

Dewey Livingston: This is an oral history interview with two members of Cordell Expeditions who participated in the historic dives on Cordell Bank in the early 1980s. They are Bill Kruse and Tom Santilena. It is October 28, 2010, and this interview is taking place in Inverness, California. As lead interviewer, I am Dewey Livingston on contract with Cordell Bank National Marine Sanctuary.

Jennifer Stock: I am Jennifer Stock, the education and outreach coordinator with Cordell Bank National Marine Sanctuary.

DL: So, if the two of you would state your name and spell your last name, please, to get us going.

Bill Kruse: So, my name is Bill Kruse, and my last name is K-R-U-S-E.

Tom Santilena: My name is Tom Santilena, and my name is spelled S-A-N-T-I-L-E-N-A.

DL: Okay, thank you. We will move that a little closer. Okay. Well, to begin with, if you would please tell a little bit about your personal background. Meaning, something like your birthplace and hometown and general education.

BK: So, this is Bill. I was born in Palo Alto, and I still live there. My father was an engineer. I went to school and became an electrical engineer and designed hardware for many years for microwave testing like my father did. But I got a college degree in electrical engineering, and evolved over time so that – actually, the exploration of Cordell Bank became a way to transition my career from hardware to computer work and computer mapping. So, I find Cordell Bank has been a significant part of my life.

DL: Tom?

TS: This is Tom, and I was born in Alameda, California in 1949. I think I'm older than Bill. I went to school and was raised in Alameda. I went to college in Berkeley. That's not Berkeley Campus. It's Armstrong Business College. I became an accountant, and I've been financial controller for about four companies now that I worked for. Bill and I have been friends for thirty-eight years. That's why we kind of stick together.

DL: Did you have personal interests other than diving that might have related to your future diving interests?

BK: Diving got us involved with Cordell Expeditions, but our interests were in projects related to diving, and all of the things that went together and needed to come together to do a project

versus just going to Monterey, jumping in the water, looking at the fish, shooting a fish, taking a picture and such. Also, I was interested in underwater photography long before Cordell Expeditions. That provided an early excuse to go diving and to travel. It was a great excuse. But as time went on, just going into the water and taking pictures was not quite enough. Before Cordell Expeditions, Tom and I and several other people actually had a project of our own where we explored a cave, Bower Cave, in the mother lode of California, which was first explored by John Lindbergh and Ray deSaussure back in 1952 and was on the cover of *Life Magazine*. So, we found out as something to sort of suck us into a project, and we spent ten years diving there and doing, I'll say, pseudoscience. We were not scientists, but we were interested in documenting what we found. We collected a number of new species – amphipod, planarian. We had reputable scientists at the Smithsonian and Old Dominion University do the description. So, we had some experience in trying to document and do scientific work in the environment of a project exploration, and an adventure actually, to be frank. It all tied together. When that project ended, we looked for something else interesting to do, which is pretty much how we came together with everybody else, which we'll probably talk about later.

DL: Did you have to train, have any special training to do the cave diving? Which sounds very dangerous to me.

BK: We did the training pretty much on the fly as we figured out how to keep ourselves safe. We did a lot of work in the ocean – training dives in actually Monastery Beach, which we used for Cordell Expeditions as well, because it was deep and it was dark. It was challenging, and we did double – tried out new gear, lighting equipment, and tanks. But of course, at Monastery Beach, we could surface. In the caves, we couldn't. So, we figured it out as we went, because we really had no experience before we started doing it.

DL: Anything to say about that, Tom?

TS: Well, for me, in beginning to dive, it was my brother, actually, took me on my very first abalone dive in 1967. In fact, interesting thing is John was also on the first dive with Bill and I, though he didn't show up for that particular evening. So, after I went in the service and came back from Vietnam, I had always wanted to be a NAUI instructor, and in fact, had studied to be a NAUI instructor while I was in the Army, and came back and did that. So, for the next two years, it was all teaching and sport diving, and as Bill said, doubles diving at Monastery Beach and other places to get you ready to do things. I think that probably, the important thing for me and Bill on Cordell Bank Expeditions is we had so much experience using equipment. So, equipment management was easy for us, because whenever we went anywhere, we load everything up someplace, you'd tear it down to set it up for diving, then you put it into the water. Then you have to tear it down again and then load it back up. So, equipment management was something that, through osmosis, just had to do, you had to do. So, after doing all the sport

diving and the teaching, I met Bill right after the Army – in fact, the same month that I got married. He was doing the projects at Bower Cave. That's when we started to get in on expedition-type, project-type diving. Once you do that, sport diving – I don't know if I ever did sport dive again after that. Everything was pretty much in preparation for whatever we were doing or whatever project. I think you forgot one project that was worked on, and that was the sea otter. That was a big project for you. Bill actually got to tag sea otters to mark their migration patterns. I thought that was pretty interesting. The other project was the nudibranch project where we were making a film about a tube worm and a sea slug. It was really quite a dramatic sequence. We did that for quite a while, too. I would consider that a project. So, there were more projects than just Bower Cave. Although, Bower Cave is memorable, because if anything goes wrong, you are no longer. [laughter] You're gone. So, an exercise in really believing in your equipment, because you are at their mercy. We always bought the best, because if you put your life on the line, you want the best.

BK: So, Tom and I actually both became NAUI-certified diving instructors at different points in time. But that was in our background too. That was sort of the transition from just sport diving to semi-professional, though I never really taught. Tom worked a little bit more at it perhaps than I did. So, we were evolving our understanding of what needed to be done and how to do it over time. We didn't know what we were doing. We didn't know what we were planning. But we wanted to do more than we were doing. So, it was kind of the general motivation.

DL: This was the 1970s that we are talking about?

TS: Yes. [19]72 with Bill is when I started with Bill. Bill had done other projects before. I think Lilburn Cave was before you and I.

BK: Actually, it was afterwards.

TS: Really?

BK: Because we couldn't get access to Lilburn Cave and Sequoia National Park. Paul Hara, who was involved in Cordell Expeditions, and Mike Green and I tried to get access to a cave in Sequoia National Park. We applied, if you will, and they said, "You don't have any experience." So, we found another cave that we spent time at and got the experience, and proceeded to actually go back to Lilburn Cave. To this date, I believe Paul Hara and I and Tom and – maybe Tom and Mike Green.

TS: Yes, Mike Green.

BK: Probably less than a half dozen people have ever dove in that cave. There are still people

looking to dive in the cave, and they call me every decade or so. But as far as I know, nobody ever has actually been back in again. So, we did some things that probably were beyond our capabilities, but we incremented gradually up, because we didn't know what we needed to do. In essence, this was good training for surviving Cordell Bank, I think. Not planned, but still coincidentally useful.

DL: For the record, could you spell Bower Cave and Lilburn Cave?

BK: Bower is B-O-W-E-R, and it's near Highway 120, near the entrance of Yosemite National Park.

DL: Lilburn?

BK: Lilburn is L-I-L-B-U-R-N. The group that was running that project was Cave Research Associates. Bruce Rogers, who's still involved in caving, is still involved. Used to work for USGS.

DL: Now, did you do ocean diving as well?

TS: At what point in time?

BK: Before going to Cordell.

TS: Absolutely. We've been diving since 1972 with him, and he was diving before we met. I was diving well before we were met. So, both of us had been diving for a long, long period of time before Cordell Bank. A long time.

BK: I got certified in 1965, and got certified as an instructor in 1969. As many of us get fixated on our hobbies, we were in Monterey almost every weekend as soon as we got the driver's license. So, we know every dive site in Monterey, I believe, except the ones accessible by boat. We know some of those too.

TS: That's right, that's right.

DL: Well, then getting to Cordell and Cordell Expeditions, and in preliminary to preparing for your first dive, could you tell, both of you, how you first found out about Cordell Bank? Had you heard of it before?

TS: Well, after we were doing the cave diving, in the record, there's a Paul Hara. Paul Hara had read something in the public record that there was going to be a meeting of people trying to get

together to do a project. So, Bill, me, and Paul went to that meeting to see what it was all about. Was it there that we had to do a resume?

BK: It was at the Cal Academy where the meeting was held. You probably have the records, Jennifer. I don't remember the details.

JS: No, but Bob brought it up during his interview.

BK: But the three of us from the Bower Cave project came and said, "This looks interesting and challenging. Probably nobody else will be there." There were a lot of people there. We were sort of like, "Oh, boy. How do we get involved with all this competition?" So, we all went away and actually wrote resumes to apply to this job, if you will, this project. We were a little crazy at that point, and perhaps more so than we are now. Surprisingly, Bob said, "Well, come on over." I think it had more to do with the fact that we actually came over than the resumes. But we did have some relevant experience. In fact – this may seem a little immodest – probably among the people we were applying to, we probably had more technical diving experience in those days. It doesn't compare to the capabilities now, but in those days, we probably had more deep water, double tank, dual regulator type experience than anybody else at the time – in this group, anyway. So, Bob said, "Sure." The fact that we were crazy enough to keep coming back probably had more to do with it than anything else.

DL: Is that the similar...

TS: It's exactly the same. I don't remember Bob all that much, but I do remember all the people that were there, and the corners and the equipment that they brought in for show and tell. It was presented in an official – and very well done. It wasn't just people getting around and talking about it. There was a purpose involved, and the purpose was fulfilled.

BK: As we know, Bob can go on, much like we are, a lot. He did so that night. It sounded very interesting, exciting, and official, perhaps much more than it really was. Don Dvorak was one of the people there and had his camera setups out there. We scratched our heads and said, "These guys really know what they are doing." So, perhaps we were a little snookered. But in the end, we all found a way to work together to make everything happen. But it was quite an interesting evening because we were all trying to feel out each other to see is this real, number one. Do we want to get involved in this project? Boy, it sure looks interesting, but it also looks – with lots of unknowns. So, there was this tension on do you get involved and is this worth doing.

DL: My understanding was that meeting was in 1978 preliminary to a 1979 dive. Do you have a handle on the dates?

TS: It was 1978. I remember that pretty distinctly. It was the tail end at...

JS: Can I ask what was presented at that meeting? Was it an official expedition? "This is what we want." Bob wanted to explore Cordell Bank? What was presented?

TS: That was presented, Bob giving a speech as he frequently does. He tells his intentions and tells what he wants, what he thinks you need to put some of this together. There were all these little ideas that people had, most of which were not ever used. But it was all important to find out who the people were, who's going to really be interested. Are you just a sport diver curious, or are you somebody with a little bit of experience? So, it was a feeling-out process for Bob. I don't think Bob knew at that point in time he'd be able to get anybody to go on something like this. So, it was put out there to really fish around for people.

JS: About how many people were there?

TS: I seem to remember maybe twenty, about twenty people.

BK: I seem to remember more, but it's a really vague – it seemed like a lot of people for something that was still so preliminary. But there was a lot of interest. I believe it was in the *San Francisco Chronicle* or *Examiner* was a news story, and that's how it was announced. So, there was a lot of exposure to at least the fact that there was a meeting. Diving was a real popular sport at that point in time. A lot of people were taking classes and getting involved and looking for something beyond going to Monterey on the weekend. I think it was in everybody's mind who came that night.

DL: So, what was your impression of Cordell Bank before that meeting? Did you know anything about it?

TS: I did not know anything about it. I had no impression. It was just an opportunity to start a new project and discover along the way.

DL: Go ahead.

BK: I had never heard of it. I looked at a map, and it was the old chart. It looked really far out and deep and difficult. It was a little intimidating, frankly. Actually, it was a lot intimidating.

DL: Did you take part in then the planning of the first dives?

TS: I think everybody, to a degree, took part in the planning. I don't think anybody knew how it was going to come out. Everybody had certainly their opinions on how it should be done. But I

think in the end, it just came about by itself. If you're talking about on the boat directly, that's when it all came together, because Bill and I knew that we were going to be the first one. It was my Zodiac. So, we knew from that standpoint what was going to have to be done. I mean, it evolved like a normal dive for us. It was pretty normal equipment. It's just that we were probably a little bit more confident than the other people to actually do it. So, we really just got there. Once we were there, we did it.

DL: So, you are saying there was not a lot of preparation, meetings, to this...

TS: I'm sure there was a lot of preparation and meetings. But when it comes down to it happening, it happens completely different than what you planned.

