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Sherman, Kenneth ~ Oral History Interview

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Voices from the Fisheries
166 Water Street
Woods Hole, MA 02543

Interview with Kenneth Sherman by Madeleine-Hall Arber

Summary Sheet and Transcript

Interviewee

Sherman, Kenneth

Interviewer

Hall-Arber, Madeleine

Date

June 30, 2016

Place

Narragansett Lab

ID Number

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Use Restrictions

Biographical Note

Kenneth Sherman was born on October 6, 1932 and was raised in Boston, Massachusetts.In his early years, he would spend time with his father at the local Boston Fish Pier to observe the fishermen. He graduated from Suffolk University with the idea of attending law school. A mentor guided him towards biological sciences so he appliedto theWoods Hole Oceanographic Institution. He taught in western Massachusetts for the Audubon Society before he began his career at the Bureau of Commercial Fisheries in 1956. He received his Master's degree in Biological Oceanography from the University of Rhode Island and a DSc from the Sea Fisheries Institute in Gdynia.He worked in Washington during President Nixon's administration when NOAA was created. He has traveled to Hawaii, parts of southern Africa and other parts of the developing world and Sweden in his pursuit of the study of plankton and fish relationships on a global scale in hopes to further advance fisheries sustainability. He has spent the last several years working with the Office of Science and Technology on the assessment and management of Large Marine Ecosystems.

Scope and content Note

Interview contains discussions of: plankton, mackerel, herring, tuna, faux sardines, Randolph High School, trawls, large marine ecosystems, MARMAP, and Large Marine Ecosystem sustainability levels

Kenneth Sherman recounts his 56 year career with NMFS and his work with plankton and Large Marine Ecosystems.

Indexed Names

Agassiz, Alexander
Alexander, Lewis
Bigelow, Henry
Clarke,John
Edwards,RobertL.
Fish, Charles
Fish, Marie Poland
Hardy, Alister
Hickel, Walter
Knauss,John
Longhurst, Alan
Lubchenco, Jane
Nixon, Richard
Sullivan, Kathy
Townsend, Jack
White, Robert
White, Teddy
Wise,John P.

Madeleine-Hall Arber: We can-- maybe-- I might have to put this closer to you.Most likely actually.

[Sound of adjusting microphone/recorder and papers shuffling]

MHA: Can you just say something so that we can see if the mic is kicking you up sufficiently?

Kenneth Sherman: Yes, this an oral test one, two, three.Am I being picked up--

MHA: You are.

KS:--adequately?

MHA: I think that looks--I think that looks good. I'm going to, um... maybe. This is a little bit new to me.

KS: [faint] looks like an MITgadget.

MHA: I know, doesn't it! They actually sent it to me from the science center down there at Woods Hole.

KS: Oh. Okay.

MHA: So, um. I want to-- I just have to introduce this.It's an interview for *Voices from the Fisheries* as part of the Voices from the Science Centers project funded by NOAA's Office of Science and Technology. I'm Madeleine-Hall Arber and I'm speaking with Kenneth Sherman at the Narragansett Lab. And it's now ten after ten on July--I mean on June thirtieth. So-- can you introduce yourself and just uh, give me your name and where you work.

KS: Yeah, I'm Ken Sherman and uh... I work here at the Narragansett Laboratory but in fact, over the last several years I've been working directly with the Office of Science and Technology on a... comparatively new concept called [the]Large Marine Ecosystem Approach to the assessment and management of goods and services from coastal ocean areas around the globe. And... this has been quite challenging and quite satisfying few years and it has been a realization of a long career. This is my fifty-sixth year--

MHA: --Oh my goodness

KS: --with the organization... and it's been my principal activity for all those years to deal with marine fisheries resources within the context of the natural environments that support the fish and fisheries.

MHA: So, how did you first develop an interest in marine science?

KS: Um... it's a matter of being born in a place that had ready access to the ocean and so... as an... urban resident of Boston... one of the excursions as a young child was having my father walk me around the areas where they were landing fish at the Boston Fish Pier and as a five, six and seven year old that did make an impression of something rather exotic ongoing that just suggested this is something I might want to learn more about. Where do these boats come from? How do they catch these fish in there so... wide variety of the species being unloaded and what not. So, it was the propinquity of... where my father decided to push me around in my stroller, I guess.

MHA: So, I forgot to ask you, the date of your birth?

KS: That's way, way back in the far histories of uh... October 6, 1932.

MHA: And, in Boston?

KS: Yes.

MHA: I see, and you grew up in Boston, I presume.

KS: Yes, I did. And I... had my first position with the then Fish and Wildlife Service and the Bureau of Commercial Fisheries. It was a result of a train trip that I took after graduating from Suffolk University where a mentor... actually directed me into biological science rather than... legal kinds of things-- I had intended to be a law student at Suffolk University. But, I... followed his mentoring and... one day decided to…knowing that my graduation was coming close-- took a

train from Boston to Woods Hole, and simply walked into Woods Hole Oceanographic Institution and asked if they had any positions for somebody that was a biology graduate and they said not at the present time but the same old story, just fill out a form and we'll contact you should something turn up. And on the train ride back--I thought, quite a fascinating place Woods Hole, you know, in of itself, and I knew a bit about the history of the Woods Hole Oceanographic Institution so... I thought it would be quite nice if they ever did contact me. And in the interim, I took a position with the Audubon Society in Boston to teach science to elementary schools in western Massachusetts where I went from school to school with a variety of living animals, and... found that quite fascinating.

MHA: So that kind of got your start in teaching.

KS: Yes, yeah... yeah that was quite nice. Especially when the uh... hedgehog ran up the chimney of a classroom and I had to go chase it up there. So there are [laughing] many experiences that I'll remember.

MHA: Oh, that's fun. So, how-- so did Woods Hole ever call you?

KS: It's quite interesting. While I was on my first job out there in western Massachusetts for the Audubon Society, I received a... telegram. And the telegram simply stated, "We have your application" which apparently was transferred from Woods Hole Oceanographic to the Fisheries Laboratory which was right down the street there on Water Street in Woods Hole and they said they've come into some funding from the Saltonstall-Kennedy and... have a position-- would I be interested in participating in fisheries research and I immediately responded yes.

MHA: And when was that?

KS: That was...1940…1956 probably, yeah. And so I made my way there and had an interview and was hired to-- as a, uh, biological aide... to interview fishermen at the dock, where my father had taken me years before, as to where they fish, what species they caught, how much time they spent, what sort of nets they used and so on. I have to... tell you that that was not an easy position because... even in those days there was a certain distance between federal government and fishermen who are extremely independent, and uh... not willing to share information willy-nilly. So it took me actually, persistence for several months and I attribute a cold day in-- in the winter-- January or February--where I was on the wharf, actually bending a haddock so I could measure it on my measuring board in minus 20 degrees. Quite cold. And I think that the... locals... local fishery mongers, the people that were pitch-forking the fish into big tubs-- I think they passed the word that, this was a hard working person and perhaps we can give him the benefit of the doubt.

