

TRANSCRIPT

INTERVIEWEE: David Owens

INTERVIEWER: David Todd

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Google Voice [00:00:00] This call is now being recorded.

David Todd [00:00:03] All right. Well. Hello, Dr. Owens, nice of you to call.

David Owens [00:00:12] Dave, really. Dr. only to my undergraduates. There aren't many of those anymore. So.

David Todd [00:00:20] OK, well, from one David to another: it is nice of you to do this, and I really look forward to learning from you.

David Owens [00:00:27] Sounds like a fun project.

David Todd [00:00:31] It's been fascinating. You know, it's given me a sort of portfolio slash excuse to talk to lots of interesting scientists who have been doing really wonderful things. So, thanks for pitching in here.

David Todd [00:00:50] And let me explain what "here" is. I just want to make sure that that I didn't garble things earlier. With your OK, the idea here is to record an interview for research and educational work on behalf of a nonprofit group called the Conservation History Association of Texas, for a book and a website for Texas A&M University Press (you know that place), and for an archive at the Briscoe Center for American History at the University of Texas, here in Austin. And of course, you have all the rights to use the recordings as you see fit, too.

David Todd [00:01:36] And I just want to make sure that sounds like a good thing to you.

David Owens [00:01:41] Well, no, I think it sounds like a great idea. I've heard about oral histories along this vein, I've heard about interviewing sailors, veterans, all kinds of things - grandpaws. So sounds like a good idea, as a grandpa myself, yes.

David Todd [00:02:00] OK, well, good. Thank you so much. Well, let me know if you don't mind. I'll just set out the date and where we are and what we're doing, and then we can jump into it with some questions for you to consider. It is April 12th, 2021, Monday. My name is David Todd. I am representing the Conservation History Association of Texas. I'm in Austin and we are fortunate to be conducting an interview with Dr. David Owens, who has been a professor at Texas A&M University, as well as the University of Charleston. And he's been a long-time sea turtle researcher. He is based in Charleston, South Carolina. And this interview is being done by telephone.

David Todd [00:02:56] And the goal today is talk about his life and career and particularly his work on Kemp's Ridley sea turtles - efforts to study and recover it to a more sustainable place.

David Todd [00:03:12] So, we usually start these interviews with just a question about your childhood, and what we're wondering is if there might have been any particular people or experiences that were a big influence in your lifelong interest in working with animals and sea turtles in particular?

David Owens [00:03:33] Yeah, well, I'm a sort of a strange, strange arrival at this, the world of Sea Turtles. I grew up in Illinois and I really never saw an ocean until I was about 20 years old. I'm a newcomer to marine biology in that sense, but I loved aquatic biology and fishing and hunting and canoeing. And I was in Boy Scouts and we did community trips around the country, Wisconsin, Indiana, Missouri. So I loved water and I loved aquatic systems.

David Owens [00:04:08] And so after undergrad and after I'm through all my schooling, I was really lucky. I had really nice teachers in the sense that they encouraged the interest in natural history and science and that sort of thing. So I wasn't discouraged. Even when I mentioned "marine biology", they didn't laugh at me. That's good fortune. A lot of people, they say "marine biology", and they get discouraged because people are so negative about it. I mean lots of great jobs in marine biology and lots of really cool people do marine science and marine biology. And so I've always been sort of sensitive about that one. Anyway, I survived the criticisms and stuck with it.

David Owens [00:04:46] Went to a little school called William Jewell College, which is in Liberty, Missouri, just outside of Kansas City. And there I had a fantastic teacher, Dr. Newland, who let us go on canoe trips. And we did everything. We collected snakes and turtles.

David Owens [00:05:03] And one of my research projects was on the Missouri River. There had been a real big drought back in 1965, I guess it was. And these big ponds that border the river dried up. And I was out there one day. Actually I had a jeep - I was in my jeep and I was driving along with these ponds and I saw something moving in this mud. There was no water left in the pond. And I got I just had little shoes on. I started walking in mud and everywhere there were turtles. I mean, thousands of turtles. And they weren't dead. They were stuck in the mud. And it was so dry that the mud was beginning to dry up and the turtles were becoming encased in this mud. So I said, what a great project, it was like already sitting there. So I started gathering up turtles. So over the course of a few weeks, I went out there and I collected every kind of, freshwater turtles now, every kind of turtle you can imagine. And so I made a collection at my little school where I was going to for one of my research projects for my zoology professor. And he was very impressed. And from that time I really was just in love with turtles.

David Owens [00:06:12] And by a weird coincidence, after I graduated there, I went into the Peace Corps and once again, I had still never seen an ocean, OK, but I went into the Peace Corps and I served three years in the Fiji Islands. And I lived on an island with about 600 acres and there were about 65 people lived there. And they had been turtle fisherman, sea turtle fishermen, that had been there, historical sort of program for making money in the area. And so they had these big nets hanging in the coconut palms. And I asked them, well, why don't we use those nets? Oh, those nets aren't any good anymore. And I said, "Why not?" They said, "Those are sea turtle nets." Well, why aren't they any good?" "Well, we caught all the sea turtles." I said, "What?" It sort of shocked me because my project that I was working on was a fisheries project. So I was helping these people develop a kind of a commercial angle to the

fishing that they were already good at. But the whole idea of sea turtles, which they knew a lot about, they had, they had literally with these fancy monofilament nets had caught all the sea turtles. Well, my gosh.

David Owens [00:07:19] So anyway, I never saw very many sea turtles during my whole three-year period in the Fiji Islands. But lo and behold, while I was there, two really famous sea turtle biologists came through working for the South Pacific Islands Development Agency, and they were looking into sea turtles. And so because I lived on a remote island and I got the job of showing them around, which was really fun.

David Owens [00:07:42] And at the end of the two years of my stay there, I applied for graduate school with both of them, and one of them accepted me, lo and behold. And I ended up going to the University of Arizona, where I worked with a guy named John Hendrickson, and I started working on sea turtles at that time. That was about 1971. Anyway, so since that time I've most of my research career has been dedicated to sea turtles in one form or another, conservation or pure research kind of project.

David Todd [00:08:15] This is really interesting, in lots of respects, but what sort of caught my ear just a moment ago, you were talking about arriving in the Fiji Islands and, and meeting these people who had been fishing for turtles, I gather, for hundreds of years there.

David Owens [00:08:36] Their tradition, yes.

David Todd [00:08:39] And I imagine they had figured out a way to, to touch them in a sustainable way so that they could continue to do that for so many years. Why do you think they found they were overfished and out-fished about the time you arrived?

David Owens [00:08:55] And that was the whole issue. They had always fished for turtles and they were divers. I mean, these, these people were tremendous that they would go diving 50, 60 feet all day long. And that's how they caught fish. It was coral reef. We couldn't use nets because they just kept tearing them up. So what they would do for the turtles, that somewhere in the 1950s, they got these monofilament nets, which were a new thing at that time. And of course, turtles cannot see monofilament. And it's particularly the green sea turtle that's found there. And there were these big grass pastures all around the island, and the green turtles would feed on that grass. Well they put the monofilament out in the evening or in early morning when it was really very dark still. And the turtles were get caught in this monofilament net and they were so good, but the point is, starting in the middle of the 20th century, they start fishing them out and they never had for hundreds and hundreds of years. And because of this new technology that they had, which was causing the population to collapse, which it did, it totally collapsed. And even today, there aren't very many turtles in Fiji, nothing like what you would think for the number, considering the number of islands, although they do have good conservation programs now. Just as a side note there - that they are recovering populations now, but sea turtles take so long to mature and develop as a population that is a real long-term investment as we'll talk about some more later, I'm sure.