BK: We did have meetings, though I don't remember them in detail. I'm sure Bob has them documented in a box somewhere. But we did do practice dives in Monterey with the gear, making sure we could doff it and don it and get in through the surf. Also, I think we actually took the boat out as well and fell off the boat and got back into the boat and tried to simulate as much as we could in Monterey the types of conditions. But I don't remember feeling as confident in our capabilities as Tom seems to remember when we went out there. It seems to me, in my memory, that we made several trips out there before we actually were able to dive that season. We didn't know the weather window. We didn't know currents. So, it seemed like it was getting iffier and iffier as each trip occurred. We were starting to wonder if we really knew what we were doing and knew if we could do it. So, I wasn't as confident as Tom seems to think he was.

TS: I actually skipped the beginning part. There was a lot of preparation in terms of practice dives and this sort of thing to make sure that – what really were the capabilities of the people who were there? Were they capable of doing the things that they advertised themselves for? How good of a diver are you? Bill and I can look at people and pretty much size them up on what their capabilities are. Yes, there was a lot of preparation. Whenever we go out, Bill's right, we didn't get out there and jump in the water and go to the bottom. There were many things, many times and attempts to get out there. But I think the thing that was most intimidating was the weather. You never knew how the weather was going to be. Coming out from Drakes Bay around the Point, the weather is always – not the weather, sorry, but the conditions of the sea are always a bit lumpy there until you get beyond. So, you never knew what you were getting into until you got there. Then the problem was, can we find this place. That was what took the most problems. That's what ruined or made a lot of the dives unsuccessful or trips unsuccessful, because we couldn't find it.

BK: So, I'll have to correct you. In the early days, we came out of Bodega Bay exclusively.

TS: Yes, that's right.

BK: Because that's where we could rent a boat and a skipper who would take divers out, which was pretty unusual.

DL: Now, Bob definitely had his goals for this expedition, and what turned into an official expedition. Did you have any particular goals or something you wanted to get out of it?

TS: I just wanted to have fun and go into a project. That's my only preconceived desire and goal, just go out and get it done.

BK: So you didn't have to do yard work. [laughter]

TS: It's better than yard work. It's harder than yard work, but much more interesting.

BK: I was interested in the photographic opportunities. I'm still an amateur photographer, but I love to do it. So, I was interested in taking what we learned in the cave diving and applying it to the offshore diving. I mean, I've done photography all over the world and in Monterey a lot. I've traveled before this. Cordell Bank was a place that nobody else had been before. So, it seemed like an opportunity to get the first pictures of some place where nobody had been. You think back to the moon landing and think, "Nobody's ever been there." Well, nobody had ever been to Cordell Bank before, at least that we knew at the time. So, that was the spirit of adventure for me, other than just the mechanics of doing it all, which, of course, I get into. We'll probably get into this later, but it evolved into actually mapping the place. That, to me, became, other than photography, the most important thing for me.

DL: Now, you mentioned the chart. All you had to go on then was that one chart? How was it approached to find this place if all you had was a chart that did not give you a lot of confidence?

TS: Well, we were depending totally on Loran and our just general direction. I guess Bob had been there before, so he knew generally where it was. But in those days, it was by the seat of our pants that we would get out there. I think the first was Loran-A, and then it got to the more sophisticated. What was it Loran-C?

BK: We actually depended upon the skipper of the boat that we rented initially and whatever navigation equipment he had, be it a compass, be it a finger in the wind, or be it a Loran-A or C. None of these things seemed particularly reliable, and the shallow point on the chart was a dot, twenty miles out the sea. That was just a little hard to imagine finding. It actually amazes me that it was found, and it was because of the skipper and his sea sense that actually brought it together. But finding it again over time, we continued to evolve our methods – of course, until, I

think, just about on the last trip in 1986. We actually had one of the first GPS systems, but only for two hours a day, because there weren't enough satellites up there. It required a huge nineteen-inch rack of equipment and also an engineer from Motorola to operate the thing. So, as time went on, the navigation improved. But by the time we essentially ended our intense efforts on the project, we still didn't have what we have today, which can put us right on the spot within meters.

JS: Do you remember the date of the chart, the NOAA chart you were working with? Was it a NOAA chart you were working with?

BK: Yes.

JS: Do you remember the date of that chart?

BK: No.

JS: It was pretty early? It was an early chart, though?

BK: It had to be like 1975 or something like that. I probably still have it, but I don't remember.

DL: Now, you have spoken of your experience in diving in risky places, and that you have never been to Cordell Bank. What were your safety concerns?

TS: I think the biggest safety concern once we got out there was the tanks and things moving around, just basically being able to keep up with all this equipment. As you came out, you just saw this array of tanks, regulators, weight belts. There was just all of these things and all of these people who you never really dove with very much before, so you really didn't know. To me, that was a little bit intimidating. Could you pull all that stuff together? Because it all has to get together in this neat little package before it works.

BK: My concern was slightly different. It was farther out to sea than I had ever been before to go diving. You could barely see land on a clear day. If we had a decompression problem, we really didn't have a way to deal with it – immediately, anyway. One could call the Coast Guard, and that would take a long time. One could go to shore, and that would take a couple of hours. So, you had a minimum of four to six hours to get appropriate help. We looked into renting chambers, and the technology just wasn't there for a small boat, nor did we have the resources to do it. So, decompression sickness, just being out there and getting lost, not being found when you surfaced. That led to many discussions about the descent line and buoys and ways to keep track of things. This is before you had whistles and horns and scuba tubas and stuff like that to catch people's attention. But even so, on a foggy day, even with all of those things, you might be

in the boat, which – first, we started anchoring, and then we evolved to line boat situation. You couldn't see the buoy, because the fog was so thick. So, getting lost at sea, or getting injured and not being able to get the help, and the depths, all the things that could go wrong, and you didn't really have a backup plan that was reasonable, those are the things that concerned me. Quite frankly, at 3:00 in the morning, they still concerned me, thinking about them. But when we got out there, we managed to overcome them. We were smart, but I think we were lucky too.

TS: I think, for me, it's because I wasn't smart that I wasn't worried about these things. We knew the Navy dive tables. We devised these little pole T apparatuses with tanks strapped to them. So, if you could get to them, you could decompress. We knew we weren't going to be down the bottom that long. So, not being smart, I had faith. So, to me, it was a leap of faith, and I really wasn't nervous about that. The more that was nervous is going down, down, down in that deep, deep, deep, deep water, not knowing when you're going to get there, if you're going to get there, and what you're going to find once you do get there. I guess we'll get down to the first dive when we get to it further along.

DL: We are almost there. Who was there on the first successful dive? Can you pull that out of your hat, and a little about them?

TS: I remember Paul was there. I remember my brother, John, was there.

DL: Paul Hara?

TS: Paul Hara. He was there, wasn't he?

BK: I can't remember.

TS: Paul was only there for a short period of time because he suffered from seasickness. He just didn't want to do it anymore. My brother was the same way. He suffered from seasickness. I don't think that's a reason why he stayed away. I think that's just the way it happened. As far as the other people, I'm sure Harry Sherman was there. I'm sure Bob was there.

BK: Dvorak.

TS: Don Dvorak was there. That's a long way ago, a long time ago. I think there were probably some other people, because there were always a lot of people there. But I can't remember who all they were.

DL: Did people in that first expedition – I am assuming that the first one was a trial, was a figure out how we are going to pull this off. Did people have specific tasks that they were assigned for

that dive, or was it pretty much everybody was equal?

TS: Well, for me, it was getting the boat ready. It was my boat, and we had to be able to get it blown up, over the side, get the motor on there. So, mine was pretty focused in that one area.

BK: So, that's surface issues. Of course, we all brought our tanks and our equipment and stuff. I think this is what I thought was being asked, is, on the first dive, we did each have tasks. Tom and his brother, John, and I, on the first dive that we did, which was the second year – there had been a previous dive. But this was the first dive where we had a larger group of people involved. I believe I had a camera, but I can't remember now.

TS: I assumed you had a camera, because you never went anywhere without a camera.

BK: The goal was, all three of us, to get the anchor positioned for subsequent teams. Tom was to collect sediment and shoot macros. John also had a goodie bag to collect samples. So, we had specific tasks, and they were very limited.

TS: But they were planned ahead of time that this is what we were going to do.

DL: Then on the day before the dive, in the night before, how did you feel approaching this unknown? Did you sleep well, for instance? What was going on in you as you approached that day?

TS: The night before, not much. The day of the dive, the same thing I have every time I go into the water, and that's butterflies. I always had butterflies until I hit the water. But once you hit the water, there's no time for butterflies. But I was always nervous in every dive I've ever taken outside of just sport diving.

BK: I don't actually remember. But I can imagine, based upon how I feel about everything I do today, that I was thinking about it all night long and probably didn't sleep too well. I believe we left shore early, so we had to get up early, and I'm a late sleeper. So, I was concerned, but we had done so many things before, it wasn't a fear. It was more like, "Oh, geez, it really sounds like a lot of work." We don't quite know how it's going to work out, but we want to live to be old and cantankerous. So, we've got to do it right. So, I know there was some trepidation, but I actually don't remember.

DL: Now, we have been talking here then about the days, months before your first dive on Cordell Bank. Is there anything else that comes to mind before we move on to that first dive, of a subject or a story that might come up?

TS: What sticks with me, and I'll never forget it, is all the equipment getting loaded on the boat. It was just lines of people passing each other. You'd pick up something heavy, come to the boat. Usually, it was dark when we started out, because we had to get there with some reasonable time left over in the day. I always remember that, the boats, the tanks, the people, side by side, passing shoulders to get everything on the boat. I always remember that.

BK: My biggest concern – and I really wasn't involved with it much, Bob took care of most of it – was, are we going to even have a boat? Is it going to be a boat we can actually live with? Is the skipper going to be somebody who's willing to work with us? That actually concerned me, because it seemed like the most critical thing. Beyond all the things we had control over, we didn't have control over the boat. For many years, we didn't have much control over the boat until Bob finally bought a boat. But that was two or three – maybe at least three years later. So, that was the big unknown, because the skipper might not show up, or he might change his mind after you put all the effort into it. So, that concerned me beyond just the diving and the planning and stuff. Why did it concern me when I wasn't responsible for it? I wanted the boat to be there, and I had no control over it. So, I was worried about it.

DL: We going okay here?

JS: Yes.

DL: Well, your first dive on the Cordell Bank for the two of you, you just said that you did not dive the first of Bob's dives. So, do you mean this was a week or two later or was this the next year?

BK: The first dive was in 1978, I believe, and I don't remember the month. The meeting at Cal Academy took place after that. So, they were able to present that we have dove on Cordell Bank and it is there, and we got this anchor. They had been working on it for two years, and they had gotten one dive in, in, I believe, 1970. Probably the fall, I'm not sure. The meeting at Cal Academy, I think, was October, late October, or early November, if I remember right. So, we had a year before the next weather cycle. I'm not quite sure whether we knew the weather cycle when we did the dive. We'd have to look back. So, this was a year later, in my recollection, between when the first dive was and when we had a larger, more organized group to do it.

DL: So, this would be October, roughly, of [19]79, just to get this clear.

BK: I would assume so.

TS: Was it our dive?

DL: Yes.

BK: Yes.

TS: Yes, it would've had to have been about that time. The weather window was from September...

BK: I was in Alaska all summer. So, it couldn't have happened in the summer of chasing sea otters.

TS: It's within a three-month window. There's no doubt, because we wouldn't even dive until September.

JS: We can double-check Bob Schmieder's record too, because he mentioned the first day.

BK: Sure.

JS: He got it down to the day.

TS: That's Bob.

BK: Well, he's a detailed person. [laughter]

TS: That's right.

DL: Now, your first dive – adjust that a little. How about if each of you just tell the story of your first dive, everything in as much detail as you want to go into, from looking down to the water, the descent, what your tasks were, what it was like.

