Dr. Carolynn Culver is an Aquatic Resources Specialist with the California Sea Grant and a Research Scientist for the UCSB Marine Science Institute. She is the principal investigator of the Culver lab at UCSB, which mainly focuses on marine invertebrate fisheries and aquaculture. Past projects include eradicating a marine pest, investigating the dynamics of invasive species (zebra and quagga mussels), and creating training programs for local fishermen. Current work in the Culver lab includes research on Giant Rock scallop aquaculture, Brown Box crab fisheries, and domoic acid in crustaceans.

Lauren

This is Lauren Jennings and Carrie Culver. Carrie, do you consent to being recorded?

Carrie

Yes.

Lauren

Thank you. Okay, Carrie, could you tell me a little bit about yourself?

Carrie

Sure. What would you like to know?

Lauren

Where did you grew up?

Carrie

Oh, I spent most of my younger years in Illinois. And then spent a little time on the East Coast and then ended up on the West Coast.

Lauren

Awesome. It seems like you have lived all around.

Carrie

Yeah, I got to experience a lot of different places, which has been really, really good.

Lauren

I've only lived in two places now. So, I've been a West Coast girl my whole life.

Carrie

That's not a bad thing.

Lauren

Yeah, I guess. Yeah, I grew up in San Diego, and then just came to Santa Barbara for college, which is essentially San Diego 2.0. I didn't really go anywhere too different.

Carrie

Actually, they are quite different.

Lauren

They are, they definitely are. But on a surface level, they seem the same.

Where did you go to college?

Carrie

I went to UC Santa Barbara. Three times.

Lauren

Did you enjoy going to UCSB?

Carrie

I did. It got better and better each time I went back. Three, three goes at it.

Lauren

So, you went to UCSB for undergraduate and then graduate, twice graduate? And then now you're here again, as a PI (Principal Investigator), actually.

Carrie

So, four times, actually probably five times. I've been twice for graduate school. I did a master's degree. So, between degrees, I went and worked for a while, between degrees and then came back when I felt there was a need for another degree.

Lauren

Yeah, seems like you must really love this place.

Carrie

It's nice. I never thought I would stay here.

Lauren

Really?

Carrie

Yeah.

Lauren

Why not? Are you surprised that you ended up staying here for most of your life?

Carrie

Yeah, very surprised.

Lauren

Are you glad you said it's worked out?

Carrie

Yeah. I mean, again, I've lived a lot of places. So, I know. There's a lot of really nice places in the US. Yeah, so I don't have any, you know, I've always wanted to go somewhere else, I think. But just given the profession, and it's not an easy place to get work. And that's true. It is easier than it was back then.

Lauren

Since you have to be near the coast?

Carrie

Yeah, yeah. Illinois was not really an option, even though I thought I would go back there.

Lauren

Okay, anyway, what field were your degrees in? Are they all in biology?

Carrie

Yeah, so I did aquatic biology for the bachelor's, then my masters and PhD were in EEMB.

Lauren

What interested you about marine biology?

Carrie

I think when I realized there was this other world in the ocean I became very fascinated because I liked the water. I swam a lot you know, in Illinois, but we didn't have an ocean we had a big

lake. Of course, that was very, very different. So I think the whole fact that there's this other world out there intrigued me, but it was one of my ideas for a major when I started my Bachelor's but I had other non-biology interests. So I wasn't set on it like some people know that's what they want to do. I went in doing the science track, swerved away and did business for a short time. I have always been involved with small businesses. So that was the other thing I realized, with farming the ocean, way back then that's of interest to me. Yeah. So small business and marine science.

Lauren

It's interesting how in the aquatic sciences, you get these intersections of different fields, like aquaculture and fisheries, and then like business and art and statistics. It's so interesting how you can combine so many different skills.

Carrie

And that's the thing, I love to encourage students, you know. It's like, don't feel like you just have to be a marine ecologist and be out working on a boat or at the beach. You know, there's so many other scientific fields, or even art and other things that you can even enter. We've made science into that.

Lauren

During your time in college did you do any research? Were you involved in a lab at all?

Carrie

I was. I was in the crab lab with Adrian Leonard and Mark pages. He was a graduate student at the time.

Lauren

Did you have any mentors back then? Anyone who influenced you and your career?

