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MacKenzie, Clyde ~ Oral History Interview

Bonnie McCay

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

Interview with Clyde MacKenzie by Bonnie McCay

Summary Sheet and Transcript

Interviewee

MacKenzie, Clyde

Interviewer

McCay, Bonnie

Date

June 9, 2016

Place

J.J. Howard Laboratory
Sandy Hook, New Jersey

ID Number

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Biographical Note

Clyde MacKenzie completed his undergraduate studies at University of Massachusetts Amherst in 1955 and his master's degree in 1958. He began working for the Bureau of Commercial Fisheries in 1958, spending 14 years at the Milford Laboratory. While there, his research focus was on predation control in the development of oyster hatcheries. He has spent his entire career working with shellfish and their habitats.

Scope and Content Note

Interview contains discussions of: habitat, oysters, Milford Laboratory, hatchery development, starfish, oyster drills, predation controls, Norwalk, New Haven, hard clams, field work, Hurricane Agnes, North Atlantic Oscillation, bay scallops and recruitment.

MacKenzie discusses his many years of working with shellfish and the importance of habitat conditions for the health and productivity of various shellfish species. He also discusses how he sees tremendous value in combining field work and laboratory work.

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Transcript

Bonnie McCay: I'm talking with Clyde MacKenzie at the Sandy Hook Lab, the J.J. Howard Lab, Sandy Hook, New Jersey and it's June the 9th, 2016. I would actually like you to, before you go to that question, just tell me how did you get training as a scientist? What led you to do this kind of science?

Clyde MacKenzie: Well I, well, yes I, what led me to do this kind of science is very important because I've followed the original principles all along, in fact I'm doing it right now and they're very valuable. I took two courses in wildlife management at the University of Massachusetts under Dr. Reuben Trippensee, and that training has been the basis of all my work ever since, believe it or not,

BM: Dr. Reuben Trippensee

CM: Yes, Trippensee, two "e"s at the end. Dr. Reuben Trippensee. I should have brought down his picture because he's been very important to me. Then I took one course in invertebrate zoology at the University of Massachusetts, and that provided me with a nice foundation while studying shellfish.

BM: What in particular did you get out of courses with Trippensee? What was it that made those courses?

CM: Let me give you one example, just an example that he illustrated. A jackrabbit, which I'd never seen, grows in habitats with grass about knee high, habitat and the habitat is very important to every invertebrate. Each animal requires a different habitat, a unique habitat, but the habitat is very important and that's what I've always looked for. And wherever I've been with oysters in Connecticut or Prince Edward Island, how do we improve the habitat of the oyster to increase its abundance? When you do that, they're abundance is going to increase. There are three ways to manage oysters. One, most people say, "Well, if the landings are going down, they must be overfished, so we have to manage fishing", ignore the habitat, and it's just managing the fishing, but that philosophy is used with game animals all across the United States, if there are fewer deer, reduce hunting, if there are fewer ducks, reduce hunting, you know, and just in Delaware Bay, if there are too many oysters being harvested, shorten the season. That's it.

BM: That's right, yeah.

CM: That's not what I did in Connecticut, you have to improve the habitat for the oysters. The other way, the third way, and it makes me upset to do it because my professor hated hatcheries, hated pheasant hatcheries. The State of Massachusetts had these hatcheries for pheasants mainly and pheasants are down. Well, we'll release young pheasants today, and the same thing with fish hatcheries, freshwater fish hatcheries, he didn't think much of that. So he zeroed in on me in a class and had a little room about this size right here, 12 to 14 students and he used to talk to us. They were very nice lectures in an old...well, it's not old...but a regular wooden building there.

BM: So that really, really got you trained, as fundamentally as an ecologist, because you're looking at the habitat, the whole system.

CM: Right, and one afternoon he picks up these oysters in Connecticut. We have to improve abundance, we are going to spread more shells, and we're going to control their enemies, starfish and oyster drills, and any other factors that are reducing their abundance, causing mortalities. Let Mother Nature provided all the larvae and we'll fix up the habitat, so that more can be produced. I sent Trippensee a paper I'd written. He was quite old, and this is after I'd been going quite a while, and he said something to me - I was little though, this sounds as if I was happy, but he said you've learned. You've used my teaching more than any other student I've had. But I said, but well, what about these other fellows that's what I thought, these other fellows went on to learn this stuff, maybe they didn't, I don't know.

BM: You were the one that he remembers.

CM: Well, I sent him my paper and he saw that I'd used all his stuff, and I felt a little bit disappointed in that, I really did. I was kind of pleased with it I guess, but...

BM: So that was your undergraduate at UMass Amherst? And then you went on...

CM: To Master's degree and Virginia Fisheries laboratory.

BM: Oh, you did?

CM: Yeah, I went there and it was interesting in a way there. There was a director there who was all over fishing, J.L. McHugh. My major professor was William Hargis. I've always worked with big thinkers. Hargis, when he took on with the laboratory, he increased the size about 10 times. I guess we all became big thinkers after him, but he learned this thing on overfishing. He was against the fisherman, the fisherman were doing all the harm, stripping out all the beds, but I didn't believe it partly because during the summertime, when I was paying my way through the University of Massachusetts, I harvested hard clams and also in the fall. It took me two years to do my freshman year at the University of Massachusetts. My sister was going to Radcliffe at the time and my little family didn't have money at the time to pay us, to support us, so I did bay scalloping, too, in the fall, two falls. And I could see there that they weren't all over harvested, these quahogs or bay scallops, it was just Mother Nature producing at will. I'm still working on these bay scallops in the same places where I harvested, in fact I have to go up there this summer. Next week I'm going up to Massachusetts.

BM: Would it be bay scallop work?

CM: Bay scallop work and it's a continuation of things that I've learned working on Martha's Vineyard the last 12-15 years.

BM: Before we go on, what date did you graduate from UMass?

CM: 1955

BM: Class of '55, and then you got your master's degree...?

CM: 1958, yeah

BM: And then did you go on from there?

CM: No, I didn't go onto more education.

BM: So, that was enough.