David Todd [00:10:25] Yeah. Oh, that's, that's so interesting. And, and so originally they had caught these turtles by diving or some other technique?

David Owens [00:10:35] Diving with spears. Yes, no,.

David Todd [00:10:38] Diving with spears! Oh my.

David Owens [00:10:38] Yes. They have, it's a spear. It's probably something you've never seen before. It's a very long spea. Imagine about a 15-foot long spear with a spike on the end of it that is about a foot long. And it's quite a substantial spear. And they, they dive with their arm up above them. And then they, they, they sort of float down towards the fish or whatever it is. And then they thrust the spear through the animal. And they were very good at it, except there were no more turtles when I was there, but I saw them fishing for fish all the time. And this is how they, this is how they, they really did their fisheries, they were making money for the village.

David Todd [00:11:22] Gosh, well, that's just, that is a fascinating story. Thank you for sharing that. Well, you spoke about green turtles. Can we talk a little bit about the Kemp's Ridley sea turtle, which I understand you've spent years thinking about and studying?

David Owens [00:11:39] Yeah.

David Todd [00:11:40] Describe a little bit about the Ridley turtle and see if we can understand a little bit about it.

David Owens [00:11:46] Sure. No. It's a, it's a really fascinating turtle. It's one of the smaller sea turtles. There's the Kemp's ridley, and the olive, and they're sort of cousins species. And they're both the smaller of the sea turtles and they're ... all sea turtles take a long time to mature and to reach sexual maturity. But the Kemp's ridley and the olive ridley - are the quickest of all. They're probably going to mature in 10 to 15 years, which is fast compared to like a green turtle, loggerhead, which is maybe 30 or 35 years to be reach sexual maturity. So it's a very long, slow developmental process. Now, when I got into the turtle biology game, we didn't know that. My advisors told me, oh, three or four years to reach maturity because my project was going to be working on reproductive development, reproductive systems in sea turtles. And they said, by the time you get your Ph.D. in four or five years, you'll have some adults. I said, "OK." Well it turns out this didn't work out - these guys grow so slowly that it took a lot of patience. And most of what I did is I worked on the development of the reproductive system in immature animals, because those were the ones I could get my hands on.

David Owens [00:13:05] But anyway, the Kemp's ridley is tremendously interesting. It's the only sea turtle that nests primarily in the daytime, which is striking. You're used to thinking, OK, they're going to come up on the beach at night to make it safer, but they had this very unusual nesting behavior called the "arribada". Often, the Mexicans called it "arribazon." A different word and slightly different meaning, but they never, the Mexicans never took the word "arribada", even though it's used commonly in the literature.

David Owens [00:13:35] But anyway, so these animals seem to aggregate off the beach, particularly the famous beach at Rancho Nuevo, I'm sure you've heard of, just down in Tamaulipas, Mexico. As they aggregate off shore, coming in as the weather gets right for their, for their nesting, coming in closer and closer to shore. And then the day before they begin to nest, they literally, you can go snorkeling out there and there's turtles everywhere. And then all of a sudden, for on one particular day, and this has never really been thoroughly understood they mass and all come up on the beach at the same time in broad daylight. And they're very fast nesters. And we're talking 30, 40 minutes, which is quite fast compared to other sea turtles, that might take as much as a few hours to finish nesting.

David Owens [00:14:25] So this is a really unusual adaptation that we think the basic rationale for the evolution of this is to swamp out predators. So you can imagine if there's a, if there's a lion or a coyote living on a beach there that eats turtles and they come up one or two a night then he's going to have a nice meal every night. But if they come up all at one time then he have one nice meal, but 99% of the turtles won't be impacted. And so we believe that's how the evolution of the arribada came about, although that's pretty much speculation.

David Owens [00:15:01] But here's this really cool small turtle and it's a little easier to handle because it is one, in other words, a couple guys can grab one and do just fine. And once people learned about the turtles coming up in broad daylight, it was a no brainer for them. Just, you know, cruise down the beach and start collecting the eggs, or the turtles, whatever their interest is. And then of course that's the biggest, that has been the biggest issue for the Kemp's ridley, is that it has only this, primarily, this one nesting beach down in Tamaulipas at Rancho Nuevo. There are other nesting beaches now that have developed, of course, but at that time in the, in the '60s and '70s, there was really only one major nesting beach. And the people in the community just harvested those eggs out the wazoo. And that caused, that was a major cause of the collapse of the population over decades of doing that same sort of thing.

David Owens [00:15:56] But anyway, other interesting characteristics, they have a very, pretty much a traditional life history, like other sea turtles have it. They, they had this, when the hatchlings scrambled down the beach. They take off and they tend to head out towards open water as fast they can. And so they have this energy supply left over from yolk in the egg. And this allows them to just beeline out in the open ocean and there, the currents pick them up and. They began to migrate around. In the case of the Gulf of Mexico, the big gyre that moves them around the Gulf of Mexico, and in the case of the East Coast, like the loggerheads, they go way out into the giant Atlantic gyre, right all the way over to England and those European areas as they cycle around. Anyway, so this early period then is when they're developing, they're quite small, and this takes actually several years to mature. And then, suppose it's a Kemp's ridley, and it's two or three years old, they are big enough to begin to dive better and then they come in-shore and they begin to feed in shallower water. And this is sort of the next major stage in their life history. We call it the "developmental stages". A lot of animals have these kinds of things, where they do one thing and then in this case a hatchling, and then another thing as a juvenile, one or two or three years old, and then a third thing as it reaches adulthood. And so they live in different places, in different parts of their life history. And so anyway...

David Todd [00:17:25] And say that that first three years of their life, what are they feeding on? How are they supporting themselves?

David Owens [00:17:32] So they actually change feeding habits. When they're quite young, they're primarily animal feeders. All young sea turtles eat animals of various kinds, and that, this is with anemones, and small jellyfish, and small fish that they can catch. A lot of them like to eat small crabs, hydrozoans, all kinds of little invertebrates that live mostly in the floating weeds, things like that, that are out in the middle of the ocean. And they sort of, they munch on those things, feeding pretty close to the surface because they're not, they're so small that they're not really great divers at this point, as far as we know. And then, of course, after the two- or three-year period, when they move into shallow water, then in the case of the Kemp's ridley, it really becomes very strongly a crab feeder and begins to go after smaller and then larger and larger crab as as the animal grows itself. And so throughout the rest of the life, they're primarily crab-feeders.

David Todd [00:18:36] OK. That's so interesting that they can shift gears and have a whole new phase or chapter in their life - different kind of behavior and diet. Wow.

David Owens [00:18:46] Yeah, and that's standard for all the sea turtles. They each have a different story. But that's, that's sort of the Kemp's ridley story.

David Owens [00:18:54] And then, of course, in adulthood, they're feeding in deep water. They can, they can dive better. So they're, they're able to find, you know, larger and larger crabs as they're feeding in deeper water. Now, it's a, depending on, I presume we're going to talk about the shrimping and that sort of thing. And what was really confusing at first, when people started looking at stomach contents for the Kemp's ridley, they found fish and shrimp in the stomach contents of a Kemp's ridley. That was like a startling thing, because if you've got a Kemp's ridley in a tank, they can't come close to catching a shrimp or a fish. They're just not, they're quick, but and for a crab, they're perfect, but to chase down a fish, that's really not what they appear to be designed for.

