

TRANSCRIPT

INTERVIEWEE: Pat Burchfield, Ph.D.

INTERVIEWER: David Todd

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David Todd [00:00:00] Well, good morning, Dr. Burchfield.

Pat Burchfield [00:00:05] Morning, David. How are you?

David Todd [00:00:06] I'm fine. I'm fine, thank you.

David Todd [00:00:09] Well, as we discussed a little bit offline before, we're doing an oral history here. And I'd like to lay out what the plan is so that you sort of have a heads-up about what the idea is. And if you have any reservations, you share those.

David Todd [00:00:28] So the idea is that with your approval, Dr. Burchfield, shall we plan on recording this interview for research and educational work on behalf of a non-profit group called the Conservation History Association of Texas, and for a book and a website that are under way for Texas A&M University Press, and finally for archiving at the Briscoe Center for American History, which is located at the University of Texas here in Austin. And of course, you'd have all rights to use the recording as you see fit as well. And so that was the thought here. And I just want to make sure that sounds good to you.

Pat Burchfield [00:01:09] No problems. Sounds good.

David Todd [00:01:13] OK, well, thank you. Well, let me just lay out the when and where and what we might be about here. And, and then we can broach some questions and hear what Dr. Burchfield has on his mind.

David Todd [00:01:28] It is April twenty ninth, 2021. My name is David Todd. I'm in Austin and I'm representing a non-profit group called the Conservation History Association of Texas. And we are fortunate to be conducting an interview with Dr. Pat Burchfield, who's worked with the Gladys Porter Zoo in Brownsville since its opening in 1971 and serving as its director starting in 2007. He has spent decades working on the recovery of the Kemp's Ridley sea turtle, among many other things, but that's probably our focus here today. And with regard to the turtle, he's helped initiate an international effort to protect them at their nesting grounds down at Rancho Nuevo, just north of Tampico in Mexico. He's based in Brownsville in Texas. And this interview is being done on the Ringr platform.

David Todd [00:02:27] Today, we'll talk about his history and, and particularly about the Kemp's Ridley sea turtle, its decline and his efforts to help protect and restore it.

David Todd [00:02:39] So we usually start these interviews with just a question about your childhood and if there might have been some experiences or people that might have influenced your interest in working with animals and sea turtles in particular.

Pat Burchfield [00:02:55] Well, to give you a little bit of background, I grew up in urban Columbus, Ohio, in the north end of town, and my father was a commercial art director. But fortuitously, we lived about four blocks from a very deep ravine, which no one went into because of rumors of bad people down in the ravine. But it was a magical place and every rock had a salamander or a little brown snake or a garter snake or a frog. And it was just the kind of place to be an incubator to develop someone's interest in nature and natural history.

Pat Burchfield [00:03:32] And on top of that, my father, despite being in a totally non-biology related field, was always rescuing wild animals. He would, he would buy a snapping turtle from kids that had caught it in the river, and he was afraid they were going to hurt it, and he'd bring it home or a bullfrog. And one time I can remember, he brought home three fox kits, red fox kits, because a farmer had killed the mother but didn't have the heart to kill the babies. So we ended up raising those at home. So from the time I was a small child, I was, I always had rescued wildlife in my, in my existence. And again, that was probably the genesis of my interest.

Pat Burchfield [00:04:17] And unfortunately for my dad, he was afraid of snakes and I was always dragging them home. But my mother was my, my champion, and she forced him to allow me to, to keep them and look after them and learn about them. So it was kind of a unique situation. And again, I think my interest in reptiles probably started because those were the first animals that I actually encountered and would drag home and stare at by the hour and keep them in aquariums or vivaria or whatever it was at the time.

Pat Burchfield [00:04:48] And so as a high school student, I ended up volunteering six hours a day at the Columbus Zoo reptile house for two years because I only needed a couple credits to graduate, and that was when I was 16, so when I turned 18 in 1960, the zoo actually hired me as an unskilled laborer, but working in the reptile department. So reptiles have always been my, my, the group of animals that fascinated me the most. But not to say all, all animals and plants don't fascinate me. They're all fabulous and interesting and have their own stories to tell. But those were the ones I was most familiar with.

Pat Burchfield [00:05:32] And in 1963 I enlisted in the US Army and was assigned to the U.S. Army Medical Research Lab, where I was ultimately in charge of producing snake venom for active immunization studies for U.S. G.I.s going into tropical areas, and also antiserum production. As we founded, our laboratory helped found and build the Picado Institute in Costa Rica, which is the largest antiserum producing facility in Central America, even today. So that was some of our taxpayer dollars that did something really beneficial, because at that point in history, Costa Rica had a very, very serious snake bite problem because most of the population was rural and dealing with some pretty dangerous snakes like the fer-de-lance.

Pat Burchfield [00:06:23] But, that said, in 1970, in November, I went to Brownsville, Texas. They were building a zoo and they contacted me about the possibility of heading up their reptile collection and building their reptile collection. And so in November of 1970, I signed on to what then was the Ringgold Park Zoo, which was later to become the Gladys Porter Zoo.

Pat Burchfield [00:06:51] And by 1972, I'd realized that, along with the giant tortoises, king cobras, mambas and other popular animals, I knew that that people wanted to see, I knew

Mexico had more species of reptiles than anywhere other in the world, other than perhaps Brazil. So on one of our collecting expeditions in 1972, my, my local guide and friend José Burnell said, "hey there's, there's a gringo and a Mexicano on the beach doing something with turtles." And that so intrigued us that we hiked the 13 kilometers through the forest on an old mud cattle trail to a place called Rancho Nuevo, where we ended up meeting Dr. Peter Charles Howard Pritchard and Dr. Rene Marquez, who were both young men at the time. And they started telling the story about how critically endangered the Kemp's Ridley Sea turtle was and how they had existed in tens of thousands. And now the big nesting aggregations, or arribadas, were in the hundreds at the most. And again, this is 1972. So that kind of piqued our interest in in the Kemp's ridley turtle clear back in 1972.

Pat Burchfield [00:08:08] And in 1976, a co-worker, Jim Wicks, and I were on the beach, went to that site because it was a pretty good reptile collecting area as well. And lo and behold, behind the primary dune (and Kemp's ridleys tend to nest on a narrow beach with a fairly high dune, and 70 percent of the nesting females will select half way up on the primary dune as their nest site, which just coincidentally is above the high tide mark for everything except hurricanes), so in 1976, behind the primary dune in an area where the babies couldn't make it over the dune (they would have perished in the extreme heat), Jim Weeks and I found a large number of turtles that had hatched and were basically doomed to overheat and die. And we carried them up over the dune and gently released them at the water's edge and watched them scurry out into the water. And that probably wasn't the ideal thing to have done at the time, but we didn't know any better. But we managed to keep seagulls away from them. And that was kind of our first introduction to releasing baby Ridley turtles into the Gulf of Mexico. And this was in 1976. The binational program where Mexico and the United States formally decided to intercede and do something to protect the turtles was begun in 1978.

