Sample counts per unit area can then be made by examining the photos. Nesting of an adult female takes an hour or less, and involves crawling up the beach from the surf, selecting a nesting site, digging a nest cavity, laying eggs, covering the nest and crawling back to the surf. False crawls also occur. A false crawl is one in which a potential nester leaves the surf, crawls up the beach, attempts to find a nesting site, but fails to nest, and returns to the surf. Females may lay one clutch or more during a nesting season.

Obviously, arribada nesting is very dynamic. The use of aerial photography produces voluminous quantities of time-series counts of adult males and females in the water, and adult females and their tracks on the nesting beach, whether or not they nest successfully. Use of UAVs is combined with additional sampling on the beach, including counting nests and eggs per nest, measuring carapace lengths of adult females, examining nesters for previously applied external tags or marks, and internal tags, and tagging those not previously tagged or that lost their tags.

As already mentioned, analyses of samples of Kemp's ridley count data provide statistical challenges that heretofore have not been adequately accommodated in the estimation of abundance, density and demographic vital rates of adults, eggs and hatchlings. Frequency distributions of such count data are typically skewed to the right, and their means are right of their modes and medians. Failure to recognize and properly accommodate positive skew of sample counts of Kemp's ridley life stages per unit area in statistical analyses raises questions about validity of estimates of demographic rates based on count data.

In July 2021, we submitted the following manuscript to Marine Turtle Newsletter:

Caillouet, C.W., Jr., P.M. Richards, N.F. Putman, R.T. Beyea, B.J. Gallaway and R.A. Valverde. Editorial: Positively-skewed sea turtle count data, Taylor's Power Law, estimation of demographic vital rates, and population modeling.

Q. While all are rare, why do you think that green, loggerhead, leatherback and hawksbill sea turtles have done better than Kemp's ridleys?

A. I would not say that sea turtles are rare, including Kemp's ridley which is the most endangered. Olive ridley is the most abundant of the sea turtles and Kemp's ridley the least abundant. Olive ridley is widely distributed among the world's oceans and has numerous nesting beaches. Kemp's ridley evolved from Olive ridley a few million years ago, as the Isthmus of Panama emerged:

Hendrickson, J.R. 1980. The ecological strategies of sea turtles. American Zoologist 20:597-608. (https://academic.oup.com/icb/article/20/3/597/213477)

Kemp's ridley is disadvantaged by its later origin, restricted geographic distribution, and limited number of nesting beaches, and may therefore be more vulnerable to climate change than other sea turtle species:

Butler, C. 2019. A review of the effects of climate change on Chelonians. Diversity 11(8):138. (https://www.mdpi.com/1424-2818/11/8/138/htm)

Frandsen, H.R., D.F. Figueroa and J.A. George. 2019. Mitochondrial genomes and genetic structure of the Kemp's ridley sea turtle (*Lepidochelys kempii*). Ecology and Evolution 10: 249-262. (https://doi.org/10.1002/ece3.5891)

Lamont, M.M., N. Moreno, F.Y. Camacho-Sánchez, |H.H. Acosta-Sánchez, S. Glaberman, M.A. Reyes-Lopez and Y. Chiari. 2021. Genetic diversity of immature Kemp's ridley (*Lepidochelys kempii*) sea turtles from the northern Gulf of Mexico. Aquatic Conservation: Marine and Freshwater Ecosystems 2021;1-8. (https://doi.org/10.1002/aqc. 3684)

Patrício, A.R., L.A. Hawkes, J.R. Monsinjon, B.J. Godley and M.M.P.B. Fuentes. 2021. Climate change and marine turtles: recent advances and future directions. Endangered Species Research 44:363-395. (https://www.int-res.com/abstracts/esr/v44/p363-395)

While some natural and human threats to sea turtles affect all sea turtle populations, the types and intensities of threats to different species vary on a worldwide scale.

For further details regarding threats to sea turtles, I refer readers to NOAA's Protected Resources recovery plans for each sea turtle species. (https://www.fisheries.noaa.gov/species-directory/threatened-endangered?title=&species_category=1000000045&species_status=any&regions=all&items_per_page=25&sort=)

Reintroduction

Q. In 1948, John Werler reported seeing Kemp's ridley Sea Turtles on Padre Island. Can you please give us an idea of the early history of Kemp's ridleys visiting Texas shores?

A. In his 1951 paper, John E. Werler reported a Kemp's ridley nesting on Padre Island in 1950 (not 1948), but he was not the person who observed it:

Werler, J. E. 1951. Miscellaneous notes on eggs and young Texas and Mexican reptiles. Zoologica 36:34-48. (https://www.biodiversitylibrary.org/page/50969963#page/53/mode/1up)

Werler credited Mr. Jesse R. Laurence (whose middle name was Robertus), a Nueces County Engineer, with this information. It was Laurence who, on March 23 1950, observed an adult female Kemp's ridley crawl onto the Padre Island beach, construct a nest cavity, and lay a clutch of approximately 100 eggs. Laurence also incubated 18 of the eggs in a basket of sand left outdoors and exposed to the sun, and occasionally sprinkled water on the sand when it became dry. Eggs began to hatch on July 25 1950. The hatchlings were kept in captivity for 120 days thereafter, but Werler did not state where. Four survived and were "donated to the zoo", but Werler did not state which zoo. No other details were provided concerning where or how the hatchlings were kept in captivity for 120 days; it is unlikely that any would have survived out of seawater or without food for that length of time. This also may be the first record of incubation of Kemp's ridley eggs in captivity and rearing of hatchlings in captivity.