MHA: So, do you remember who your supervisor was at that time?

KS: Um...yes... John Clarke was my supervisor. He was an assistant director of that laboratory at that time. And he was responsible for the ground fish survey concept. It wasn't yet fully a ground fish survey but they had the idea that it would be a good idea to trawl at prescribed areas along the continental shelf to obtain fisheries independent estimate of the species and their abundance over two periods of the year, once in autumn and once in spring. But they were not funded to do

that fully so at that time they were mostly dependent on catch data plus this other semi-independent estimate of fishing effort where I was providing punch cards and sending them down to Woods Hole along with my interview commentary but that later turned into a...very substantial body of data, probably the best in the world that... were collected in standardized ground fish surveys back-- I think we probably have the first surveys in the '60s-- late '50s, early '60s. Then I was part of that because... of my interaction with the folks at Woods Hole, it occurred to me that this might be a good profession that would suit my interest and curiosity and so I went on after Suffolk University and after Audubon. While... working at the Commonwealth Pier where the fish pier was, I took courses at Boston University in marine ecology and later applied for a Office of Naval Research fellowship down here at the University of Rhode Island for a Master's degree in biological oceanography and was accepted. They had a two year program in biological oceanography where I learned about plankton and that became my... specialty in marine science. Attributed to another experience with good mentoring down here-- and this was before they had a formal graduate school of oceanography, there was a person whose name was Fish, [laughing] appropriately named, and he had created a... opportunity for doing acoustic research on fish noise that was of interest to the Office of Naval Research. And, he-- in the course of his work he and his wife, Marie Poland Fish-- they actually obtained funds from theNavy, to support five fellowships and I was one of the first of the five fellows. And so, that was a marvelous opportunity.

MHA: That's actually very fascinating. I didn't realize they were listening to fish that early.

KS: Yes, yes, and the Navy was quite interested in the sounds- biological sounds.

MHA: And-- do you know why?

KS: Yes, because of the importance of... the Cold War and the investment that we made in... submarine and undersea surveillance in warfare. So, when the sonar operators were listening, there were sounds that were not easily identifiable, and the monies that went here to the acoustic research helped identify biological origin of those sounds, and that was extremely important in-- during that period-- to the Navy. Yeah.

MHA: Very interesting... so, when you first started working with your first job, that was out in western Mass, were you actually living out there?

KS: Yes, I lived on-- in the Audubon-- well, I lived in an apartment in Springfield but worked on the Audubon sanctuary out in western Massachusetts where they had contracted to the school districts to provide science instruction from a-- ecological perspective although I'm not even sure if they use that term but it was multi-disciplinary. And um, it was something that I was quite interested in and enjoyed quite a lot.

MHA: That's great, so then you went to Woods Hole to the NMFS office so you moved down to Woods Hole, I assume?

KS: Well, I was working out of the, out of my home in Boston--

MHA: --Oh, okay--

KS: -- at the fish pier until I went to graduate school down here, then I moved down here--

MHA: Oh, I see--

KS:-- for the two years of the course work. Yeah.

MHA: And then after that?

KS: Then after that I decided it would be... possible to obtain a professional position but... although they had some Saltonstall-Kennedy funds, positions were... limited for people and um, while I was... waiting for a response for the paperwork that I had submitted to the civil service for a position as a fishery research biologist, I took a position as a biology teacher at Randolph High School. And while there, I created an oceanographic laboratory and used my own boat and collected with the sophomore biology students... samples in the coastal waters around... Nantasket, Cohasset and that led to a number of science projects and several of them were published subsequently after I had joined the Bureau of Commercial Fisheries. So, at the conclusion of my first year I did get to-- I received notification that they had a position in Hawaii for somebody that was willing to study plankton of the Central Pacific. And that study was related to the movement of skipjack tuna fish in the Central Pacific and the Hawaiian fishery which was a pole and line fishery then in the '60s and it was seasonal. And the oceanographers at the then Bureau of Commercial Fisheries Laboratory in Honolulu had a hypotheses that the fish were moving in relationship to water mass movement and that it might be a good idea to get a biological oceanographer out there and identify water masses with biological indicators and that was just the sort of study that I had been engaged in during my training here at URI so, um, I jumped at the opportunity. My wife was teaching at that time in Newton and I was teaching at Randolph and so, with very short notice we packed up...and moved ourselves to Hawaii.

MHA: How long were you there?

KS: Uh, I was there for two years and they were two very good years, but there was a source of frustration there in that... while I was able to identify a genus of copepod that inhabited the upper water layers of some central Pacific water masses-- when I brought that information forward, I found that nobody was interested in applying that to any fishery management and the reason was that at that time, in the evolution of... fisheries exploitation in the United States, the idea was to explore to find the fish and catch every fish that was available to the tuna industry.There was no great interest in any idea about management. So, my information was used to forecast the movement of those surface water masses with *Pontellid*copepods, ratherlarge-scale [in distribution]little crustaceans, that were related in their movement as they were carried into the Hawaiian area during some seasons and then... were moved out in other seasons, but there was a correlation between that water mass and this skipjack tuna. So from that point of view, from a strictly scientific point of view, that was quite nice and I was able to publish my results. From a fisheries management point of view, there was a huge disconnect.

MHA: So when, when-- why do you think you became interested in fisheries management as opposed to just the scientific knowledge that was so interesting?

KS: Well, I have a pragmatic streak in me and, as I said, the idea of... people going out in rather harsh conditions, catching different species of fish, bringing them to market, that always fascinated me from my very earliest time. That was reinforced when I was working at the Boston Fish Pier and saw the whole industry in front of me, that is the vessels that went out after the fish, the trawlers, the dealers who unloaded the catch-- and people called lumpers they actually have pitchforks [laughing] and they put the pitchforks right through the skin of the fish into carts that were drawn by humans, people pulling these carts around on the Boston Fish Pier and then that product would turn up into an excellent chowder that we had for lunch there on the fish pier and uh, I could view this as a whole system. And so I was interested in the broader aspects of the system that is the... the relationship between plankton, oceanography, and fish.

MHA: So, I see a thread going through your whole history of this much broader viewpoint than is typical maybe.