David Owens [00:19:40] But what was going on, and we realized this later, where they were following shrimp boats, and they were eating the bycatch that the shrimpers threw over the side of the boat. And this actually was bad for them because they, they became acclimated to the shrimp boats and began living primarily in the areas where the shrimping was going on, which is, of course, one of the big problems they had as far as conservation.

David Todd [00:20:08] No kidding. Oh, my gosh, that's, that is just fascinating. I didn't realize that they had learned, I mean, over the course of not too many generations, I guess..

David Owens [00:20:19] Oh no, they just.

David Todd [00:20:20] To sort of take the benefits out of these trawlers.

David Owens [00:20:25] Yeah, no, that's very, it's very common for animals to go for the easy meal. In other words, a lot of animals will eat carrion if it's not too nasty, if they're hungry enough. You know, like eagles, for example, commonly eat carrion, even though they're fishing animals. For the same sort of story, if you've got a free meal, you're not going to pass it up. And you can imagine shrimp and fish were great food for the turtles as well. So that's what they commonly did.

David Todd [00:20:58] Thank you for explaining that. OK, so, so you've taken us through to their, I guess, mature years, where they're diving and and feeding on crabs, and then I guess following these trawlers around and catching shrimp and fish bycatch. Can you take us full circle to when they might be ready to breed again and..

David Owens [00:21:24] Sure.

David Todd [00:21:25] And sort of start us off where you, you finished where you started us off?

David Owens [00:21:28] For they're, or course they have a foraging ground and a lot of, a lot of sea turtles (people don't realize it), they, they both imprint to a beach where they're going to nest eventually, but they also develop a real affinity (I'm not sure imprinting is a good word) for a foraging ground where they learn to quote, "do well", on a particular kind of, it just happens to be the shrimp ground. Or if it happens to be off Louisiana, and some of that

shallow water with great numbers of crab, that might be ... they might go back there year after year as a regular part of their life cycle, their history, from migration to migration.

David Owens [00:22:11] So anyway, so each turtle finds a place that it, and they can change places too. They can over time they can move. But they really do tend to go to a specific place, at least for a while. And then once they reach maturity and then their hormones kick in. And I'm interested in this, I'll probably keep throwing kind of an idea out, because I'm interested in reproductive physiology and what it was for my Ph.D. work, was to study the hormones that regulate the development and growth, maturation, and the cycling of sea turtles with their migrations and the development of their eggs as they, as they prepared to migrate.

David Owens [00:22:49] Anyway, so so that's really what I was interested in as far as my laboratory side of my research for a number of decades. So, so, once they then, sort of this signal happens, and we're not too sure what that means. But it happens probably in the dead of winter because what the turtles do as they begin to ramp up so that in very early spring, we're talking in the northern hemisphere, February, March, they are beginning their migrations. And the in the case of the ridleys they actually start pretty, pretty early, even earlier than some of the other species. But they make a migration. Almost all sea turtles make a migration. It may not be vast distances, but usually it's at least 50 or 100 kilometers. And in the case of the Kemp's ridley, they may go all the way across the Gulf of Mexico, maybe a thousand kilometers.

David Owens [00:23:38] So, but anyway, they do make this migration. And what I've been interested in over the years, is the whole logistics of how they orchestrate this. And what's really cool is we found out the males begin their migration first. And so in the say we're thinking about Rancho Nuevo and Tamaulipas, Mexico, what would happen is we'd probably find males hanging out near that nesting beach or kind of on the way to the nesting beach, they may be 50 miles from, or 50 kilometers from the actual nesting beach. But the males hang out near there. And as the females come by, they'll do the courtship and mating. But the males show up first, which is so cool. And then when and then they only mate once for one period. So say a Kemp's ridley female is going to nest two or three times, which would be normal in a given season for her to nest. And they'll nest, probably in the case of the ridleys, right about a month apart.

David Owens [00:24:41] So what she'll do then is she'll nest two or three times. But by the time she does her second nest, she's no longer interested, interested in courtship and mating and the males have all gone home. They don't stick around, because when the new females stop arriving, there's no more females interested in reproducing. And so the males lose interest and they migrate back home. But in the meantime, the females will stick around in the nesting area pretty close. In this case, Rancho Nuevo, they might go five kilometers offshore and they just sort of sit on the bottom. Usually they don't do anything very adventurous. They're not feeding primarily during this time. They're concentrating on the reproductive cycle and spending all their effort, all their energy, into ramping up that next batch of eggs that they're going to crawl up on the beach and drop, you know, in three or four weeks. So they really concentrate their effort in this time. And then after she finishes, let's say, her third nest, she'll migrate pretty much directly back to that foraging ground that she came from three or four months earlier.

David Owens [00:25:45] And then maybe, they don't nest every year, usually some do nest every year in the case of the ridleys. But often they'll nest every two years. And so she'll skip a year, get good nutritional accumulation or a good energy reserve, good fat reserves. And then

after, say, two years, she'll make that migration again. The males, of course, don't have to accumulate egg masses, so they're more likely to migrate on an annual basis, although they don't all do that either. You can't, you can't make any rules here because turtles don't like rules and they tend to be somewhat flexible. And if the, if the male had a bad year on the foraging grounds, if it was a bad year for crabs or whatever, then he may take an extra year off and not make that migration.

David Owens [00:26:29] But that's the basic history, life history, where they do these migrations depending on the reproductive status, the nutritional status, when they're actually ready to go.

David Todd [00:26:41] Thank you. Such a clear explanation of a complicated life history and migration strategy. Wow. Well, and what's I think is so interesting to me is that it seems like this is, is relatively new information. I mean that these sea turtles were, I guess, considered quite a riddle for a long time. And I just wonder if you could talk a little bit about the, that first recording that Mr. Herrera made at Rancho Neuvo, which seemed to be so startling to people.

David Owens [00:27:16] Yeah, no, that's a great story. Anyway, so, Andres Herrera was a very well-off businessman. He was building, constructing in Mexico City. And he had a plane and he did a big game hunts in Canada and Africa. Very well off. And he'd heard about these turtles down on the coast of Tamaulipas, which is maybe about 200 miles as the crow flies from Mexico City. And he'd heard about all these turtles but no one, he had never seen pictures of. So he kept bugging his friends. Just show me this. And he went down there and he found this, this guy on the beach, and he said, "Yeah, they come in." And so he tried several times to test this.

David Owens [00:28:02] And now remember: it takes like one or two days and then they're done. And so he could go down there on, you know, on June 5th and they came on June 3rd, and he missed it. And so and they said, "Oh, yeah. You're too late. You missed it." Yeah right. I mean, he thought they were putting him on, to tell you the truth. But he, eventually, he got down there and the movie was made on a day in which he arrived during an arribada.

David Owens [00:28:27] And so the video shows his plane on the beach and shows him panning up and down the coastline, thousands of turtles, various estimates of, you mentioned in your questions, of the various estimates of how many turtles there actually were. And it's actually a very difficult thing to do because the turtles are coming and going over the course of, say, eight or 10 hours and you're not too sure how long one turtle's on the beach and they're crawling over each other. So it's actually been very difficult to get a good, solid count. But most people think that maybe 20 to 40 thousand turtles nested here in that day or in that period of the arribada.