Carrie

Oh, yeah. I mean, I feel like a lot of people have influenced my track. Sure. I'm not gonna remember them all. But yeah, there's, I mean, a professor who's no longer with us at UCSB who really kind of opened the door and encouraged me to pursue aquaculture. That was my, like I said, my real dream early on. And then he led me to the person who has my current job, at the California Sea Grant. And that really changed my whole life. So you know, at Sea Grant, our thing is to work with the University and the fishing communities and bridge that gap to solve any issues. And so the researcher knew I was very interested in aquaculture. And so he knew the person that was my job. And then, right after I graduated, I was able to start working with that person. That was when I first started with Sea Grant.

Lauren

Was it difficult back then to get involved in marine biology or aquaculture science?

Carrie

Oh, yeah. Because there just wasn't as much going on. I mean, things have really changed. In the last 15 years, I would say there's so much more to focus on. Now, networking is probably the

key. You know, obviously, you need to be a hard, dedicated and passionate person, because a lot of people want to do it. So that also helps.

Lauren

Definitely, I know now, it's just so competitive. Just trying to get any jobs, even entry level jobs.

Carrie

So tough.

Lauren

But now you are you have your own lab, the Culver lab. So what do you what do you do in your lab?

Carrie

Well, you know, one side of it, right, the more biological side of it, which is, you know, studying Fisheries and Aquaculture, the basic biology of organisms to try and either protect them for fisheries or enhance them for culture. Right. So that's, that's my, that's always been my drive, that's my biological side of life. But through my work, I, you know, had been able to do a lot more about the human side of things. So not just fisheries as the resource and the fish themselves, but the people that rely on those for their livelihood, and for consumption, you know, and the consumers, all sides of it. And I really enjoy that part. It really drives home, why you're doing some of the things you do, maybe like that. So there's a whole side of my lab that you don't know too much about, that has to do with Seafood Marketing, and, you know, trying to

work on harbor infrastructure. And then there's citizen science and beach profiling for which again, that was more driven towards engaging people in science.

Lauren

Yeah, I've definitely heard about at least some of those, especially working with fishermen. That was something that was part of the Box Crab project. And I know that you develop training for fishermen, right?

Carrie

Yeah. So, you know, they're out there on the water every day, and you would not believe what sponges they are in the sense of their thinking and absorbing, they are truly scientists at heart. Because the only way they can fish is to figure it out. And how they can figure it out is to track all these different variables. I personally feel like they're smarter than most academics. I would absolutely believe that. And I learned so much from them, that I worry sometimes with projects that they're not learning anything from me. Which I know hopefully, is not the case, but it feels like that sometimes.

Lauren

I mean, this speaks to the worth of practical knowledge. I think that's something that a lot of academics, at least from what I've observed with my generation, don't necessarily get as much since we're so focused on, you know, getting good grades and taking tests that we don't necessarily expand ourselves enough to learn the practical side of things as well.

Carrie

Yeah, I mean, it's just a different world. I feel like it's always been that way, right? You have the academic track. And then you have kind of the practical, you know, on the ground track. Definitely, so to speak, right. And so that's what I do. I like that about my job too, is that I have to go between, like, I need to be on the ground with these guys helping right. And to me, I am learning from them as much as they are learning from me. So, it's fun. Everybody has something to share. I feel like knowledge. So, it's effort I really enjoy.

Lauren

So earlier you gave a good overview of some of the broad topics that we cover in our lab. But what are some of the projects that you've done, and are there any that are your favorites?

Carrie

The Giant Rock Scallop aquaculture will always be something I'll be passionate about. I really want to share that with more people. Yeah, and I've done a lot of work on training fishermen. I've done a lot of work on trying to help gather information to sustain fisheries. Anyway, so I've you know, been able to work on a lot of fun things. And tasty things.

Lauren

Yeah, that's definitely a plus of being in your lab is being able to occasionally take home free seafood. Like the bags of crab legs and claws.

Carrie

Yeah. We can't waste anything. We make it worthwhile. Absolutely.

Lauren

I mean, when we were dissecting so many box crabs, like, if we just throw that away, it would be hundreds of dollars' worth of crab down the dream.

Carrie

Yeah. I do like to minimize that amount.