KS: Yes, yeah... I would say so, and it was enhanced by the leadership down there at Woods Hole. The day that I started my job-- at Woods Hole-- a person was appointed as the assistant laboratory director and he was a Ph.D. from Harvard who had done some exploratory work on fisheries and … and was quite visionary. His name was Robert L. Edwards and he had taken a position from a point of view of broadening... the way fishery science was being applied to the very early days of fisheries management. And so that was propinquity again. We... came together, pretty much again, mentoring [in a]student kind of relationship and after receiving my degree, I went back to work with Edwards and with another person, John P. Wise,who was at that facility, at the Woods Hole Laboratory, but also who had a broadened vision of fish in their environment and was instrumental in initiating the bottom trawl surveys in the '60s and I participated in those-- we did those on a trawler that was named the Albatross III and uh, we would go out there in that spring and autumn, and account for all the species in a stratified random design that would hold up over time and prove to be, at least in my mind, the most comprehensive bottom trawl survey in any place at any time. And that's now continuing. So that's quite extraordinary in of itself.

MHA: So, um, I think it means-- since you've been involved with NMFS for so long, you could probably talk a bit about the change over time.

KS: Yes, yeah the big change was, was first-- and this is an important point-- the opportunity for young scientists to practice science without a pressure on them for linking that science directly to fisheries management. I was sort of the odd ball in that I was interested in that linkage but others were interested in just advancing science which was quite a good thing. Um, but uh, it was a source of frustration with me, and through the two years at... the laboratory in Honolulu, I thought it would be nice if I could have a position where I could link the work I did in plankton to some fisheries issue and that opportunity presented itself at the 10th Pacific Science Conference in Honolulu where somebody from the laboratory-- Bureau of Commercial Fisheries Laboratory in Boothbay Harbor, Maine, was attending that meeting and I had known him casually through literature and he had offered me a position to apply my knowledge of plankton

to an issue that they had that was fisheries related and... that had to do with the movements of immature herring in and along the Maine coast. Now, they canned that product, which was less than two year old herring, as a sardine andin fact, it's not a sardine at all in terms of genus and species but nevertheless it was sold under the label sardine and they clipped the head and the tail so it would fit into a can as an immature herring. And there I became very much interested in the relationship between...a pelagic species like herring which it feeds directly on the plankton in relationship to... availability to fishery. And I had-- ten good years of doing some research on the zooplankton/herring relationships along the Maine coast, having the use of a seventy foot research vessel available to do sampling along the whole of the Maine coast and that brought me into contact with the literature and the early literature was in Europe, where they were very much interested in herring as a product-- the whole herring. Here, it was sort of a specialty in the limited use of a sardine. But, at any rate that brought me into the literature and, a man by the name of Alister Hardy who did some innovative research on the relationship between zooplankton and herring in terms of its availability as a species to the fisheries in and around the... the UK and I have one of his original plankton collectors right over there, that torpedo-like thing, and he had a little disk in it and it was that disk that had mesh that collected the plankton and it was deployed by the fishermen. So they could detect plankton rich waters and know that's a good place to set their drift nets. So, I followed up on his work and work of other Europeans relating plankton hydrography to fish, and then discovered the early work of Henry Bigelow who was our first oceanographer in this country and I pushed back on that history and followed Bigelow back to the first kind of marine scientist in this country in 1846 and that brought me back to Agassizthe twoAgassizs[father Louis, son Alexander]and the Museum of Comparative Zoology [at Harvard]and the exploration in the Pacific of…the Wilkes expedition which not too many people knew about but was important to us so, that historic string brought me to Henry Bigelow who was a student of Agassiz, theseAgassizs, the son,at MCZ [Museum of Comparative Zoology]in Cambridge and he used to come to Agassiz's [summer]place which is right across the bay here, overlooking the entrance to Newport Harbor, and complain about his-- his professor, that he would never get his Ph.D. He had access to all the jellyfish that were collected by Agassiz in the initial Albatross, which was purchased by Agassiz, and used out in the Pacific Ocean for collection of fishes and other marine biota and Agassiz would tell him,"No, no you really need to be patient and persist," which he did and he received his Ph.D. It was quite interesting looking at the archives at the MCZ, I used to go there quite a lot…I found a personal letter on a…on stationary of the BigelowBank of Boston, assets twenty thousand dollars, addressed to Agassiz by Mrs. Bigelow saying that I have a son, he's quite a nice chap, can you find a summer position for him? [laughing] And that was that connection to Agassiz because he took him on as a summer assistant. And the reason I mention that is that, when I was at Boothbay Harbor, I used to visit the MCZ quite a lot and have chats with Bigelow and he would tell me, "Oh Sherman, he had cute little names for each of these copepods. And one is called *Calanusfinmarchicus*. He would say "Calfin doesn't do that! Not--" and he was quite salty he was an old Yankee and sprinkled his chit chat and I would argue with him and say here's my data and he'd go "No! That's can't be." At any rate, one day in '56 I think it was, either '56 or eh, no it wasn't fifty--I think '65, I received a package in the mail at Booth Bay Harbor and the package said "Dear Sherman, I find I have copies of my original monograph on plankton in the Gulf of Maine. I think it will do more good in your hands than it will in mine, Henry Bigelow." That's my favorite memento.

MHA: Yes.

KS: And I keep it right here on the desk to keep me grounded properly.

MHA: But you were in Boothbay uh, for about seven years, did you say?

KS: Nine years.

MHA: Nine years.

KS: Yeah, so that would be through the '60s then in 1970, this mentor, this Robert L. Edwards, had me working on a number of committees because we were not very successful on a science side in convincing the political side, to adhere to the total allowable catch levels that came from our survey and analyses of demography of the species. And we would present the results each year to [the]International Commission for North Atlantic Fisheries, ICNAF, which was a regional fisheries organization designed to conserve the resources. However, at that time ,we had very, very heavy fishing pressure from Europeans and other countries off our coast. Hundreds of big trawlers, factory trawlers. And we had evidence of overfishing. We had recommended TACs that would sustain the fisheries. So the science was good, but the politics was bad because as the science was being interpreted to the decision makers, the decision makers took the political course and... would double the TAC and simply not apply the science on a one to one basis. They would always exceed, by very large margins, what was being recommended scientifically.

MHA: And this was at-- to the benefit of the foreign trawlers?