Pat Burchfield [00:09:40] But I need to preface that with the fact that in 1966, Mexico was well aware of the fact that the Kemp's ridley was on the decline and they sent biologists Umberto Chavez, Martine Contreras, and there was a third gentleman, I don't recall his name at the moment, but went to survey what was left of the nesting Kemp's Ridleys. And from 1966, in 1967, Mexico formally sent people out to try and protect some eggs and nests and females there at that site at Rancho Nuevo.

Pat Burchfield [00:10:14] And then in 1978, the turtle had reached such dire straits that both countries collaborated to set up a binational program involving U.S. Fish and Wildlife, Texas Parks and Wildlife, National Park Service and their counterparts in Mexico, which at that time would have been Instituto Nacional de la Pesca and the state, state of Tamaulipas, various agencies in both countries.

Pat Burchfield [00:10:40] But at that point, the turtle was so depleted that population modelers said it's already functionally extinct in the wild. You can't bring it back. You're wasting your time. But nobody told the turtles or the biologists.

Pat Burchfield [00:10:55] So we began the binational program in 1978. Dr. Pritchard, the man I previously mentioned, was in charge of that program, along with Dr. Marquez from Mexico. And Dr. Pritchard was there representing the Florida Audubon Society, but sponsored primarily by U.S. Fish and Wildlife Service. But in 1981, the U.S. Fish and Wildlife Service, realizing Gladys Porter Zoo was right here on the border and a lot closer than Florida, asked us, if Dr. Pritchard was willing, if we would assume helping the U.S. Fish and Wildlife Service and represent them in the binational program with our colleagues in Mexico. And we've been doing that since 1981.

Pat Burchfield [00:11:42] And there's kind of an interesting chronology that happened. In 1985, that was the low ebb for the camps. Ridley. I think we had 709 nests for the season, which represented about two hundred and eighty some odd nesting females for the entire season. Whereas in the 1940s the famous film done by Andres Herrera from Tampico showed, actually depicted on 16 millimeter movie film, an estimated forty thousand turtles nesting simultaneously. And that was the first time biologists had ever heard of this type of mass nesting aggregation, which in Spanish is referred to as arribada or "great arrival". But then it was documented.

Pat Burchfield [00:12:33] But unfortunately for the turtle, Mr. Herrera actually premiered that, that, that film in the United States to a couple of different groups. But unfortunately, they were business groups, and not biologists, that really didn't understand the significance of what they were seeing. So nothing happened despite Mr. Herrera's cajoling and, you know, talking to these people that something needed to be done. And it wasn't until several years later that, in 1961, that Dr. Henry Hildebrand, from the university in Corpus Christi, was down there consulting on in Mexico, consulting on a shrimp project. And one of the one of the Mexican biologists said, "Hey, Henry, there's a film we think you'd enjoy. You like turtles." And there in front of his eyes were approximately, or an estimated, forty thousand Ridentles coming up on to shore and digging their nests and throwing sand in the air and going back to the water. And at that point in time, it was unknown to science.

Pat Burchfield [00:13:39] And so Henry brought it up and he premiered it in 1961 to a conference of ichthyologists and herpetologists. And in that crowd was the dean of sea turtle conservation and biology from the United States, Dr. Archie Carr. So the first time anyone knew where Kemp's ridleys nested was when that film was unearthed by Henry Hildebrand and shown in front of a group of scientists, and from that point on we knew about arribadas with turtles in the genus *Lepidochelys*, which is the Kemp's Ridley and the Olive Ridley. And from that point on, people started paying attention to Rancho Nuevo and what was going on there.

Pat Burchfield [00:14:25] But anyway, the irony in that whole thing is those ensuing years between 1947 and 1961 and even '70s, there was a massive exploitation of the eggs and the turtles for everything from whether from eating the eggs, which were thought to be an aphrodisiac in Mexico. And it wasn't just local consumption which, which the popular population could have withstood at that point in history. It was a matter of trucks coming in from Veracruz City, Victoria, Tamaulipas, the capital, Mexico City. And they literally took the entire reproductive potential off the beach year after year after year after year.

Pat Burchfield [00:15:12] So that after we began the binational project, as I said, in 1985, we had 700 nests for the season, which represented 280-some odd nesting females from that year. And at that point in history we thought the turtle nested that every second or third year. So you could have probably effectively doubled that number is what was left in terms of nesting females. And we had no idea about males.

Pat Burchfield [00:15:39] So several strategies were proposed by the binational group. Number one on the list was to protect all the nesting females, all their eggs, and all their hatchlings to maximize the number of babies that we could put out into the Gulf of Mexico.

Pat Burchfield [00:15:55] Now, another initiative, primarily by the National Marine Fisheries Service, was to create devices that would exclude turtles from shrimp nets because even

though shrimp trawlers were not the original cause of the great decline in the turtle, the fact is that they did get caught in incidentally in shrimp nets and every adult is worth hundreds of baby turtles because they take anywhere from nine to 13 years to reach sexual maturity in the wild. And we didn't even know that when we started the project. We didn't know what the age of sexual maturity was, because we know in some other species of sea turtles that it can be as much as 30 years. So we knew basically nothing about this turtle that we were embarking to save. And so everything every year brought tremendous learning experiences.

Pat Burchfield [00:16:49] But as I say, between 1978 and 1985, it was pretty grim because the turtle numbers went down and down and down. But because we protected every nesting female and maximized the number of hatchlings coming out of protected corrals and facsimile nests in those protected corrals. After about 1988, '89, we started to see the numbers gradually increasing and over the years we released more and more baby turtles and we started seeing those numbers go up exponentially. So kind of up until 2010, we were on a 15 to 20 percent annual increase in the number of nesting females. So we were on an exponential curve heading towards recovery and perhaps even de-listing or down-listing of the species. So that's kind of a thumbnail history in a nutshell.

Pat Burchfield [00:17:52] But in addition to protecting all the nesting females, in addition to National Marine Fisheries and fisheries working together to develop effective turtle excluder devices to keep adult turtles out of trawl nets, another experiment was begun in 1978. And that was the imprint Head Start experiment. And I, I emphasize the word, "experiment", because up until that time Archie Carr had hypothesized and you remember I told you he was the dean of sea turtle biologists out of the University of Florida in Gainesville. He had said that he believed turtles returned to the spot, the exact spot, where they hatched to lay their eggs and dig their nests and lay their eggs as adults. So that would have been termed an "imprinting" process. So he believed the turtles imprinted on their natal nest site. But that was a hypothesis and it wasn't improve proven until many years later.