TS: Well, of course, the task, as always, is to bring up samples. Pictures are wonderful too. I brought a little Nikonos macro camera with me. For us, it was the very first dive. I remember we went down the anchor at that time. We thought we'd set the anchor. You'd go over the side, and I remember it was just crystal blue. It was so blue. I couldn't believe it could be that blue, because we're used to low-visibility areas. We'd go down this anchor line in the blue, and it just went off into nothing. You could see nothing. It just disappeared. As we went down the line there, it would start getting darker and darker and darker. The further down you go, the sounds of the bubbles change. At first, it goes [imitates bubbles] like they do, [imitates bubbles]. As you get further down, they start getting higher in pitch, [imitates sound]. Then we get into the dark area. Now, you don't know where the bottom is. You look up, you can't really see the top, and you're in it now. I remember thinking, "Where's the bottom? Where's the top?" Then we

just kept going down, going down. Eventually, you'd come to where you could see the bottom. Maybe it was sixty, eighty feet below you. But the reflection of whatever light was left would shine off the sand at the bottom, and things would get more illuminated. So, we started going further down, and all of a sudden, we noticed that the anchor was floating freely. It was not anchored at all, and it was just going further down into the blue. If we didn't do something now, it was never ever going to get done. So, it was at that time I just decided, let's just go for it. I went as fast as I can, as I could, to get to the bottom. The narcosis was just really, really screaming at that point in time. Basically, I just went down, and it was 205. I remember getting down to the bottom. I don't know why I had the wherewithal to look at my depth gauge, but I looked at my depth gauge, and it was 205 feet. So, I knew that this was much further down than we needed or wanted to go. So, I went down as fast as I can, shoveled sediment – or samples, as we would call them – into my bag, reached over, snapped a picture, snapped a picture, and then got out of there as fast as I possibly can, because now, we're in free water. There is no anchor line. We're just coming up free. We had to deal with that thought process going up. There are no little T-bars with scuba tanks on them for decompressions. You had to somehow, in the rough seas, take care of yourself. So, you were totally, totally on your own. Knowing this from the time you were going to leave the bottom, knowing there was no rope, that's when things in your head really start to go. When you're narced out, things are always intensified. More questions have been asked of me on what is this nitrogen narcosis. How does it feel, and what does it mean? All I could say about narcosis is it's predictable, because everybody gets it. Everybody gets narced. Maybe at different times, and different days, it's worse than the other. But it's always there, and everybody knows it's going to be there. So, how do you prepare for something like that? In my book, you have to prepare. You have to know exactly what you're going to do so you don't have to make any decisions and just do it. Now, for me, it's extremely simple. Get in the water, go down, take picture, scoop, come up – just as simple as you possibly can get. Now, the real heroes are the photographers, because the photographers, of course, who make the beautiful hall here, beautiful for people to come in with all the pictures, they have the same thing that I had. But now, how do they plan for their dive with all these unknowns going on? They've got to position the strobes, shutter speeds, aperture, all these decisions that you have to make on the fly at the same time you're all narced out. So, these are the people that had it harder than anybody, and they're the people who made the sanctuary alive. So, to me, the photographers are the heroes.

BK: Thank you, Tom.

TS: You're welcome.

BK: That's very nice of you. [laughter] I guess I'll have to pay you. No. I remember it similar to Tom, but different as well. We had attempted to get the anchor hooked, and as has been discussed since then many times, hooking the anchor in the exactly the right spot is challenging,

even when you roughly know what you're doing. We tried to get the anchor hooked, but perhaps it wasn't a big enough anchor or perhaps it didn't get in the crevice that it was supposed to. Perhaps it was on the down current side of the ridge rather than the up current side of the ridge, so it wouldn't catch on anything. But we had actually dropped the anchor more than once before this, trying to get it, and it had drifted. This time, it had been dropped. As far as we could tell, with our extensive navigation equipment, it wasn't moving. But we didn't know. So, we assumed the anchor was supposed to be at 150 or shallower when the dive plan was made. I agree with Tom. My first impression was it was really clear and really blue and really beautiful. When you've been in the water a lot and seen really nasty conditions, this was just pretty wonderful. I thought, "This is going to be a really cool dive, because we're going to get to see all this stuff on the bottom that we've heard about." As we went down and didn't see the bottom coming up, that started to concern me. But once you start getting to one hundred feet is when the narcosis begins, and it kind of sneaks up on you. We just kept going down, because we knew the bottom was at 150 feet, because that's where we put the anchor. When we realized that we were looking at sandy bottom rather than rocky bottom covered with lots of life and small fish that we assumed were there – we didn't know at the time. It was like, this doesn't look like we expected it to. I remember looking at my depth gauge and it said 180, which was deeper than the whole dive plan was supposed to be. As Tom mentioned, the anchor appeared to be freely bouncing along the bottom and not catching on anything. It was going from shallower water to deeper water. It obviously had been on a ridge or nearby. We didn't see it, but it was sloping up in the up current direction. So, it was getting deeper. Much as Tom did, there was a decision point of – we knew how much everybody was counting on this dive happening at all, because we were about to give up. It was becoming a real problem for money, resources, and with zero to show for it. We had been to 180 or 190 feet before, and we knew that we probably could function and that we had enough air – air being the problem. So, it was clear enough the bottom was right there. You could almost touch it, but it was twenty feet lower. So, we made probably the right decision for the sanctuary, but the wrong decision for ourselves, and went down and decided to do it quickly and real quickly. Tom described about one minute of activity on the bottom that he was involved in. John, next to him, was doing roughly the same thing, but without the camera. He was collecting sediment as well, as I remember. I believe I had a camera and was taking pictures of them. Though, I don't know whether I actually took any pictures, because what I found is this was the day that narcosis affected me more than I had had it affect me in the past. So, it started to affect my vision. It wasn't just thought processes. It started to affect my vision. As I've mentioned before, and then we've talked about before, I decided that I'd rather have those problems on the surface than at the bottom, because like I said earlier also, I wanted to become old and cantankerous. I'm making progress on both of those things. So, I actually decided not really consciously, but automatically, to start ascending. Since we were away from the anchor and away from the line, it was straight up. The water was clear. We had a clear day. There was no fog. So, getting to the surface was the priority. But the tunnel vision continued to close down until I was able to get much higher. But meanwhile, I'd left Tom and John. We weren't attached

to each other any longer. We were no longer a dive team. We were dive individuals, and didn't know what was going on with anybody else. So, the reality of the fact is I made it to the surface very quickly. Fortunately, we're down a short enough amount of time so that the risk of bends was minimal, though probably not insignificant, and managed to exhale so I didn't get an embolism, and as I'm told, came to the surface quite rapidly. It was important to me. But still, I don't remember actually becoming aware of what was going on clearly until probably a few minutes after reaching the surface. Then it kind of hit me as, "Where's Tom and where's John?" That became my focus, because I was at the surface, and I was not feeling – I didn't have any problems except that I'd gotten there quickly out of control. At that point in time, here's two people I had spent many years with doing many things with, and I thought, "My gosh. I survived this and they didn't." It really bothered me for a few minutes until we figured out that everybody had gotten up. But we came up in different places, and everybody on the surface did their job to come and pick us up and take care of us and find us. So, the fact that we had talked about something like that happening in a general sense, everybody jumped into place, and it did it. I feel very fortunate that, number one, I made it to the surface. Number two, there was no side effects. Number three – notice number one is I was worried about me – then I was worried about these guys. I was really worried about them. Driving home that night, it was very sobering, because that's the closest I've been to not having control of the situation at all anymore. But still, I can say it clearly – we made the wrong decision based upon safety and planning. This was not the plan. It may have moved the project forward, but it was wrong. So, we probably should have found another way to do it. I'm just glad we're here to talk about it.

DL: When would you have changed directions if you had your hindsight then?

BK: When I hit 180 feet, looked and saw the bottom and saw it was 180 feet, and knew this was well beyond – it was the first time I realized that we were beyond our dive plan. The anchor was loose. We were deeper than we should be. If we had followed our plan, we would have gone up, and we didn't. So, we should be admonished forever, and anybody who does that, forever. It was the wrong decision.

DL: Did that ever come up again of not having the anchor in the right place, or was that the lesson learned?

BK: We had drifting anchors again, and we aborted dives. I can't point to a specific one, but I remember aborting dives because the anchor was not what we planned on it. So, I think we learned from that rather dramatically. In most cases, Tom and I – not all, but in most cases, Tom and I were the first ones down. So, we took that lesson to heart. If the anchor wasn't in a place where we could dive, then we would abort the whole thing and reset the anchor, and somebody else would go in and check it later. Or if it was in a place that was not conducive for the rest of the day's plan, we would do our best within the timeframe we had. We would stop what we

would plan and reposition the anchor. Tom has a story about doing that, but we can't quite remember when that was, where he actually moved the anchor up to a shallower position. We wasted all our air and our dive, but we got more teams in as a result of it.

TS: That's right. We didn't get the anchor down many times. The whole idea was to go find the current, go above the hump, and then drift backwards. Of course, we probably failed more times than we succeeded. But once we did succeed, we would go down. Bill and I would go down to see if it was safe for anybody else. There were times when we just – if it wasn't safe for us, it certainly wasn't going to be safe for anybody else. Of course, there was the one time where the anchor was too deep, but there was a pinnacle up there. So, I just grabbed the anchor, went up, [imitates sound], up a little more, [imitates sound]. I was sucking so much air, but we were able to get the anchor high enough to where it would go. Now, we should probably clarify this. The first time we went down in Cordell Bank, it was the boat anchor. It's a great, big boat anchor. After that, we used buoyancy balls and stuff. It was the same technology that fishermen use. You get to where you want to be. You have these iron plates. You throw them over to the side where you think they'd be, and then you used this ball as your descent line. That's where we take the Zodiacs over to the ball, dive out of the boat, and that's how you descended. So, like I say, we probably failed getting anchored more times than we didn't fail.

DL: This year – this is tangential – they got it right every time. Skipper got it right every time on the Furmer.

JS: Do you think that was because of the maps that they have and the technology to locate the...

BK: It was because of the maps. The depth center views looked exactly the same, but there was also the GPS. So, you could actually determine accurately the direction of drift and current. So, you could find out how you drift relative to the shallowest point or the point you wanted it, and then reposition the vessel upstream, if you will, or up current or upwind. When you knew that you were there based upon the GPS, you could drop it. So, GPS helps a lot, because it's repeatable within a meter or two. So, yes, and skill. It helps to have a good skipper who knows his boat.

JS: It sounds like the first dive was really just so physically intense with the narcosis and leaving John and Tom on the bottom. Do you remember biologically what you saw there in terms of – or did you see the bank? It sounds like you were in a sandy patch maybe next to the rock. But can you describe biologically what you might remember, or was that a cloud?

TS: I remember vividly, we weren't anywhere near anything that could be conceived as the Cordell Bank top with the living things. There were no living organisms. There might have been some kelp over there, short stuff right next to the bottom, and a little clump and rocks and

little rocks. This was a sandy bottom. Clearly, we missed it.

BK: There were rocks coming through and coral and marine debris all over. It was like looking at a channel between the rocks that we've seen in pictures and stuff. But it was tending deeper in a very shallow angle, and you could see rocks emerging up. You've probably seen this in the submersible dives. But this is the broader expanses that were planed off by the past sea level changes. So, we saw no structure. We just saw a flat, slightly sloping area, which we've seen in several other places leading off away from the dive sites when we had a clear day.

DL: Was yours the only dive that day because of the anchor situation?

TS: Yes.

BK: Yes. We were all significantly sobered by the whole adventure.

TS: Except Bob. He was very, very happy because he got a picture and a bag of sediment.

DL: But Bob did not go down on that one.

TS: Oh, no, nobody. Just us.

DL: So, back on the boat then and the returning, it was a narrow escape. So, what was the feeling on the boat in general? I know you have your own feelings about what was going on. Was it still sort of a victorious day, or was everybody a little sobered by it?

TS: For me, it wasn't as sobering as it might have been for the others. I was at the bottom. I did what I wanted to do, so I was happy. I saw Bill go up, and I knew he was leaving, because I saw his flippers going in that direction. Generally, that means you're gone. For some reason, I wasn't the least bit nervous about Bill. He turned around. I didn't know he necessarily had a problem or anything like that. He went up, and I said, "Well, time to go up." I wasn't the least bit concerned. I was more concerned about my brother, because I never saw him. I thought he was the one that was having trouble – I didn't think Bill was – because I couldn't see him. I could see Bill, but I could not see my brother. My brother was gone, and I remember really being worried about my brother. Was he going to make it? I remember thinking that on the way up. Is he going to make it? I was worried about him, not Bill. I didn't care. [laughter]

DL: So, when did you first see John then?

TS: I don't remember. I think he was probably already on the boat.

BK: I have this vague recollection that John saw the situation evolving, and he may have collected some sediment. But John is resourceful, and I think he took care of himself. Really, there was not much any of us could do for each other at that point. We had all dove together enough that I think he was probably comfortable that we were going to do our bit and be done with it and all meet back on the surface. But we just didn't know that that's what he was thinking at the time. I believe we were told when we got to the surface that he had gotten there already, and they picked him up. It may have been five minutes later or ten minutes later, because we came up in different places. So, the Zodiac had to come around and get us. But it was a clear, calm day. So, once you're on the surface, it's just like floating in Monterey.

TS: I had to stop to decompress. I clearly remembered how am I going to stay at the right depth, because even though it was a clear day, you could see, even from underwater, that the ocean was rolling a little bit. There were no T-bars, but I still stayed down to decompress. I don't know if I was at the right place, the right depth, but I did it anyway.