KS: It was to the benefit of, in that case the foreigntrawlers, the fishing industry that was using the product because we were importing quite a lot of it. And, the idea of... sustaining the resource had not reached the ears of the American public in any way, shape or form, so that there-- there wasn't the... counteraction from ... various groups that didn't exist at that time very much and it was later on that the Conservation Law Foundation and other NGOs recognized the seriousness of what was ongoing and that led in the early '70s to the idea that we were going to extend jurisdiction over 200 mile and thereby control what was [an]out of control situation in fisheries. And at that time, Edwards contacted me and asked me to sit in on a number of planning meetings for broadening the base of our science on the assumption that we [the U.S.] were going to extend the EEZand that based on a... rather lengthy study of the condition of marine resources were going to recommend the establishment of a--another entity--government entity to deal with the oceans in a more systematic way than it had been done before. And, as a result, I was co-opted from my microscope... not overjoyed to go down to Washington where Edwards had been given a planning position as chief planner for this transition from the Bureau of Commercial Fisheries to an entity in...the newly established entity [NOAA], neither of which was very well defined at the time and it was Richard Nixon that decided that...Walter Hickel would not be the head of an agency, of a separateBureau, a new agency, but he could be the head of this thing called [the]National Oceanic and Atmospheric Administration.So NOAA was created by executive order in 1970,[by]Nixon. And Edwards sort of yanked me, kicking and screaming down to Washington, for two years where I... had to rent my house and…on the assumption that a memo that I had prepared (that I later found out wasn't worth anything)said at the end of two years I

will return to my science and not be infected with Potomac Fever. So, that was an interesting two years under the Nixon Administration where I would be answering letters to Nixon about the exploitation of tunas and the mortality of dolphin and a whole host of other kinds of things where I learned something I had no idea about that... letters would be written and his signature would be put on, you would be writing the letters and some automatic thing--contraption would put his signature on it. But more importantly, Edwards did have vision... and uh, obtained some funds to contract with TRW Company which was an aerospace firm at Redondo Beach, California, and he was convinced that there was a way to systematize what we were doing. To break away from these individual science laboratories into a much more cohesive systematic fisheries organization within the general framework of this new NOAA. And, those were two--two very busy and instructive years because I was the person that was the link between TRW Company and the planning--very small planning group that was there in the planning shop at headquarters and uh, they were patient because we said you can't prescribe or engineer science, that's just not the way science is done. And they said that they were planning a mission to Mars and if A, B, C, and D would fit together, they would be successful and they didn't see that was very much different than collecting data on fish and analyzing it and drawing some conclusions. So, we produced planning documents that had event logic diagrams, things I had no idea about prior to that but I was the person that had to brief the new NOAA administration on how fisheries was going to be much more national in perspective than its history showed. And the first Administrator was White-- Robert White, and he's from MIT as a meteorologist. His brother was Teddy White who wrote *The Making of the President*, so they had certain connections in the upper echelons of government and that even though Nixon was the President, they did hire Bob White as the first Administrator [of NOAA]. And Bob White went to the aerospace industry to hire a person whose name is Jack Townsend. I remember him because he wore bright red socks and could do everything. Nothing was impossible for Jack Townsend. So, he was an aerospace person dealing with fisheries and... with these documents that were demanded by the systemsengineers, we engineered a whole system for monitoring and assessing marine resources called MARMAP, Marine Resource Monitoring Assessment and Prediction program. And, the old guard in the former Bureau of Commercial Fisheries that became NOAA people, resisted it. And there was one center director, in particular, his name is Alan Longhurst,he was from the UK and was working as head of our laboratory in La Jolla said, "Sherman, if you think I'm going to follow this system, you better think again. You're not going to issue me in arm band that's labeling me. I'm continuing to do the work I want." Well, he left [laughter] shortly after that and went off to Canada someplace and we did implement this MARMAP program. We received a handsome sum of $7 or $8 million dollars and... I like to think back at our first briefing with Bob White and Jack Townsend, sitting around a table at headquarters of the new NOAA where we had this thing called a horse blanket but it was [an] Event Logic Diagram that covered this whole wall for doing bottom trawl surveys, ichthyoplankton, zooplankton surveys, oceanographic surveys and linking them to fish stock assessments. And they said, "Alright Sherman, tell us, what is E7?" So there were few things I really knew on that chart and that was one of them [laughter] so that was a successful briefing. Then later on, after the departure of Longhurst, there was an investigation as to how this $7 or $8 million dollars was being allocated and... the Inspector General of the Commerce Department-- it's either Commerce or Interior at that time, I'm not quite sure, went around and visited the various laboratories to track the funds and... when they got to La Jolla,Longhurst said, " What MARMAP? I don't do any of that here!" and that was devastating for an IG to[hear]for the report. And so after the IG gave his report, they called me in as a

witness and Townsend was sitting at this table and the reason I remember his red socks is, he had his feet on the table and these bright red socks [chuckling] and his argument was, "well, you know these people are just scientists, they don't know about any formality of doing things by any book, they're creative people what are you bugging them for?"He just dismissed this whole thing as just nonsense and nothing ever came up.

MHA: Wow....

KS: Yeah, so that was my experience with MARMAP but when I came back, I set up a-- a MARMAP office here and we conducted it mostly in this place, in the Northeast part of the country because we have the commitment in the ground fish, and I had a history of plankton and ocean studies and so we were able to bring it all together because we had a director who was quite supportive in Bob Edwards. So... that ledto the MARMAP activity and that then led to further thoughts about, is there a better way to link MARMAP to ecosystems?

MHA: So was that terminology, ecosystems, was that prevalent at that time?

KS: It wasn't prevalent but Edwards was not shy about using it. And of course every time he used it, he would turn off the fishing industry because their perception was he was here to help them with fish not science per say. And-- but he was-- he was an extraordinary individual, so he persisted on supporting the broad-based science. And... I had a discussion one day with a colleague here who happened to be-- this is propinquity again-- this is two things, propinquity and serendipity. This guy lived across the street from me here locally, but he was also the head of the Marine Affairs Program and was very close to the Dean, John Knauss,and... was... engaged in a report that lead to the formation of NOAA.And so, we would have a chit chat some times. He was kind of an annoying person. He would come across the street and tell me how to rake my leaves. [laughing] And I would say, "You know, Lew, you are a pain but I have this idea and I have some Polish Vodka" which was another dimension to Edwards--which I'll fill youin on but at any rate,[I said,] "Why don't [you]come over in a half hour? I have some Polish vodka and I have an idea I'd like to share with you," and so he came back and we sat in my living room and we had a chat about the concept of... the Northeast shelf as a Large Marine Ecosystem.That the plants and animals in it evolved pretty much along the same line and they were somewhat different than the ecosystem to the north or to the south and how about designating Large Marine Ecosystems as we see them and can identify them around the globe. Now, this professor,Lew [Lewis]Alexander, was very conversant with the Law of the Sea and I thought he would just dismiss this all. However, much to my surprise, he said, "That's a really good idea." And his background was geography. In fact, for two years, he was the State Department geographer. So, he said "Yeah, let's go to your office and show me some of the data that could be used for this sort of thing." And so we spent two or three months going over the literature and finding that, with four ecological criteria, (i) bathymetry [and] (ii) hydrography that would determine the level of (iii) productivity in terms of grams of carbon per unit and trophic linkages up the (iv) food chain. Using those four criteria, we divided the coastal areas around much of the world into, at that time, 50 large marine ecosystems. And we took that idea to the Dean here, Dean Knauss, and said if he could provide us with some funds, we would convene...contingent on approval of [the]American Association for the Advancement of Science (AAAS), a symposium at the annual AAAS meeting, and that was going to be in... in New York in '84. And John said, "You're going