CM: Yeah, that was enough, and it was interesting. They said at VIMS [Virginia Institute of Marine Science], it was a man named Dan Quayle said you know what you want to do...don't go to Rutgers for bench training.¹ I mean I'm glad I didn't really, I'll tell you why because, they're record was all don't overfish, and I wouldn't have learned that which I already knew. Go to Milford – I went to Milford – and learn what you can there. But again that was no good because they were all hatcheries. I knew that it was habitat, you have to improve the habitat on hatchery stuff.

BM: Were you at Milford lab for a long time?

CM: 14 years.

¹ Narrator Clarification: The Virginia Institute of Marine Science was at that time named the Virginia Fisheries Laboratory. The name was changed to VIMS under the directorship of William Hargis around 1959.

BM: 14 years there yeah.

CM: And I worked on predator control and soon I was working for Loosanoff for 5 years

BM: Working for...?

CM: Victor Loosanoff, he's the one who hired me, began working that was 1958, I began there. Was my supervisor, Loosanoff.

BM: Is that Loosanoff?

CM: L-O-O-S-A-N-O-F-F

BM: Oh, I see.

CM: By the way, he thought he's great, you know. He'd be shocked if you didn't know his name, how to spell it.

BM: I apologize, Victor. [laughter]

CM: They thought, they named the new boat after him now.

BM: Oh is that right?

CM: Yeah the "Loosanoff" I mean, I used to chat with him a lot, and he wanted the laboratory to be named after him not just the boat. He loved to see his name in print publication. Every paper that went out of there after that would be so and so's name, Victor Loosanoff Laboratory, Milford, Connecticut. His name would be on every paper that came out of there. I guess once in a while they put the boat's name on there as well. [laughter]

BM: So you worked with him for a good while...

CM: 5 years.

BM: Did he support your interest in habitat?

CM: No, no.

BM: No

CM: Well, my job was to, the whole thing was built around hatchery development, hatcheries, and raising larvae. Another one, another group was raising seed and sending it to places down along the coast, also Rutgers and Virginia.

BM: Right.

CM: And he said, "Well, if you can raise these here, you can teach local people how to do it

and they can build their own hatcheries.” My job was to develop chemical methods for controlling starfish and oyster drills and I worked on that for several years. We were successful in controlling the oyster drills.

BM: You were successful with the oyster drill?

CM: Yeah.

BM: But how could you use chemical methods for that?

CM: There was in favor then...It was ok to do.

BM: How would that..I shouldn't ask you that, I'm just curious, a marine environment, you got an oceanic environment and it's not contained very well, so to control the oyster drill you have dispersion of whatever chemical you put it.

CM: We mixed it with sand and clay pellets.

BM: Ok, I see, so then it would be contained that way.

CM: Oh yeah, it wasn't just loose. It was in pellets with sand, did it with sand initial. And then we spread this over oyster beds, and oyster drills all swelled up. It was a long process, finding out if the oysters accumulated some of these chemicals, and they did, and then how long it would take for them to release the chemical. Could you transplant these to another bed? And how long did you have to leave them there before you can harvest them? Went through a lot of work there.

BM: Interesting work.

CM: But um.. and as soon as he left and here I am doing this I said, “are starfish and oyster drills the only things that are killing oysters?” So then I went on to a five year project, that was very successful.

BM: Yeah and what was that project?

CM: Well, I wanted to study the environment...First thing I did is to look at the oyster beds in Connecticut all the way from well from Norwalk to New Haven, about 30 miles. I swam all of them to see what part was good enough to receive a set and it turned out to be way less than one per cent. The rest was all bottom as the fishermen called it...sand or it might have been gravel and stones and some shells.The gravel and stones would have been good for a set but it was covered with a fouling, bryozoans or something. Scummed over. Oyster larvae couldn't set on it. So, I told the manager of the Norwalk company, the Bloom Oyster Company, and he said, “How do we get more oysters here?” I said “Look, if you could cover this part from Norwalk to New Haven, that's 30miles. In a band three miles wide just off the shore with solid oyster shells, say 1,000 bushels an acre, you would have so many oysters, you couldn't handle them even if there's almost no set at all. You'd still see...There's never a year where there is no set and you find some even in a very poor year, you would have enough oysters so many you wouldn't even be able to handle 'em." Never mind a big

year...So going back to what I did next, then I followed the oyster larvae from the time they set...I looked at the beds, saw the oyster beds sending shell over, then followed the set from the seed – little juveniles – from the time they set. The idea was to follow them for five years all the way from the initial set all the way to five years to find out what controlled them. I don't think that's ever been done in marine biology.

BM: Yeah, right and you found different controls, different predators at different points in time...

CM: Different sizes. I wrote a paper on that but that was...and here's talking about the agency.² Initially, I was going to do this off our laboratory boat since...and the boat's tied up, it's occupied, the captains are on vacation this week. Well, things are happening out in the beds. So, I went to each of the oyster companies, the two companies. I asked the managers if they would take me out on their boat.³ They did.

BM: And that's the way you got out there. Did that begin, was that an important part of the development of the strong relationships with the industry?

CM: Yeah, we were great friends, really great friends. Used to call them up, I dove on those beds 50 days a year for 5 years.

BM: 50?

CM: 50.

BM: Wow

CM: Through the winter too, and I went a lot in the winter time, but I would go out with them for the day, and the manager was on the boat with me, and I told him where we wanted to dive, usually five different beds. What I did is examine the beds then I'd come up and collect oysters on there, the little oysters bring them in, bring them back in the laboratory and examine them for causes of mortality and then I'd write a letter to the company manager each time, and I'd sent a letter to the manager, so they should see the results. But after each dive, I came up and I would tell them what was there what I saw, and of course I brought these shells...oysters in and then when I went out on the next trip which might have been a week later, I brought these oysters back, gave them to them. I didn't take any. I didn't lose any oysters. If I saw any starfish on the beds, I'd put them in my bag and brought them up. So he and I, whether it was Dick Nelson in New Haven, or Hillard Bloom in Norwalk, we're talking about fixing up these beds all the time. Every six months, I wrote a general letter to both companies and told them what I had seen and all we'd seen. It wasn't me, it was us, what we'd seen and observed and so they both got this report every six months, and they were interesting reports. I've lost them all, in that paper I sent to you on success and restoring...