BK: That was the right thing to do. That's what I should have done if I had had control of the situation.

DL: Now, Tom, you went up freely, though? You did not follow the anchor?

TS: No. None of us followed. Did you follow the anchor line?

BK: No, the anchor...

TS: There was no anchor. It was gone.

BK: We went off the anchor because it continued to move into deeper water, and we let it. We picked a spot, and we all focused on it. The plan was to do this quickly and go up. We did have some hand motions, so we had the general understanding that this was going to be just a quick pop to just do something rather than spend time there, because we hadn't planned for that depth or the air consumption or anything. So, we had a general understanding that it would be done quickly, and we'd be gone. It just got more complicated. But we were off the anchor and free, but clear and nice sunny day and relatively warm. It was a nice day at sea, actually.

DL: Do you have anything else with the diving in particular?

JS: Not that, but the next question – we are back at the boat. You have all reconvened. What were the thoughts next in terms of, "Should we do this again? Would I do this again?" What were the next thoughts in terms of where this would go?

TS: For me, like I say, I'm not that smart, so I never even went that far. We were told to get up there and – what did they call it? Debrief. That was the next thing. I certainly worried that he was okay, he was okay, and that was the end of the thought process for me.

BK: I remember Bob saying we've succeeded, because Bob always defines it as a success if there's the slightest chance of it being called a success. So, I think Bob projected more confidence than perhaps some of the rest of us had at that point until we had reflected. But he leveraged a very small success in a challenging situation into something he could build upon. So, I think the general mood of the boat was, since they hadn't experienced all of the details that we had, that though we had failed to get an anchor where we could put more people in, that we had succeeded that day. So, the mood was, I think, more upbeat than downbeat. It was more the private reflections of the details, because those were very personal. But I think the boat was more upbeat because everybody was okay. We did it, we came up, and we were fine.

TS: Got pictures. We have sediment. Scientists, if they can find any way to deem it a success, they do. If we have something, we deem it a success.

BK: So, we didn't ignore the elephant in the room, but it was not the major point of conversation. I think we all, as a group, moved on, and some of us still today think about it as a very significant day in our life.

TS: I have never forgotten. It's a significant day. There's no doubt about it. I remember that there was concern about Bill. People wanted to know that Bill was okay. He might not have known that at the time, but from me talking to other people, everybody, "Bill okay? Is Bill okay?" Because not everybody was privy to what's happening at that moment in time at that particular place. But other people would say, "Is Bill okay?" "Yes, Bill's fine."

DL: So, going home, getting home that night or whatever, the next day, what did you tell people? Was it just back to work? What would you say about that experience?

TS: I would tell my wife. Nobody else of my immediate friends were divers. They wouldn't understand anyway. For me, I enjoyed it. It was a great adventure. We were home safe. We got there. Like Bill says, it was a little more than we really needed to do. But it was over. I had no problems in as far as calling anybody and telling anybody. I did not. Like I say, I'm simple. Simple people do it by brute force and generally don't get lost...

BK: Tom is more complex – I'm sorry, I speak out of – Tom is more complex than he lets off. I went to work the next day or the day after that. I think it took a while to put it in perspective. But we were planning another trip soon after, as I remember. Maybe not that year. I can't remember the timing. But we got back to planning it and learning from our mistakes and vowing

not to do those things again, and actually, we didn't.

DL: So, you definitely wanted to go again, it sounds like.

BK: It was a pretty cool place.

TS: It was a real good adventure. That's what it was all about. It wasn't a sport type for us. It's an adventure.

BK: Yes.

JS: It is funny Bob calls it – it was not an adventure. It was an expedition to collect. He really wanted to downplay the adventure part of it.

BK: That's Bob's point of view on it. Actually, that's probably what made it more successful. We worked on Bower Cave for ten years and got a few species and did slideshows and hundreds of presentations around the state and colleges and stuff. But no major written material resulted from it because it was an adventure. We wanted to tell people the story, but we had a different outlook on how to do it. Bob came from it as a scientist from a research lab, as a physicist, and said – and this has probably been said before. He says, "If you don't write it down, it didn't happen." Now, perhaps we're writing a few things down today, but these are old recollections, not fresh recollections. So, in that sense, even reading through some of the materials last night to jog my memory, the fact that quite a number of articles got published, an awful lot of material got covered. Not everything, not the details, not the behind the scenes, but enough to put it in a historical perspective, which, now, of course, it seems much more important, because there's a sanctuary that actually had use for that information, whereas before, it was fishermen. You go to Cordell Bank to go fishing. That was the only real purpose as far as I knew. Now, there's a much more significant purpose. So, Bob's view of it actually turned out to be much more valuable than probably most of us gave him credit for at the time. I hate to give Bob a pat on the back, because I like to bug him so much. [laughter] But it was that point of view that brings us here today. If Tom and I were doing it, we wouldn't have a sanctuary. So, it's a different in personality. So, it took a team of different personalities with different goals and different interests, where some of us had adventure. I had adventure too, but I was interested in photography. We each had a goal, but Bob kept it tied together no matter how much gaff we give him for doing it.

TS: He was the glue to the expedition. There's no doubt about that.

BK: I've discovered in many other projects since then, if there isn't one strong, outspoken, dedicated person, however annoying, around, the project usually doesn't happen. So, that's the

key to a successful project, somebody that never gives up.

TS: Strike annoying. [laughter]

DL: That one is going. So, you have made your first dive. You continued with Cordell Expeditions, which had been formed, I believe, by that time, as an entity.

BK: I believe so.

DL: So, now, first, what I would like to ask you about is subsequent dives – not in any particular order, but things that you would remember. But to start with, you, Tom and Bill, have been friends for a long time and dive partners for a long time before this. So, could you tell me in the context of your so-called career diving Cordell Bank, how did your relationship, your dynamics work as a dive team? I get the sense that you two guys were a bit of a team in yourself. Is that a correct assumption?

TS: It's absolutely correct. Bill, in all of our past projects and stuff, I've always looked to as the leader of the pack. I always looked at me as the carrier of the pack. [laughter] As time went on, because we stayed together through all the projects all of the time, it's almost like we're brothers. When we get into the water, I don't think of anything, because we know what each other is going to do. I don't even think about it. It just happens. I can look at him, know exactly what he's thinking with the most minimal hand signs that there could be. When you're a team that long, you just gel.

BK: I know Tom better than I know my brother, and trust him a lot more too.

DL: Bob used you – he acknowledged that and put you guys together?

TS: Yes, he used us. [laughter]

DL: Wrong term, wrong term.

TS: Oh, wrong intonation, right?

BK: Like Barack Obama last night, you did a hell of a job. I'm sorry, that can be edited. [laughter]

TS: Well, I think that because of the known kind of – let's call it resume, that we have together, knowing that not just together, but with the projects that you've gone on, our knowledge of equipment management – because basically, Cordell Bank was a function of equipment

management. We've had so much equipment management experience. Looking at these things that needed to be done was, for us, rather easy. So, to me, my feeling was that as far as divers, we were looked at as the leader divers simply because it seemed like we knew what we were doing. I think we did.

BK: The goal was to solve problems. It was not just for ourselves, but for the group, because it was a project, and it was a team effort. But Tom and I bought the compressor that we end up using. It was really hard to get tanks filled on land in Bodega Bay or Point Reyes. So, we bought a compressor. Hope you don't want me to pay you back yet.

TS: I've been waiting. [laughter]

BK: So, we bought a compressor. Bob and I bought a Loran. When we really had to have something for the expedition, we figured out who had the resources at the time, because we were all working, but there's always there's never enough money and never enough time. So, we pooled our resources to do things. Tom and I are able to work together and not get on each other's nerves most of the time, and that's valuable. The thing is, Tom is one of the people I know who is good at a lot of physical things. He plays – well, maybe he doesn't so much anymore – golf, tennis, all the physical coordination sports. Some of those coordination skills, you actually need to keep everything glued together in the field. So, he's good at that. You don't have to worry about him stumbling over something and breaking it because he is not watching out. He's very aware of what's going on. So, in that sense, we found that we work together well. We think together and, in an emergency situation, it just seems to work. I mean, we were trained for that in the diving education stuff, but also, the activities help tune those skills too. I mean, there was a diver along on Cordell Bank, who, to this day, says that because I calmed him down there when he felt he was short on air, he's here today and happily married and off having a great life. You don't plan on those things, but sometimes, they happen. Other people need your help, and we needed other people's help at times. So, anyway, the bottom line was we work together well. I'm not quite sure why. There's just some chemistry, something that works. Our wives get along too, and that's helpful. [laughter]

DL: Now, Bob called you, and I quote, "My strongest divers." I hear from other people we have been talking to that it sounds like you two were often or maybe always the first to go down on the dive to set things up. Is that the case? If so, can you tell me about that?

TS: I only remember one time where we weren't, and I don't remember why that was. But I think it was because of our experience. As I said before, we'd been in difficult times. I mean, the cave diving is really, really dangerous stuff. So, after you think about cave diving, ocean diving is nothing. I don't know. To me, ocean diving is not very difficult. I was more nervous in a cave when there was nowhere to go up to. So, I think, through osmosis, it was pretty well

understood that we had more diverse experience than anybody else. The fact that we made it down the first time and didn't die, maybe they wanted us to go down to make sure we didn't – no, scratch that. I really think it's because it was obvious to everybody that we had the most experience. It was to me.

BK: I look at it differently. Rather than there was any anything politically going on, we did get the opportunity to do it the first time and perhaps the second time. Then we just got it done. The fact that it got done meant that it was reliable. That probably, more than anything else – if it could be done, we could get the dives set up for the rest of the day. So, reliable, that's probably more of it than anything else, because we only aborted the day a couple of times, and it usually was conditions, whether the weather was picking up or the anchor just couldn't get it, or we really were at the wrong spot and didn't have time in the day, in the daylight, to go find the right spot. We fell into it at the beginning. We sort of volunteered, and then it worked. Bob chose to keep it working. The other thing is, over the course of the whole expedition, we were there almost every trip. Not a hundred percent, but almost all of them. We had other groups of people – individuals and groups. The Sacto Team brought incredible skills and experience and energy and enthusiasm and a lot of fun. But they were there a couple of years into it and then had lives to deal with. So, we sort of bridged between a group – different groups of people came through. So, there was some consistency. That was valuable for the trip, because people didn't have to relearn it from scratch. Of course, we evolved that so that everybody with an individual and strong skill really got a chance to do what they did best. Sacto Team did many more things than I ever imagined they could do or should do, but they were fun. So, I think it's just because we were there through the whole thing and we didn't screw up too much.

JS: Bob refers to those people as the core team that were kind of through the whole thing. There were those that came and went, but people like yourselves, he called the core team. Why don't we talk a little bit more about some of the subsequent dives the following years? Want to go into that?

DL: Sure. Maybe this would be a way to lead into it was I was going to ask how – or if you could be specific about what you did when you went down to set up for the subsequent divers, about setting up transects, things like that. Did this involve actually driving the stakes – what exactly did you do when you went down?

TS: What you did once you get there was truly an evolutionary process. The whole idea was to be scientific, precise. We talked about grids and recording exactly where we were. But the most important thing we thought about is, what are people going to do once they get there? How are they going to know where to go? How are we going to know where we are down there? So, I think that one of the first things we did, we created a transect line. I don't know if you were over at my house, but we had this long, long, long rope. We had this binary system made up with four

colors, and we would put a different color every three feet or meter. Eventually, we called them shmeters instead of meters. So, at any given point along that line, you could take a picture and know exactly where you were. So, we put this long thing together on my street where I lived, and then we put it on a great big coil. We would go down and spread this thing out primarily so that the people who came down subsequently knew where to go and knew how to get back, because you couldn't just hang around and anchor...

BK: And could work in different areas on some sort of reasonable plan that didn't actually cover the same area as the previous dive.

TS: But at least you had a way to reference yourself, because once you get off the line, if you don't see it, you don't know where you are. So, these things at least gave you an opportunity to get back to where you were. If you were doing something meaningful to say, "Well, where was that in relationship to where you were –" because we always knew where we were – so where are you going and how do you get back. I mean, this was a big old spool we'd go down. I think you have a picture of that spool someplace where we had a rope in front of everything. It was kind of a mess to have to carry this great, big, thick old rope. Eventually, we got pretty smart, and you just got one of these yo-yo things. You hold on to the end of it. It's a tape, a tape measure, and it worked out really, really well.