to have liquor there?" I said that we have to.[The Dean said], "You can't get money from me because I can't... approve that but I can go to the Rhode Island Foundation and if they are willing then I'll support it." And that-- that was possible. And so we did convene[an LME Symposium]at AAAS in '84. They found it of interest and so they encouraged us, came to us and asked us if we would bring the Symposium into a book form. So we peer reviewed the papers and AAAS published that first volume in '86. Subsequently we had other [LME] Symposia and the idea was attractive to a number of people but the interesting thing is, at the time of the first Symposium, we invited marine geographers[and]marine economists-- we were not limited to fishery biologists or fisheries folks, it was multi-disciplinary. And I think that's what attracted AAAS. So... fast forward from '84 to uh... I forget when the last book was put out but we have 14 published volumes with 450 different authors published by AAAS, Blackwell Science, and Elsevier Science. And, that came to the attention, in late '80s, to the World Bank and the Global Environment Facility which sits inside a World Bank and that is a result of three world summits on environment. So the first one was UNCED, United Nations Environment and Development and that was held in '92 in Brazil.Um, that then led to the agreement amongst the world leaders. The first President Bush was at that meeting – it was very high level – and they agreed, yes the oceans are in bad conditions, let's allocate some funds to help fix it but direct those funds only to [economically]developing countries. Let the more advanced countries pay for it themselves. And they said-- they organized the Global Environment Facility (GEF) with its own CEO within the framework of the World Bank. And they endowed it with a trust fund-- a huge trust fund. So I got a phone call one day asking if I was the [chuckling] the Sherman that knew about LMEs, Large Marine Ecosystems, and I said, "Yes." They asked if I would come down and make a presentation on the large marine ecosystems to a group... and I said, "Yes, I'd be willing to do that. Where is this?" And they said, "Oh, well, it's in Sweden." [chuckling] I said "Well, -- I'm not sure I can do that" He said " Don't worry about it.We'll cover all the costs and what not." And so I ended up at some institute in Sweden where the GEF was--having a meeting revealing the results of some studies that they supported in Africa and, they asked me to make a presentation on large marine ecosystems which I did. And it turned out that the key person there was from western Massachusetts. Was the first person in his family to graduate from college, was a-- was a graduate of Boston College, had a Ph.D. out of Duke in hydrology and knew about the Patriots and knew about the Boston Red Sox ... [chuckling] and... it really is strange but, that was a beginning of a partnership that exists to this day and from that time to now, there is-- well, from that time to 2014, there was an investment of $3.15 billion in Large Marine Ecosystem projects in different parts of the developing world. There's another $2.86 billion in the [GEF] pipeline from 2014 to 2018 so in effect, there will be $6 billion that will have been allocated to, uh, application of a system that we've developed largely evolved from what I've described to you called the Large Marine Ecosystem Approach to the assessment and management of coastal ocean goods and services. And that's based on the application of five modules of indicators of changing conditions within the spatial domain of one of these Large Marine Ecosystems. We've now identified 66 of these places. And we've had meetings each year, for... over 10 years at the IOC UNESCOin Paris, bringing people in and exchanging information and so on. So it's quite, well established now as a way to practice ecosystem based management.

MHA: So, do you feel optimistic about ecosystem based management, that it is moving in the right direction?

KS: I do because I moved from being head of the ecosystem activities within the Northeast Fisheries Science Center, from being this lab director to a division director to finally headquarters saying, " Well Sherman, why don't you just lead a Large Marine Ecosystem program for NOAA" which I have been doing now for the past 4 to 5 years. I have the same office I've been in most of my 40 years around here. But nevertheless, the reason I'm optimistic is that... this is a bottom up approach rather than top down. Now... I served the United Nations as an advisor in the '60s on sampling ichthyoplankton, that's fish eggs and larvae, as an independent means for determining the species composition of fish and -- when they're in the planktonic stage, they can't avoid the sampling gear. So you can get a really good profile of what's [present] there, not only commercial but all species. But what I found was that the ships never left the dock and that they never followed up and that was top down.Because here I was a hired hand, coming to Africa or Southern America, what not and I was pleasantly accepted and so on but no follow up. This is entirely different in that the GEF is fully transparent in what they do, the countries need to, participate at the ministerial level and they need to sign a series of documents that commit whatever resources they have to the project. And that project then is reviewed quite thoroughly by outside reviewers. And then once it's funded, it's tracked very closely by the GEF. And so, they now have this framework of five modules which consist of indicators of (i) productivity, (ii) fish and fisheries, (iii) pollution and ecosystem health-- a whole series of indicators there-- but that's linked directly from the natural sciences to the social sciences to two other modules, (iv) socio economics and (v) governance. And so that five together is the systems approach to EBM [Ecosystem Based Management]. And I am optimistic because we have been successful. Our biggest success is in Africa and in Southwest Africa, a place called [the]Benguela Current[LME]which... is important to three countries... Namibia, Angola, and South Africa. They share the resources of that Benguela Currentwhich is one of the big [LME] upwelling systems. They recognized the natural boundaries. They've focused their science and their management to that geographic construct. They are the first in the world to establish a Commission for [LME]management and now they have a Convention that they signed. And so they went the full gamut of—[assessment and management].

MHA: --So the three countries are working jointly on that?

KS: Yes. And not only that I have a volume coming out... it's just been published where we have the ministers of each of the three countries, for four ministries in each of the countries, so we have 12 ministers, demonstrating the multi-sectoral nature of this thing. Minister of the Environment, Minister of Fisheries, Minister of Energy, that's gas and oil which is very big off Angola. Uh, and diamond mining which is very big off Namibia and South Africa. All those ministries have signed onto this and we have the first paper, to my knowledge, that takes policy into action in this volume that we just published of three hundred and something pages with an international journal that has the [natural] science papers, has the social economics papers, has the governance papers and then has the statement -- by these 12 ministers. So when I say I think--I think it's been successful, I would say there's substantial evidence to point in that direction.