²MacKenzie, Clyde L. "Biotic potential and environmental resistance in the American oyster (*Crassostrea virginica*) in Long Island Sound. *Aquaculture*, Vol. 22(1981): 229-268.

³ The oyster companies to which narrator Clyde MacKenzie refers are the Tallmadge Oyster Company of Norwalk, CT and Long Island Oyster Farms based in New Haven, CT. J.R. (Dick) Nelson was the manager at Long Island Oyster Farms.

BM: Right, yeah.

CM: One of the reviewers of that said why not include a couple of these reports, a couple of semiannual reports in this. Everyone said that would have been good, that could have been nice to see, It would have been nice to see just what was on these different beds how these starfish and oyster drills were controlled, and silt. Silt was a big problem, but we got along great, Dick Nelson and I. You know the name Nelson?

BM: That was Norwalk company?

CM: No, New Haven. But Dick Nelson was the father.

BM: Oh that was New Haven, I'm sorry, Dick Nelson.

CM: Hillard Bloom but Dick Nelson was the father, brother of Thurlow Nelson of Rutgers and Julius Nelson.

BM: Oh really? So it was the Nelson family...

CM: He was a very smart and a very capable man. I learned a lot from him. We had a great relationship there and the same with the Blooms in Norwalk. After three years, the oyster industry was almost gone when Loosanoff had left. I know this one man, George Vanderborgh he said, "Loosanoff's leaving? He promised us that he was going to make us all millionaires. He's leaving? Close down the lab." He was so damn mad. So the whole thing was...the industry was very close to the end but after three years, those beds built up and up and up, because nobody had...knew what was going on. So I sent them...when I sent those letters to those fisherman [informing them of what killed their oysters]...340 in Norwalk...70% alive...30% dead and all the dead ones, they were killed by starfish, oyster drills, silt or whatever in each of the five beds and I kept a running score so they could see right it in front of them what was going on.

BM: So what did they do?

CM: Oh they controlled the starfish, oyster drills and the silt. ...

BM: They used the controls that you suggested.

CM: I was in the laboratory there 5 years under Loosanoff trying to develop a method of controlling starfish. I get down to Norwalk and they have a beautiful method. Loosanoff never went down there, never interacted with the fisherman and they were controlling with quick lime beautifully, wiped them right out. They stop feeding within 10 seconds after you spread it.

BM: Is that right?

CM: Yeah, there's no more feeding, and in 48 hours, not only are they gone, but you don't even see their skeletons. So what I did, with Dick Nelson in New Haven, was getting pretty good losses from starfish, "Ok, Dick. Here's how you control starfish," they had used it

before, following Loosanoff's recommendations. He came up, he got the idea from the idea from a man, Butler Flower in Oyster Bay, the Flower Company. Flower and his father developed, started using quick lime. Loosanoff took it over, tried it in little pans to see how little you could use and still have a positive result, that came to 300 pounds an acre, that's what he recommended to the fishermen. And it didn't work, so New Haven gave it up. I tried 300 pounds out in a tray on a dock there's nothing, 500 pounds nothing, so Norwalk was using at least 1500 pounds an acre. It was still cheap, very cheap and that wiped them right out, so I told Dick Nelson how to do it. I didn't tell him where I got the idea from because they were sort of rivals. And he used it.

BM: Did it work?

CM: Ah, did it work! What Dick Nelson did...Norwalk used these 80 pound bags, bags from the company, you open the bag and dump into this trough, and then it goes down through this little opening, and there's little holes at the bottom spraying it out, going across the bed, it's beautiful. Dick Nelson got these two great big tanks, one on each boat, 15 tons on two boats, and he had, how big was that one? Like a 35 ton tank on his dock and this company came and filled that loose. They had a great, big, two trucks, filled it up, and they ran it over to the boat and they went out with mops, starfish mops, to check for starfish. There weren't any there...wait for slack water and spread them, spread that right on there. The oyster abundance, looked like they exploded on the bed, the abundance. Bloom used Polystream the chemical to control the drill but after three years and certainly four, they had so many oysters there they were having trouble selling them all, really.⁴ They were way down, way, way down. It was a joint effort with the two company managers and myself.

BM: Well that was a nice outcome, an unusually good outcome!

CM: It was a good outcome. But I didn't follow...I followed Trippensee's ideas, not Loosanoff's.⁵ Not government ideas [such as] hatcheries...But I don't know if I want that said on tape.

BM: Well, I think the focus on habitat is currently very, very important, for this I mean nobody would disagree with that now.

CM: It was all habitat. Interacting with the fisherman, I was very close. We were very close. Dick Nelson and I were very close. Hillard Bloom, gee we were. I have to call a deck hand

⁴Polystream, manufactured by Hooker Chemical Corporation of Niagara Falls, NY during the 1960s, was a chemical used by oyster growers to control predation by shellfish predators such as thick-lipped drills (*Eupleura caudata*) and Atlantic oyster drills (*Urosalpinx cinerea*). For further reference on the effectiveness of Polystream as a chemical agent and studies conducted by Milford Laboratory, refer to: MacKenzie, Jr., C.L. "Control of Oyster Drills, *Eupleura Caudata* and *Urosalpinx Cinerea*, with the Chemical Polystream." Bureau of Commercial Fisheries Biological Laboratory, Milford, CT, 1970.

⁵Reuben E. Trippensee (1894-1997) and Victor L. Loosanoff (1899-1987), two leaders in shellfish research, prioritized differently their emphasis on environmental improvement and aquaculture as solutions for the oyster propagation. Other resources include: Loosanoff, V.L. and H.C. Davis. "Rearing of bivalve mollusks" in *Advances in Marine Biology*, F.S. Russell, Editor. Vol. 1. Academic Press, New York. 1963.; MacKenzie, Jr., C.L. "Success in rapidly restoring two failing oyster industries: A Personal Account" *Journal Shellfish Res.* 34 (3) : 867-878.; Schultz, T.W. *Transforming Traditional Agriculture*. New Haven: Yale University Press, 1964.; Trippensee, R.E. *Wildlife Management of Upland Game and General Principles*. New York: McGraw Hill, 1948.

who worked on Bloom's boat. He's been out there clamming.