BK: So, Tom did all the work, and I thank him for that, on those set up dives. Whatever we were going to set up, Tom brought down and set it up. So, I have a different perspective than he does as far as the photography, because since I wanted to do the photography, I volunteered to do the photography. I got assigned to do the photography, and I got to actually take pictures. So, Tom did the work and I took pictures of Tom doing the work. How valuable was that? Well, it's probably scientifically ancillary. We documented what we were doing. Coincidentally, you can pick a lot of stuff out of the pictures if you're taking the time to do it to see what's on the bottom. But basically, I was having a good time playing amateur photographer as we did this. This evolved over time to the situation where, as Don Dvorak has mentioned a number of times, a roll of film – I wish we had digital photography in those days. But a roll of film is thirty-six exposures, and the dive lasts approximately twenty to thirty minutes. You can shoot a roll of pictures in about ten minutes. Don first, he set the bar, added the second camera to the camera bar, added a second strobe for better lighting. So, over time, Don and I continued to compete with both the amount of equipment and how many pictures we could shoot on a particular dive. I stopped at two cameras, because that's all I could afford. Don went on to three, because he just wanted to outdo me. But in the end, we were able to get a setup – Tom described earlier that there are a lot of things to set. Don Dvorak says it best when he says, "You set each camera for the type of picture you're going to shoot, and you don't think about that down there because you can't think about that down there." You just remember that this is the close-up camera and this is the far-away camera, and you use them appropriately. That simplifies the process. So, basically,

you're moving around the camera rig and keeping yourself in position and trying to get as much of the bottom, as much of the environment, as much of the process that's going on. It's interesting that even with the dives in 2010 here, they did much the same thing. So, I really had the simpler job, except when we were off on an exploration. Tom would go straight there, and I'd have to go way out in order to get the right shot. So, I was like the dog that goes on the hike with you, always running around off into the distance, and still keeping track of the line and where Tom was in order to get the shot that sets up the right thing. So, I did a little more swimming than Tom, but he did more work than me in the process. So, that was, overall, through most of the dives, the way things were broken up. Tom set things up, and I took pictures of them and tried to put that into some perspective that we could talk about afterwards like we did on the reef crest expedition this year. We were able to see everything that night. In the 1980s, it took two weeks to get it all back from the film processors. So, that's how our task evolved. I'm not sure I remember what the question was, to be honest.

TS: [laughter]

DL: I was just saying, what were you specifically doing down there. What did you see – some examples of wonderful things you saw or interesting things or your impressions of being down there, since your first dive, you did not really see too much. You have photos.

TS: For me, it may have been more beautiful than Bill, because Bill was taking pictures of me. So, I was right on the bottom, and as we've seen from many pictures in the past, it was absolutely gorgeous. Life was living on top of life. If there was room, life was living on that spot. One of the real interesting things for me also is when he found this hole. It's clearly not supposed to be there. I said that before in other interviews, that this hole was definitely out of place. It definitely wasn't natural. It was fairly symmetrical as a round circle. That was pretty unbelievable. When you look at the sides, the sides aren't quite as vegetated as everything else as usually sides would be. So, that even more confirmed to me that this was something that was man-made. Of course, Bill was taking pictures of me. So, I was down there up close and personal with the beautiful life that was down there.

JS: In terms of the habitat and the life that you saw, were you surprised when you really got a glimpse of that? Was that a surprise to see that density?

TS: It absolutely is a surprise. You go down to Monastery and you go to 150 feet or so, you don't see much of anything. But to go down here, you're below 120 feet. Now, subsequently, we found that we were not on the high spot. Very few people ever got right to the high spot to see the corals and the colors. Luckily, we had light to see the vibrant colors. It was absolutely nuts. As far as I was concerned, you would not see life like this on the bottom. No possible way. There's not enough light. When there's no light, things don't live. So, the only thing I can

attribute to all the life that we saw is that it was clear enough out there where some of that ambient light got down to the bottom. But this is the beauty in the light down there. I did not expect to see that at all.

DL: Did you know what a lot of that was?

TS: Yes. A lot of it, I knew what it was. From teaching diving, you have to tell people what things are. So, just through time, you know what it is. Could I tell you the family and genus and all that? Absolutely not. But a species of fish, probably, I could tell you a species of fish. This is coral. That's a starfish. This is a sponge. California, these corals here. So, for me, I just totally did not expect this to be that way. There should be nothing there.

BK: One of my impressions of Cordell Bank, compared it to my diving experience in Monterey, where I started in 1965 and watched as they put the sewage outfall off of Carmel and saw the decline of the diversity of the ecology of the bottom over the years, to what it at least was the last time I saw it, pretty bare in comparison. Monterey, and perhaps Point Lobos – Point Lobos probably came as close to what we saw at Cordell Bank, but it didn't measure up, probably because it was near shore, more sedimentation, and also the fresh water from Carmel. But Cordell Bank had a higher density of life on it than anything I'd seen except in the Red Sea. Of course, that's a completely different species and such. But the Red Sea was the only place where I'd seen comparable densities of stuff climbing all over everything. So, this was pretty special. It was like going on a trip into some foreign country and finding something that you never see along the coast of California. That was impressive. The other thing that I noted is that we started, of course, on the nineteen-fathom pinnacle, because it was the shallowest place and perhaps the most accessible. But as soon as you get to 150 feet, there's almost this demarcation where everything changes within about ten feet as far as – I assume, being an engineer rather than a biologist, has much to do with the light that gets down there. So, though we found this lush coverage, many of the places we go like Craine's Point and the Western Pinnacle, they were not as lush, but they were deeper, and that was consistent. But still, everything looked really healthy. Most of the time, we had good visibility at the bottom, even if we didn't have good visibility on the surface. So, that, of course, enhanced the impression of what we found. We were looking at a picture here of the nineteen-fathom pinnacle, of the first hole we found, and that was – we found right at the beginning pretty well. The first time we dove there, we found that, because it's right at the top and it can't be missed. We thought, among other things, "My gosh, what would cause this?" There was wild speculation at the time. What we didn't realize is there's numerous other holes in the area of the ridges surrounding here, and we found a year or two later a much larger one just across the channel on another ridge, on a deeper ridge. I mean, more than three or four times as large. By then, we were learning that the Navy probably had something to do with this. But this was all very cloak-and-dagger type information at that point in time, and we puzzled about it a lot. When you don't have your full capacity of thinking – and

that was the case at 150, 180 feet – when we were doing this, this kind of caught you by surprise. So, we were blown away. We didn't know it. Tom and I came across them first because we were laying the transect deck. That's when we found them. It was totally unexpected. Beyond all the biodiversity, I think that blew us away as much, if not more, because it seemed impossible. We didn't know at the beginning what could have caused it. So, it was like, "This is impossible. How can it happen, and it's there?" Yet, we see it, and we have pictures of it. So, that was part of the adventure. There was the spirit of adventure there, because you're finding things beyond what you ever imagined, completely different, having nothing to do with Cordell Bank, the location.

TS: I remember being kind of disappointed because it was like somebody's been here first. That must have been like Scott in the South Pole when Amundsen already got there before him, and he was devastated. I remember being a little disappointed. It was so difficult for us to get there. These guys got here pretty well, and they dug holes there.

JS: The holes, as you saw them, they looked pretty clean, right? There was not a lot of marine life in them?

TS: There was less marine life. The closing, crustacean-type stuff was in there, a few little sea anemones. But as you can see in the pictures, it's not going to get as much light when you have a cylinder there. The sunlight's going to come from one angle, and there just wasn't – it was clean. I could stand down in those holes and not worry about an urchin or anything like that.

BK: Maybe we can see how clean it is here. This is another picture in, I think, this same hole at the top. But it didn't look like it had been cleaned. It just looked like it hadn't grown as prolifically, probably due to the angle to the light. That was my impression. I have nothing to base that on, but my impression.

JS: Now, on this 2010 dive trip that you were just a part of, did the NOAA divers see some of these holes? Could they have marine life in them this time?

BK: They came across the hole right at the top of the nineteen-fathom pinnacle, and they did find an iron bar there that was left by the Sacto Team many years ago and asked if that was our contribution to the ecology of the Cordell Bank. Yes, it was. So, it was still there. Nobody's been there to remove it since then, apparently, even your submersible.

DL: So, they did not find a beer can down there. Sacto Team talked about beer cans.

BK: We actually had a rule. I'm not quite sure how religiously, if you will, or fanatically, we enforced it, but there was very little drinking on these expeditions, because we actually were

concerned that it could be more of a problem than one might think. In fact, several people were summarily removed from the vessel because of that. That was hard, since beer was an important part of our life. [laughter] But NOAA's ships had – at least they did have beer once in a while too.

JS: Oh, they do not anymore.

BK: Every twenty cans in the soda machine. So, the nineteen-fathom pinnacle area and the adjacent ridge with the larger hole are one of the significant dive areas, because we actually visited it so many times. Upon clear days, you could see out in the distance that the ridge was going each direction. They're parallel, and you can see that on the depth center. Now, fortunately, we can see it on the sonar from 2005, and to a lesser extent, from 1985. But we wanted to see where it went. We wanted to shoot pictures of the dive. We kind of wanted to visit as much as you could within a single dive without moving the anchor. We still wanted to have that shallow point. So, we talked Bob into letting Tom and I, on one weekend, on one dive, take the grand tour, where we started at the nineteen-fathom pinnacle. We went across the abyss to the other ridge that had the larger hole and continued in a clockwise direction, starting heading roughly east. Went to the end of that ridge, crossed at about 180 feet, and came back up the long way to the nineteen-fathom pinnacle. You could not see the whole thing at all times, but it happened within a twenty-minute swim. So, you could put it all together in your head. That was probably, of two or three dives, among the most significant to me, because we could see the whole thing for the first time. I don't think anybody else got a chance to make that tour, and I feel pretty fortunate. Having looked at the 2005 sonar data, I can actually see the individual – we can see the exact route, and we showed that last year to some extent.

JS: Right, you showed the slides.

BK: But that was significant.

DL: Could you see from the nineteen-fathom pinnacle? Could you see to the next ridge, at least?

BK: On a clear day?

DL: Yes.

BK: Yes. When we had good visibility, you could. When we did it the first time, you only saw kind of a shadow over there. You knew it was there, but you couldn't see it clearly. Until we got more than halfway across, it didn't actually come out of the haze. But it's close enough that on a good day of visibility, you can see it. Yes.

DL: See, I would picture that you would see not a shadow, but you would see a glow because of the marine life on it. Is that not the case?

BK: It's a deeper ridge, so there's less of the – well, you don't see the color so much anyway, but you see less. Yes, you see the top of it, because of the way the light, but it kind of sucks in the light, because it's dark. It's the dark granite. It looks like a whale swimming by, actually.

TS: It's a silhouette.

DL: But a darkish silhouette...

TS: Absolutely dark. Remember, you're going to lose your light in the first few feet, really, from coming with the surface. So, without lights behind you, everything looks kind of – let me say grayish for the lack of a better word. But these pictures that you see in the sanctuary and everywhere, those are illuminated by artificial light. So, when you're down there, if you even had a flashlight, there might be a small beam. I would carry a light, and it'd be a small beam. But for all intents and purposes, it's not that beautiful when you don't have artificial light.

BK: Light. Artificial light, I'm sorry.

TS: What did I say?

BK: Life.

TS: Sorry.

BK: At least that's what I heard. [laughter]

DL: Were there any memorable marine life sightings during your many dives down there that come to mind?

TS: I think the Metridian were – they're very, very beautiful. They're an anemone that has a long, long neck, and they're bright, bright white. Because they're bright, bright white, they're easy to see. They're pretty nice. I remember one time that was – aside from the meridian, we were going across one of those channels. I remember looking down into the white bottom of sand, and there were hundreds of fish. These were big fish, not little tiny schooling fish. These were probably ten-pound fish. I think we called them red cods. But they were all spaced evenly away from one another. It wasn't a school that was going this way. I mean, there was perfect set of distance between each one in front, side to side. It was like they were a marching band. That

really, really impressed me. I didn't understand what would ever cause fish to do that. I've always remembered that because it just never happened. They were dead stopped. They weren't going anywhere. It was like they were sitting on the bottom and somebody told them. That was pretty unbelievable to me.

DL: Anything come to mind, Bill, of fish, sharks? Did you see sunfish? Whales?

TS: I saw sunfish. We always jumped in the water, there were sharks. There were always sharks when we jumped in the water. I never saw one once I was in the water. They were all blue sharks, and they just kind of scattered. Once you're under the water, I never saw one. In all my dives, I never saw one. Other people said that they saw them. I never saw one.