Andrés Herrera's movie of the 1947 Kemp's ridley arribada showed hatchlings being handled. Herrera could have collected some eggs during that arribada and incubated them elsewhere, perhaps at his home in Tampico. However, I am unaware of any record confirming that Herrera incubated eggs collected during the 1947 arribada, but he could have collected hatchlings originating from nestings that occurred 2 months before that arribada. This is not to say that such records do not exist.

Q. In 1962, Fred Locket showed the Herrera film to at the Valley Sportsmen Club in Brownsville, and one of the other Club members, Grover Singer, began promoting ridley reintroductions to Padre. From 1964 to 1967, Dearl Adams buried over 5000 ridley turtle eggs from Rancho Nuevo on Padre, and released over 1200 hatchlings there. Please help fill out this story of the private, volunteer efforts to return ridleys to Padre.

A. I refer readers to our two companion papers, Caillouet, Shaver and Landry (2015) and Shaver and Caillouet (2015) (both cited above). They covered Kemp's ridley head-start and reintroduction of nesting to PAIS. It took us 5 years to examine the historical literature, interview most of those involved in the early planning, draft the manuscripts, have them peer-reviewed and edited before acceptance, and make final changes before publication. These papers were published in the proceedings of the Symposium entitled *Head-Starting Turtles - Learning From Experience*, held on July 12, 2010, during the joint meeting of the American Society of Ichthyologists and Herpetologists. The meeting was hosted by University of Rhode Island, Brown University, and University of Connecticut, and held at the Rhode Island Convention Center in Providence, Rhode Island. We did not attend the meeting, but were encouraged to submit our manuscripts for peer review and publication.

Evelyn Sizemore's book also recounts the early voluntary efforts to establish a nesting colony on the coast of South Padre Island, Texas:

Sizemore, E. 2002. The Turtle Lady Ila Fox Loetscher of South Padre. Republic of Texas Press, Plano, Texas. 220 pp. (https://books.google.com/books/about/The_Turtle_Lady.html?id=NuquPQAACAAJ)

Q. I have read that the National Park Service first formally proposed reintroducing the Kemp's ridley Sea Turtle to Padre Island in 1974, with leadership by Robert Whistler and Henry Hildebrand. Why was there a view that a second nesting beach, in addition to Rancho Nuevo, would be useful? How did that come about?

A. Robert Gerald Whistler and Henry Hildebrand were well aware, prior to 1974, that Kemp's ridley nestings had occurred in Texas. They were aware of Werler's (1951) paper. They were also aware of Kemp's ridley from firsthand experience in their field work on the coast of Texas. I refer readers to our two companion papers, Caillouet, Shaver and Landry (2015) and Shaver and Caillouet (2015) (both cited above). Together they cover the early history of Kemp's ridley nesting on Texas beaches, the earliest but apparently unsuccessful voluntary attempts to reintroduce Kemp's ridley nesting to South Padre Island, and the subsequent successful reintroduction of Kemp's ridley nesting to PAIS.

This topic is also covered in detail by Chapter 8 of the Administrative History of the National Park Service's PAIS (https://www.nps.gov/parkhistory/online_books/pais/adhit.htm), as well as by Evelyn Sizemore's book (cited above).

Head Start

Q. From 1978 through 1988, in the Kemp's Ridley Sea Turtle Restoration and Enhancement Program, 22,507 Kemp's ridley eggs were incubated and imprinted at Padre Island, and then the National Marine Fisheries Service reared the hatchlings at its Galveston Laboratory before release to the Gulf. Would you please tell us how this Head Start program began, and why it was started?

A. This topic is thoroughly covered by our two papers published in Herpetological Conservation and Biology in 2015 (cited above).

Q. It would also be good to know about the process of incubation, imprinting, rearing and release once in the States.

A. This topic is thoroughly covered in Pamela Plotkin's 2007 book (cited above), and in our two papers published in Herpetological Conservation and Biology in 2015 (cited above).

Q. Please talk about the strategies used to mark and track Head Started sea turtles.

A. This topic is thoroughly covered in Pamela Plotkin's 2007 book, and in our two papers published in Herpetological Conservation and Biology in 2015 (all three cited above).

Q. Please describe the collaboration on behalf of the Kemp's ridleys between the U.S. and Mexico, and among various agencies, including the NMFS, USFWS, and NPS.

A. This topic is thoroughly covered in our two papers published in Herpetological Conservation and Biology in 2015 (cited above).

Q. Why did the U.S. Fish and Wildlife Service cancel import of Kemp's ridley sea turtles from Mexico to the U.S. in 1993? I've heard that there were some who felt that head-starting was just masking problems in the Kemp's ridley's larger environment, like trawler take, causing odd behavior, like travel to Africa or

Nicaragua, or simply costing too much? What do you think were the main reasons? Do you think the cancellation was premature?

A. These topics are thoroughly covered in Pamela Plotkin's 2007 book, and in our two papers published in Herpetological Conservation and Biology in 2015 (all three cited above).

I sincerely believe that cancellation of the head-start experiment at the level of 2000 eggs per year was premature, because most head-started Kemp's ridleys were released during years 1978-1993, prior to implementation of U.S. federal regulations requiring TEDs in shrimp trawls in all areas and at all times within the NMFS southeast region. Continuing the head-start experiment into years in which such regulations were in effect could have bolstered restoration of the nesting colony at PAIS.

Under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the U.S. Fish and Wildlife Service (USFWS) can issue permits for importation of endangered species into the U.S. During years 1978-1992, USFWS issued CITES permits that allowed importation of approximately 2,000 (more or less) Kemp's ridley eggs per year from Rancho Nuevo to Texas for the reintroduction and head-start experiments. In some cases, they also allowed importation of hatchlings. In 1993, the CITES permit issued by USFWS restricted importation to only 200 Kemp's ridley hatchlings for captive-rearing by the NOAA NMFS Galveston Laboratory to sizes appropriate for testing TEDs. Thereafter, only loggerheads (*Caretta caretta*) were used for such purposes, and they came from beaches within the U.S.