BM: Oh, is that right?

CM: Yeah, he has a boat of his own. He and I love to talk together. Dave Hopp, his name is. I have to call him...see how he's doing. He's out there with his grandson who is running the boat.

BM: Is he clamming here in Raritan Bay?

CM: No, he's up in Connecticut. He tells me exactly how many they're getting and how many boats there are. There are 42 boats clamming and now the...one thing, talking about habitat is something I get into...I had to do drop that, after the oystermen had all these oysters, it was going great. By then the laboratory [had] changed to an environmental laboratory, and we had to change the project more to that and, so I said, "Why don't I follow a food chain of Milford here? Find out what factors control hard clam abundance." I'll dive down and see what's eating the hard clams. I dove down there and the bottom was loaded with juvenile rock crabs. So what I'm going to do after is after every month, I did this for 14 months, surveyed the abundance of these juvenile rock crabs find out what they're feeding on, find out what's feeding on them, I took section samples. I would dive down, took samples so I get their abundance, its peak abundance was in August. I'm going to go back up there in August, the fish stomachs there are four species feeding on the crabs at the crack of dawn.

BM: Oh, interesting

CM: So I dove down there just once though and here are these crabs all over the bottom feeding. There are 53 per square meter, that comes to 5.3 per square foot.

BM: That's very high, wow.

CM: Their main food are little mud tube worms. They reach down to grab it, aim it head first in the mouth, the mud tube would fall down, they'd reach down and grab another one, they kept on doing that. But then right at the crack of dawn, they started to go down to the bottom and these fish went zip zipzip going as fast as they could.

BM: So the crabs are diving down into the bottom hoping to get away, but the fish were capturing them.

CM: Catching them, yeah, you could see the survival of [the] fittest right there. Those numbers went down from 53 to two per meter, by late October, and the fish, the four species, there were sea robin, sea raven, and two shark, spiny seadog and smooth dogfish. The sea raven and the sea robins each have about 12 or 14 crabs in their stomachs when we sampled. This was about two hours after the sun came up, and the sharks had like 20-22 in their stomachs. I had time, but to get the boat to do it, sample those fish before the crack of dawn, after the crack of dawn and then in the evening just before the sun went down, how many crabs were in their stomachs and then right after.

BM: You couldn't do that.

CM: No, to get the boat to go out..

BM: So when did you do this work? Just recently?

CM: No I didn't do it, that was 1970-71 Just before I went up to Prince Edward Island.

BM: One thing that I've known about you for a long time because of the work we did over the years of the spawner sanctuary and reading your work, is that you really do go down and look at what's there. Is that standard practice in the fisheries center? I mean how many of the people actually dive down to look at the bottom?

CM: How many people go out on boats?

BM: Yeah, so has there been a shift away from that over time?

CM: Yes, it's laboratory studies. It used to be that what you should do to get good information is fieldwork and laboratory work all together, like I did, this with the bay scallops, sample then and then saw predators, then we took those predators in the laboratories in separate basins. This fellow there in Massachusetts, Eastham, Mass, was raising little scallops in hatcheries so we put the hatcheries seed in separate basins with different basins to see which predators would eat them, and there we discovered that shrimp would feed on them.

BM: Which you never knew before...

CM: No, I was over in Europe, at a meeting there and they were talking about shrimp eating shellfish, what?

BM: You'd never imagine that!

CM: Nobody knew that here! So we did it and they eat them up, we put one shrimp eat maybe 10 little seed in three minutes, rapidly, wipe them right out, little fishes swimming right along, picked them up, one at a time. up.

BM: That's pretty amazing, you just don't think about shrimp and mollusks.

CM: No, I went to a nature place over there in eastern Long Island, somewhat before that and there were shrimp in this tank and I said to this lady I didn't know anything about them, but what do they eat? Oh they have little claws and they just eat little crustaceans and that's what was what my first knowledge would be, and they also eat fish.

BM: Really?

CM: Yeah!

BM: That's interesting

CM: I was studying soft shell clams over here in the Navesink River. Again, a field laboratory situation, and there were little hatched out -- well, I've learned that killifish and mummichogs lay their eggs and then they hatch out and swim in the marsh the little ones, and at the end of low tide, here's the marsh over here, they swim out and they're right on the edge of the marsh where there's water, but then I scooped up some sea lettuce there, here's some shrimp, so Chris Chambers here was raising *Fundulus* for his experiments and I said "could you give me a plate with eggs on it," I want to see if these *Fundulus* feed on the eggs, and he did and I put these in a pan up in my office and some of them hatched out, and those shrimp swim after it trying to catch the *Fundulus* and they couldn't quite catch them, so what I did after trying this, I took a little hatchling and squeezed it so it couldn't swim any faster, and so I put it in by the shrimp, it would swim but slowly, the shrimp grabbed and ate it. Brought it over to its' mouth, chopped it up and you could see that its mask one of the foregut...

BM: You would never expect that that's very interesting

CM: You would never expect that...and then Ken Able's group down there found out that shrimp, sand shrimp eat juvenile Flounder.

BM: That's so interesting.

CM: So that's what I'm into here now.

BM: Let me stop for just a second. See how we are doing now here.

BM: Second batch, ready to go!

CM: These disks that I have, that I was telling you about, reproduce my voice. I had it on at home there one day, and my daughter she's like 10,11 years old, she was in the living room, this was in the dining room. I had it on, and she asked me who I was talking with, it sounds just like my voice, I guess.

BM: It's a great thing to have, I hope you can do something with those interviews with Patricia, she said she would talk with you about it.

CM: Oh you talked to her?

BM: Oh yeah! She said that she thinks she talked with you some time ago, she neglected to follow up on it so I said well, the two of you will work it out.

CM: Yeah, I'll talk with her. I'd hate to see them go into some government place down there, just to sit around.

BM: Well, let's get back to the topic here, so we were talking about the field work that you've done and how it's been translated into laboratory work and going back and forth between the field and laboratory work. And to my mind, as an outsider, is also, you're very much a person who's involved in the natural history approach to things. In other words, of careful observation and asking questions based upon that.

CM: I asked a lot of questions of the local people.