MHA: How about here? Is the--

KS: I have more success working in Africa and Asia-- it took 15 years, it's a good thing I'm living long, it took 15 years to bring... Korea and China, People's Republic of Korea [and]

Republic of China, to agree to [a]Yellow Sea [project]. So they moved right to where they're about to establish a Commission for the Yellow Sea [LME]. So, I've seen that as well. In this country, we have a 200 plus year history, a long tradition of dealing with the ocean but we have an enormous bureaucracy and multi-sectoral kind of thing. We're making some progress where this Administration [Obama] has made more progress than any other one, and we have, for the first time, a marine policy signed off by the White House and that is [an] Executive Order in June of 2010 where U.S. is committed to ecosystem based management (EBM) and they set up regional management units and they use Large Marine Ecosystems as the domain for the assessment and management. We made most progress in here, in the Northeast shelf[LME]. The problem we have in the Northeast shelf [LME]iswe have mixed fishery. So when you pull that trawl over the bottom, you're going have multi-species [catches], some of which are far poorer condition than others, and that's a very complex situation. In contrast, we're implementing ecosystem based management (EBM) on the West Coast and there we're much more successful because the principle biomass species are more or less isolated in the trophic picture. So... we can, calibrate the TAC much more readily and control it on the West Coast for the big fisheries than we can here where we're trying to recover the fisheries. So, it's a challenge but we restored haddock. That's now at full biomass potential and, most importantly, the sea scallops from a very low level to a sustainable level-- the low level was 50,000 metric tons, the sustainable level is 250,000 metric tons so that's a difference between a few million dollars and $400 million dollars which is sustainable for the fish and fisheries of southern New England, New Bedford and so on. In contrast to the ground fish story, we have... success for scallops,success for haddock. Climate change is a complexity around codfish but the productivity here is among the highest of the world, 360 grams of carbon per meter square, per year that can support about a million metric tons of fish [or] fish product. We're now at about 600[,000 annually]. So we've got ways to go, we're not going to run out of fish but we will have problems with the market[ing]of what you can eat and sell.And that...is another issue people should pay attention to.

MHA: Can you comment at all on herring? There's a lot of controversy in—in... the commercial herring fishery versus the tuna fishery... uh the prey versus um--

KS: --The predator-prey interaction. Yes, well ah... That can be taken into account with the kinds of quantitative modeling that has been applied to that issue and I would take the position there's sufficientherring and mackerel, these are two pelagic species in the Northeast shelf Large Marine Ecosystem to support the ecosystem and a...a healthy fishery for both species. One of the issues that I'm familiar with is [that] we do not have great market acceptance for herring so it's used for lobster bait whereas in Europe when the…all the big ships were [fishing] here, that was for food consumption. Same with mackerel. During WWII, my mother made very nice mackerel but uh-- my daughters won't go near it.

MHA: Um, so you've talked a bit about how science theories have changed. Have the mathematical and statistical models changed over the time that you've been involved and-- has that effected your--

KS: --Well I guess that I-- I would not want to be on record saying the science has changed. I would say that the application of science has broadened from individual species stock assessments to multi-species stock assessments and that's been broadened to multi-

sectoralassessments so that fish can now be considered within the context of other sectors like energy production or shipping or tourism [or]mining. Those activities should be taken into consideration with regard to fish and fisheries and that can then lead to sustainable production and I think we've demonstrated that as I say with [the] scallop, demonstrated that with haddock and I believe that's the way forward, for the future. And within that context, what we haven't yet achieved, is the tradeoff for protein, so we will have sufficientprotein to feed-- what do we have seven hundred…billion [people and], whatever that number is, by 2050 [9 billion] from the ocean in terms of the primary productivity capacity but it won't be in species that are familiar to people. And... how many of the iconic species we can maintain is... dependent on how committed we are to sustainable fisheries based on the modeling. So to answer your question, we've gotten a whole lot better in modeling and projecting demography of fish within the context of climate change and the environment because these are now not exotic terms. They were 10…15 years ago but now people talk about ecosystems and they talk about model projections and climate change on an everyday basis. So the public is tuned in and so are most politicians, not all, so to answer your question am I optimistic, I certainly am.

MHA: So when a new analysis or maybe a new methodology is proposed, how long does it take for the general system to incorporate it and use it?

KS: Well, that's a big question, and that's not easily answered but in my case... you consider that the idea of Large Marine Ecosystems was first put forward in 1984 and now, 30 years later, we have seen it be practiced. So, there's an example that it doesn't happen overnight and so suddenly within adecadalframework, one could look to an evolution. It's not a revolution which is the topic of my little life history thing[1]. These changes, at least as I have observed them, are evolved,but they're built on the shoulders of those scientists and managers that preceded us and we should not forget and begin *denovo*. That would be a step backwards.

MHA: So do you think that these new ideas need a champion like you to proceed and to move forward?

KS: Well, that's getting to the heart of the matter and... that's a source of concern. You really do need champions of one kind of another and the more champions, the better but the good ideas cannot be just left to proceed on the basis of previous accomplishment so it's absolutely essential to maintain a focus and I use an analogy to Coca Cola. Where ever you go in the civilized world, you'll see a sign drink Coca Cola. They're never satisfied that the message is out there,it'spersistence. In fisheries management or marine resource management, we're just beginning to recognize that you don't publish one paper and the issue is solved, there's a level of persistence that's essential. Whether we achieve that level in the case of our Large Marine Ecosystems I'd say, we're not past the threshold but we certainly have the building blocks in place. And... so there you have it.

MHA: So... when you were developing the concept, you mentioned the multi-disciplinary aspect and so on, did you also incorporate some of the traditional ecological knowledge of the fishermen or the local knowledge of the fishermen, did they get involved at all at any level?

[1] Sherman, K. 2015. Food for Thought: Sustaining the world's Large Marine Ecosystems. ICES Journal of Marine Science, 72(9), 2521-2531.