David Owens [00:29:06] So, then, Andres Herrera was really interested and he got a hold of Walt Disney, believe it or not, and this was in the late '40. He got a hold of Walt Disney was telling him about this thing. And Disney said he wasn't interested. So Herrera put the thing in his closet at home, the movie that he made with his like a little home movie camera, and forgot about it. He didn't say anything about it. He didn't tell anyone about it.

David Owens [00:29:30] So then in the 19, early 1960s, there is this great guy named Henry Hildebrand - American, worked at the University of Corpus Christi at that time, and he is fluent in Spanish. And he was really determined to try to find out what the story with this Riddle of the Ridley. People called it the bastard turtle, all kinds of strange things, because no

one ever found nesting of this animal, even, even like the famous Dr. Archie Carr had been looking all over the Gulf of Mexico to try to find this animal because there were lots of them in Florida. But they were all juvenile. And he never found any big ones. What is this animal and what kind of story is hanging there? So all of the sea turtles well-documented nesting beaches, stuff like that. So that was the riddle of the ridley story that Dr. Carr wrote about in one of his books.

David Owens [00:30:20] But anyway, so Henry Hildebrand heard about this movie and he went to Mexico City and found Andres Herrera, looked him up and said, "Yeah, I got this old movie. You want to take a look at it?" "Of course!" And so he looked. Henry just about dropped his jaw when he saw this movie. Literally no scientist and never seen a single one of these turtles nesting. So here were thousands on the beach at one time.

David Owens [00:30:47] So Henry did an incredible thing. He called Archie Carr. Of course, at University of Florida, the dean of all sea turtle biologists, still most respected of all sea turtle biologists, even though he passed away many years ago. But any rate, Henry Hildebrand told Archie Carr, and said, "Archie, we're having a Society of Ichthyology and Herpetology meeting in Austin, Texas." It's 1963. And he said, "I want you to come to see a movie." And Archie said, "Oh, come on. What is this?" No, and he said, "Archie, you're going to want to see this movie."

David Owens [00:31:21] And so, Archie came to (I'm making this text up. I don't really know what happened in the conversation, but it had to be something like this). And so Archie came to the University of Texas meeting at Austin. And they showed this movie. I mean, we're talking about herpetologists going crazy because here was not just the discovery of nesting. It was the discovery of a total behavior no one had ever seen in sea turtles previously.

David Owens [00:31:49] And so Archie Carr and Henry Hildebrand each wrote papers about this and Archie's paper on (I'm trying to remember the title. It's kind of a cool title. Takes a minute ... "A Pan-specific Nesting Aggregation of a Turtle". "Pan" meaning the whole species. And he argued that the whole species was nesting at this one place, at this one time. I mean, that, that's a startling biological thing to do. And so anyway, they, of course, began to show the movie. I still show it in my lectures whenever I can. It's such a phenomenon, it's an old-world, seedy kind a movie. Have you ever seen it?

David Todd [00:32:28] I have seen it. It is tremendous, it's extraordinary.

David Owens [00:32:32] Extraordinary thing. So it's, you know, it became the documentation for the Kemp's ridley to immediately be placed on the Endangered Species Act in 1973 when the act was passed by Congress. So it was the evidence - a movie made in 1947 by a Mexican businessman. That was all there was.

David Owens [00:32:57] And of course, in the meantime, people went back. Now from '47 to '63, OK, nobody even looked at, no scientists went looking for that period of time. In that period of time, the population had taken a tremendous plunge. Still a few thousand nesting. But the numbers go way down and nobody could see anything like that what they had seen in that movie in the '60s and '70s when they began to look into, when they begin to develop conservation programs for the species. And so it was it was dramatic already by that time that the species was in real trouble.

David Owens [00:33:31] And so people like Dr. Peter Pritchard, Archie Carr, Henry Hildebrand, they all went down to Tamaulipas, Mexico, and documented this really, this story.

And worked with (very interested in this) several really good Mexican biologists who had been, by that time, become interested in sea turtle conservation as well. Because Mexico, at that time, had big fisheries for all the sea turtles and it was commercially very valuable issues for these animals. And so they were like, oh, my gosh, if this animal's endangered, we need to look into it and see what's going on. So, of course, they immediately began to work with Mexican biologists as well in the '60s. And I think of, you know, the story of the head-starting program. We can talk about that if you want to, but that's the basic background to the Herrera video that became so very, very important for the conservation of the Kemp's ridley.

David Todd [00:34:26] What a story! And I guess one that I guess was really alarming from the, from the very outset that they're discovered and then they're, folks realize that they're so rare.

David Owens [00:34:43] Yeah, disturbing.

David Todd [00:34:45] I think you had touched on some of the reasons why the population had declined so much since Andres Herrera made that film.

David Owens [00:34:55] Yeah, there are a couple of ..

David Todd [00:34:57] Egg collection, is that right?

David Owens [00:34:59] Yeah, absolutely. There are two major causes for the problem. The egg collection, which, of course, the local people had been doing, and they literally would load gunny sacks full of eggs on burros and haul them up to, in the '50s and '60s, well-documented, hauled them all the way to Mexico City, in some cases, or the other cities nearby, in Tamaulipas. And they'd sell them for, you know, there, in a lot of cultures, they're considered aphrodisiacs - the turtle egg. And so you have a cerveza, and you have a turtle egg, and that's going to make it good to go for quite some time. So that became quite popular. Of course, a very good protein source anyway. So that was a major, a major reason for its expiration.

David Owens [00:35:52] But I think the other thing, that you touched on in your questions also, was that somewhere in the after World War Two, we developed these really powerful diesel engines that could pull a trawler very efficiently and very quickly across the bottom. And imagine in the old days they did it by sailboat. So obviously it wouldn't be that fast. But here were these trawlers. Very powerful. And by, by the 1980s and '90s when I lived in Texas, the big boats were actually pulling four trawls at the same time. So you can imagine - it's just like a swath about the size of half a football field that you're able to cover with your boat as you cruise along. Anyways, a tremendous amount of trawling.

David Owens [00:36:39] There are notebooks from fishermen that, from the 1950s and '60s, notes like caught about 50 turtles this trip. Wasn't that bad. A lot of dead ones. We only ate a couple of them, you know, so it wasn't that bad a trip. This and that. It was a bad thing for them, because it was - imagine a 100-pound block thrashing with, with its flippers in with your shrimp that you're trying to sell. Just beat the heck out of it. So they really didn't like to have the turtles in the net with their shrimp, kind of ruined their product. But they, they were, something they had to deal with.

David Owens [00:37:16] But then, of course, by the 1980s where people were saying, oh, we've got to monitor the shrimping, we've got to start using specialized nets that allow the turtles to escape, the fishermen said, "Oh, no, that's not a problem. We don't catch any turtles."

And so, and you, you know what? The shrimpers weren't lying. That was true. So you can imagine there are seven or eight thousand boats working off Louisiana and Texas, but not to mention Mexico. Mexican has lots of fishing too. And so seven or eight thousand boats - imagine you only catch a couple of turtles a year because the populations are so low. But still, that's fourteen or fifteen thousand turtles that could be killed in your nets, because when you drag one of those nets, you've got such power you can leave it underwater for three or four hours and that will drown even an animal that can hold its breath for tremendous amount of time.