Records documenting travel of head-started Kemp's ridleys to Africa and Nicaragua are suspicious at the least, and rare at best. However, it may have been possible for head-started Kemp's ridleys to travel to such locations. If they did, that would be remarkable by itself; it would indicate that they survived during such travel. It is true that many claims were made that some head-started Kemp's ridleys exhibited what was considered at the time to be aberrant behaviors, after their release into the wild. In our 2015 paper on Kemp's ridley head-start (cited above) we assumed that the longer head-started Kemp's rdleys were exposed to human care and artificial conditions of captivity, the greater was the risk of their developing maladaptive, abnormal, or aberrant behaviors that could be detrimental to their performance and survival in the wild. The same is true for ill, injured and stranded wild Kemp's ridleys that are found, resuscitated, brought into captivity, given medical treatment and rehabilitated, then released back into the wild. In other words, holding any sea turtles of any species in captivity, for any reason, has the potential of reducing their ability to survive in the wild as compared to those that spend their entire lives in the wild.

In August 1989, a Blue Ribbon Panel comprised of Drs. Thane Wibbels, Nat Frazer, Mark Grassman, John Roscoe Hendrickson and Peter Pritchard was convened at the NOAA NMFS Galveston Laboratory to review the Kemp's ridley head-start experiment. The panel recommended that head-start not be expanded, and that it be limited to 2,000 hatchings per year and 8-12 months of captive-rearing. The panel concluded that there were enough adult and near-adult Kemp's ridleys in public aquaria in the U.S. to facilitate captive-breeding should the need arise. The panel recommended that the experiment be continued for a 10-year period following installation of TEDs on all shrimping vessels in the U.S. portion of the Gulf of Mexico and Atlantic. This recommendation was based in part on the time it takes Kemp's ridleys to reach maturity.

Another review, which supported termination of the head-start and captive-breeding experiments, took place in August 1992 at the Galveston Laboratory, again prior to promulgation of federal law requiring TEDs in all shrimp trawls, at all times, and in all coastal areas within the NMFS southeast region:

Eckert, S.A., D. Crouse, L.B. Crowder, M. Maceina and A. Shah. 1994. Review of the Kemp's Ridley Sea Turtle Headstart Program. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-OPR-3, 11 pp. (https://repository.library.noaa.gov/view/noaa/3769)

However, what is most important is that, despite all negative claims about head-starting and the head-started Kemp's ridleys that were released into the wild, enough of the females survived to maturity, mated, and nested to restore the nesting colony at PAIS. This was an unprecedented achievement as far as I am aware. The Kemp's ridley nesting colony at PAIS is the only one in the U.S., and the third largest anywhere in the world. In addition, captive-breeding of Kemp's ridley was also achieved by Cayman Turtle Farm, Inc., British West Indies, in cooperation with Mexico, NOAA NMFS Galveston Laboratory via its head-start experiment, and USFWS via its permitting:

Owens, D.W. and G. Blanvillain. 2013. Captive Breeding in Sea Turtles. An Important Success Story. Pp. 23-40 in Keiichi Sato (Editor). Proceedings of the Symposium on Reproduction of Marine Life, Birth of New Life! Investigating the Mysteries of Reproduction. (https://churashima.okinawa/sp/userfiles/files/page/ocrc/23-40_owens_and_blanvillain_edit.pdf)

I also emphasize that all head-started Kemp's ridleys were tagged or marked in multiple ways, and some were fitted with tracking devices, before being released, so that they could be identified as head-started. Tag returns and tracking provided the means to evaluate various causes of their strandings, capture, or entrainment, which were shown to be similar to those for wild Kemp's ridleys.

In my opinion, federal agencies of Mexico and the U.S should consider experimental translocations of excess Kemp's ridley clutches of eggs from Tamaulipas nesting beaches to Gulf of Mexico beaches North and East of Tamaulipas as well as to beaches of the U.S. East coast, as a way to enhance nesting on beaches of Texas, especially at PAIS, and to establish new nesting colonies. Lessons learned during the Kemp's ridley head-start and restoration experiments, as well as subsequent research that has greatly improved methods for safely translocating clutches of eggs, could be applied. Such conservation interventions could increase the Kemp's ridley population's resiliency, diversity and sustainability under scenarios of global warming and sea level rise:

Caillouet, C.W., Jr. 2012. Editorial: do male-producing Kemp's ridley nesting beaches exist north of Tamaulipas, Mexico? Marine Turtle Newsletter 134:1-2. (http://www.seaturtle.org/mtn/archives/mtn134/mtn134p1.shtml)

Bevan, E.M., T. Wibbels, D. Shaver, J.S. Walker, F. Illescas, J. Montano, J. Ortiz, J.J. Peña, L Sarti, B.M.Z. Najera, and P. Burchfield. 2019. Comparison of beach temperatures in the nesting range of the Kemp's ridley sea turtle in the Gulf of Mexico, Mexico and USA. Endangered Species Research 40:31-40. (https://doi.org/10.3354/esr00977)

Caillouet, C.W., Jr. 2021. Substantial reduction in annual production of Kemp's ridley sea turtle hatchlings on beaches of Tamaulipas, Mexico may allow abundance of adults to increase. Marine Turtle Newsletter 163:1-7. (http://www.seaturtle.org/mtn/archives/mtn163/mtn163-1.shtml)