KS: I would say that-- that is a very big consideration in developing parts of the world where much of the fisheries is not industrialized but it's based on work done at... village levels along the coasts, all the coasts of Africa and that's very much in the minds of the people who are carrying the projects in those places so as I say they're not dictated to, it's a bottom up approach and the reason it's a bottom up approach is that the GEF supports that and that they require two processes to be completed before they will accept a project. The first process is a TDA,[Transboundary Diagnostic Analysis],which is an analysis of the highest priority activities that are agreed to by the participants. Second thing is a SAP, a Strategic Action Program. Again, they need to agree to the priorities in their program and to the time table of the program so back to TRW. We were not dealing with fisheries in that context in the '60s in this country, now we have a process for the developing countries that is quite an advanced concept where they're going to deal with what are the high priority issues and then how are you going to get from A to Z? That'sthe Event Logic Diagram thing that we thought was so challenging way back then. And these countries can do that and they are doing that and if they don't do that, they're not funded. And all that is bottom up. So it's quite nice to go to these meetings where for the first time countries could sit with each other without being directed from the UN or some other place [entity] because they have the funds to do the planning. If you have a... proposal that's acceptable you--the proposers-- will be provided with up to $1 million dollars in 12 months to do the planning. So for the first time in history, the countries of West Africa can sit with each other, on their own terms, and work out what they would consider a useful TDA and if they're successful, they know there's a SAP on the other end. So they've got the million dollars, then they have the potential for $20 or $30 or $40 million depending on the multiplier of in-kind contributions and the numbers build up and as I say it's outstanding-- astounding that from the...let's say 1995 to 2014, $3.15 billion, which I can account for and have in documentation, is out there now and another [$2.86 billion]is in a pipeline, so that's $6 billion. That's a far cry from sitting in a desk Boothbay Harbor in Maine figuring out how you're going to link herring to zooplankton.

MHA: So do you happen to know about the-- any programs out ofSenegal?

KS: Senegal yes. That's one of the countries participating in the Canary Current Large Marine Ecosystem project and I have all that documentation. Here the person that's leading that project is from Senegal and he's very good. His name is [Birane]Sambeand... as I say this [project] is by the Africans for the Africans and for the people and that's why I'm enthusiastic about it. So in that case, it's 8 countries that are former Spanish colonies that are working together in the Canary Current large marine ecosystem project. And they just received their second infusion of funds so I argued with the GEF that they're not talking about Ph.D.s thesis for a year or two years or three years. If they're considering changing the culture of countries, they need to consider this in adecadal framework and it took a few years but now that's recognized and so that-- that is acceptable. So the first five years, if you've done well [in the project], you get another five years. The first decade if you've done well, you can have another decade, and it'll probably take-- to answer your other question probably two or three decades to move from one culture to another culture but what you're bringing on with it is [marine] science, socioeconomics and governance. It's... it's quite a huge undertaking but the success in [the] Yellow Sea and inthe Benguela [Current LME] and what we expect in [the] Canary Current [LME] or the Bay of Bengal[LME] with 8 other countries around the Bay of Bengal-- it's very encouraging to go to the meetings, see

the folks, see them in their early thirties, where they could be working in other kinds of things because they all had to be computer literate, they all need to know English, and they're committed, you can actually see… it it's sort of Kennedy-esque in my mind since I have to admit I'm a little…[a] Kennedy Democrat so I... just admire what comes through from these people, from whatever education they're getting.

MHA: That's fascinating. I did my field work in Senegal and--

KS:-- Oh you did?

MHA: --Yep, I was, I spent a year there at-- among the women who market fish--

KS: -- Yeah!

MHA: --That's why it's of particular interest to me, um, that was in '81 so--

KS: -- Yeah, well, they're pretty shrewd, those women, they know what they're doing. Yeah. It's the same in Ghana, right down that whole coast. Fisheries are-- they're caught by men and merchandised by women.

MHA: [laughter] So um, has NOAA, or NMFS itself, changed since you've been here?

KS: Yeah, I used be in the Bureau of Commercial Fisheries and that was a-- title which suggested that they would support the commercial fisheries and expand them and indeed during the early parts of my careers I said that was... exploratory fishing and... let's find new resources and so on. However, in the change that took place with ownership,[of]EEZsin the '70s that allowed for expansion, logarithmic expansion of new labs, new ships, new people and much broader multi-disciplinary science so it began in the '70s, it matured... towards the... end of the '90s so in the 2000s, we have satellites, computers, ships, gliders you name the technologies at-- available, and systematically being used... to uh... assess and sustain marine goods and services. And in this Administration [Obama] we've had a lot of support for it. I've seen a lot of different administrations but I have to say that even in the Nixon administration, there was support for this sort of thing, I mean he passed the Marine Mammal Bill. And...Clean Air Bill so it's not until recently I've been hearing these nutty things coming out of some parts of Congress.

MHA: So I think that I read that you also teach?

KS: Yes, we've had a long-standing lecture series and that's been on our Marine Affairs program with Lew Alexander but he since passed away. And so right now I give a lecture or two a year and I'm going to meet next week with a new man that's come to the Coastal Resources Center leadership [at URI] across the street and I met with the Dean and I'm looking to perhaps just transition from NOAA to academiawith potential of an academic institution carrying this thing forward, without the constraints of political change or government bureaucracy or that sort of thing. So if it isn't here at URI, it might be someplace else. And, seeing that you're at MIT and the-- I shouldn't call them the Greek mafia but [laughter from both] nevertheless the connections that we've had with long-standing good people there, uh, I don't know what they do on the

international side but, I think there's a whole [LME educational program] that needs to be nurtured outside the government because as you say, if I leave the government -- we don't have-- they're not too excited about bringing the champion on-- I was a handful for them to deal with as it is and... [redacted]

MHA: How about, do you--do you have any-- anyone you're mentoring to come up behind you?

KS: I did have somebody that was a former director of this Northeast Center but she ran out of favor at headquarters and so I lost her, and that's kind of too bad. But I don't believe…the present [senior] administration of NOAA which is devolved to folks that I no longer have any personal contact with…all of the visionaries and independent thinkers are gone from fisheries. Kathy Sullivan is pretty good but her predecessor was even better. So with Jane[Lubchenco], we've had a good relationship for a whole bunch of years because she was active academically where I was active both academically [and]…So we knew each other for thirty-something years. I invited her to what I figured would be a milestone... meeting in Boston in 2013 where I linked a LMESymposium with AAAS meeting in Boston. And I held it at the Kennedy Center and... beyond my little note from Henry Bigelow, that volume, which was since published, is something I'm quite proud of because, I was able to invite the heads of the major [ocean] agencies around the world-- I should say institutions--engaged in marine [assessment and management] stuff. So that included Jane, who came-- did you know Jane?--

MHA: Not personally I-- I knew-- I've heard her speak and--

KS: --Alright so that was Jane Lubchenco, the head of NOAA... [the] person who was the head of IOC UNESCO [Dr. Wendy Watson-Wright] , who happened to be a woman… it was a long-standing working relationship because IOC UNESCO has been our host institution for the past 17 years, withmyannual [LME Consultative] meeting there. ICES [International Council for the Exploration of the Sea], do you know that one? The head of ICES, another woman. So I don't know if you can reach back and remember WWII but they had the big three - Stalin, Roosevelt, Churchill. So we had the big five [actually four].