David Owens [00:38:08] So, anyway, my theory that most people believe is that, it was that post-World War Two tremendous increase in shrimping effort that started taking out the adults. Remember? Its eggs that had been harvested at the beach primarily. A thousand eggs doesn't equal one turtle because, you know, a sea turtle in its lifetime will lay many thousands of eggs, typically. And so, but when you destroy the adult nesting population, that's the calamitous part of the story.

David Owens [00:38:43] And I think that was really what put the turtle into jeopardy starting in the 50s and 60s when, when the intensity, and of course, shrimp tremendously valuable product. Everybody wants to go after it. And every Gulf state, every southeast state was shrimping very heavily because it was quite a valuable product at the time.

David Owens [00:39:04] So I think that's the. It was a combination of egg harvesting and shrimping that caused the problem. It was, incidentally, very hard to convince the shrimpers that they were the problem. Because, like I said, they said, "we don't catch that many." They're not wrong. They didn't get that many, at that time in the '80s and '90s. But, with so many boats working. That was the real problem - that the intensity was so heavy, so heavy that they took out lots of turtles.

David Todd [00:39:34] So I guess you mentioned the TED, these Turtle Excluder Devices - I guess that was one strategy to try to bring these turtles back. I understood that they tried to protect Rancho Nuevo from egg collection and then this head starting tactic as well. Can you talk about some of these, you know, different ways that people tried to save these turtles?

David Owens [00:40:05] Yeah, it was probably the most intensive of all the sea turtle conservation programs around the world. This is probably the most intensive one that had ever been undertaken. Mexico got interested early on, but like I said, they were interested in the commercial side and they didn't want to lose the species. They didn't want that black eye. And so they, they started sending scientists down to the beach to monitor the population. But they didn't have a very strong funding base. And so it was pretty haphazard and they didn't have great support. But what happened is some Texans, actually from South Texas, this guy named Dearl Adams and a lady named Ila Loetscher. They're just citizens and are just doing their own thing. But they loved turtles. And they'd heard these stories. Dearl was a great fisherman. Ila was a strong conservationist.

David Owens [00:40:57] Anyway, they started going down to Mexico and talking to some, actually some Americans who lived down near Rancho Nuevo who had fish camps, and they talked them into giving them some eggs and they brought the eggs back to Texas, South Padre Island, and they started incubating eggs and raising them to hatchlings and began to release them. To be honest, they weren't very successful because at that time, no one really knew very much about how you care for a little turtle like that. And, you know, that they would get diseases and wouldn't have great nutrition for those little guys.

David Owens [00:41:28] But anyway, the ideas got initiated at that time to bring them to a, up to the U.S. because the theory was, if all these turtles are nesting there at one place and what if we have a hurricane or an oil spill or something like that, it could wipe out that whole beach. We need an insurance beach, you know, an extra place where these things nest. And it turns out, the Native Americans had always talked about nesting of turtles on South Padre Island and actually all the way up towards Corpus. So there had always been some nesting that was known and people thought it was mostly greens, but it was probably also Kemp's ridleys at that, historically speaking.

David Owens [00:42:10] But at any rate, so about this time Fish and Wildlife Service had already declared the Kemp's ridley an endangered species in 1973. And in the mid '70s, people said, well, what should we do? What should we do? And so Dearyl Adams and Ila Loetscher said, "Hey, let's have a big program, work with Mexico. And Mexico... so there's a big meeting - Fish and Wildlife Service, National Marine Fisheries Service, Instituto Nacional de Pesca. And they all got together and they dreamed up this program to have some American funding go down to Rancho Nuevo, bring some volunteers in, both Mexican students and American students. And they would work at Rancho Nuevo and protect them, the beach, from poachers and let the turtles survive. And they actually developed these corrals where they would put the nests. So even, you know, coyotes and other animals that would eat the eggs were kept away from the developing clutches.

David Owens [00:43:10] Anyway, so this became very effective, very useful, and a lot of money was plowed into it. But it really worked well. They were releasing thousands and thousands of hatchling turtles every year.

David Owens [00:43:22] And so by about 1978, the idea that, actually I think, I'm not sure who first had the idea, but Archie Carr was one of the people who thought turtles imprint to the place where they nest. So this is not news anymore. It's very well documented. Turtle comes up from the beach. That baby turtle as it's incubating, starts, I don't know what it does, but it starts remembering something about that beach, about that early little oceanographic experience it had. And then again, you know, 15, 20 years later, it goes back to that same beach. So, yeah, that's, that's the crude definition, the simple definition of imprinting.

David Owens [00:44:01] Well Archie Carr had proposed it because he knew some people that worked on salmon. And salmon and trout had been shown to do this same kind of thing. It was based on smell, their sense of olfaction. So Archie and other people thought, well, maybe they've got a great sense of smell and maybe they can use that to help wend their way back towards the nesting beach by moving sort of up-current, against the stream, to find their way back to their nesting beach.

David Owens [00:44:26] And so, anyway, the imprinting idea then was the concept that people used to bring some turtles up to Padre Island National Seashore, Corpus Christi, and back in those days, forget some of the things that Ed Kleiner was in Galveston, Jack Woody with Fish and Wildlife Service, Henry Hildebrand, he was involved, Archie was involved. And Peter Pritchard, the famous turtle biologist who just passed away last year, they were all involved of this kind of concept. And they, I think, I'm not, that this issue they were interested in was great. But I think they made a mistake because they called this a conservation project and really, because at that time, imprinting had not been proven, it was really a big experiment.

David Owens [00:45:18] And so you ask why they ended up closing the experiment down after 10 or so years. One reason was they had called it conservation and in truth, by that time, there hadn't been any success. No turtles had been clamoring up on the beach, because what they did was they, they incubated these turtles that were from Mexico. They didn't let them get any even sand in their, on their eggs, in Rancho Nuevo, but they flew them up to Padre Island, and incubated them in Padre Island sand. And the idea was to quote, "artificially imprint" them to Padre Island sand and then let them hatch there, let them crawl down the beach. And then do everything that they were doing. This was called "artificial imprinting" when we really didn't know if imprinting really worked. See what I'm getting at?

David Todd [00:46:03] Yes.

David Owens [00:46:05] And so when the government, when the government sold this idea as a conservation program, a lot of real hardcore conservationists and scientists said, "Wait, isn't that like a couple of steps before we really know?". And they had to admit, "Yeah." But the animals were actually showing good growth in captivity, actually faster than they do in the wild apparently. And there were turtles hanging out, hanging around up and down the coast. Now, these turtles were on only weighing 10, 12, 15 pounds. They were a long way from maturity. And everyone were saying, "What's going on?" They must be stunted or not that well. They weren't. It just takes that long. I mean, there was no use of even thinking about the project being successful or not until 10 or 15 years. Seeing what I'm saying? And so the criticism started happening after five or six years, which was way too early to be, to be thinking about, is this working?

David Todd [00:47:02] So there really wasn't an understanding of what you mentioned before, that it might take 15 to 20 years for ridleys to be sexually mature and return to the nesting beach?

David Owens [00:47:13] These people said three or four years. I mean, I can remember in 1970, I... The reason I know pretty well is in 1978, I got a job in College Station in the marine biology department. And they had just started this project and they were all excited about asking me about reproduction, said, "Guys, there's no reason to worry about reproduction for a long time yet, because these are a little bitty guys. And it's going to take..." "Oh no!" And so they, they sort of readjusted their thinking at that point and realized it was a long-haul project that they were getting into. And so then they started talking about captive breeding and other kinds of things. And they actually did some captive breeding at a couple places around the country. I was involved in that because of I was really interested in reproduction.