BM: Ok, asking lots of local people and appreciating their knowledge right?

CM: I listen to them and I listen to what they say, and I don't buy everything, but it's, I listen, I hear it, and do I hear it again? How about my own observations, does that jive with what I saw. In fact, there's one fellow there, his grandfather had just died, he was like 97 years old. I knew him a long time ago when I was a little boy. Well, I was out with him alone up in Edgartown on Martha's Vineyard and we were judging scallops. This is what I've been working on from here, and he said, "We get good sets after a cold winter" is what he came up with. His grandfather told him that they'd noticed that over the years. And that turned out, I kept that in mind, and that turns out to be true. That's a fisherman's observation. In fact, there's one thing down in Delaware Bay, if you're interested in the oysters there's an observation, let's see, I told those fellows on Martha's Vineyard this too. Let me see when this was... Oh! yeah, just before I left for Prince Edward Island, this is 1972, there was a bad storm, Hurricane Agnes, tropical storm Agnes. And, I was giving two talks on this, and the audience was quite interested, one of the things that I observed was that, in Connecticut the wind in the summertime blows from the southwest, and that keeps the water against the Connecticut shore, the phytoplankton, the larvae against the shore. And Agnes, and I was really upset because I thought there was going to be a really heavy set, because Agnes came along and the winds blew from the north, steadily from the north, day and night, for what it seemed like a week, or more, 10 days. And I went out to look at that water, it was crystal clear. All that nice water had blown across to the Long Island side. And I learned later they got a set over there, there was a little set late in the year, very light in Connecticut. The conditions build up again for a good set, the water built up for a good set, but going back to Delaware Bay, I mean I see that southwest wind. If you look at Delaware Bay, that southwest wind keeps that water--

BM: Cape shore right?

CM: -- Cape shore. And on all those seed beds up there. And those Delaware beds get much better sets than the Delaware side gets, far better, ten times better. It's not only the wind, but I never heard that before about the wind, but I would think that that might be possible. The main thing, or what used to be the reason was because, when the Delaware River flows into Delaware Bay, the coriolis force deflects the current to the right, and when it comes into the Bay, it slows down a lot of silt forms and land on the Delaware side. The water can keep going, out in the ocean, far to the right. And I have scuba dived three different times in different days on those Delaware beds. And they have a lot of silt on them, far more than on the Jersey side. I made one trip along the coast, those Connecticut beds, as I told you, so I wanted to look at the seed beds from Virginia waters, James River all the way up in Maryland beds that was interesting. Let me write that down, because I saw something there! You learn so much scuba diving -- I'm going to write something down here. And then I did the Delaware Bay beds, Connecticut beds again, I didn't go any farther north I don't think.

BM: That was quite a big trip to begin with!

CM: It was a long, quite a long trip, and I did the James River last, and I lost my face mask, and I dove down with no face mask on. Dexter Haven, I don't know if you know that name,

he was a prominent oyster biologist. He's reviewed my papers, he died when he was about 95 so I miss his reviews, but he mentioned me, my going down without a face mask. But these, I have surveyed, the pearl oyster fishery in Eastern Margarita in Venezuela, got one down there, wrote a paper on that. Those divers went down there mostly with no face mask, you know just plain eyes. But in Maryland, I did not look at the condition of those seed beds. There were anemones all over the place. And I wrote a paper on that, I surveyed the distribution of the anemones numbers, and wrote a paper on that. Then I brought some back to the laboratory, put larvae in with them, and saw how the larvae swim against one of the tentacles and grab it, take it right down to its' stomach. So, I tried to, that proved that they would eat the larvae. So there was field and laboratory combined. That's bothered me here too, to tell you the truth, that people just do laboratory stuff. Here, they have these students up here in the summertime learning only laboratory work.

BM: Really? They don't go out on the boats or collection?

CM: No! They should spend half the time out seeing how to do field work! How to write down what they see...good night! This is like studying human behavior, if you go to a county jail and watch a prisoner in a cell! It is, because I did some only laboratory work. And in Connecticut, I brought in some starfish in the laboratory and I couldn't do it, the behavior was totally different then. Loosanoff had a tank there and he used to put starfish in these tanks, he'd have like 20 in a tank as big as this room. And maybe 6 feet deep with sea water. He said "Starfish go together like this. They go together like this. They don't do that out in the field. If they're moving, they go in one direction. They don't do it." And he rarely when out on a boat. He wrote a lot of papers.

BM: How are we doing with the questions here. Well, I think we're doing fine because really we're touching upon all these questions, what kind of work you were doing. There is a question about scientific theories and I don't know how you'd address that. I mean, you've certainly working from a fundamental basis in zoology and ecology, marine ecology, how would you characterize...

CM: Here's something I know is that... I've worked now mostly, not with fin fish, oysters and these clams produce millions of eggs. Most of these are fertilized. So there's an enormous biotic potential. I had a University of Massachusetts student out with me, we contract with them to do some work that was supposed to amplify what I was doing. And he said, "What are you doing?" We're on a boat leaving Nantucket to get samples out there. And I've thought more now about what I should have told him. Here were these scallops here in Nantucket Harbor in a certain abundance. They have the biotic potential to cover the earth if their environment were suitable, they produce enough young to cover the earth. Then why, what holds them in the abundance they are in now, what holds them in this abundance, something else, predators, food, substrate that they sit on. I should have told him then, but I didn't. That would have been good enough.

BM: He might have not had the imagination to understand.

CM: But that's what it was. I was going to say something else there and I lost it.

BM: Well, I guess, your scientific framework...

CM: Yeah, I know that these animals, the fish, produce several million eggs a piece, and something is holding them back, and I know that this is true. And I know that something holds this all back. In the environment. The environment is not suitable for them to keep expanding. And what's going on now, with what's... I didn't bring a chart over here, it's over in the other building... it shows from 1950-1980, landings of shellfish were level from year to year if you average it. Average the various areas, along the coast. Certain areas, like fishermen don't harvest all at market size. They don't harvest them all, and if they leave the market tells them that they can't take them all. So then they sell the left over for the year after. Bay scallops are pretty good to study though, because if you don't harvest them all, they die!

BM: They have short life spans.