The rescue, resuscitation, rehabilitation and release (RRRR) of Kemp's ridleys and other sea turtles found stranded alive is similar in many ways to Kemp's ridley head-starting, since they involve prolonged exposure of the turtles to human care in captivity. Sea turtle RRRR has been practiced worldwide for decades. The 2011 Kemp's ridley recovery plan (cited above) stated that "…live stranded turtles are transported to rehabilitation facilities and a large percent are later released, thus directly contributing to

conservation." I am unaware of any evaluation that has determined that RRRR has contributed significantly to population recovery of any sea turtle species anywhere in the world, but there are humane and other reasons why the USFWS has issued permits that allow RRRR within the U.S. and its territories. Our 2016 paper called for evaluation of Kemp's ridley RRRR:

Caillouet, C.W., JR., N.F. Putman, D.J. Shaver, R.A. Valverde, E.E. Seney, K.J. Lohmann, K.L. Mansfield, B.J. Gallaway, J.P. Flanagan and M.H. Godfrey. 2016. A call for evaluation of the contribution made by rescue, resuscitation, rehabilitation, and release translocations to Kemp's ridley sea turtle (*Lepidochelys kempii*) population recovery. Herpetological Conservation & Biology 11:486-496. (http://www.herpconbio.org/Volume_11/Issue_3/Caillouet_etal_2016.pdf)

Shrimping

Q. It would be helpful to understand more from you about the impact of the shrimping industry on the Kemp's ridley. I have seen notes that the shrimping pressure off Rancho Nuevo increased a great deal after 1945, with introduction of new diesel engines and reregistering of trawlers to allow trawling in Mexican waters.

A. I refer readers to the following publications covering the history of development and expansion of the U.S.' Gulf of Mexico shrimp fisheries, and their current status:

Condrey, R. and D. Fuller. 1992. The US Gulf shrimp fisheries. Chapter 5. Pp. 89-119 in Glantz, Michael H. (Editor). 1992. Climate Variability, Climate Change, and Fisheries. Cambridge University Press, New York, 450 pp. (https://www.cambridge.org/core/books/climate-variability-climate-change-and-fisheries/09A4F23B30E7662F8DEB1509F0A324BC)

Iversen, E.S., D.M. Allen and J.B. Higman. 1993. Shrimp Capture and Culture Fisheries of the United States. Halsted Press, New York. 247 pp.

Caillouet, C.W., Jr., R. A. Hart and J. M. Nance. 2008. Growth overfishing in the brown shrimp fishery of Texas, Louisiana, and adjoining Gulf of Mexico EEZ. Fisheries Research 92:289-302. (https://www.sciencedirect.com/science/article/abs/pii/S0165783608000490?via%3Dihub)

Hart, R.A., J.M. Nance and J.A. Primrose. 2008. The U.S. Gulf of Mexico Pink Shrimp, *Farfantepenaeus duorarum*, Fishery: 50 Years of Commercial Catch Statistics. Marine Fisheries Review 74(1):1-6. (https://spo.nmfs.noaa.gov/sites/default/files/pdf-content/MFR/mfr741/mfr7411.pdf)

Hart, R.A. and J.M. Nance. 2013. Three decades of U.S. Gulf of Mexico white shrimp, *Litopenaeus setiferus*, commercial catch statistics. Marine Fisheries Review 75(4):43-47. (https://spo.nmfs.noaa.gov/sites/default/files/pdf-content/mfr7543.pdf)

Hart, R.A. 2017. Gulf of Mexico Penaeid shrimp stock assessment update for 2016. NOAA Fisheries Service, Southeast Fisheries Science Center, Galveston Laboratory, Galveston, TX USA. (https://gulfcouncil.org/council_meetings/BriefingMaterials/BB-04-2017/D%20-%205(d)%20Hart_GOM-Shmp-Assess-Update_Feb-3-2017.pdf)

Keithly, W.R. and K.J. Roberts. 2017. Commercial and Recreational Fisheries of the Gulf of Mexico. In: Ward, C. (Editor). Habitats and Biota of the Gulf of Mexico: Before the Deepwater Horizon Oil Spill. Springer, New York, NY. (https://doi.org/10.1007/978-1-4939-3456-0_2)

Gallaway, B.J., S.W. Raborn, L. Picariello and N.F. Putman. 2020. Changes in Shrimping Effort in the Gulf of Mexico and the Impacts to Red Snapper. iScience 23, 101111. (https://www.cell.com/iscience/pdf/S2589-0042(20)30296-0.pdf)

In summary, after 1947, a major increase in shrimp trawling effort (as measured by the number of days fished) occurred within the northern Gulf of Mexico. However, this upward trend later changed to one of decline, due in large part to economic challenges within the shrimp trawling industry, exacerbated by damage to the shrimping fleet and related onshore facilities from hurricanes in the mid-2000s. As shrimping effort declined, the Kemp's ridley population increased through 2009.

Q. To help protect the Kemp's ridley, during the 1970s Mexico expanded enforcement on its shrimping grounds off Tamaulipas, and during the 1976-79 period entered in a treaty with the U.S. to phase out U.S. shrimp trawling in Mexican waters. What impact do you think that had on the turtle's recovery?