David Owens [00:47:57] But they're, they, they kind of, it was, it was like we didn't know enough about the biology of the animal. And they said, "Well, let's do something even if it's wrong." You see what I'm getting at? That was sort of the philosophy and the concept of starting a new nesting beach in Texas was very inviting. And everybody agreed that should be done, that could, if that would work, would be very exciting.

David Owens [00:48:21] But see what I mean by, so by 10 years or so, when nothing much is happening, there weren't like any new batches of turtles showing up at Corpus or anything. People began to think, "Whoa, man, this is pretty expensive to, you know, this is more, we're spending more on this species than we are on all the other sea turtle conservation projects in North America at that particular time."

David Todd [00:48:43] And so if I'm following you, part of the problem was that there was competition with other conservation initiatives, maybe with other turtles, with other species, that were similarly rare?

David Owens [00:48:58] Oh, yeah, no, no other species was as rare as the Kemp's ridley. The reason, the justification for doing this experiment... For, now, the really solid conservation was working with Mexicans at Rancho Nuevo - that was proven technology. We knew if we could get those eggs hatched out and in the water that eventually there would be some more turtles out in the Gulf of Mexico.

David Owens [00:49:23] But the experimental part was the head-starting: that had not really been proven anywhere at that point in time. And so that's what really ... They didn't shut down the whole conservation relationship with Mexico. They closed down the head-starting program at that time in 1988 or something like that. That's because they were, there were many other, like at that time, the loggerhead turtle on the East Coast was really in a dive, I mean, in a nose-dive. Still many more, many hundreds more individuals than the Kemp's ridley. But there was, there were issues about the Kemp's ridley, I mean, the loggerhead and the green turtle. And so the money that Fish and Wildlife had, the money that National Marine Fisheries Service had, was all divided up, you know, among the different species. And so the Kemp's ridley was getting a big chunk of it. And so that, for this unproven technology, there was a lot of criticism and that's why it was shut down. But in the meantime, they continued the beach work in Texas and other kinds of things, mostly working with TEDs, looking for how animals respond to different kinds of turtle-excluder devices. And so the Galveston lab story became very involved in all that kind of research.

David Todd [00:50:46] Well, you mentioned the Galveston laboratory and TEDs a little bit before. Can you go into a little bit of detail about how those TEDs were developed and the kind of...

David Owens [00:51:00] Yeah.

David Todd [00:51:00] Effect they had in the response they got from the shrimpers who had to use them?

David Owens [00:51:06] It really strikes you as a real mixed response. First of all, once again, to give the shrimpers credit, they had already developed an excluder device to put in their nets. Now, this, this thing goes up, you see its head, it's sort of mounted in front of a bag. So you can imagine a big wide open mouth that narrows down to, you know, maybe 10 feet in diameter and then down to five feet and into a bag. Well, before you get to the bag, there's, if you put the turtle excluder device or whatever efficiency device, and it would be like a gate that would pop open when the turtle would hit the gate and allow the turtle to escape. Well there are many, many different designs that were envisioned to do that.

David Owens [00:51:53] One of the very best designs had already been developed by a shrimp fisherman, not to get rid of turtles, but he wanted to get rid of jellyfish. You've see the cannonball jellyfish along the coast of Texas? And when they're, when they're abundant, man, they are kicking: they can literally bog down a shrimp trawler. And so this happened, of course, in South Carolina and Georgia. This guy named Sinkey Boone, in Georgia, and he wanted to improve the catch of the shrimp, but not have to haul in so many jellyfish. And so he made this device that had a grate on it, so that when, when the jellyfish hit the grate, they would pop out a little trapdoor. And meantime, the shrimp little guy, about two or three

inches across, would go right through that bar, grate bar and into the bag and he'd catch the shrimp and not caught the, haul in tons of jellyfish every time.

David Owens [00:52:44] So they were already using this on the east coast. Now, the Texas shrimpers didn't know much about this. And they didn't ever use them. And it became a very different story. When people began to promote the turtles-excluder devices, they actually were more successful on the east coast, South Carolina and Georgia, because those guys had already used something similar in their fishing when the weather conditions and the jellyfish were abundant, they had already been doing it. But the guys in Texas had never used anything like that. So there was much more resistance in Texas and Louisiana.

David Owens [00:53:24] In fact, it was so bad that when the federal government basically made it a law that shrimpers were going to have to use TEDs, there was a boycott and there was, in the Galveston ship channel, shrimpers blockaded the ship channel, so the big tankers couldn't come and go. And now we're talking people were losing millions of dollars a day in obstructing this industry.

David Owens [00:53:48] And so the shrimpers got the attention about this problem. And so they then, they went to arbitration. Of course, the legal losses, things like that happened. Shrimpers were claiming they didn't catch any turtles. But in the meantime, the National Marine Fisheries Service had started a study. Have you heard of observer programs where you put a non-participant on board a boat? They do it in salmon and they do it in codfish and all kinds of fisheries. A person gets on board the boat and the captain sees this person, but the person doesn't work for the boat. And all that person does is document how much, how many fish they catch and which species they catch. And if they catch turtles, they do, they document that as well.

David Owens [00:54:40] So what happened was the federal government did a massive observer study in the '80s, and this study was so incredible and so convincing, it showed just how many turtles were being captured. We're talking something like 14,000 turtles per year were being killed. This was, this was a smoking gun that the shrimpers could not deny. So anyway, they, of course, objected.

David Owens [00:55:07] But in the meantime, the law was then reinforced and the Coast Guard was pulled in to start doing enforcement and National Marine Fisheries Service, which has an enforcement agency. And they began to fine shrimpers who were caught illegally not using their turtle excluder devices. So now it was very contentious. It was, it was a really ugly scene. This is the mid '80s. By the late '80s, it went on again. And then in 1990, there was a major study introduced by the National Academy of Science. And it was called the Magnuson study. Actually there was a guy named Gary Graham who was on that study. I was actually a member of that study group. Karen Bjorndal who was the director of the Archie Carr Research Center for Sea Turtles, Jim Richardson, famous Georgia sea turtle biologist - a lot of people on this study.

David Owens [00:56:07] And this is when the data on these observers began to be used to make the case for that being a key problem in conservation of the turtle. So with this 1990 study. Everything changed. It became just how are you going to use these TEDs? Is the government going to help you get a TED. A TED cost some money and it costs them money to rig it in your, in your shrimp, in your shrimp net. And, you know, to tell you the truth, you're not going to catch quite as many shrimp in each haul when you've got this thing sticking in the net. See what I'm getting at? Because some of the shrimp are going to get away. And so this

was really, made the blood boil for a lot of shrimpers. But any rate, so they began working together. Sea Grant, you know, the Texas Sea Grant program was very much involved in TEDs in Texas.

David Owens [00:57:02] And this guy named Gary Graham, I was telling you about. He was an extension agent. He's a great story. Just I mean, you can just imagine an old guy and shrimper, and this guy would go on the boats of these guys, and they'd be arguing about it and Gary Graham would say, well, I got the proof of it. He'd show pictures and videos and anyway, by cajoling and conniving and making deals, he got the shrimpers to begin to use these turtle-excluder devices. And that made all the difference. All of a sudden, we didn't have all these dead turtles washing up on the beaches every year.