Pat Burchfield [00:18:56] But as an experiment, we took turtles directly from the cloacas. As of nesting females, we actually dug a little trench behind them and we caught the eggs in sterile gloves and placed them in sand which had been brought down from Padre Island National Seashore. And we created the moisture in the sand with rainwater from Padre Island National Seashore, with the thought being that if there is an imprinting process that takes place in the nest itself, hopefully we would cover that possibility. And those eggs were flown within the first 24 hours up to Padre Island National Seashore, reburied at Padre Island or incubated at Padre Island. And when they hatched, they were allowed to crawl out into the water because perhaps the imprinting process was chemosensory with water.

Pat Burchfield [00:19:50] So we tried to cover all the bases and you'd have to interview Dr. Donna Schaver from Padre Island National Seashore. She can give you all of the details on the imprint process there in great burning detail.

Pat Burchfield [00:20:03] But we actually did have turtles that we use that imprinting process on that ended up nesting both on Padre Island and back at their natal beach at Rancho Nuevo in Mexico. So two things happened there. They did indeed imprint on Padre Island National Seashore and they did socially facilitate wild turtles with which took them further south and they nested at Rancho Nuevo at one of their historic nesting sites. So in terms of imprinting, we still don't know exact, the exact imprinting mechanism on Kemp's ridleys, whether it's geomagnetic orientation, whether it's celestial navigation, whether it's water chemistry, or a variety or a combination of all those things. But we do know they imprint on

their natal beach. And given the opportunity, they will come back up to pretty much the same spot every year unless there's been a tropical storm and there's rocks that have washed up the seashore, on the seashore, or on the beach to prevent them nesting in that spot. But they do have the behavioral plasticity to move and try another site if their initial attempt is, is failed.

Pat Burchfield [00:21:16] So every year we learn something new and different about the turtle. And that's what's so exciting about biology. You never know it all. And when you think you know something, the animals will prove you wrong and do something entirely different.

David Todd [00:21:31] David!

David Todd [00:21:33] What a great story.

Pat Burchfield [00:21:34] I tend to ramble on!

David Todd [00:21:36] Not rambling at all. This is fascinating. I've been scribbling and trying to keep up with all the good information you're giving us. You know, there's so many aspects to this story. And I think, you know, given the limited time that we have with you, it might be good to focus on, you know, the very specific work that you did down on Rancho Nuevo for, for so many years. Can you maybe describe the typical summers down there and sort of the arc of, of your efforts in Mexico, I think, again you're the special person to tell us about that.

Pat Burchfield [00:22:22] Let me, let me begin by saying we're very fortunate being guests of Mexico all these many years. And I think that, perhaps, this may be the longest running, binational Mexico / U.S. endangered species program. And just that in and of itself, when you think of all the politics in two countries, is kind of amazing. But we've been very fortunate in that we've had dedicated people on both sides of the border that have pretty much bought into, "this is what we're going to do. We're going to bring this turtle back."

Pat Burchfield [00:23:00] And our job, or my job specifically, more than anything else, was to help in in those early years to put crews of young people from the U.S. We've had people from France, Germany, Italy, the Netherlands, all over on the U.S., in the contingent down there. But and in some years, all of our students were from the University of Texas at Brownsville. But the, the big trick was to find those kids, or young people that had that same fire in their belly for conservation that's needed to survive some pretty harsh conditions, at least in the early years. We were living in tents out on the beach.

Pat Burchfield [00:23:43] And we were walking the beach. We had one ATV, but that was more for moving eggs or anything. The patrols were done on foot and there was only one camp because that was the only place we were aware that the ridley turtles actually nested. And over the years we found out they were nesting other areas kind of serendipitously. We'd be talking to people from another village and they'd say, oh, you should have been up here two weeks ago. We had large numbers of turtles on the beach, and that's kind of how the project grew over time.

Pat Burchfield [00:24:15] First, biologists didn't know where the turtles nested. And Kemp's ridley at one point in history was actually called the bastard turtle. They thought it was a hybrid between two other species because no one had ever found a nesting female or a female with eggs in it. So they, they didn't even recognize it, fishermen didn't even recognize it as being a separate species.

Pat Burchfield [00:24:37] But anyway, to make a long story short, our big thing over the years has been developing first a team that that were acute in terms of learning about the biology and taking advantage of the biology to increase the production on the nesting beach. And at the same time, we realized early on that we're not going to change the attitudes of, in many cases, father or grandfather, you have to involve the children. And early on, when we were kind of viewed as outsiders, and not just us, I'm talking about the Mexican biologists as well, because any, anyone from Mexico City was an outsider where people living in the rural ejido or small village were concerned. And in the early days, they actually thought we were there to steal the eggs from them because the eggs represented an economic benefit. And again, you're dealing with people that if they were to kill a turtle, it would feed their family for several days. And there was no there was no refrigeration or electricity on the beach. And the species could have withstood subsistence hunting. But when the entrepreneurs got in there and they started bringing in tandem-axle cattle trailers and removing the entire reproductive effort on an annual basis, that's what really drove the turtle towards extinction.

Pat Burchfield [00:26:06] But our role, year-in and year-out is to work with our Mexican colleagues. And we've never had enough money to answer or do all the science, even basic science, that we need to do down there, because all of our money goes into protecting the largest number of nesting females possible and putting out the largest number of hatchlings on an annual basis. And it's just been recent years that the Kemp's ridley expert working group and recovery plan have said basically, you know, you need you need to cap it at ten thousand nests in terms of what you're trying to protect on an annual basis.

Pat Burchfield [00:26:49] So anyway, our role every year is to assist Mexico in a very difficult task in a remote site. It's just been the last year or two that we've had electricity in, in Rancho Nuevo. And the remote camps, a couple of them still don't have electricity. But instead of operating or helping with one camp, we assist with six camps in Tamaulipas - the northernmost being Playa Soto la Marina or not Soto la Marina, La Pesca, at La Pesca, which is on the Soto la Marina River. And then the next most northerly camp is at Barra Tepehuajes. And that's another camp. And then Rancho Nuevo, then Playa Dos is at Barra del Tordo on the Rio Carrizales. And then we have two camps near to Tampico - one Playa Miramar and one actually in the industrial port of Altamira. So we've got six camps that we help out with on an annual basis.