BK: Of all the shark stories we heard, I only saw one shark swim by and ignore us on the decom line one day. I think several other people had a similar experience. We never saw a whale underwater. In fact, I've never seen so many whales as we saw a couple of weeks ago, ever, anywhere, anytime in my life. We saw whales, but very few out there, and nothing underwater. I think from a moving marine life perspective, the juvenile fish on the bottom, we hit a year which was much like this year where they were all over the place. They were in the way. They were in the way of the camera. They were in the way of the divers. They were in the way of doing anything, at least in a perceptual thing – how you perceived it. So, that was impressive. I had never seen that type of schooling of small juvenile fish except in the Red Sea where, at least at the time, it was pretty pristine. It's changed now. It's still there at Cordell Bank. So, I remember the Metridiums that Tom talked about, because on several of the deeper, flatter dives, I think Craine's Point area was one of the areas where we found a large group of them. The reason they were important, other than they were easy to see, is we had encountered them many times in Monterey off Cannery Row in the deeper water of sixty feet and deeper out there. So, we were familiar with them. I don't remember if we saw any sea pens, because we were not in muddy areas, and sea pens require the muddy areas. Metridiums can be on the rocks.

TS: I mean, you're asking us for interesting things we saw. I think also what was an interesting thing is what we didn't see. There were many dives where we'd go out there, and no fish. They seemed like they were gone. Then other times, like Bill said, they were just all over the place. You can't get them off your camera. That's pretty interesting too, to go down to a place that's so lush in life, and all of a sudden, there's no fish.

JS: Are you talking about the juvenile ones, the smaller bunch?

TS: I'm talking about any.

JS: Altogether?

TS: No fish that you could see. I mean, occasionally, you see one. But for all intents and purposes, there were no fish.

JS: I wanted to ask that, actually, just to follow up with what you had said. So, year to year, you saw some changes in fish population. Sometimes, you would have extreme abundance, sometimes, none at all. Overall, did you see major changes from when you first dove at Cordell Bank to your very last dive in terms of just overall impressions of the benthic habitat or the fishes in general?

TS: For me, from a non-scientific point of view, no. It's difficult to say, because one day, there'd be no fish, and the next day there would be many fish. So, how can you judge whether there's been, over a long period of time, a swelling or a decline of any species? Because it's all what happened on that day, and every day could be different. So, from that standpoint, I couldn't say where the coral raked. None that I could really say – we know that there are fish nets down there. We would find them. So, you know if they were dragging nets, if they're going to screw up the bottom in terms of the crustaceans and whatnot, and you assume that they would take some fish with them. But could you say that they were depleted in any way because of man or because of ecology? I couldn't say that, no.

JS: Can I ask about the nets you saw? Were they trawl nets where you would be dragging it, or were they long lines?

TS: No, I think they were trawl nets. They were made out of ropes with a square. They were the kind with the squares. They weren't gill net type things. Those are the kind of things that fishermen lose all the time. I've been an avid fisherman for many, many years, and those are the kind that you'd always pick up on your rods. Fishing boats just generally go out there to get shrimp, and they drag these nets in the bottom, but not long lines. No.

BK: So, I'll ask Tom, do you remember seeing those nets anywhere but the Western Pinnacle? Because I don't.

TS: I can't say that. I don't know. I never know where I am when – I use Bill as my compass, because I have a poor sense of direction, but he has a great sense of direction.

BK: Big mistake.

TS: [laughter]

BK: So, I wanted to follow up on that question with Tom. I would give the same basic answer.

We probably did more dives on the shallow nineteen-fathom area than any other single place, but we didn't always go back there every year. So, I don't remember any obvious changes. Except in the juvenile fish population, I didn't see the other. But the other places we dove all had different environments, which was encountered this year as well. The Western Pinnacle and Craine's Point and the Tor Hakluyt Ridge in the northern end of the plateau, all these have different depth profiles. So, we would see something different. We didn't return and visit those as often. Sometimes, we didn't revisit them at all. So, we have no time history to look at that.

DL: A couple more. The current, did you have any problems with currents up and down? How did those sort of change over time?

TS: It's not even a change over time. It's more or less the same thing as with the fish. It was different each time. Sometimes, we went down there, there was no current or hardly ever any current at all. There were some times that you'd get there, and you'd be here. In the next minute, you'd be ten, fifteen feet over here, and then you'd come back over here. I mean, sometimes it was a washing machine when you're down there. I remember being with the Sacto Team on one, and we were just laughing like crazy and then we'd be all tangled up in this line. We took out our transect lines and dragged it across. Then all of a sudden, when you have to come back, they'd just bow up and getting caught in everybody's face. So, currents were different on any given dive. Usually, it was nice, but there were some times where the currents were moving pretty good. I remember one time where it was hard to get back to our starting point because it was like being on a riptide. You got to swim against this thing. It's like the current and the swell of the current was pushing you back further than you could go forward. You really had to fight to get through it. So, there were currents at times, yes.

BK: It seemed like the current had more to do with the time of year – when they were serious, anyway. We figured that out fairly early and started avoiding other times of the year, other than the September to November timeframe, late September to early November in the weather windows. In those windows, though, we had the surge from the swells going by, of course. I don't remember anything consistent, because each trip could be different. But that window of weather also was the window of potentially the least amount of current. The days that there were no current, it was like diving on the beach at Monterey, except deeper. It was just so pleasant. Once you get in the water, it was just a pleasant experience. It wasn't work. It was pleasure, if it were only warmer. But we had current most of the time. Usually, it was low enough. It wasn't a big deal except for one or two times where we really had trouble. Each team had to fight it that day, and we didn't get as much done.

TS: The norm was, though, it was the vacation diving. There were times, but for the majority of the time, it was nice.

DL: You mentioned water temperature when you wished it was warmer. Were you cold down there?

BK: Yes. I used to be thinner than I am now and had less insulation, and had learned that dry suits were helpful in that. But when you get down at that depth, I never used a technical dry suit. We always used a neoprene dry suit, so I lost the insulation. Yes, I always came up cold, because there was less insulation. We were always in the low fifties. I think one time we hit in the upper forties. I understand it's warmer now in many cases, but yes, I just didn't have the best equipment available at the time and was cold. But not to the point of being debilitated. It was just uncomfortable. But you were so jazzed, you didn't notice it until you got to the boat really, or when you were decompressing. About ten, twenty minutes into the decompression, that's when it hit you. One of the divers this year, Thor, real thin guy, he had a little leak in his dry suit. He was commenting for the cameras and stuff when he got back and talking about the dive, and he was just shivering, because he had gotten some water in the suit. He was just freezing.

TS: I was going to mention before, Bill never used gloves too. So, he probably lost a little heat there, because he needed his dexterity in order to work with his cameras and whatnot. I never got really very cold. Like he said, when you were on the decompression line at the end of the day, of course, it's going to be colder then. But I only had a regular wetsuit. But our bottom times, to me, were so short, you really didn't have enough time to get that cold. At the end of the dive, of course, you're going to be a little more cold. When you're on the bottom, a little bit, because your suit compresses more. So, there's a little bit more space. But again, the suit was giving you enough warm water, and your bottom time was so short, I never found it much of a problem.

DL: Well, let us take a break.

Dewey Livingston: So, we are back for the afternoon second section of talking to Bill Kruse and Tom Santilena on October...

Bill Kruse: 28th.

Dewey Livingston: 28th, 2010. Where we left off, just to see if there were any more stories or anything to tell about the dives, for instance, Tom, did you have something to talk about with your father, for instance?

Tom Santilena: Yes. Well, one of the interesting times for me is when we went out to tell about dedication to the project. Just as we were leaving, we got a radio call from the marine operator. My family managed to get ahold of us. They didn't really know how to do that. My father had had a massive heart attack, and that was before the dive. So, I had to go out and do the project

and do the dives with that on my mind. Then when we came back in, ready to bed down for the night, ended up having to bag my stuff all up in one of these black garbage bags and throw me over the side and swim to shore. Paul Hara was with me for that. I don't remember why he had to leave. So, that just shows you the kind of things that can happen on an expedition. You just have to deal with things as they come up. In essence, once you start out to do something, you do it. Just like in the entertainment business, the show must go on.

DL: Okay. Well, in the six or seven years it seems that you were diving, how could you characterize the – I used the word evolution or the change over time in these dive expeditions from beginning to end?

TS: You go.

BK: Okay. So, when we began, we didn't quite know what we were up against. But we were crazy optimistic and appeared, looking back, to have a way of figuring things out as we went. Finding out when the weather was right, when the currents were right, when we should turn around, when we should abort the dive – all of these things we learned the hard way, in some cases. Also, the equipment we were using, we didn't know what we needed to begin with and slowly but surely evolved the techniques. There was really nothing to reference to, at least in the sport diving field, in what we were doing. It was different than cave diving. It was different than most of the other rec diving. We were out at sea. We were exposed. We had to deal with navigation, so we went through a series of navigation upgrades, from the compass to the LORAN-A to the LORAN-C. We actually bought a LORAN-C and put it on whatever boat we were on, so we could have a better navigation technology than the skipper did in many cases. Towards the end, we actually had a GSP, one of the first GPS that were available commercially. It was the size of a full nineteen-inch rack, three-U high. The engineer from Motorola had to come out to operate it because he didn't trust us. Then we could actually visit places and revisit places as long as we did it within a two-hour window when the satellites were in position because they weren't all up there. We found there was trouble getting tanks filled. Bodega Bay and Point Reyes don't have dive shops just sitting there, ready to fill tanks. So, we bought two different compressors. One, that we had used before, but didn't have the capacity to serve the expedition. Finally, Tom and I chipped in, and we bought a real compressor that we could put on the boat. So, we were actually able to fill tanks during the day and coming and going. We had extra air available without bringing incredible amounts of extra tanks. So, it reduced the load. It increased the safety that we had. By and large, even though we trained every year, because we had new people, we had to get in shape. The routine started setting in so that we could actually pretty well predict, this is how long it's going to take. This is what we have to do. We could bring new people up to speed pretty quickly because we'd made those mistakes to some extent before. So, it got more efficient. The last significant trip that I remember, which was in [19]86, to a place we discovered with the NOAA sonar survey, it actually was quite a

smooth dive. We had many people in the water. I believe we had three or four teams in the water at one time, which was pretty incredible for a forty-foot boat. Though it was a lot of work, it went relatively smoothly at that point in time. Of course, we had good weather, and that helps an awful lot. So, it did evolve. It evolved to the point where, for what we were doing, what we were willing to invest, and what we had to find out, or what we thought we should find out, we sort of found it was time to move on to something else. We pretty much plateaued in what we could do. We'd solve the problems, and we'd started the process to not having the sanctuary nominated. That was well on its way at that time, and there wasn't a whole lot more to do. We were hoping that the establishment of the sanctuary would create new opportunities and more rigorous science in the long run. Now, we see even climate-related science that could be built on that, but we didn't see all those things at the time. But it seemed like we'd hit a logical break point to see what would happen next because since it was volunteer and we were paying our own way, we all had other things we wanted to do too. So, the expedition moved on to other areas – Point Sur, Farallones, and Alijos in Mexico – to explore different areas to apply what we'd learned in different areas. Those turned out to be pretty satisfying trips all in all, too.

TS: Another – sorry.

BK: But didn't evolve in the same way. They were scientific, but they were more short-term adventures as well.

TS: Another thing that I thought of in terms of the evolutionary part of it, away from the technical stuff of it, is that you had a core group. We always talk about a core group. There was a time at the beginning we had no idea what we were doing. So, you had no choice but to evolve. Well, the core group was pretty much there through the whole expedition, but there were people flowing through the expedition all the time. One of the worst things for a person to have to go through, I'm sure it's the same with everybody if you don't know what to do, if you go on a fishing trip or onto a boat, and you just look, "What should I do?" As we went along, we knew what was going to happen. We had evolved to the point to where we could tell somebody, "Here, do this. Do that." So, they weren't so closed and in the dark and feeling this trepidation of, "Why am I here?" So, we could actually tell what was to be done because what we'd already gone through, we didn't know what was done. Now when we knew what had to be done, we could pass that on to other people so they didn't feel so uncomfortable. They felt really part of the group.

BK: So, this reminds me that the Sacto Team actually came much better prepared than any single group of people before that and integrated almost immediately, both in ability to do stuff safely and efficiently and also to work into the routine that we had developed. They had done enough of this level of diving before that we worked together well. I think we had more than a good time.

TS: Yes. They were really friendly. One of them, Jerry Seawell, he and I almost became brothers out there. They were technically astute and at the same time, they were just a wonderful group of people that were fun to be with, which on an expedition is fantastic if you have people that you like and enjoy being around.