CM: Short life spans, and they're easier to study, and they're easy to catch, easy to harvest. And the predators are right with them. There are just two year class. They're easy to study, I've learned quite a lot. You can tell what's going on in the North Atlantic oscillation, how that effects them.

BM: How can you study the North Atlantic Oscillation in a creature that only lives for a short time?

CM: Couldn't be any better, because...

BM: I mean there would be any record in their shells or anything like that...

CM: No

BM: It would be more the question about if there are changes in recruitment of abundance...

CM: Right, from year to year. We had a Rutgers employee here who taught me about the North Atlantic Oscillation and Jennifer Francis, oh you know her! I told her that this happened, that happened. Well, that's the North Atlantic Oscillation, I said, "What's that?" So I looked into that. After a cold winter, like that young fisherman told me, you get a good set, a good set of scallops, a good set of oysters. Cold winter, and the North Atlantic Oscillation brings that about, this cold winter. So, we just had a warm winter. I hope there's a set but I doubt it. So that's very important. You say what do we measure? We measure the amount of set mainly, reproduction, recruitment. Recruitment is everything. Right now, I zero in on recruitment. It's not... what's holding back these offshore fisheries, oysters and bay scallops is recruitment. It's not size of spawning stock. It's almost irrelevant.

BM: That's an old issue isn't it, in fisheries, the stock recruitment relationship and whether there is one. It's a fundamental axiom in fisheries management.

CM: That's what our whole agency is based on, that whole axiom.

BM: Alright.

CM: Fish diseases... this whole laboratory... a lot of this laboratory... the Center... Oxford laboratory... the Atlantic fisheries center was working on fish disease. Right now, there aren't

any fish diseases. There's...fish don't die of disease at all. Now, where did that idea come from.⁶

BM: Yeah, interesting.

CM: All this work we do on fish now, and more in these other laboratories, Woods Hole, Narragansett. There isn't any fish disease...there isn't any mortality from fish disease. Look I'll give you a name on it, do you want to know the name?

BM: Yeah, sure.

CM: Carl Sindermann

BM: Oh, Carl Sindermann, yeah.

CM: He was wrong.

BM: He was the one really pushing the whole thing on fish disease.

CM: And what about overfishing?

BM: And where does that come from, the focus on overfishing?

CM: Well, you know who...I'm pretty sure he was the head of biological research in the Bureau of Commercial Fisheries, if that's the right name. I forget what it was then. This was back quite a while ago, the 1970s I guess... '60s, and I'm not sure if he was then, but somebody else was. They believed it was all...any declines were due to overfishing. Same with shooting ducks, geese or whatever and that was Larry McHugh. He drilled that into everybody's mind but I didn't believe it, because I see it with my own eyes with bay scallops and quahogs, that we weren't overfishing...and when stocks were very low, we'd see a big set. Had nothing to do with the amount. And the same thing in Connecticut, there was a good set in 1966 when the stocks were way down low, and there's a big set...1968 a big set. It had nothing to do with the...And 1968, 1969, there were all these oysters. How come we don't get big sets. No, we didn't, could be nothing, could be very poor sets.

BM: I guess the surf clam story is something like that too, isn't it?

CM: It must be!

BM: When you had the huge set of surf clams, what year was it, 1976 or '77? Off Asbury Park and it followed the year after the fish kill, the big anoxic events that had occurred.

CM: But it killed the crabs.

BM: So I remember Haskin's thought, it killed the crabs. So anyway you have that next year with this huge set, and then the industry lived off of that for many years, and then they

⁶Narrator Correction: The narrator was referring to the Northeast Fisheries Science Center in this statement. Carl J. Sindermann's research focus included diseases in bivalve mollusks. One of his earlier papers to which narrator Clyde MacKenzie referred was: Sindermann, C.J. and A. Rosenfield. "Principal Diseases of Commercially Important Marine Bivalve Mollusca and Crustacea." *Fish Bull.* 66: 335-385.

waiting for another set to come along, I mean.... It is this question about the lack of clear relationship between the spawning stock and successful recruitment, I mean you're really contributing a lot to identifying the reasons for not holding on to that.

CM: Yeah, I talked with my co-author of this shellfish paper that we now have out in print, Mitch Tarnowski...and gee the Maryland story is really almost comical. Every year there's a new proposal, a new thing coming up. But now, they're putting out these, what do you call them, they're cement, like hollow stones with holes all through, I forget the name.

BM: Fish aggregating device or something like that?

CM: Yeah but they're putting it out for oysters, I think they would be good for fish. It would be good.

BM: They're doing this for oysters?

CM: Yeah, to collect oysters. There was a talk up here at the Hudson River Roundation by Jake Goodwin, and he said, "What we're trying to do is build up the spawning populations in Harris Creek. We're putting all these cement blocks out." And in other places they said. Mitch said they were putting out thousands of them. So, we'll have all these spawners, and we'll have all these oysters, and we won't need hatcheries anymore. I know there's a group down there, Don Merritt, trying to push these hatcheries at the University of Maryland, and the guy's trying to get rid of them. Now what do you think of that, putting out all these, I don't want to put you on the spot, I know what I'm gonna say.

BM: Well, I mean I think, remember when we had little projects on spawners in Parker Cove, Barnegat Bay, remember that?

CM: Yeah, if there's nothing there.

BM: I mean, that was a failure really, and, in that case, I remember the next year, Bruce Barber did a study of the spawners that we put out there, and he discovered that they were malnourished. Their gonads were in really bad shape, they were just not healthy critters, which suggests that the problem was not the lack of spawners, but the lack of nutrients in that area of Barnegat Bay.

CM: Well, what I say is that in Maryland oysters now, there are plenty of spawners already. Concentrate on the conditions of the setting ground, the sea beds. You can put out spawners by the billions, and you wouldn't have any more oysters on those beds.

BM: The critical thing is where they can actually set.

CM: That's what I did in Connecticut, and on Prince Edward Island, same thing. Don't put out any more spawners, you're wasting...I was just, one paper I'm working on during the day here, so I'm working on the research paper on the offshore fish. I collected all these publications for the bivalves and everything. I'm using that information plus some stuff on the offshore fish on the offshore grounds. I'm supposed to now work on offshore stuff. The Center Director, Bill Karp, I don't know what's gonna happen, we're supposed to be reorganizing here now. And Bill Karp is retiring.