MHA: [laughter]

KS: We had Jane. We had the head of IOC UNESCO. We had the head of ICES, a woman[Anne Christine Brusendorff]. We had the head of GEF [Naoko Ishii], a woman! Former deputy finance administer of Japan. She was there-- so we had the big four. And they each made their presentations and they got to know each other and so on, and we did that in the spirit of John F. Kennedy which we captured [in the spirit of international cooperation] pretty well and coincidentally, I asked the other day to have the photos of that [sound of shuffling papers] event, so anyway, the photos are here and it was quite an event but the important thing is the volume which had other leaders not quite at that stature but still in the different sectors. And I was able to frame it in the context of Kennedy, known to accept challenges, whether it was the stand-down in Cuba or putting a person on the moon, he would accept them and I indicated that folks here[were there] with the same level of... of global challenge. So having done that while I'm still alive, I'm quite happy about that!

MHA: It's amazing. You have a wonderful history. I'm sure that there's lots more to ask you, and you certainly have lots more to tell but, um we have been at this for quite a while now so I think I should let you go.

KS: You're staying power (?) is very good

MHA: Oh, it's absolutely fascinating, I knew it would be interesting to talk to you because I read a little bit about the large marine ecosystems before I came, and um-- so it's really.

KS: Well, good. I'm glad you're here, and I'm glad I'm still breathing and—

MHA: This will be a footnote

KS: Okay... So, one of the issues I neglected to bring forward that is quite important is that MARMAP, that systematic approach under Bob White that allowed us the flexibility, financially, to make an investment in collecting, sorting and identifying plankton from around a whole periphery of the United States, within the domain of large marine ecosystems. The problem that we've had and the reason it hadn't been done systematically is it's... labor intensive. The collection is not too difficult, but the sorting and identification of the tens of thousands of organisms collected in the plankton net that have filled one third of a thirty two once jar... that's a big challenge, because you have to aliquot that number down to extrapolate them to numbers per cubic meters of ocean. Well, during WWII the United States, after the war, was providing food and other kinds of goods and services to devastated Europe. One of those countries was Poland. And so we accumulated millions of Polish dollars in our embassy, and one day, a note came around here asking if we could think of a joint project with Poland that might advance our science and train their scientists. And, I knew we had this problem because I had people down here sorting these plankters, if we could train people and use those funds that would be a great thing for Poland especially for us. And so Edwards was willing to go to Poland with me, sit down with the Polish government but this was the early '70s. That was the height of the Cold War. So we were dealing with communist leaders. So it-- the person that we ended up... being invited to present this proposal to, was called aWojewoda. He was the Governor of Pomerania. That part of Poland that most of the central... north central part of Poland. And he was made known to us through our connections with ICNAF and the Polish ships that had come here, taking our resource away. And so, our proposal was; we could make those Zlotys (Polish dollars) available to the Polish government if they would invest in a building-- putting a building in some place that was centrally located for shipping these samples. We tried for two years, we got no place. We went two trips for two years.The third year we said okay Bob let's try one more time. We went over there and was sitting at this-- this is the same Wojewoda, the same governor. He's got a huge office with a big oak table and no papers on it, just one red telephone and a picture of Lenin behind him someplace. And he's got these sycophants all around him and he goes: “Are you Americanski?" "Yeah," [I said.]"Well, what can I do for you?" in Polish he said. "Well, we're here again and we have all these Zlotys and it'd really be a good thing for Poland and the U.S. if we could develop some joint program to process these samples."He said "What!? Plankton!? What is plankton!?" So he turns to one of his guys he says, "Oh, very important" this man, this Polish man-- "Oh yeah very important!"

He said "Well, this week I sign contract with Pepsi Cola, I now have Pepsi Cola for my Wojewodaship. "You want plankton, I give you plankton." [chuckling] And so, they actually built, in 1974, put a building in Szczecin, Poland, on the grounds of the Szczecin Agriculture Fisheries... University. A building to house a sorting center for plankton as we laid it out in terms of how it should be equipped and manned and taught. A high [number] of thirty something young ladies that had just graduated from a master's program in marine activities... They may not have been related particularly to plankton, in fact, they weren't but they were oriented to marine things. And... we trained them, we sent them to all our laboratories to be trained in identification of fish eggs and fish larvae off the U.S. coast and we're now still operating in that. We used the Polish money, it's called Zloty-- a dollar. We had millions of Zlotys in the embassy, so once we sign this agreement with the Wojewoda and he put in motion the building of this thing, we went to the American Embassy and they said "Oh yeah, see that lady down in the central part of the embassy? She has control over the Zlotys." So we said, "Well we're going to be here a few days.Can we use those Zlotys?" "Oh yeah" Once the lady signed the thing, she reaches in a thing that looks like a shovel [laughing] and is pouring all these Zlotys in a big bag. And that was my introduction to theZlotys. Well, over the years, they did such a superb job that when we finally ran out of those Zlotys, we converted it to appropriated funds and continued that project. That's U.S.- Poland. This is our forty-third year-- forty-second year-- forty two years from the Cold War up to now, we've been doing this joint work with Poland and I thought we ought to commemorate it somehow, and you know what a high school yearbook looks like, so-- we made one. And I've got to give you one to look at, and then you can return it. But we have the profiles of each of these women. They were young girls then, they're now grandmothers. They've been with us, most of them, for all this time. And they just celebrated their... anniversary of this institute just a couple weeks ago, and they invited me over to... represent the U.S. in this celebration. So in terms of making a breakthrough, so we can have alithotrophic…[commemorative publication]. Without that component, we wouldn't have been able to do that. With that component, we could move to ecosystem based management because captured in those plankton samples is a cross section of every fish that lives in the-- that inhabits that ecosystem.

MHA: That's amazing.

KS: So we know the commercial ones, we know the prey ones, we know the others that are inhabiting as potential sources of a protein.

MHA: So what about the other LME around - the world are they also doing that kind of work?

KS: Because they were so effective in Poland, the Gulf of Mexico, Southeast Fisheries Science Center joined that activity, the... La Jolla lab has a working relationship with the Scripps so they did not join. But the Alaska laboratory, they joined. So we have East Bering Sea, West Bering Sea... Gulf of Mexico, Southeast U.S., Northeast - we have four to five larger ecosystems. They now... have a time series that's four decades, doesn't exist any place else in the world and that allows us much better input to the trophic model-- modeling multi-species modeling than anybody else has.

MHA: That's amazing.

KS: Yeah, so.

MHA: Great story.

KS: That's a P.S.

MHA: Yeah [laughter]