A. In 1990, shrimp trawling was characterized as the greatest human threat to sea turtles (https://www.nap.edu/download/1536). Therefore, decreases in shrimp trawling effort can be expected to reduce unintentional bycatch of sea turtles in shrimp trawls. Mexico's establishment of the Kemp's ridley refuge along the coast of Tamaulipas near Rancho Nuevo in 1977, and the U.S.-Mexico treaty that phased out shrimp trawling by the U.S. fleet in Mexico's waters by 1980, coupled with declining shrimping effort due to economic challenges within the shrimping industry, have reduced Kemp's ridley mortality due to unintentional capture in shrimp trawls:

Lewison, R.L., L.B. Crowder and D.J. Shaver. 2003. The Impact of Turtle Excluder Devices and Fisheries Closures on Loggerhead and Kemp's Ridley Strandings in the Western Gulf of Mexico. (http://www.conservationecologylab.com/uploads/1/9/7/6/19763887/lewison_et_al_2003.pdf)

Márquez-Millán, R. and M. Garduño-Dionate (Compiladores). 2014. Tortugas marinas. México City, México: Instituto Nacional de Pesca. 94pp. (https://www.inapesca.gob.mx/portal/documentos/publicaciones/LIBROS/Tortugas-Marinas-x1a.pdf)

Crowder, L. and S. Heppell. 2016. The decline and rise of a sea turtle: how Kemp's ridleys are recovering in the Gulf of Mexico. Solutions 2:67-73. (https://thesolutionsjournal.com/2016/02/22/the-decline-and-rise-of-a-sea-turtle-how-kemps-ridleys-are-recovering-in-the-gulf-of-mexico/)

Q. Would you please talk about some of the proposed trawling closures (like the Georgia/Florida one in 1991), or the seasonal Texas Closure to shrimping that began in 1981?

Seasonal closures of coastal areas (neritic habitat) to shrimp trawling have been shown to reduce sea turtle mortality. The Texas Closure was also implemented to protect juvenile brown shrimp along the Texas coast to allow them to grow to larger, more valuable sizes before being harvested.

Lewison, Crowder and Shaver (2003; cited above) covered this topic, as did the 2011 recovery plan and 2015 5-year review (both cited above).

Q. I have read that federal regulations were issued in 1987 initiating use of Turtle Excluder Devices on shrimp trawls. By 1994, TED use had spread to be required on all trawls, at all times, at all sites. How did those regulations come to be enacted? What was the reaction from the shrimping industry?

A. The shrimping industry was initially opposed to TEDs. Actually, the earliest excluder designs were developed by commercial shrimp fishers in Georgia and used in the Georgia shrimp fishery, years before TEDs were required by federal regulations. The history of development and use of TEDs was covered by:

Conner, D.K. 1987. Turtles, trawlers, and TEDs: what happens when the endangered species act conflicts with fisheries interests. Water Log, A Legal Reporter of the Mississippi-Alabama Sea Grant Consortium, 7(4):1-27.

Yaninek, K.D. 1995. Turtle excluder device regulations: laws sea turtles can live with. North Carolina Central Law Review 21(2):article 5. Pp. 256-299. (https://archives.law.nccu.edu/cgi/viewcontent.cgi?article=1550&context=ncclr)

Jenkins, L.D. 2012. Reducing sea turtle bycatch in trawl nets: a history of NMFS turtle excluder device (TED) research. Marine Fisheries Review 74:26-44. (https://spo.nmfs.noaa.gov/sites/default/files/pdf-content/MFR/mfr742/mfr7423.pdf)

Q. I saw your 2017 presentation that noted the major decline in the brown and pink shrimp fishing effort. Why do you think trawling dropped, and how do you think that may have affected Kemp's ridley populations?

A. Your question refers to the following presentation:

Caillouet, C.W., Jr. 2017. What caused the Kemp's ridley sea turtle nesting setback in 2010? Texas Sea Grant Oil Spill Science Seminar, Sea Turtles and Oil Spill, Gladys Porter Zoo, Brownsville, Texas, 23 March 2017. (https://www.youtube.com/watch?v=-mEHJ1ev_j0) Note: skip the ads to view my presentation.

As mentioned already, decreases in shrimp trawling effort can be expected to reduce unintentional bycatch of sea turtles.

See also: Nance, J., W. Keithly, Jr., C. Caillouet, Jr., J. Cole, W. Gaidry, B. Gallaway, W. Griffin, R. Hart and M. Travis. 2008. Estimation of effort, maximum sustainable yield, and maximum economic yield in the shrimp fishery of the Gulf of Mexico. NOAA Technical Memorandum NMFS-SEFSC-570. 75 pp. (https://repository.library.noaa.gov/view/noaa/8617)

Gallaway, B.J., W.J. Gazey, C.W. Caillouet Jr. *et al*. 2016. Development of a Kemp 's Ridley Sea Turtle Stock Assessment Model. Gulf of Mexico Science 33(2):138-157. (https://aquila.usm.edu/goms/vol33/iss2/3/)

Aquaria

Q. I understand that some head-started Kemp's ridleys were placed at Cayman Turtle Farm and other aquaria to create a captive brood stock. Can you tell me how that came about and why?

A. This topic is covered in detail by Owens and Blanvillain (2013) and Caillouet, Shaver and Landry (2015) (both cited above).

Dip- Early 2010s

Q. In 2010, strong recovery trends that had been seen in Gulf of Mexico Kemp's ridley numbers reversed, dropping by a third. Some have pointed to the Deepwater Horizon oil spill and related dispersant use that began in April of 2010. Others have thought that reduced discards from shrimp trawlers were responsible, while others have theorized that problems with the overall carrying capacity of the Gulf, for instance a decline in blue crab, might be at fault. Or maybe diversion of cold waters from the Mississippi were a factor? Perhaps incidental capture by recreational hook and line fishing contributed. What do you think caused the reversals for the turtle?

A. All of those factors likely contributed, in varying degrees, to interruption of the 1986-2009 trend of increase in the Kemp's ridley population, as measured by annual counts of nests on the Tamaulipas index beach. However, the rate of increase in annual counts of nests on the Tamaulipas index beach began to show signs of slowing as early as year 2001. This suggested that the Kemp's ridley population passed the inflection point of its sigmoid (S-shaped) growth pattern 9 years before the Deepwater Horizon oil spill occurred in 2010. It also suggests that the population began experiencing density-dependent effects limiting its rate of increase well before the oil spill.