Pat Burchfield [00:27:53] And in some years we've had as many as 26 sponsoring agencies, everything from the shrimp fishing industry, seafood industry, U.S. Fish and Wildlife, Texas Parks and Wildlife. But one of the important things in building a long-term program is developing a broad base of partners because it's hard, year after year, to keep people's enthusiasm over a project, particularly if it's starting to look successful. There's a tendency to walk away. Well, we haven't reached our, our goal of getting this species off the endangered species list. And we had a major hit a few years back. And we're just now, hopefully again, on a, an increasing trajectory with our population. But in answer to your question, our role at the Gladys Porter Zoo is to help with providing a, a highly skilled team on the field to assist our Mexican colleagues in the recovery efforts for the species in Mexico.

David Todd [00:29:06] Well, I think one of the aspects of your work down in Rancho Nuevo, however, that you mentioned, I believe, was these corrals. Can, can you describe how those were designed and built and what their function is?

Pat Burchfield [00:29:23] OK, well, let me, let me again just begin by saying the first corral I ever saw was built by Martine Contreras and Umberto Chavez from Mexico. And it was just a simple structure, with either chain link or some mesh on wooden posts buried down in the ground to try and keep coyotes, skunks, raccoons, and other predators from digging into the corral. Because at that point in time when the nests were, like in 1985, we were down to 709 nests for the season. Predators would get one hundred percent of the nests left out on the beach. So there wasn't any option, we had to put them into some kind of protective situation. So that's that was the genesis of the corrals.

Pat Burchfield [00:30:10] We had a student, a guy named Ignacio Flores Silva, who actually did a master's or, or maybe a bachelor's in Mexico on predation on Kemp's ridley nests. And left on the beach, in those early years, there were 12 predator attacks, per nest, per night. So obviously, isolated nests would not survive on the beach, particularly in a species that depends on these massive nesting aggregations or arribadas where you have hundreds of thousands of eggs on the beach so the predators can eat their fill and there's still some going to survive. And that's termed a predator swamping strategy.

Pat Burchfield [00:30:53] And a lot of species do that. You know, some frogs'll lay thousands and thousands of eggs, et cetera, but some will survive. And that's kind of the same way with the ridley turtles. But it had reached a point where an isolated nest on the beach had no chance of survival. So they had to build corrals. And over the years, we've continued that to try and maximize the number of hatchlings we've gotten back into the water off the beach.

Pat Burchfield [00:31:21] But now actually we're doing we're doing studies on, on corral hatchlings versus hatchlings that hatch on the beach in terms of fitness, survival, survivorship, or survival potential, et cetera. So every year we learn something new and different. And it's, it's still an ongoing process. And because we've had to spend all of our money in trying to increase the numbers of turtles to get to a point that they can survive, we've had precious little to spend on some of the basic biological questions that need to be asked. And so we depend on outside entities.

Pat Burchfield [00:31:59] For the past few years, Dr. Thane Wibbels, from the University of Alabama, has been doing most of the science for the U.S. side on the beach and has provided us with real nice studies in terms of temperature-dependent sex determination, temperatures, real time temperatures, so we can tell at the sands getting too hot and might kill the developing eggs or embryos as we're going into this warming trend globally. So there's a lot of state of the art stuff going on right now and thank, thankfully, we get outside entities, whether it's a National Marine Fisheries Service, the University of Alabama, U.S. Fish and Wildlife Service, we get additional grants from time to time to do some of these things. But basically our focus has been producing more turtles to get the population back to a point that it can withstand natural pressures.

David Todd [00:32:57] Well, and it sounds like you've taken two tactics to try to protect and restore the eggs that you find. One is, I guess, to, to capture the eggs immediately. And then you do this head starting experiment that you mentioned.

Pat Burchfield [00:33:17] Well, that was done just for ten years from 1978 to 1988 because the Fish and Wildlife Service in 1988 said, "hey, this was an experiment. These are critically endangered animals. We need to stop until we see if the experiment worked well."

David Todd [00:33:32] And I was curious if you could help us understand why that was discontinued or cut back in large measure.

Pat Burchfield [00:33:43] Well, for one thing, it was an experiment. We didn't know if was working and only time would tell. And we were taking two thousand eggs a year out of Mexico and we had no idea if those turtles would be successful in coming back up on the beach anywhere. And the Service just took the position that we're not going to do any more of this until we know that it actually does work and they are imprinted on this other beach.

David Todd [00:34:12] So the thought was to maybe have a little hiatus in the experiment until turtles were seen returning to South Padre Island?

Pat Burchfield [00:34:22] Exactly. In other words, we needed we needed nine to 12 years to, minimum, to see if the turtles had indeed imprinted where we tried to imprint them or whether they were just wandering around aimlessly, not knowing where to nest. Or showing up in places where turtles had never been recorded historically. So it was an experiment and they were justified in their thought process.

Pat Burchfield [00:34:48] And the second reason for trying to establish that second nesting beach was at that point in history, 99 percent, and that's still true today, 99 percent of the world population nests on about 88 miles of Tamaulipas coastline. And if something, be it natural or manmade disaster were to occur down there, that would effectively wipe out the species. So the second thought process in creating the nesting beach on South or North Padre Island was as a back-fall population because there was historic nesting in that area. When I said that the 1961 Herrera film or why it wasn't '61 film, it was viewed by scientists in '61, it was filmed in '47.

Pat Burchfield [00:35:41] But actually in the 1950s. John Werler from the Houston Zoo, or he may have been at the San Antonio Zoo at that time in history, actually wrote a paper on nesting Kemp's ridleys on Mustang Island. But that article from 1951 went pretty much unnoticed by scientists because it was just a footnote in an article on species of reptiles that occur in that area. But there was actually a precedent for ridley turtles nesting up in the Corpus Christi area clear back in the 1950s. So that was the first place we looked. And plus the fact there is a large national seashore there which could be afforded protection from both human and animal predators.

David Todd [00:36:35] Well, and then my understanding is that the the Kemp's ridley sea turtles were seen to return, and that was it then some 10, 12 years after some of these head-started ...

Pat Burchfield [00:36:51] Exactly.

David Todd [00:36:52] released turtles. What was the reaction to that?

Pat Burchfield [00:36:56] Oh, everyone was elated. And, you know, Dr. Shaver, of Padre Island National Seashore, is a trooper and been with the project since the very beginning. And a large amount of the credit for that goes to Dr. Schafer and a man named Charles Caillouet, who was with the National Marine Fisheries Service at the time. And the NOAA lab actually did the head starting the turtles for nine months to a year. In other words, after they experimentally imprinted them on the beach and in the water there at Padre Island National Seashore, they were brought back to Galveston, where they were grown up to dinner-plate

size prior to being re-released in an area where juvenile ridleys historically had been encountered in the wild.