DL: Now you went on with Cordell Expeditions then. It sounds like you stuck with Bob and his projects for a while longer. Is that right?

BK: I think it's pretty much into the early [19]90s when we did two trips to Alijos Rocks off of Mexico.

TS: Yes.

BK: I think, Tom, you went on one.

TS: I went on the very first one. In fact, I went out on a fishing boat out there and did the prep work, took pictures. This is what it looks like. Because nobody really knew what it looked like and stuff. But I'd been out there many, many, many times on long-range fishing trips. So, I was very familiar with the place. So, I was able to come back and give everybody a rundown here, pictures, here's what it's going to look like ten miles out, and took pictures right up to the end. I think he's got some of my pictures in his book. So, it was really, really fun. It was equally difficult and challenging, just like Cordell Bank. We got out there on the tail end of a hurricane, so we were working in swells that were tremendously high. Myself and Ron Skinner and Jeff Bazanek, we climbed to the top of the tallest pinnacle. Actually, we managed to get to Bob Schmieder up there too, who...

BK: What you see on the website is Cordell.

TS: We actually planted the...

BK: That's where he [inaudible].

TS: We planted the flag on the top. We put a bronze plaque on the little landing area. That pole that we had the flag on was there five years later, and you could go back there. Everybody wondered, "What's that pole up there?" I was able to say, "I put that there." Talk about celebrity, I was a celebrity. "You've been up there?" "Yes."

BK: So, that and Point Sur and the Farallones. I got busy with an all-encompassing job in that point in time, so I didn't get on each year. But it went on into the early [19]90s.

TS: Yes, [19]91 was the last the last dive we did for Cordell Bank – that I did.

BK: Okay. I don't remember. So, Bob, of course, as you know, still runs the boat for educational purposes, but we haven't done that much since.

DL: Okay. So, Bill, let us shift into your mapping experiences. I understand you had quite a project in support here as far as mapping Cordell Bank.

BK: It actually turned out to be the beginning of my next career, which I'm in the middle of now, which is a remote sensing mapping computer career. It came about based upon some of the things we talked about earlier, where we didn't really know what was there. The charts were vague at best. Depth sounder profiles were local and not particularly accurate in their location and position. We wanted something else, but we hadn't figured out what to do. Of course, you can design things, but you might be a decade doing that. Apparently, there was a national need to know what the coastal areas were in what's called the exclusive economic zone. I had something to do with some world treaties that were happening at the time. But President Reagan signed that effort into being, I think, in 1983, somewhere around there. That led to NOAA actually officially doing a long-range, large-scale mapping of the coastal zone out to two hundred miles. So, it started with the GLORIA side scan off the shore in the deeper waters. USGS handled that, and I think that was in [19]83 or [19]84. Then we heard that NOAA was going to use a seabeam or a multibeam sonar along the Pacific coast. Bob had some connections with people at NOAA because he had already, at that point in time, suggested, "What do we do to see if this can become a sanctuary? I think it's important." Not everybody listened to him, but at least he was able to get feedback and information of what was going on. Somewhere in that process, Bob wrote a letter and got us the opportunity to go on board the ship that was going to come and map Cordell Bank. They mapped Cordell Bank because, basically, Bob asked them to. It wasn't on the official plan. What was most spectacular about it is Bob and I actually got to go out on the ship and participate in the survey. I actually got to run the sonar equipment because they were one man short. Of course, it was the midnight to 4:00 a.m. shift. You get that shift when you're the low man on the totem pole. But it gave me insights into the problems, into the data quality, into when to look where there's bad data. Because I actually was on shift one time when we had equipment failure and we had to stop the ship and get it back up and wake some people up and do that. So, being able to touch and feel and understand what was going on is different than just reading it in a book and intellectually. We could watch the bank being mapped on the pen plotter as we were going, and that was incredible. We were able to see things where we had been, and we could see the depths. This wasn't a nice picture. This was a contour chart with depth soundings all over the place, and we could see that as we went. So, this lasted for ten days. We had requested that we get a copy of the data. The trouble is the data was in a format specific to the software that was on the computer on the ship, and the post-processing

back on the East Coast, I guess Reston, Virginia, I think, is where the NOAA mapping office is.

Jennifer Stock: I am not sure.

BK: A little vague on that, Reston, Virginia. So, Bob says, "Well, what are we going to do?" I said, "Well, why don't we ask for the software?" Little did I know. They said yes after some cajoling. So, we got copies of the source code of the mapping software that NOAA uses to translate this stuff from the ship to what they make the contour charts with, or at least feed to the contour plotting system. I looked at it and I said, "Oh my gosh, they're throwing away ninety-eight, ninety-nine percent of all the soundings and just picking the shallowest one, because that's important for charting. You want to know where the shallowest point is for the chart. Then they're throwing away a few more in that area, saying, "Well, we have contours every ten or twenty meters. We don't need all those points to draw those contours." So, those are thrown away too. So, maybe one, maybe two percent of the data was actually being used, and the rest was being left on the cutting room floor, so to speak. But the data was all there on the source tapes, and the program to process every single sounding was there. All you had to do was change a few lines of code to export it. So, it was more work than it may have sounded because this software was for a computer I didn't have. So, it had to be ported to another computer system, another computer compiler. Then it took about a month to debug it and get it to working so I could get the same results as we got on the ship. We made sure we had sample results processed on the ship so we could compare them and get the exact same numbers. The only problem was, and this was completely independent of what we were doing, is there was a conflict between NOAA and the Navy and Congress, apparently, about how this data could be used. The Navy wanted it classified, Congress wanted to map the exclusive economic zone, and NOAA wanted to have it and figured it should be shared with every agency and organization that needed to use it for minerals and strategic planning and stuff like that. But somehow, we got in early in the process, made the request, and were granted the request for the data before this officially was all written up and agreed to. The trouble was when we went to leave the ship, they told us, "You can't take the data." I had the tapes in my hand in the box, but, "No, you can't take them. They are going to be classified." So, I went home, and for a month we didn't know whether we could get the data after all this preparatory work. Somewhere in the system, some rational person spoke up and said, "Everybody's going to get the data eventually. This is a place that's in the process of being nominated for a national marine sanctuary. It's a small postage stamp location. Yes, it's important. Yes, it might be sensitive, but maybe we should just go ahead and let the data be used." I'm not sure they really expected us to use it in the way we were, even though the people within NOAA – I'd been communicating with the guy who was in charge of the software back there. So, we finally got the tapes, and then, of course, it was wow. I'm getting out of sequence here, but after we had processed the data, I got a phone call from a guy from Lockheed. He said, "I'd like to come and speak with you," and he did. Bob was there, and we showed him what – he said, "I'd like to hear what you're doing with Cordell Bank." I suspect

some of this was already triggered by the whole publicity back a couple years earlier. They knew who we were and what we were doing and were interested in how far we were going to go with it. I think some people thought perhaps we'd gone a little too far at that point. So, there was tension in the government, in the defense industry. We weren't sure where it was coming from, but we were in the middle of it and didn't know quite what would happen. So, to make that section of the story shorter, we did get the data, we did get to keep it, and we did get to put it in the public domain. At the time, that was pretty special, apparently. I just went back last night to read some of the articles in *Science News* about this. It talks about some of the details that I'd forgotten how special Cordell Bank was. Apparently, there was only two locations in the whole exclusive economic zone where they declassified the data so it could be used. I don't actually remember what the other one was. So, one of the challenges at that point in time in the computer software is we didn't have graphics cards. We didn't have Photoshop. We didn't have GIS systems. We didn't have the software to handle the results of this sounding data. So, I'm eternally optimistic and things can be fixed and things can be done. So, I made a reasonable attempt, limited by my own capabilities at the time, to write software to grid and render the imagery. That's what we ended up using for the 1986 trip out to Cordell Bank to find things. Of course, we didn't have navigation that well. Actually, the survey itself wasn't GPS-referenced, like 2005 or the reef crest trip a couple of weeks ago. They had ranging transmitters, a mini-ranger navigation system where there were antennas on shore that the ship would ping off of and measure the time delay and position the ship relative to these antennas sitting over USGS markers for reference on shore. So, it was supposed to be accurate to within several meters. Embarrassingly so, we're still having trouble aligning the data from those days with the data from the GPS survey. But I think that must be something stupid I did rather than the original navigation. So, we actually were able to create from all of the soundings a digital elevation model or digital surface model of the bottom and do some shaded relief rendering of it, which at the time was pretty unusual. It was a twenty-megahertz, sixteen-bit computer that did all the work. Each picture took thirty minutes to render. So, it was the sort of thing you could start things up in the morning and go to work at your job. The other challenge, and this is a really excruciatingly technical issue, but the data format on the tapes that came from the ship was eight hundred bits per inch computer tape, and that was already obsolete in the rest of the world. So, I had to actually go to a surplus auction at the Lawrence Livermore Lab to buy a tape drive that I could interface with the computer just to be able to read the tapes on the computer. So, we jumped through a lot of hoops, which was challenging and interesting and frustrating at the time. But the end result is we had the only and the best map of Cordell Bank that had ever been made at the time. For twenty, thirty years? Twenty years, that remained the only map of that quality. So, it was a pretty technically interesting and personally satisfying effort. NOAA actually was kind enough to provide a small research grant to produce some of the imagery in the end, which, to a large extent up until recently, has been the imagery used for presentation purposes. So, we pushed the envelope, and we got more than we had hoped for in the end.

TS: Did you ever find out why they were so reluctant to give you the information? What was so sensitive about some plots on a –

BK: It had to do, I think, with submarine warfare and people knowing where they were in submarines. This was before GPS, so you used inertial navigation for navigating the submarines. One way to correct for drift was monitoring contours on the bottom topography with the sonar. You could correlate this with the actual position if you knew what the bottom topography was accurately. So, this was the most accurate bottom topography that, as far as I know, had ever been imaged. It was four-meter resolution sonar pings. There were other multibeam systems, but they were all being used in deeper water, so they were lower resolution in the deeper water. So, there may have been other places where this sonar had been used, but this is the first time it had been used in this way. Of course, with the right-sized check, you can go out and buy one of these and put it on your skiff. But in those days, it took a 220-foot vessel and a crew of, I think, sixty to put this out to sea. The other thing that happened when we were out there is, as has been discussed perhaps in other places, the weather in April is really nasty at Cordell Bank. Generally, there's a north wind and a current. The weather was so rough that half of the crew on the two-hundred-foot NOAA ship, *Davidson*, was seasick, and this is the crew on the ship. Fortunately, I wasn't and got to eat well and sit with the captain and work with the equipment and work with the technicians who created the data.

TS: So, does all this confirm the thought we had always thought that perhaps these holes were used for listening devices? Does any of that for you confirm the fact that that's really what it was, or is it still just a rumor?

BK: There's no connection at all in the survey because, even in the survey from 2005, we can't see that high resolution to identify those things. So, as far as anybody knew in those days, that was all hidden from the public. Only because you and I went down there as part of this trip did it come to light publicly. But an interesting story that may not be connected directly with the sonar mapping but certainly with our being out there is one day when we were coming back to San Francisco after a dive at Cordell Bank, we were sitting on the fantail of the vessel. The sun was sitting and there was a beautiful wake and the marine coastline was off to the side. All of a sudden, this big, black, bulbous thing surfaced behind us. It was a nuclear submarine. It surfaced behind us and followed us for a little bit and then went back down again. This is all speculation. At the time, I thought they'd been monitoring us. But I've since read a book that suggests there was an awful lot of other submarine activity going along the West Coast of the United States and also tapping telephone signals over near Russia. So, this just may have been one of those ships passing through on the way to San Diego, and who knows.

TS: When you...

BK: There was a lot of submarine activity connected with completely other stuff that's come out in the public domain since then. It was happening about that time. So, perhaps it was just a coincidence, but still, I was impressed and a little humbled by the fact that the Navy could come up behind us, surface, take a look at us, and go down again.

TS: Now before, I had heard anecdotally – and I don't know if it's true or I heard it wrong – it seems to me that at the beginning of the Cordell Bank expeditions that there was – I heard that maybe they went out there and actually took these hydrophones out. Did you ever hear whether that was true or not?

BK: My information is only from Bob Schmieder, and he says it's true because he talked to a diver who actually locked out of a submarine to do that.

TS: That sounds like good proof.

DL: [laughter]

BK: Now, I can't verify that. I have no other information.

TS: Or it's classified, and you just breached it.

BK: I have no idea.

TS: [laughter]

BK: I don't have a security clearance.

TS: [laughter]

JS: Who knew that Cordell Bank was so special?

BK: Intriguing.

JS: [laughter] Quite a bit of mystery around it.