David Owens [00:57:41] You asked about the closed season thing. That was the really important thing. When, well, one time they just shrimped all the time. But they began going to a close season in Texas and Louisiana. And what would happen is they would open the fishery up, I'm making this up, like May 1st or something like that. And then on May fifth and sixth, dead turtles would start showing up on the beaches. And shrimpers would say, "We didn't do it!" You know, and there had been no dead turtles for three months? And so there was no doubt that the closure for the shrimp fishery to try to increase the catch of shrimp was the final nail in the coffin of the point that shrimp fishing was really a main problem for the turtle.

David Owens [00:58:26] So anyway, they started using TEDs - it was very reluctantly. And I'm not sure everybody ever really got, started using them. But, but they started using them. And this then dropped the number of mortalities documented on the coast. And at that point, about 1990, is when the Kemp's ridleys really, really started to recover. And if you look at the population, you can just see how beautifully these, the numbers begin going up over the next two decades. And so on, now the other day, I don't know what we got, maybe 10,000, 20,000 turtles nest this past year. So when you went from three hundred in 1985 to like 10,000, it's a dramatic, and one of the great, conservation success stories, I think, in the United States.

David Todd [00:59:13] Well, that's exciting. It's nice to see that it was, you know, not a sure thing. It was an experiment as you said, and all the political controversy and pushback.

David Owens [00:59:27] It was heavy duty - lawsuits and everything. And but I think everybody ended up shaking hands on the shrimpers going about the business. And, of course, the sad thing about shrimping was along about that same time, tremendous increases in the cost of diesel fuel were being dumped on the shrimping industry. Also, the tremendous amount of foreign shrimp coming from other countries. Farming shrimp had picked up in Panama and Indonesia, places like that, and they were getting shipped. So here the shrimpers were getting hit from every side, with their, what had been a safe traditional industry, that they'd been able to make, you know, a decent living at. They were being hit from every side. And so the turtle excluder device is just like the straw that broke the camel's back. Was just so much for them. They couldn't do anything about the other things. But anyway, the government, to make a long story short, the government also began looking at other kinds of restrictions on importing shrimp, things like that, to try to give the American shrimpers a fair chance. And I think that that worked to some degree. But if you, if you go by shrimping fleets today, they're just a shadow of what they used to be. I think we've got like, I think we've got five boats in Charleston now. And there used to be 25 or 30. I mean, it's a shadow of what it used to be. It's just..

David Todd [01:00:49] Boy.

David Owens [01:00:49] Oh yeah. They just, they can't, they can't pay for the fuel and get enough money out of the shrimp to make it pay for itself.

David Todd [01:00:58] Have you seen this wonderful story about the recovery arc of the sea turtle from 1990 forward, I guess a couple of decades. I was struck by some things that I read and I'm sure you know more about it, that around 2010 there seemed to be a pretty significant dip in the numbers of sea turtles being seen. Is that true? And maybe you can tell us more about what might be going on.

David Owens [01:01:31] There was there was, well, you know, when an exponential curve just kind of shoots up, well all of a sudden it just levels out and it had a serious dip. I think, I'm not sure, maybe, 2012, around, around the time of the big oil spill, for sure, and so that was the immediate, fingers were pointed that direction. And that, there's no doubt a lot of turtles were injured and killed by those contaminants. And I mean, that's documented. There are studies that have pointed out what happened there.

David Owens [01:02:03] But what, what other folks have suggested and these are fisheries biologists now, that study this kind of thing in all kinds of species. And every species has a sort of a natural limit around which that population would normally fluctuate up and down, depending on how much preys of animals. In the case of Kemp's ridleys it is going to be shrimp and other things, I mean not shrimp, I mean crabs and other things that they can, they can easily forage. So, and you can, and the population is growing and growing. And don't forget that if you've got, say, 10,000 nesting females, that means you've got 30 or 40 thousand juveniles out there. Not little bitty sea turtles now, not eating the small flotsam and stuff in the open sea. But these are ones that are also going after crab. So the pressure on the food resources for these turtles must have been increasing tremendously in the '90s and 2000s as these populations were recovering.

David Owens [01:03:14] And so some people think that what they had done is they'd reached a term which they call, "carrying capacity." That is, they'd reached the number of animals that can be well fed by the food resources around you. Now the turtles don't die. They don't disappear. But remember, I told you that they all depend on how well they did on the foraging ground? That depends on how often they go nest. Well, they just slowed down that process. Instead of going every year, every two years. They were going every three years.

David Owens [01:03:46] And so that suggests that the carrying capacity for the Kemp's ridleys in the Gulf of Mexico has been a met, not proven, but that's a theory that a lot of people are looking into and believe could very well be happening. So coincident with the oil spill, which was clearly a problem, this other phenomenon was probably going on with the Kemp's ridley in the foraging ground.

David Todd [01:04:13] And is that, in itself, a conservation issue, that the carrying capacity isn't what it might have been, you know, at the time of Andres Herrera's filming or is that not the case?

David Owens [01:04:28] Yeah. When Andres Herrera was filming, of course, there was not an intensive crab fishery to speak of. I mean there were people fishing for crabs. But they, once again, they didn't have the, the boats and things like that as modern fisheries folks do. And so I think that, at that time, let's think in 1940, the carrying capacity for the Kemp's ridley was probably much higher than it is now in the 2000s with so many other challenges to the use of

those resources. And I think it may very well be that that has changed dramatically, the environment. And once again, I don't know this a factual thing, there are people down in College Station (oh my gosh, I'm losing people's names) - Caillouet. He, I think, Charles Caillouet maybe lives down in the Valley. But there are fisheries biologists - Charles worked for the National Marine Fisheries Service. Then he has a business where he does environmental assessments, very, very well respected fishery biologist.

David Owens [01:05:47] But they're the ones that thinking that this may be a different story now, and it may very well be happening around the world where many sea turtle populations are beginning to really show some strong recovery. Now remember it takes a long time and the ridleys may have been the fastest ones. But the green turtles and, and loggerheads may be reaching that sort of a carrying capacity. That's a, that's a theory that really needs more work. I mean, that plus climate change, are the two biggies with regard to sea turtle conservation that into the future, we've got to be more political.

David Owens [01:06:27] Well, and my understanding is that you've studied the effects of temperature on, I guess, the sea turtle's biology. Have you seen a connection with climate change in terms of sea water or sand temperatures and impacts on turtles?

David Owens [01:06:47] Sure, yeah. Well my, I'll make a long story very short. My, my Ph.D. work was at a turtle farm called, on Cayman Islands, called Mariculture, Ltd. And they were raising green sea turtles to try to make them commercial. This is before the Endangered Species Act was passed. And so they, they would bring in turtle eggs from Surinam, the Ascension Islands, and Mexico, and they would incubate them on the back porch of the farm manager at the turtle farm. And they would come in at different times of the year. And they would then, they would grow up these turtles.

David Owens [01:07:24] And this is where they first found out how slowly the turtles grow. They thought they were going to have a commercial product in a couple of years. And they are very slow growing, even in captivity. But what I noticed, and I was doing my research on reproduction at that time, and they would give me some turtles. Now, OK, one thing you need to know: you cannot tell the sex of a sea turtle until they're almost adult. The male develops a long tail and these claws, which are quite distinctive, but that doesn't happen until the green turtle is 200 pounds. OK? And so here I was looking at these little hundred-pound turtles and I didn't know what sex they had.