Published sources covering the trend in annual counts of nests on the Tamaulipas index beach from 1966 onward are as follows:

Caillouet, C.W., S.W. Raborn, D.J. Shaver, N.F. Putman, B.J. Gallaway and K.L. Mansfield. 2018. Did Declining Carrying Capacity for the Kemp's Ridley Sea Turtle Population Within the Gulf of Mexico Contribute to the Nesting Setback in 2010–2017? Chelonian Conservation and Biology 17(1):123-133. (https://doi.org/10.2744/CCB-1283.1)

Caillouet, C.W., Jr. 2019. Excessive annual numbers of neritic immature Kemp's ridleys may prevent population recovery. Marine Turtle Newsletter 158: 1-9. (http://www.seaturtle.org/mtn/archives/mtn158/mtn158-1.shtml)

Caillouet, C.W., Jr. 2021. Substantial reduction in annual production of Kemp's ridley sea turtle hatchlings on beaches of Tamaulipas, Mexico may allow abundance of adults to increase. Marine Turtle Newsletter 163:1-7. (http://www.seaturtle.org/mtn/archives/mtn163/mtn163-1.shtml)

Revival – Late 2010s

Q. In 2017, 353 Kemp's ridley nests were found in Texas, a 90% increase over the prior year. Likewise, nests in Mexico saw a 35% bump up from the previous year, reaching 23,700 (about 8000 females). What might account for the late teens' resurgence in Kemp's ridley counts?

A. When counts of Kemp's ridley nests on the Rancho Nuevo nesting beach approached then reached their lowest level in 1985, year-to-year counts were generally low numbers and variations from year to year in these counts were therefore relatively small. After the decline reversed in 1986, and the trend of increase developed, the year to year variations around the upward trend also increased. When counts are low, percentage changes represent low numbers. When counts are high, similar percentage changes represent high numbers. The upward trend in counts peaked in 2009, then dropped in 2010, and there has been no discernible trend of increase following 2009. However, there have been some relatively large arribadas (the largest around 8,000 nesters), which are good signs. The 2011 recovery plan's (cited above) threshold level of 25,000 annual nests (equivalent to 10,000 females nesting in a season) that

would justify downlisting from endangered to threatened status has been closely approached in recent years, but not reached. A more appropriate metrics for downlisting and recovery might be the largest, single-day arribada during a nesting season.

In my opinion, the major problem appears to be that there are too few adults, both females and males, in the population while abundance of neritic juveniles seems to be excessive.

In 2015, I, Benny J. Gallaway and André M. Landry, Jr. called for modification of the 2011 bi-national recovery plan for the Kemp's ridley:

Caillouet, C.W., Jr., B.J. Gallaway and A.M. Landry, Jr. 2015. Cause and call for modification of the bi-national recovery plan for the Kemp's ridley sea turtle (*Lepidochelys kempii*) - second revision. Marine Turtle Newsletter 145:1-4. (http://www.seaturtle.org/mtn/archives/mtn145/mtn145-1.shtml)

RRRR

Q. You and other turtle researchers have urged more study of the role of rescue, resuscitation, rehabilitation, and release (RRRR) translocations in Kemp's ridley sea turtle recovery. What is your theory about the role of these translocations, many of which are probably originally undertaken more for humane concerns for ill and injured turtles?

A. In my opinion, the role of RRRR translocations needs to be evaluated scientifically. In our 2016 paper (cited above), we called for such an evaluation for Kemp's ridley, and suggested it be applied to other sea turtle species as well. It is surprising that no evaluations have been conducted to determine whether RRRR translocations contribute significantly to Kemp's ridley population recovery, or to population recovery of any other sea turtle species. Methods that were used to evaluate and terminate the head-start experiment could be applied to evaluate RRRR translocations.

Numerous published evaluations and critiques of the Kemp's ridley head-start experiment were cited in our 2015 head-start paper (cited above). There is a major information gap concerning sea turtle RRRR, because relatively few Kemp's ridleys (or other species of sea turtles) have been marked, tagged, or fitted with transmitters to determine how long they survive in the wild following release, and what proportion reaches maturity and reproduces. In the U.S. and its territories, another problem is that many if not most sea turtles saved by RRRR have been required by the USFWS to be released near locations where they were found stranded. This requirement needs evaluating. It probably would be better to release rehabilitated Kemp's ridleys into waters of the western Gulf of Mexico where most nesting takes place. Like head-start, RRRR are highly manipulative conservation interventions. They involve extended exposure of captive sea turtles to human treatment and care. Conditioning to extended human exposure and care may reduce their survivability in the wild.

National Park Service

Q. The National Park Service has recently proposed cutting back on the Sea Turtle Science and Recovery Program on Padre Island National Seashore. From the outside, that seems odd, since it looks like the program has been effective in helping restore the Kemp's ridley, and in educating and building support among the public. Can you help us understand the reason behind these policy and funding changes?