BM: Oh he is?

CM: Yeah, in September, and they're trying to get things set for the new administration to come in and establish everything.

BM: Of course, the new administration would want to reorganize it themselves.

CM: I would think they would.

BM: What about, tell me a little about how you got to PEI [Prince Edward Island] and what that meant for you.

CM: Well, I had finished with the, I wanted to tell you some things about my experience with Canada too. I had, I really finished my work with the oysters in Connecticut. The oyster administrator is going good, and I was into this environmental work with those crabs, and a group from Canada came down and saw our regional director, and he sent them over to Milford. His name was Ozzie Norris. The regional director was Ozzie Norris. And, they wanted to see if they could get somebody to go up to Prince Edward Island to help with the oyster industry up there. They had just had a new election, and a man named, what was his name, I bought a necktie with his name on it, anyway, he wanted to revive the oyster industry that had been going down down down for thirty years, that was his big thing, to revive, he was in the cabinet, the new cabinet.

BM: At PEI.

CM: At PEI, the new fisheries cabinet minister. His goal was to rebuild the oyster industry. Now, in Canada, you might know, the federal government is in control of it. But he wanted to take it away from them or get permission from them to run it themselves. But they needed somebody, they wanted somebody to go up there and advise them, so they asked me if I would do it and I said, yeah I would because I had finished with oysters here. But that's how I got up there. Bruce that was his first name. And after two weeks there, he sits me down in front of the Premier, and he wanted to know what I was gonna do, and then he gets me in front of the fishermen there and we had a joint meeting, the fishermen and the Provincial Department of Fisheries, and he asked me to give a talk about what I was gonna do. I said, what I told them was, I'm not going to try anything new on you, what I'm gonna use is oystering methods and principles that have been tested, long time tested in the United States that work. I'm gonna bring those here and see what we can do. First thing I wanted to do, they were interested, the federal government was interested, so was Bruce Stewart, he wanted us to build up leases, don't concentrate on the public grounds, build up leases. Let each fisherman farm is on lease. I said, we're gonna build up these public grounds, which I knew produced, always produced here in the United States, they're very productive. The lease is going to be secondary, and that's what I pushed, and I had all the fishermen.

What was interesting to me in a way, we had that meeting, it was about a month after I got there. At a big hotel, the biggest hotel on Prince Edward Island. I was staying there, by the way, at first. I stayed there when I went up on subsequent trips. But I sat down, I had been interacting immediately with fishermen when I got there, immediately. So, we had this meeting, there were like 15 or 20 fishermen including the leader of them, Fenton Boylan his name was - hope he's still alive, he's 89 years old, I didn't get a Christmas card from him, but

I hope he's ok. We had a meal there, and I didn't sit with the Provincial Department, I sat with these oyster men. I sat with them telling them what we were going to do. Again, we, what we were going to do. And they were all in favor of it. And I sat with them, and I told them Bruce, what was his name? Stewart I want to say, got me to talk, I gave a little talk. I told them we're gonna use methods, and that's what we started doing.

BM: And that turned out to work very well.

CM: That worked, we built up these two areas very nicely there. I had in my mind right away, I said in my paper, that my goal was to, when an oysterman tongs up his oysters, he's gonna have, if he's getting two oysters there now, we're gonna have four or five in those tongs. I had that vision the whole time, all the time. And there were so many interactions with people along the way there, and every time, if that that goal was not gonna be met, and the interaction went towards that.

BM: So you just kept reminding them and yourself of that goal?

CM: Yeah.

BM: That was smart.

CM: One thing interesting to me, I want to make sure I mention here is that the people on Prince Edward Island, I guess, and I'd heard this when I was in Milford. That the Canadians were more practical minded than the scientists were along this coast. Scientists doing just esoteric, scientific work. Just doing biology. And one fellow up there said that they weren't gonna support that. They didn't tell me that, but they didn't have to tell me that. They weren't going to do that. But, although they wanted to come up with practical solutions, they did not want to interact with the fishermen. They did not want to interact because then you're getting politicians, you're getting these fishermen involved, and boy, those people in the Provincial Office were nervous as heck about me.

BM: Really?

CM: Oh, the day we were to do our first dredging out there, this was in the East River, that day the Minister of Fisheries, the new minister, and I was glad that they did put in a new one, and the Deputy Minister took off for two weeks. If anything went wrong, there's newspaper articles about problems with the fishermen, they weren't there, they were safe. They weren't there. I said to myself, "ok boys. Leaving me with all the responsibility here if something goes wrong. If this goes right, I'm taking all the credit for it", I said that to myself, I really didn't do that. Then when I wrote a paper on it, I gave them credit, "Thanks very much for this one and that one for their support". When I went up to see them, and they'd seen the paper, they kind of wanted to know if they really should have gotten any credit. But they did support it. But the first minister who hired me who wanted this done was shifted out of the position about midway through my term there. And I was glad he was, because you know what he wanted to do? He wanted to take, I discovered all these oysters in the East River, a 150 thousand bushels, and described how many bushels there were in Bedeque Bay. He wanted to take those out of there and put them on these leases. Put them on these leases so these oystermen could farm the lease. I worked out with those fishermen, no no they're gonna stay right in place, we're gonna work there. Right on these public beds.

BM: But were there already, there were already people with leases--

CM: There were leases, probably about a hundred.

BM: They already had the leases. Were people working the public beds and then taking oysters over to the leases? Where they doing that?

CM: They did that in the spring in Bedeque Bay, which produced about 60% of the oysters. Those were polluted oysters, they brought those to the leases, harvested in the fall.

BM: Oh okay yeah.

CM: Then in the spring, in the fall fishery, like in the East River, they harvested them directly and went to market.

BM: I see, yeah, because it wasn't polluted there.

CM: It wasn't polluted.

BM: Yeah, interesting.

CM: So I kept us, and they're still going with the public beds there a lot. It's partly under the, I don't know who, I think the Provincial Department still has a lot of control over the fishery, but the federal people there, who's office now is in Moncton, not Halifax, wanted to, kind of wants that to be all private leases.