Lauren

So, we have the rock scallop project; the rock scallop project is an aquaculture project focused on figuring out how to culture the Purple Hinge Rocks Scallop. But what other projects are going on in your lab right now?

Carrie

So, there's a couple of projects dealing with the domoic acid issue. Which is this natural toxin that will bloom occasionally, in different places, that can be a problem for fisheries, because if the toxin is consumed by humans it can make you sick or even kill you. So, it's a serious thing. But it hasn't luckily, been a problem in terms of making someone sick yet. I think there's a lot of different reasons for that. Yeah. But yeah, so I have a couple of projects are going on that look at how the toxin gets into the crabs and lobsters. And what they are eating that transfers that toxin. And then, looking at how fast they uptake it, how fast they can get rid of it, and if there are ways

we can help them get rid of it, in the hopes that we hold the animals for a week or two and have them get rid of it.

Lauren

Do you have any ideas of ways in which we can help them get rid of the toxins?

Carrie

Well, the project is to look at things like temperature, because usually the warmer the water is, the more they excrete, and the higher their metabolism is interesting. There are some things about certain diets. So, what I would really love to do is find a laxative that would just make them get rid of everything. I haven't figured out what that is yet. But we're looking at different diets and how that might increase their excretion rate. Yeah, and then just air exposure, expose them to air for a short time. And when you put them back in the water, they'll excrete more.

Lauren

So, say in the case of the lobster fishery. If you figure out say, like, giving them this diet makes the lobsters pass all the acid within the fishery, would you fish the lobsters and then like, feed them that diet before selling them?

Carrie

Yeah. So that's, that's the concept. So right now, with certain bivalves, like clams and mussels, they, they can go through a process to get rid of sand. So it's the same idea, that you just hold them in a different system for a short time, then sell them at the market. So it's kind of the same

idea, except it could be, it will be a bit more labor intensive, because lobsters are so much bigger, and they don't filter feed, right. So you actually have to feed them. But for instance, with the rock crab, they were not able to fish them for like nine months, because they kept coming up with this toxin. And if you could clean them out in 10 days, then that wouldn't happen. So it'll be interesting to see number one, if anything works, but then if it does, how fast can you make it work?

Lauren

So, has your research changed at all since you first started as a PI, when you first got your own lab, to now, when you're well established? Have your interests changed? Or your research changed?

Carrie

Lots of fun questions. Let's see. So my interests, I would say, have always been extremely broad. And I feel like they've probably broadened even more, but I think it's that I'm just being exposed to more. But in terms of my lab, yes. And you know, it's grown a lot, I have done a lot more than biological projects. Early on in my research I did a lot of invasive species or research. So it was very biological, biologically oriented. And now, as I mentioned, it's gone in a lot of different directions. And it was, you know, I always had those interests, but at the beginning it was a new job and kind of fit the biological side. And then just through networking and collaborations, things have expanded as well.

Lauren

That's awesome, though. I mean, this lab has a very diverse amount of, I suppose, like topics within marine biology that we address. Some labs, like really, really narrow in and focus in on little details, but we do all sorts of stuff. And switch things out a lot. So it's never boring.

Carrie

Well, I think it's, it's just a difference in the job, too. So, you know, some people do specialize, which has its advantages there. But because my job is also to help California handle issues, coastal issues, it's always changing, and I have to respond to those changes. Definitely.

Lauren

What are the most influential contributions to marine biology that the Culver lab has achieved? Or alternatively, what are you most proud of in your work?

Carrie

Yeah. I mean, I just, I always wonder how useful some things we work on are. So that's why I'm kind of hesitating, because I'm like, I mean, we do a lot of practical stuff as well. I mean, there's a lot of data we've collected that has been used for management purposes. You know, with the fisherman collecting with our lab, with both groups working together in aquaculture. There's been some discoveries, you know, that have been made that hopefully will be helpful. Especially with rock scallops, which are not cultured yet, so, yeah. Hard to be proud of it when it hasn't made it to commercial levels. So I feel like in a way, I'm not doing anything different. And yet I am and it has changed. That hasn't been the same thing over all the years. But it's hard to know,

sometimes it makes a difference. So that's probably one of the hardest parts of the job. You think you're doing some things that help but you're never quite sure.