Pat Burchfield [00:37:47] The lost year is still an enigma with most species of sea turtles, nobody knows where the babies go for the first couple of years of their lives. They basically disappear. And it was always theorized that the baby Kemp's ridleys go out and grab the far sargassum for those first year and a half or two years. And then then they're seen as juveniles. A large number of them off ten thousand islands, the Everglades Park off Florida, is one area where we know we see juveniles. But anyway, the first year is, was always called and still is called termed "the lost year". We don't know where the babies go. We have pretty good educated guesses and, and some other researchers working with loggerhead turtles that actually tracked baby loggerheads. And they've got a pretty good handle on that. But again, it may be a combination of things with, with the ridleys in terms of returning to their natal beach. It may be geomagnetic orientation, may be celestial navigation, may be visual - sight profile of the beach because they nest on a narrow beach where there's a dramatic dune close to the water for the most part.

David Todd [00:39:07] Well, well, we were talking about the lost year of, of the Kemp's ridley sea turtles, and I thought this might be a good opportunity for you just to maybe give us the biologist's overview of the life cycle of the Kemp's ridley. Maybe you could fit that in with a sort of the larger story of its circuit from being a hatchling out to being a nester many years later.

Pat Burchfield [00:39:34] OK, well, when we began the project, the binational project in 1978 or even when Dr. Pritchard and Marquez were down on the beach in the early '70s working with them. We really didn't know how long it took Kemp's ridleys to reach sexual maturity. And it wasn't until years later, after we had them in the imprint Head Start experiment, that we actually learned how old the turtles are before they're potentially big enough and, big enough and old enough, seem to be kind of in lock-step with one another where reptiles are concerned. Because if they reach an adult size in a very short time, they can become reproductively viable much earlier than they would in the wild. We know that from our work with captive reptiles in zoo situations. An animal that would take 13 years in the wild, we can have it to reproductive size in four or five, at the maximum.

Pat Burchfield [00:40:38] So that said, in the wild, depending on food availability, a baby ridley turtle might reach sexual maturity between anywhere from, functional sexual maturity, anywhere from nine to 13 years of age. But let's go back to the beginning. Let's go back to when the female Kemp's ridley crawls up onto the beach. When the turtle crawls up on the beach (and this is something that's unique about Kemp's ridley) - it's the smallest sea turtle in the world, and it's also the only one that nests primarily in the daytime. And these are two of the things that may have led to its decline more rapidly than perhaps other species of sea turtles.

Pat Burchfield [00:41:24] Because when we first began going to Rancho Nuevo in the early 1970s, you had to walk the 13 mile cattle trail or 13 kilometer cattle trail through the forest. And it was fairly thick forest. And in, in that forest where jaguars and ocelots and ornate hawk-eagles and tropical rattlesnakes and all sorts of things. It was a totally wild place and the beach was a totally wild place. And I'm sure that historically, just like in other parts of Mexico, jaguars preyed on the adult turtles.

Pat Burchfield [00:42:01] And for that reason, people who didn't have flashlights weren't out walking around on the beaches at night, so they weren't impacting green sea turtles, which nest at night, loggerheads, which nest at night, occasional hawks bills or even Leatherbacks, because the people just weren't out on the beach at night. It was a scary place to be with all the wild animals that were out there.

Pat Burchfield [00:42:28] But the poor little Kemp's ridley, at 65 to 85 pounds, typically, one man can pick that up and carry it back to the village. And they're easy to find because they're nesting in the daytime.

Pat Burchfield [00:42:43] And in those early years, the local people taught us that you only need to go out on the beach to look for the turtles nesting on days when the wind is blowing so strong that you don't want to be on the beach. Because apparently over the millennia, the turtles evolved a reproductive strategy to come out of the water in the daytime on days that would be the most difficult for predators. Blowing sand - I'm talking about gale-force winds. And the other thing that does: the turtle being a heavy animal and leaving deep tracks and digging a nest and covering it up, the blowing wind tends to obscure the nest site and the odors from the nest site very quickly. So it was advantageous for these turtles to have evolved that behavior of coming up on very windy days.

Pat Burchfield [00:43:35] I remember walking the beach at Rancho Nuevo for sometimes two weeks in a row and not seeing anything other than crabs and the occasional gulls or frigate birds out over the water and no turtles. But if a gale-force wind came up, particularly from the southeast, not only did the turtles come up, but so did the local villagers. They'd be on their horses and they'd have bags on their saddlebags and they'd have dogs which were trained to sniff out the nests. So the local people over the millennia had learned the same conditions that typically brought the Kemp's ridley out so they knew when to go out and look for them.

Pat Burchfield [00:44:18] But the Kemp's ridley, smallest of the sea turtles, drags her heavy body up over the shell. All sea turtles are very awkward on land. They move at quite an ungainly gait using their front flippers primarily to drag themselves across the sand. But the female ridley will actually bury her lower mandible, her lower jaw, in the sand, and she'll, she'll scoot along as if she's using her, her lower jaw to perhaps sense grain size of the sand, or perhaps moisture content of the sand, but she's clearly searching something with that behavior.

Pat Burchfield [00:45:03] And when she finds a spot she likes, which is typically at the base of the primary dune, above the high tide level, then she'll start to do what we call a body pit. She'll use her, her front flippers and she'll rotate and she'll excavate sand from an area about, a little bigger than her shell size. And that body pit, the fact that this animal is a reptile and affected by temperature, they would overheat very quickly in the hot, hot, tropical sun. What I think they're doing, or what that behavior was evolved to do, is remove the hot surface sand and get to the cooler sand underneath, which is cooler and slightly more moist. And that's where the sand is compacted enough.

Pat Burchfield [00:45:50] And they use their hind flippers in alternating scoop fashion to dig a flask-shaped nest cavity, which is approximately 45 centimeters deep. And on me, that's from the tip of my finger to the tip of my elbow on my, my arm. That's 45 centimeters. So you can kind of model that for yourself, stand your, your elbow on the table and think of a flask that size. And into that flask, she's going to lay approximately 100 parchment-like shelled

eggs. You can actually dent them with your fingers. They're soft, they're not hard calcified like a tortoise egg is, or a chicken egg. They're leathery shelled eggs.

Pat Burchfield [00:46:36] But up until the point when she actually starts to oviposit or laid those eggs, she goes into, once she does that, she goes into a trance-like condition. But up to that point, if you disturb her, she'll stop what she's doing and go back to the water and come, hopefully, come back somewhere else farther up or down the beach later that day to dig another nest.

Pat Burchfield [00:46:58] But because it's hot down there, and because they nest in the daytime, that whole nesting process, from start to finish, has to be done and about 30 to 45 minutes, max, or they will overheat.