BM: Oh, they're still pushing for private.

CM: Private. They wanted to divide Bedeque Bay into leases, but that would have been a nightmare, catastrophe, because they did that in one river, the Percival River, I never got there, but it was an absolute nightmare, because it was like a checkerboard, little four acre leases, people stealing from one another. And then there was no way for the fishermen to farm them anyway, there were no shells available when I got there. No shells, they couldn't do it, but we found, my associates there and I, found a huge concentration of shells in Malpeque Bay. Millions of bushels. Millions. And I was told there weren't any shells available. And after I'd left, he got three or four boats mining those shells. That's what he did, and put them in empty spaces in Bedeque Bay for one, and he also made at least one pile of shells available for these lease holders, to take shells. They could just come and take them. So, I started that when I was still there.

BM: The fishermen using the public grounds, were they also lease holders?

CM: Most of them weren't.

BM: They weren't. So they're really two different groups of people.

CM: The ones in Bedeque Bay had their own leases. No, maybe half did. And the other half sold their oysters to a buyer. Brought them to a buyer every week, at the end of the week, instead of putting them all on a lease, they sold them to a buyer there, and on Malpeque Bay actually.

BM: I mean I see in restaurants that the PEI oysters are very popular.

CM: Are they?

BM: Yeah, they're really out there. They've maintained a pretty large market.

CM: Yeah, keep the brand name, they're really producing a lot. Their landings zoomed. It made me feel good when the fisherman said that the next year that after I left was the best year ever, and the year after that was the best year ever. It kept growing. He kept saying the best year. And the landings ultimately got up to a level that was higher than any landings in history. The landings, doing the same thing, habitat work. When I got there, when I arrived on the Island, the big thing was the hatchery. Boy, I was at a buyers place one time, I was at the place one time there. The hatchery director was there, George Henderson and I were talking to this guy, and of course he wanted to maintain his hatchery and everything, and I wanted to keep these public beds going. I said, which ever one of us is here last is going to come out on top here. And he left before I did. My boss, the Deputy Minister, Eugene Gorman, didn't think these hatcheries were worth anything. A monument of folly, he said. He used to fight everything about this hatchery, trying to get, he promised to do it. Well, a new government came in, and the new premier made this hatchery guy Minister of Fisheries. He did keep our program going, but he dumped that Deputy Minister.

BM: I see.

CM: Apparently the Deputy Minister got a good job doing other things, I mean he got another appointment, but he was out of being deputy after thirty years.

BM: Let's take a break to make sure we have everything.

BM: Now we're talking about trends in the scientific field and in the last several decades, and Clyde MacKenzie was just saying that there's certainly been more emphasis on the environmental studies. Jack Pierce was a leader of that, very influential in that here. Can you say anything more on that?

CM: There's been a lot of benthic sampling, benthic studies means studying *polychaete* distributions, there have been studies made of what's the effect of the dumpsite here on the habitat on a study here on that ...I think now, right now, the trend is for people who might think they're highly knowledgeable to study the internet, looking at the internet as a trend, looking for information on the internet, and I think the problem with that, as far as I am concerned is that the information there is at least 15 years old. There are changes in the environment, changes in the fish, shellfish over 15 years and they're always behind...I'm finding...sometimes I go out and see stuff. People think...I've heard this over the years [that they doubt my field observations] and [they think] I don't know what I'm talking about. I don't know, you know?[They say] Clyde doesn't know what he's talking about. That's not the case.

BM: So that focus on the internet, and the models really doesn't do justice to what's happening out there in nature.

CM: Right, it doesn't. No. Another thing that people have ignored here, I should definitely

bring it up. People are ignoring the effects of the North Atlantic Oscillation. They really are. I don't hear much about that in this center.

BM: Is that because you don't really have a strong oceanography group here?

CM: I think we do, but let me tell you the reason that I think is the case. You see the effects in scallop beds. Every year, every year it's going on. But other than the ocean, things are so damp and slow, so dampened and it's, there is an effect, I think, and in fact I can see an effect there. Or just reading about it there, these papers are interesting.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

BM: And, before I had the recorder back on you made a comment about models and why you don't think the models...

CM: I don't think that models work with shellfish, probably fish, because there are changes in the environment, in the habitats from year to year, storm, change in wind direction which you can't anticipate, and which have great effects on the animals, on recruitment, where the animals are going to recruit, and how important their recruitment is in terms of numbers of juveniles. And you can't, the model isn't helpful, of any use. There's too many changes out in the wild going on which a model could never anticipate. If those words are accurate, study of the models, you couldn't...in my opinion. And I don't think, somebody said sets up a model, "Well, now I know what's going on, I know if the wind changes direction, I can tell what's gonna happen."

BM: So it sounds to me like the work that you, your early, early exposure to fundamental ideas of, about wildlife management, and the importance of habitat really stuck with you, and you've developed that over your whole career.

CM: It's true.

BM: And one thing that has happened, I reflect on the Magnuson Act, is that habitat has been reintroduced into the federal legislation, right?

CM: Yup.

BM: And there's much more teeth to the legislation now so the habitat is being taken seriously. Even for fishes offshore.

CM: Well, one thought I had about going way back in time is that I remember in the first grade, my teacher had a calendar on the wall right beside the blackboard, and every day we would all say, "Well, what's today: sunny, cloudy, rainy?", and she'd write that on the blackboard. She made a point, first thing in the morning. So I became aware of the weather right then. And I think that was really important. Very early on.

BM: And then, having worked at sea, I mean, worked on scalloping and clamming, and lived by the sea, you become very aware of the weather.

CM: Oh, yeah definitely yes. Some days I couldn't go, we couldn't go, couldn't make any money.

BM: Well, thank you very much for the interview Clyde, I think this is really helpful to me, and I think other people will appreciate it too.

CM: This is, when are you going to do with this all now?

BM: Somebody will actually listen to it and transcribe it. And then you'll have a chance to look at it--

CM: Oh I can?

BM: --yeah, when it's transcribed, and then clarify some things and so forth that maybe spelling is wrong, or they got the wrong word, and then these will be put on the internet. I guess we can turn this off.