Lauren

Yeah, absolutely. So switching gears a bit. A little bit more towards like the mentoring side of things. So how many students do you typically have in your lab? I mean, undergraduates, graduate students?

Carrie

It really varies. Obviously, with the pandemic, things change. Yeah. But, you know, I typically don't have many graduate students because I usually only take them on if I have full funding. I only have one, typically. And that's hard, because of my, my types of projects. And it also supports master's degrees, usually, because they're not the long term types of studies. For undergrads I would say, like, maybe five or six on average. You know, like right now we have a couple projects now that we're coming out of the pandemic, right and trying to gear back up. But we're on the cusp, and as soon as we get some of these techniques worked out I'll probably need three or four more people. So it's just kind of depends.

Lauren

It seems like you also hire research techs.

Carrie

Yes. I try to. I have to say the pandemic really has thrown a wrench into the lab. But it's been hard to come out of it and get back to where things used to be.

Lauren

Yeah, I think that's how a lot of people are feeling right now. But with things, I guess, fingers crossed, kind of getting back to normal, there's definitely plenty of interested undergraduates. Like the past year and a half or two years they have missed out on being in a lab. Like, students probably normally approach you to be in your lab, like, often. But now I think there's definitely people out there who would be interested in working in labs.

So since I am in your lab, I consider you to be a mentor. But do you consider yourself a mentor to the students in the lab?

Carrie

I, I did. Again, I feel like the last two years, I haven't been effective. I used to be, but hopefully I'll be able to get back to being a better mentor. I really do like the one on one engagement, and having discussions with groups. I don't feel I've done very good job of that lately, in the last few years. And of course, it's been hard, we could only have one person in the lab. So it's been very difficult. But I would say in the past, I hope I've been a good mentor, because I feel like it's important to me. I don't want to just hand somebody a list and say please do this. Whether they're paid or not. I think it's really important to have engagement and talk about things.

Lauren

I don't agree that you haven't been effective. I mean, I only worked with you for about a year before the pandemic. But I think that you've still done a great job of mentoring during the pandemic. I know I mean, I didn't really start working closely with you until the pandemic. That's when I switched over to the rock scallops project, in 2020. So yeah, that whole time period, I got to come in and start working on campus during the pandemic and meet with you. And I feel like you definitely are a mentor to us, to the few undergraduates have been able to stick around during a pandemic. So I wouldn't be hard on yourself, because you definitely influence all of us a lot.

So, how do you approach mentoring students? Like, do you have any sort of strategy you use?

Carrie

For me, mentoring is about teaching people, but I think it's also about listening and engaging people, which means you're not just telling them what to do. I know I already said that, but I guess that would be my style. Or my approach.

Lauren

Definitely. I've definitely observed that as well. I mean, I worked in the Hoffman lab for a little bit last summer. And it was just wild to me and seeing how different of a structured lab they had and how they approached mentoring. I didn't realize you could have such different styles as a mentor.

Carrie

Well, it's hard because doing what I do takes more time. But I still like that strategy, that where people feel engaged and can ask questions.

Lauren

Yeah. Let's do one more question. What advice do you have for undergraduates in marine biology?

Carrie

I think to try as many things as you can. Because again, I feel like we do have a very heavy field-based marine biology department, which can be really fun and exciting. But it's much harder. I think, once you get out, there's more competition, you can only go so far in that, that arena, even in terms of your professional life, definitely. But there's so many other areas that, that you can integrate marine science. So keeping an open mind and trying different things, I think is really important. And even just research in general, like if you like research, there's other fields that do research. So not feeling like it has to be marine biology. If you have that passion, and you know, that's what you want, that's great. Further evaluating the areas that really excite you will be good and having the passion will really help. But it is difficult. I mean, I think it's easier now than it used to be. Which is kind of funny, because I know, others are like no way. There's so much more competition, but there's also more opportunities. And so it's probably really exactly the same, right? I do think it's important to keep an open mind and try different stuff. Even if it's not marine science. I mean, I don't want to discourage anyone because I think if you really feel that's your passion, you'll go far. But, just keep an open mind that there's lots of different exciting

things out there. You know, go do an internship or volunteer on some other project just to try it out. If you have the time and you can do it I think it's very helpful.