Pat Burchfield [00:47:10] But anyway, once she starts to oviposit, she's in a trance-like condition and you could draw blood from her, put a satellite transmitter on her, put a pit tag in her, anything you need to do, and it won't disturb her and she won't stop laying her eggs. And knowing that, that's when we would do any of those particular activities.

Pat Burchfield [00:47:31] But in the early days of the Head Start experiment, we'd find a turtle, and once she's in that, starts into that trance-like state, we'd actually hollow out a channel behind her cloaca and we'd catch the eggs, as I mentioned, into a sterile glove and put them into Padre Island sand. But anyway, because they're a daytime nesting turtles, because it's the tropics, they have to get it done quickly. The other species of sea turtles, whether it's green turtles, loggerheads, hawksbills or even leatherbacks, nest at night, so they don't have that that time problem. And sometimes they'll wander all over the beach and make several test holes and, and not like the, what they found in one and construct another one. The ridley can't do that. It goes up. It digs its nest, it lays its eggs, and it has to get back to the water very quickly, or it will overheat and die.

Pat Burchfield [00:48:27] But once those eggs hatch, and that will take anywhere from 48 to 62 days, depending on the incubation temperature. And typically early spring nests will incubate at cooler temperatures, and hot summer nests will incubate at hotter temperatures and take fewer days. So spring nests might be up to 62 days, summer nests or, or any time after that spring or anywhere from 48, 50 day incubation time.

Pat Burchfield [00:49:02] And the temperature of incubation does determine the gender of the developing embryo and that, that sexual determination occurs during the middle third of incubation. So if it's got a 62-day incubation on, on, on the long end, or a 48, you can look at the middle third and that's when it becomes a boy or a girl. And hot nests tend, tend to produce females. So in the last few years with the increasing temperatures, almost all of the babies hatching out are females. And hopefully years like this year when we've had a fairly cool spring, we'll get enough males that incubate at the lower temperatures to go out there and be able to reproduce and make viable eggs with the females. But the eggs are temperature-dependent. The babies are temperature-dependent in terms of their gender.

Pat Burchfield [00:50:01] And once that baby hatches out on the beach, it's kind of like running the gauntlet, historically before we were there to protect them, because ghost crabs will eat them, opossums will eat them, raccoons will eat them. Hawks will eat them. Seagulls will eat them. They, they literally run the gamut to make it to the water. And once they're in the water, the dinner bell rings again, because since those natal beaches, or those sites that they're imprinted on, tend to be, year-after-year, the fish have, have learned where to expect

the baby turtles. So they run the gamut once they get in the water. As a matter of fact, I saw one red drum in Barra del Tordo that a fisherman caught and opened up that had 16 baby ridleys in that one turtle.

David Todd [00:50:52] Wow.

Pat Burchfield [00:50:53] So, but once they get out into the water, we really don't know where they go. We surmise that they get caught up in the currents and they end out, and end up in the sargassum and they're out there for a year and a half, up to two years. And then they appear as juveniles in some of the the foraging sites that we've verified for juvenile ridleys. But, yeah, they've got a tough go.

Pat Burchfield [00:51:18] And I've heard a lot of different numbers quoted by different turtle biologists in terms of how many survive. The number I used to hear was one out of a hundred. I've heard some people say one out of five hundred. I don't know what the true number is and I don't think anybody else does either at all. It's dependent on a lot of different things, a lot of different factors.

David Todd [00:51:40] Well so you said there's this of this missing, this lost year, where perhaps they go to the sargassum. But then my understanding is they spend some, some time after that foraging in the northern Gulf. Is that correct?

Pat Burchfield [00:51:58] That is correct. And there's a big aggregation off of Everglades National Park. And we only know that because some biologists went there and studied them and looked for a place where they could find juvenile ridleys and that was one hot spot. So, you know, the northern Gulf, mouth of the Mississippi, probably east of the mouth of Mississippi, is a major foraging site for juvenile Kemp's ridleys. And also up along the Atlantic coast. For many years, those turtles that they find in Cape Cod, that cold strand in the winter, we thought were lost. We thought they'd got washed around out there by accident, but more and more, as, as data continues, empirical data continues to show us things, they weren't lost at all. That's just a major foraging area for a once much greater population of ridleys. They couldn't all forage in the same place.

Pat Burchfield [00:52:57] And that's why we're starting to see nesting in places like Galveston and other states where, at least in modern times, we didn't, weren't aware of nesting. But if you, if you want to go back in time to when that estimated forty thousand turtles came ashore on one day at Rancho Nuevo in June of 1947. That's late in the year, that was probably the smallest arribada of the year. That was a small arribada most likely, just based on, on, if things haven't changed that much over, over the last 50 years. So, the population was probably at least a couple hundred thousand. Well, logically, they're not all going to be able to forage in the same small areas. So they probably had a lot of different foraging sites - anywhere from the Bay of Campeche, this side of the Yucatan Peninsula, clear up along Texas, Louisiana, Mississippi, Florida and, I don't think that that they ever foraged up along the Atlantic coastline, but that is a developmental habitat for the juveniles.

David Todd [00:54:15] Gosh, it's one of the most fascinating things about the, your story is that the, the science is developing as you're trying to intervene on behalf of the turtle to restore it, and that there seem to be a lot of unanswered...

Pat Burchfield [00:54:31] Right.

David Todd [00:54:31] Or only partially answered questions.

Pat Burchfield [00:54:33] Yes, there's a lot of unanswered questions. And what I said about when Dr. Archie Carr hypothesized that turtles imprint on their natal beach, it was a hypothesis until we had those first ridleys that we experimentally imprinted actually come back to where we tried to experimentally imprint them. So whatever we did worked, but we're not quite sure which thing or which things, whether it was the water chemistry, or geomagnetic orientation when they were in the ground on the beach, or some chemical on the, on the beach or the, or the water. So that's still ground that needs to be covered. But we're most concerned with getting the numbers increased to where the population can function without our intervention.

David Todd [00:55:21] Well, you've brought us almost full circle. You talked about, you know, the life cycle from nesting through the lost year to, to foraging. And then I guess that would bring us up to the phase where they, they mate and then nest. Can you sort of walk us through that?

Pat Burchfield [00:55:43] Well, we still have very sparse data on mating turtles, Kemp's ridleys. But thanks to Dr. Wibbel's work with drones down on the beach, we have several recent good videos of mating Kemp's ridleys and pre-mating behaviors, which he's working on writing, writing those up as we speak. But historically, when we go down to the turtle camps, which historically was April 15th, that our crew, U.S. Crew went down to Mexico and the Mexican crew as well went to Rancho Nuevo on April 15th, the local people would always say, oh, you should have been here two weeks ago, which kind of made our eyebrows go up, because you didn't know if they were pulling your leg or if they actually had big numbers of turtles two weeks earlier.