A. I assume that you are referring to the Review of the Sea Turtle Science and Recovery Program Padre Island National Seashore, dated 8 June 2020. This review was recommended by National Park Service's Patrick Malone, Division Chief, Natural Resources, Department of Interior (DOI) Region 6, 7 and 8, reviewed and concurred with by Jennifer Carpenter, Associate Regional Director, Resource Stewardship and Science, DOI Region 6,7 and 8, and approved by Michael T. Reynolds, Regional Director, DOI Regions 6,7 and 8 (https://www.nps.gov/pais/learn/management/upload/PAIS-STSR-Review-Report_20210507_FINALamended_508.pdf)

The National Park Service's Sea Turtle Science and Recovery (STSR) program contributed in major ways, along with the NOAA NMFS Galveston Laboratory, Federal and State Agencies of Mexico, USFWS, Texas Parks and Wildlife Department, the USCG, the University of Texas Corpus Christi, Texas A & M University, Florida Department of Environmental Protection, ARCO Oil and Gas Company, HEART, etc. toward restoration of a Kemp's ridley nesting colony on PAIS. Detrimental actions by National Park Service subsequent to its 8 June 2020 review of the STSR program, if allowed to continue and intensify, will likely lead to a major setback of this successful restoration, and thereby waste millions of U.S. taxpayer dollars that were devoted to it over 4 decades, not to mention the costs to Mexico. Mexico was a full and eager partner in this restoration. In my opinion, cutting this program at this time of uncertainty concerning the causes of the interruption (in 2010) of the 1986-2009 upward trend in the Kemp's ridley population, and failure of population growth to resume over the last 11 years, is misguided at best. Instead of implementing numerous cuts to the STSR program, NPS should continue and enhance the STSR program at PAIS and participate in the ongoing investigation of possible causes of the nesting setback, which occurred despite annual releases of hatchlings from Tamaulipas beaches that have exceeded the 300,000 per year threshold established by the 2011 recovery plan (cited above) since the year 2000 (except for 2001 when the hatchlings released totaled 291,268). Data provided by the STSR program as well as from all other beaches where Kemp's ridleys have been documented to nest along the Gulf of Mexico coast and U.S. East coast should be integral parts of such an investigation.

I submitted the following written testimony to the Nueces County Commissioners Court for its meeting on 17 November 2021:

Testimony Submitted To The Nueces County Commissioners Court, Texas

by

Charles W. Caillouet, Jr., PhD

Montgomery, Montgomery County, Texas

17 November 2021

I thank Judge Barbara Canales and Commissioners of the Nueces County Commissioners Court for this opportunity to testify in support of the National Park Service's Sea Turtle Science and Recovery (STSR) program at Padre Island National Seashore (PAIS), Texas, and of Dr. Donna J. Shaver who has supervised this highly successful and widely recognized program for the last four decades.

I also thank Judge Canales and Commissioners for their staunch support of the National Park Service's STSR program.

I wholeheartedly urge and encourage (1) full restoration of National Park Service's cuts to and restructuring of the STSR program (that began early in 2020), and (2) full restoration of Dr. Shaver's supervision of this program and her many additional roles, including Texas Coordinator of the Sea Turtle Stranding and Salvage Network.

The endangered Kemp's ridley sea turtle (*Lepidochelys kempii*) was recognized as the official state sea turtle of Texas on 10 May 2013.[1] Among the STSR program's accomplishments, the most remarkable and unprecedented has been its participation in restoration of the Kemp's ridley nesting colony on PAIS, the only Kemp's ridley nesting colony in the U.S. In my opinion, full recovery of the Kemp's ridley population will depend on bolstering this nesting colony at PAIS and establishing new ones by translocating excess clutches of eggs from Tamaulipas, Mexico to beaches north of Tamaulipas along the coasts of the Gulf of Mexico and western North Atlantic Ocean. Satellite nesting colonies such as the one at PAIS will provide diversity, resiliency and sustainability to the Kemp's ridley population as global temperatures increase and sea level rises.[2]

The STSR program has also been an important contributor to conservation of other sea turtle species that occur along the Texas coast, including green (*Chelonia mydas*) and loggerhead (*Caretta caretta*) sea turtles. This program is especially important to ecotourism and public education within Texas. Dr. Shaver has received many awards and recognitions for her outstanding sea turtle research and conservation work.

Our research paper (Caillouet, Shaver and Landry 2015) explains why, how and when experimental reintroduction of Kemp's ridley nesting to PAIS was planned in the early 1970s and implemented in the summer of 1978 by National Park Service, Instituto Nacional de Pesca of Mexico, U.S. Fish and Wildlife Service, National Marine Fisheries Service and Texas Parks and Wildlife Department.[3]

This program was later popularized by a New Zealander Pamela Phillips and illustrator Janie Lowe in their extraordinary book, the Great Ridley Rescue, published in 1989.[4] On 10 November 2021, I mailed a copy of this book to Judge Canales for the Nueces County Commissioners Court via UPS, because it demonstrates the early, high level public support for reintroduction of Kemp's ridley nesting to PAIS. I hope that she received it before today.

In 1950, it was Jesse Robertus Laurence, a Nueces County Engineer, who observed the first documented Kemp's ridley nesting in Texas. This nesting occurred on Padre Island about 45 miles south of Corpus Christi. Laurence observed this nesting only 3 years after the primary Kemp's ridley nesting colony was discovered on the western Gulf of Mexico beach near Rancho Nuevo, Tamaulipas, Mexico. Its discoverer was Carlos Andrés Herrera Casasús, an engineer and private pilot from Tampico, Mexico, who filmed a movie of the largest ever documented single-day arribada (a reproductive arrival and aggregation) of Kemp's ridleys. Dr. Henry Hermann Hildebrand III learned about the movie and contacted Herrera, who loaned Hildebrand the movie and allowed copies to be made and distributed.[5] Hildebrand screened the movie at the 41st annual meeting of the American Society of Ichthyologists and Herpetologists in Austin, Texas in 1961. Dr. Archie Fairly Carr was among those who attended and viewed the movie, which inspired him to publish a paper about it in 1963.[6] From Herrera's movie, Hildebrand (1963) estimated there were 40,000 adult females in the single-day 1947 arribada.