David Owens [01:07:59] But anyway, at that time ... (And remember, this is pre Endangered Species Act. This is all legal.) ... They would slaughter the turtles and sell them for hamburgers and us and oil in England. And then they would give me the gonads. And so one batch of turtles, say from Surinam, would have 98 percent female. But where's all the males? That's statistically impossible. I don't know. And then the next batch, it'd be the opposite. It'd be 40 percent male! And so I said, "What the heck is going on here?" So it was there at the turtle farm, we first realized that sea turtles had this really strange reproductive system where temperature of the incubation nest determines which sex it's going to be.

David Owens [01:08:46] Now a lot of other turtles do. All crocodiles do this kind of thing too. But this was a stunner because we were, as biologists, so used to the whole XY chromosome thing, like people and mammals have, that we never guessed there could be any other system. And so I was actually the first one to write this down on a paper and got a lot of attention from various people who thought I was crazy. But lo and behold, other people did some really good research and proved that it's true.

David Owens [01:09:12] And so here's the issue, bringing it up to modern time. The beaches are actually getting warmer. All the beaches around the world, for the most part, are getting warmer. And so, for example, right now in Florida and even at Rancho Nuevo, we know this is true at Rancho Nuevo. In Florida, 90 to 95 percent of the baby turtles coming off Florida beaches are female. That's now. OK?

David Owens [01:09:40] And we think that as global climate change, that is warming, becomes more and more common over the years, that beach temperature will continue to rise and can continue to produce more and more females. Initially, you'd said, oh, my God, more females that's good. But the bad news is these guys are sexually reproducing animals and so they need males to provide the sperm to produce fertilization.

David Owens [01:10:10] And not only that, but there's an evolutionary argument that's pretty powerful that I'm not very good at making. But if you have, if you want an animal to change and adapt to climate change over time, you want to have a lot of variability. Variability is the secret for lots of long-term evolutionary development of animals. And so if you have males providing any variation, in other words, if one male mates with 20 females, that's good. They all may be successful. But, that means that a number of new genes coming into that gene pool is much reduced, over what it could have been or should have been historically. Those kinds of arguments are being used today for the issue of climate change and what's going on with sea turtle reproduction.

David Todd [01:11:04] Gosh, this is disturbing.

David Owens [01:11:10] And there's one other... I may as well throw this in. One of the things we've done some research on ourselves is when you, OK, we did studies where we looked at what the sex ratios of juveniles were in the ocean. You go out in the ocean with a trawler, and you capture a 100-pound loggerhead. A 100-pound loggerhead is a baby, I mean, a teenager, I shouldn't have said that. It's a teenager. It's a long way from being sexually mature. And you can't tell much about what sex it is. But if you look inside of it with laparoscopy or measure hormone levels, you can tell which sex she is. And we were finding about 60 percent female, maybe 70 percent female, which this shocked everybody, because this is before we even knew about TSD, temperature sexual determination. And so it turns out, you've got a beach producing 95 percent female. And yet the juveniles are only 60 percent female. The question is, what happened to the other 20 or 30 percent of the girls that were produced.

David Owens [01:12:12] It turns out that where the temperature is really warm in the nest, the development is screwed up. They do not develop. They use their yolk sac more rapidly. They have more abnormalities. They are very weak. We did an experiment where we, we put the turtles. If you turn a turtle on its back, it flips over. Almost all turtles have this. It's called the righting (r-i-g-h-t), righting response. And if you do this or experiment with turtles that have been incubated, say, let's say, for example, 31 degrees, compared to turtles incubated at 29 degrees. The 29-degree turtles are much faster at flipping over. Sometimes the 31-degree centigrade turtles can't even flip over, they're so weak and so lethargic.

David Owens [01:13:00] And so you can imagine all these girl turtles in, off the coast of Florida, trudging down the beach much slower than the males produced at cooler temperatures. And yet there's just so many of them. They're still overwhelming the population, but they're very weak. So there, I call them, I call them natural turtle fish lures, because along the coast of Florida, man, the dolphin fish, mahi mahi, they cruise and they eat

them by the hundred and I think a little female turtle will be much less successful. So here's another reason why temperature may be a long-term problem for the success of sea turtles. Even though the numbers are coming back, they may not be very successful in repopulating the population.

David Todd [01:13:53] Gosh, this is a story that's still unfolding, but...

David Owens [01:13:57] Yeah, that's speculative as well. Yeah, that's me being highly speculative.

David Todd [01:14:05] Well, you've given us a wonderful summary of, gosh, what I'm sure is a really complex, many-aspect kind of story. I was wondering if you might have anything to add about what you foresee for sea turtle recovery in the years to come.

David Owens [01:14:25] Yeah, well, I'm, I'm, I'm an eternal optimist. A lot of people back in 1985 said we should just cash it in. We shouldn't spend any money on Kemp's ridley, because they're done. They're gone. It's an extinct species, just a few left. And so I did not like that and a lot of people didn't like it. I mean, call us tree huggers or turtle huggers, whatever you want. But we thought we should fight that battle. And so, the very success that we've had with the Kemp's ridley is just, I think, it's a tremendous testament to both the Mexican and US conservation effort.

David Owens [01:14:58] The program, a fairly similar story, can be, can be discussed about green turtles and about loggerheads in the U.S. They're still not out of the woods. There are still other issues. But I think the sea turtle conservation story is a story of great success. I bring, I brought up the negative things about climate change and the carrying capacity stories because there are still things that we need to deal with and that we need to understand. I've always viewed the sea turtle as kind of like the show, the show-off species, if you will, for all of marine conservation. And if we can, if we can help them and induce their recovery, then I think there is a very good likelihood we can do the same thing for red drum, and snapper and dolphins and all the other issues, animals that we have great concern about them.

David Todd [01:15:53] Well, that's encouraging. It does seem like a, a long story and maybe the final chapter hasn't been written yet.

David Owens [01:16:02] Oh, no doubt. No doubt. Much more needs to be done. Much more research and a lot more conservation with whole sets of questions about conservation that we're not clear all the things that need to be addressed.

David Owens [01:16:17] And I didn't even mention the very genetics capabilities that we have repeatedly said, you can now go to Beecham and you can test, you can take blood samples from, say, 50 turtles, and you can figure out that some of those turtles are the offspring of another turtle that is nesting in time. I mean you can do matrilineal study of individuals. And, you know, then if you know how old the individuals are, you can talk about how long it takes to become sexually mature. So here these genetic capabilities have made this tremendous headway in our understanding of the population.

David Todd [01:17:00] Well, that is really heartening. Well, maybe we should wrap it up on that good, exciting note.

David Owens [01:17:07] For sure, yeah.

David Todd [01:17:08] And again, I wanted to thank you for taking time to give us, you know, a really brief introduction to, to this big story. And.

David Owens [01:17:19] My pleasure. And, of course, glad to do it.

David Todd [01:17:22] You know, thanks for all your years of work making it happen.

David Owens [01:17:28] Yeah, well, it's been great fun. Still enjoying it. I'm pretty much retired, but I love to get into the papers and read what's going on. Yeah.

David Todd [01:17:36] Good, good. Well, I hope our paths cross again. And thank you again for the wonderful lesson you gave us today.

David Owens [01:17:44] My pleasure, David. Glad to be able to do it.

David Todd [01:17:45] All right. You take care.

David Owens [01:17:48] OK, you take care now. Bye bye.

David Todd [01:17:51] All right. Bye now.