Pat Burchfield [00:56:32] So we started hearing that story often enough that we decided a few years ago, and I'd have to go back to see exactly which year, we'd get there at the beginning of March to set up camps and hopefully have everything ready by the fifteenth of April. And we started getting turtles in the last week of March on several different years. So in some years, and it's all temperature and water temperature dependent, because you have a warm winter and no cold weather, water's warm - they're going to come earlier. But if you have a year where we've had hard freezes and severe cold weather so far, we've had a few turtles nest already, but not, not a bigger arribada yet.

Pat Burchfield [00:57:17] So the time of year that they'll come up will vary. But we would talk to fishermen and they'd say, oh, we see them in you know, December, January, February, March, and they said they'd see breeding turtles. So a few years ago, we actually got a small grant and we were able to work with our Mexican colleagues and we actually captured some male Kemp's ridleys and put satellite transmitters on them. And interestingly enough, they all stayed in the general area, with the exception of one that swam up to Texas, but he turned right around and went back. And at least at the moment, with our very sparse data, we tend to think that there's a big percentage of males that are resident. They don't migrate. And it would make sense. The males just have to keep body and soul together, calorically speaking, and they intercept the females on the way back to the nesting beach, whether they're coming from the Gulf of Campeche or Bay of Campeche to the south, or if they're coming from Louisiana, Mississippi, Texas, again, going south. And they intercept them somewhere, probably in northeast Mexico, north of our turtle beaches, maybe, maybe within 88 to 100 miles from the border. But our data is so scant. That's really, really sticking our neck out for me to say that they're resident. But all indications are of the, of the 11 that we put satellite transmitters on,

they all stayed home. They didn't go anywhere except that one that made a brief trip to the US and then went back.

Pat Burchfield [00:59:06] And they tend to breed the females off the Tamaulipan coastline either in the fall or the early spring, as I'm guessing different cohorts of the nesting population come back. And again, the turtle typically, historically, we thought nested every other year; perhaps it's every third year. We don't have enough data yet to verify that because we don't have enough tagged turtles out there to, to make that, that call. But in any case, I think there are different nesting cohorts and their timing might be different. So you have an up year and a down year. One cohort may be bigger than another, etc..

David Todd [00:59:49] I see.

Pat Burchfield [00:59:50] And again, food source availability is a big thing. If there's a plentiful food, the females can get into a reproductive condition and perhaps nest every year, because we can do that in captivity, in, in animals that are in human care. We can do that. We can, you know, make them eat a lot and get them fat and they will reproduce. So if food resources are available and plentiful one year and maybe two years in a row, they're not, it might push them to every third year that they're in a reproductive condition, have enough fat to yolk a clutch of eggs. There's just so much we don't know. But we do the best we can with what we do know.

David Todd [01:00:31] Oh, well, it sounds like you're resilient, just like the Kemp's ridley has shown it to be.

Pat Burchfield [01:00:39] Oh, I'm getting old like an old turtle.

David Todd [01:00:44] Well, one of the things that I think you mentioned earlier on that I hope we could circle back to: you said that, you know, one of the vulnerabilities for the sea turtle was, of course, when it was on the beach and it was, you know, liable to have its eggs taken out or the mature turtles might be taken as well. Could you talk a little bit about the, the, the threat that the shrimping might have posed in another phase of their life?

Pat Burchfield [01:01:15] Well, again, one adult turtle's worth hundreds, if not thousands of eggs, because they've survived that 9 to 13 year gauntlet that you have to run to survive to be an adult. So adults are inherently valuable to the population. And the fact that it was the adults that were interacting with the shrimp fishery is what caused all the major concerns. And again, I'm, I'm the first person to tell you they were not what caused the turtle to become endangered. It was just the massive exploitation at the nesting beach of both adult turtles and all of their eggs, year-in and year-out.

Pat Burchfield [01:01:58] But over the years, initially, turtle excluder devices were kind of a hot button thing. But in later years, the shrimp industry, shrimp fishing industry, in Texas, I'll quantify that by saying Texas, got behind our conservation effort and actually they built the Tepehuajes turtle camp. The Mexican and Texas shrimp fleets built that turtle camp. And every year they'd refurbish it and help, help restore it and help with the conservation effort, raising money for our project.

Pat Burchfield [01:02:34] But the fact is that since they do and can catch adult ridleys, that's why they're perceived as being such a problem. And not every state is as compliant as Texas is with with using the excluders or or, you know, complying in that manner. So that's, that's why

trawls still get a bad rap. The excluders, if they have them in place and are using them right, I think are more than 90 percent effective. So basically, if they're using an excluder, they have eliminated the problem.

David Todd [01:03:16] Something else that has intrigued me, and I imagine you could fill me in on what the situation is, I think you were saying that these turtles were recovering pretty quickly in the '80s, '90s and aughts - 10, 15 percent a year. And then, from what I've read, they, they just seem to plateau around 2010. What do you think happened then?

Pat Burchfield [01:03:42] Well, we all know what happened. And there was a major oil spill in the Gulf and right up in the area where the ridley turtles forage, not so much nesting, but their foraging ground for both juveniles. And if they're out in the sargassum, that would have been a problem, too, because you remember that there was a chemical used to sink. They burned all the sargassum and sank it. So we, we have no way of quantifying the actual, discrete numbers of how many turtles were impacted, but we had a peak year in 2011, but those were adult turtles that probably weren't impacted and then we had a dramatic decline in the population. So you can't help but believe that something happened, whether it was to the turtles themselves, the food source or something that affected, that impacted us.

Pat Burchfield [01:04:44] So, again, since the turtle takes nine to 13 years to reach maturity, depending on the individual, the next couple of years, I'll be real interested in seeing what happens with the nesting numbers, because a lot of those turtles that would have been from that 2010 era, a lot of the babies would be maturing now. So it's going to kind of be indicative of how perhaps they were or were not affected. So starting with this, this last year and up through 2023, I think, may be kind of be an indicator of how the turtles were or weren't impacted in terms of juveniles and hatchlings.

David Todd [01:05:48] I see. OK.

Pat Burchfield [01:05:52] The turtles don't do anything in a hurry.

David Todd [01:05:55] Well, it's interesting, you have to have so much patience to see the cycle bear out. Well, you've told us ...

Pat Burchfield [01:06:03] Dr. Archie Carr, in his early years, experimentally released green sea turtles on several islands where they had been historically and had been wiped out in terms of their nesting production. And he waited what he thought was a reasonable amount of time and declared that imprinting didn't work. But not realizing those turtles took 30 years to reach maturity. And now they're showing up on several islands!

David Todd [01:06:36] No kidding - even an expert like Dr. Carr.