My friend, Luis Jaime Peña, who is employed by Texas State Aquarium, recently brought to my attention an article entitled La Tortuga Lora Kemp's Ridley, on pages 38-39 in the magazine Asi Es Tampico, Edition 8, published in 2011.[7] I particularly liked the last sentence of this article which described Kemp's ridley as "one of the treasures of the coast of Tamaulipas and the whole human kind [sic]."

I hope that Nueces County Commissioners Court will continue doing all it can to assure that Kemp's ridley, the STSR program at PAIS, and Dr. Donna Shaver remain the treasures they are to Texas and humankind.

Footnotes

1. https://authentictexas.com/official-state-sea-turtle-of-texas/

2. Caillouet, C.W., Jr. 2021. Substantial reduction in annual production of Kemp's ridley sea turtle hatchlings on beaches of Tamaulipas, Mexico may allow abundance of adults to increase. Marine Turtle Newsletter 163:1-7. MTN 163:1-7 Substantial Reduction in Annual Production of Kemp's Ridley Sea Turtle Hatchlings on Beaches of Tamaulipas, Mexico May Allow Abundance of Adults to Increase

3. Caillouet, C.W., Jr., D.J. Shaver and A.M. Landry, Jr. 2015. Kemp's ridley sea turtle (*Lepidochelys kempii*) head-start and reintroduction to Padre Island National Seashore, Texas. Herpetological Conservation and Biology 10(Symposium):309–377.http://www.herpconbio.org/Volume_10/Symposium/Caillouet_etal_2015.pdf

4. Pamela Phillips (illustrated by Janie Lowe). 1989. The Great Ridley Rescue. Mountain Press Publishing Company, Missoula, Montana. 180 pp.

5. Hildebrand, H.H. 1963. 1963. Hallazgo del area de anidacion de la tortuga marina, "lora", *Lepidochelys kempi* (Garman) en la costa occidental del Golfo de Mexico. Ciencia, México 22(4):105-112. A transcription in Spanish and translation to English can be accessed at: http://www.seaturtle.org/PDF/CaillouetCW_2010_Hildebrand1963ATranscriptionandTran.pdf

6. Carr, A. 1963. Panspecific reproductive convergence in *Lepidochelys kempi*. Ergebnisse der Biologie 26:298-303. https://link.springer.com/chapter/10.1007%2F978-3-642-99872-0_25

7. ASI ES TAMPICO 18 edición by Gabriela Ortega - Issuu

Data Gaps

Q. You have written about the gaps in knowledge about the Kemp's ridley sea turtles' age structure and "lost-years" migration patterns. Can you help us understand how a better understanding of these problems might boost conservation strategies? For instances, you've discussed the possibility that there are too few adult females, and too many neritic immatures – how might that affect the recovery of the species?

A. As I mentioned above (http://www.seaturtle.org/mtn/archives/mtn158/mtn158-1.shtml) (http://www.seaturtle.org/mtn/archives/mtn163/mtn163-1.shtml), I believe that abundance of neritic immature Kemp's ridleys is excessive and preventing the number of adults from increasing within the population. Age-structured models has been proposed as a means of testing this hypothesis, but it has yet to be conducted.

National Park Service is in the process of creating future data gaps, by dramatically changing the methods that were used successfully to establish, maintain and enhance nesting at PAIS.

Statistical problems associated with failure to accommodate positive skew of counts of Kemp's ridley life stages has created questions regarding validity of estimates of vital demographic rates. This requires immediate attention, and will require Kemp's ridley count data from all sources, past, current and future.

Q. I read that the next 5-year review for the Kemp's ridley has been initiated: what do you foresee for the future of the ridley?

A. I am optimistic about the future of Kemp's ridley, especially if its population growth can be restored. I believe that bolstering the existing nesting colony on PAIS, and creating additional nesting colonies North and East of Tamaulipas, both in the Gulf of Mexico and along the East coast of the U.S., will be necessary to assure survival of this species, as the atmosphere and oceans warm and as sea levels rise. I believe this will initially require age-structured population modeling to test theories concerning why the population has not been increasing since the nesting setback that occurred in 2010. Such modeling could inform sea turtle conservation agencies in Mexico and the U.S. regarding changes in current conservation interventions that may be needed in the future.

Q. For one issue, could you offer your thoughts about the impact of climate change, through temperature and gender effects, sea level rise or hurricane severity?

A. The sex of Kemp's ridleys, like that of all sea turtles is determined by temperature during incubation of their eggs. For each species there exists a pivotal temperature at which the sex ratio is 50M:50F. Temperatures lower than the pivotal temperature produce more males, and temperatures above the pivotal temperature produce more females. Sex ratios of Kemp's ridleys are typically dominated by females, and global warming is expected to increase the proportion of females.

Kemp's ridleys exhibit nesting site fidelity. In other words, those that survive tend to return to their beach of origin. Therefore, it seems prudent to begin translocating excess clutches from Tamaulipas beaches to bolster existing colonies North and East of Tamaulipas and to establish new ones, as one approach to increase Kemp's ridley population size, sustainability and resiliency. Methods for translocationg clutches of eggs have been well tested, improved and shown to be effective. Sea level rise is an additional challenge to sea turtles, because they nest on coastal beaches. Sea level rise is expected to inundate existing beaches, but other beaches can develop.

Q. Do you have anything you'd like to add?

A. David, I think your questions have covered the most important aspects of assuring survival and growth of the Kemp's ridley population toward full recovery. I greatly appreciate your having invited me to participate in this Kemp's Ridley Sea Turtle-Texas Fauna Project, and for accommodating my preference to submit this written script, and to have an oral interview by phone limited to the three parts of this script that you selected.