Pat Burchfield [01:06:39] Well, nature always does that. When it comes to nature, you're making educated guesses on a lot of things. Everything's a hypothesis until you have the empirical data to prove it concretely.

David Todd [01:06:53] Sure. Well, you've told us about the, the life cycle of the sea turtle and then about some of the challenges that it has in its restoration, whether it's, you know, the egg and, and turtle collection on the beach or the shrimping impacts. Are there any other concerns that you have?

Pat Burchfield [01:07:14] Well, right now, the big concern is global warming. And, you know, for those people that don't believe in global warming, all they have to do is look at weather patterns and some of the strange things are going on universally. But we can actually measure it because Dr. Wibbel's temperature study on the nesting beach of Kemp's ridley at Rancho Nuevo is the longest term temperature study on any vertebrate animal, I believe. And this one happens to be impacted by changes in temperature. And we're seeing temperatures in the nesting beach during nesting season reaching lethal levels.

Pat Burchfield [01:08:01] And, you know, sometimes a half a degree or one degree or a quarter of a degree can make a big difference in terms of plants, fungi, bacteria, all sorts of things. And, there's, there's been a phenomenon in amphibians for the past 15 or 20 years. Well, actually, it's a chytridiomycosis, it's a mycotic fungal infection that kills frogs. And it's, it's, it will ultimately kill, or has killed probably, and I could be wrong in this number, up to 25 percent of the known species from 40 years ago, already. But that could be a result of just a quarter of a degree of increase in temperature that caused that fungal infection to become pathogenic and rampant. So we don't know the impacts of all of these things, and that's, that's why the Kemp's ridley nesting beach is kind of a model for temperature study because we have over 13, maybe as many as 20, years of data on temperatures on that beach. So we can actually quantify the increases and verify any, any changes we're seeing in survivability of eggs or hatchlings or their vitality. We're trying to measure all those things.

David Todd [01:09:30] And what are some of the major concerns of how higher temperatures might affect the Kemp's ridley?

Pat Burchfield [01:09:37] Well, for example, we know that warm eggs above the pivotal temperature, which is 29.5 or 30 degrees Celsius, produces predominantly females. And for the past several nesting years, we've produced predominantly females. But up to now, it hasn't been a problem because the few males that are produced in the spring, at least in some years, seem to be enough to fertilize all the females that are out there, because you don't need one and one. One male can fecundate multiple females, but there is also multiple paternity in the turtles. So there are enough males out there right now. But that could become a situation where there is no maleness left in the population that could affect any sex, temperature dependent, sex, temperature dependent reptile, not just sea turtles. And where that falls out in the big picture of, of all other species remains to be seen. But there are effects, clearly.

David Todd [01:10:43] Well and did you mention that there may be an issue with the beach sands being just so warm that the eggs don't survive at all?

Pat Burchfield [01:10:51] Yes.

Pat Burchfield [01:10:56] And that's worldwide, that's not just Rancho Nuevo. But since we monitor the temperatures on a daily basis and we can we can look at the computer any time or on your cell phone and read the temperature in a nest, we're monitoring that very carefully. And we haven't reached that point yet, but it's worrisome.

David Todd [01:11:21] Well, and speaking of of global warming, do you think that sea level rise associated with climate change would be a risk for beach nesters like the Kemp's ridley?

Pat Burchfield [01:11:35] Well, clearly, it's going to modify beach profiles, but I can't answer that question. You're going to have to talk to someone a lot smarter than I am.

David Todd [01:11:46] Well, you've given us such a good overview. I really appreciate it. Well, let's, let's look into the future, if you don't mind. What do you foresee? I mean, after, gosh, over four decades of work with the Kemp's ridley, what do you see as its coming years?

Pat Burchfield [01:12:05] Well, Mexico is very, very acutely aware of their ecology and their conservation. And I can't even tell you how many turtle projects Mexico oversees on both the Atlantic, the Gulf, the Caribbean Gulf and the Pacific. But I'm highly hopeful that, unless we have something unforeseen like temperatures that we can't do anything about or we can't mediate in some way, shape or fashion, I'm very hopeful that, we'll, we'll actually see the Kemp's Ridley down-listed and off the endangered species list, because I'm, I'm, I'm very hopeful that we're on that upward, upward trajectory again. But every year is a new year. And as I say, I think there are different nesting cohorts. And the health of the Gulf of Mexico will determine how frequently or infrequently the adult females are in a condition to come back and nest. So they interseasonal nesting interval can increase and decrease depending on food availability.

David Todd [01:13:19] I see, so there needs to be, I guess, robust foraging areas to support these turtles.

Pat Burchfield [01:13:25] Yes, yes, yes. And, and unrelated, but on a similar topic just here recently, we had a major cold stunning event for green sea turtles. And the reason they all cold-stunned is because they're in the shallow water in the Laguna Madre, which can change temperatures very quickly. And the juveniles, generally speaking, don't make it out into deeper water fast enough, fast enough. And they end up cold stunning. But the reason they're in the Laguna Madre is because they feed on that marine algae, the thalassia, the turtle grass. And whereas Kemp's ridley isn't in there because it's feeding on crabs and shrimp and other organisms in the offshore waters, coastal waters. They're a shallow water turtle.

David Todd [01:14:14] I see,

Pat Burchfield [01:14:15] But obviously the Gulf of Mexico doesn't change temperatures likely the Laguna Madre does.

David Todd [01:14:22] So many factors! Well,, well, maybe we should just wrap this up. I know it's complex and we've probably just skimmed the surface, but it's been a wonderful introduction. Is there anything that you might like to add that we might not have touched on so far?

Pat Burchfield [01:14:41] No, but I will tell you that the recent cold, stunning event on South Padre Island was very heartening to see the outpouring from the general public, everything from truck drivers to a Jeep club, to shrimp boat captains, to, to pleasure boat captains, everybody out there, together, banding together to help save those sea turtles. So that gives me pretty great hope for the future that at least some percentage of humankind is, is getting it and want to do the right thing. So that's, that's the note I'm going to leave it on. And hopefully with our education programs down in Mexico with our Mexican colleagues, we'll bring the next generation along to do a better job than we've done.

David Todd [01:15:34] Well, it is great that there are people like you who share this concern, interest for the Kemp's Ridley and I want to be just one of many people I hope who've thanked you for your many years of work on its behalf. What a wonderful contribution. So, thank you so much.

Pat Burchfield [01:15:53] I'm just one of many, many who have worked side-by-side to make this happen. So there are very qualified and very good people that hopefully will pick up the torch and keep it going.

David Todd [01:16:06] All right. Well, carry on.

David Todd [01:16:10] I think that this may be a good point to to stop the recording. So I will do that.