BK: Well, I think it actually had some. Because of its location and because of its topography, we believe but can't confirm that it was possible to acoustically hide your submarine if you wanted to out there.

JS: Was the other place with unclassified data or data that they declassified, Davidson

Seamount, by any chance, or do you know?

BK: I don't know. The article in the *Science News* doesn't mention it. But there's probably other information we could find on the internet, because I found this article still is on the internet. It's been put in an archive, so one can still find it. So, I imagine. I don't know. But of course, since then, there have been numerous mapping. I know soon afterwards, I don't think that *Davidson* did the Davidson Seamount, but another seabeam system did the Davidson Seamount not too many years afterwards, if not the same year as part of the EEZ. But the *Davidson* did go down and map what's now, I think correctly, referred to as Schmieder Bank off of Point Sur. Bob and I went back to Washington, D.C. for an ROV conference and had the distinct privilege of visiting the NOAA mapping center, I think, at Reston. We were told we could come into this room, leaving our cameras and notepads outside, and we could look at the plots of the data from the Point Sur Schmieder Bank. But we couldn't take anything but our memories of it away. So, they had gone down and done that. I know the Cordell Bank data is now in the public domain and available online. I suspect that might be too. But of course, MBARI went down and did higher resolution of that afterwards because I talked to Gary Greene about that at MBARI. So, anyway, it began a whole sequence of things. It was useful, especially for Cordell Bank and helping getting the marine sanctuary established, because it provided some documentable reference point. But for me, it actually – there's a single picture of it. It's this one. This picture that –

TS: On page seven of Schmieder's book.

BK: – got published in an article in *California Geology* that Bob wrote, I believe. I think you have that. So, somebody in the remote sensing industry is a geologist, saw that and gave me a call and said, "Would you be interested in working in our software company?" I actually spent ten years at that company. This gentleman is now a close friend of mine, and I still interact with him socially and professionally. It was sort of the beginning of the rest of my life.

JS: Wow.

DL: Well, now thinking of maps – and excuse my voice, but I got the tickle in my throat.

BK: Yes, how do you spell that?

DL: [laughter] It follows page three, so it would be page four or five of Schmieder's book. It has the chart. I believe this would be the first chart that you would have been using –

BK: I suspect so.

DL: – when you first went out there, probably the only map. This is northern part of Gulf of the

Farallones. Then on page seven, you indicated this is the map that you were able to produce.

BK: That's the first full bank image that we ever were able to get.

DL: Based on the data from right from the ship?

BK: Right.

DL: How about these ones on page twenty-three? Are those related to work you were doing?

BK: Yes. The previous full bank image is a reduced data set that would fit on the screen. What we did was pull out individual tiles of the data at the full resolution that we could grid. Then used a ray trace rendering program that I wrote from some paper I read at the time to look at 3D perspective of the different dive sites that we were interested in. So, we focused on those areas because we'd never seen them this way before. I believe the one at the top of page twenty-three is the Western Pinnacle, if I remember right. I'm not certain of the other one.

DL: So, you were able to render these from any particular perspective?

BK: Yes. You had to type it in by hand. There was no mouse to rotate the screen around until it looked right in real time. I had to figure out what angle to do, come up with the numbers of the angle and azimuth and distance and feed that to the program and run it. Thirty minutes later, you'd have that picture. Then we'd shoot it off the screen because there were no screen captures in those days.

DL: Now, were other people doing this, or was this pretty groundbreaking the way you handled this?

BK: People were doing three-dimensional raster image presentation like that. To the best of my knowledge, this was right at the forefront. I don't know whether something else was actually going on at the time, but this is the first time it had been done with marine bathymetry at this high resolution. It had been done with lower-resolution deep-water bathymetry from seabeam systems because that was a commercial product that was widely used in the deep-sea research and probably Navy and certainly NOAA. This was the only thing ever done with the shallow sonar swath from NOAA, or this was the first time it was done with NOAA's shallow swath-sonar system. It had been done before with the deep-water stuff, but none of that software. There was no internet then, and you had to buy things from big companies, so we had a low budget. So, it was easier to write and tell your wife you were busy doing that and not cutting the lawn than it was to spend the money that we didn't have. So...

JS: Was this mapping data useful for leading you to the Western Pinnacle? How many dives were done after this mapping effort? Because it seems like this came pretty late in the overall expedition timeline.

BK: We wished we'd had this map at the beginning. Life would've been so much simpler because we would have been able to target the areas that we wanted to go to based upon knowledge rather than speculation. So, the last dives that I participated in were in 1986. The goal was to visit the Western Pinnacle, which one evening after dinner, the computer was crunching through the data, it all of a sudden popped up on the screen. I called Bob and I said, "Bob, there's a pinnacle that's diveable, that's shallow enough, that nobody knows about and we didn't know about." He said, "How could that be?" I said, "Well, we actually never spend any time there. We didn't think there was anything there." So, at that point in time, we knew we had to mount another trip even though we were kind of running out of the energy and enthusiasm for doing it. We actually went out there a year later and dove that site. It was one of the more spectacular sites we dove because it was – I'm looking around the room that we're in, and the top of the pinnacle was about the size of the room, maybe a little bigger. So, you had this, I think it was about 130, 140 feet. It was in the area where you still got a lot of life on the top and yet it would fall off and it was round and you could swim around it in any depth that you could stand. So, we put a team on the top with the anchor and to collect specimens. I believe Tom and I and another John, I believe, swam around it. Now, I took pictures at a whole dive, and I haven't found them yet. There's on a roll of film still that hasn't been scanned. But there's a whole sequence of pictures swimming around that pinnacle for the first time. The water was clear enough that day that you could look up and see the top, and you could look down and see the bottom at two hundred plus feet going off towards the continental shelf. It was just magnificent. This pinnacle was isolated like, what do you call it, sea stack off the coast in Oregon or California. But as you came around to the eastern side, you could see the canyon pop up and another plateau continue up. We actually were able to return to that spot the next day and dive there. That's where the pictures of Tom in the canyon silhouetted with all the fish was shot, and some of the other group pictures where you have four or five divers and lots of lights. We were able to put up to five divers in the water at a time there because the conditions were right, the Sacto Team was there, and we were ready. This was when we were at the top of our game, if you will, at that point in time. So, we got, I think, eight, nine divers in the water that day, which is kind of amazing, and collected specimens, shot pictures, ran transects on that whole area. But the diver and the pinnacle was the tops because – and this sounds perhaps selfish and stupid, but I found it and I got to swim around it within a year with my best friend, Tom.

JS: Well, now it is 2010 and you were just on this cruise on the research vessel, *Fulmar*, and they put NOAA divers down and they went to this dive spot. How was it to hear what their experiences were like in this place that you pretty much found and discovered and dove around yourself?

BK: Well, to back up just a little bit, the Fulmar expedition, the reef crest expedition this year, I was concerned that these professional NOAA, high-tech, experienced, probably bored divers had seen it all, and they were going to come up and say, "It's just another dive site." We dove the day before on the 19 Fathom Pinnacle. They just couldn't stop talking when they surfaced after that. They were blown away and they were excited and that was extremely satisfying. First of all, it was still there and it was still good, but real experienced people enjoyed it and were enthused. So, the next day, on the second dive, we got to the Western Pinnacle. The water conditions were not as good as we had hoped because they didn't have a hundred-foot visibility. They had thirty-, forty-foot visibility. But we were able to get them right down on the top of the pinnacle. They were able to both shoot video and stills on there. Everybody came up who – or the three guys. Three guys? Maybe two. Two divers who actually dove there came up and did not discount all of the discussion we'd had about how nice it was. They said it was really, really incredible. The only thing that would've been better is a little more light down there and a little better visibility. But they saw the same pinnacle, and they saw the same place. Yes, it's still there too. We were happy.

JS: Did you see some of the pictures? Were there some pictures taken there, or is that where the lights went out?

BK: I saw all the pictures, and to the best of my knowledge, I've got copies of some of them too. One's on my screen saver now. But the technology for the video and the still photography has improved significantly since we used film. The setup's the same. The general alignment of the lights are the same, but the quality of the imagery is extraordinarily improved and it's instant too. It's instant gratification. We can see the pictures as soon as the divers come to the surface, and everybody can talk about it while it's still fresh in their mind. That was an experience we wish we had been able to have before. So, when I was out there on the vessel, we revisited three sites, Craine's Point, the Western Pinnacle, and the 19 Fathom Point. Every site was a new experience and was different for the team. But the fact that they came up enthused and impressed – and these people who work in other marine sanctuaries, they know what cool is and they know what good is and they rated this pretty high on the list, perhaps near the top. They were not expecting it. They were expecting much less.

DL: This makes me think of a question that would jump back a little because you mentioned the new technology of photography, where you can look at it right away. When you took film pictures and waited to have them processed, would you then get together with Schmieder and others and scrutinize these pictures and do something with them in that way? Or did they more or less go in the file?

BK: Both. We usually had, number one, a party to celebrate the expedition for the year. That

was usually, if not before Christmas, in the late winter, when everybody had gotten everything back. The requirement was that if you shot pictures, you had to provide a full copy to the expedition. So, the pictures that the sanctuary has and that Bob has are almost all duplicates of some sort in one form or another. So, there's multiple sets between the photographers at Cordell Expeditions, and I guess the sanctuary too. So, we have, fortunately, a little diversity if any one set gets lost. I understand some were going to Cal Academy. So, we got together and looked at the best of the best in slideshows. We also provided a complete set for the archives. Then over time, we did public slideshows at times, but we ran out of steam to do that because that was a lot of work. We did a Cal Academy show, I think one or two years into it, and there were twelve projectors. It was a cool show, perhaps overdone dramatically, but we had a great time doing it, and we had all our best pictures in there and we had a full room. So, it was a pretty, pretty great experience. But it got difficult to do that on a routine basis. So, pretty much the stuff got in the archives after we looked at it. If there were specimens that got passed on to Cal Academy or UC Berkeley, usually pictures that went with that, copies would be made so they would have the photos of the area as well. So, it was informal, but there was some structure to it. That structure, fortunately, has hung together enough that the set perhaps will eventually get scanned by Cal Academy if Bob follows through.

DL: Now, with the maps and with a similar question, the map you made that we saw in the book here, was that the map of record then for a great number of years, or was there any use for that map after nobody was diving anymore? Where did that go after the work you did?

BK: I believe that we delivered all of the visual products that we had to NOAA as part of the contract that they provided us. So, they had imagery. The imagery we see in the book and stuff, they have copies of all that at NOAA. This was before the sanctuary was designated. So, it got into the system somewhere. I'm not sure whether it's still locked in a vault there or it actually gotten back to the sanctuary here in California. I actually took it over to USGS, and the sea floor mapping group at USGS got a copy of the process data. They were interested in it, of course, for the geology. I believe at lunch today we talked about chipping granite off the rocks from the Farallones up to the north end of Cordell Bank. I think that happened in [19]86 when we went out there too. So, what we tried to do is find people who were interested in the information. My concern was because we had fought the classification issue, that once it got back to NOAA, it would get once again locked away and very few people would have access to it. So, we distributed this in many ways as we could think of, and we probably left a number of stones unturned in that process. But this was early in the process. This was before iPhones and laptops and stuff. So, distributing digital data usually meant making a nine-track tape, and not many people could handle that at the time. So, the sanctuary still looks back at it, but they commissioned another survey in 2005, which was incredibly improved in quality, both because of the field technology and the computer processing that was available then. But there's still things we can do with that that haven't been done yet. So, that's the next reference set, and that's

the set that should be used going forward. The 1985 data is a historical artifact at this point in time rather than a reference point.

DL: Yes, how times change.

BK: Yes. In a lifetime.

DL: Is there any more to say about your efforts of mapping technology as far as in supporting of the Cordell Expeditions, or is that a good...

BK: We did a small project at Alijos Rocks where we didn't have a multibeam sonar, but we did do single-beam sonar mapping at the top of the volcano. It got published in a monograph of all the research papers that took place on that. But generally, I guess the answer to the question is no, it was not much more done after that. It was sort of a once-in-a-lifetime opportunity, and being civilians, we don't get to do much with NOAA except giving interviews once a month. [laughter]

DL: So, speaking of that, do you want to ask about NOAA?

JS: Yes. When did the expedition focus around this potential of designation of a national marine sanctuary? Was that early on or later? How did the rest of the team members relate to that or rally around that, or not?

BK: I don't know exactly when the idea was hatched, but I imagine it was fairly early in the process. I can attribute all of it to Bob Schmieder. I can say for certainly myself, and Tom can chime in on his own perspective, I don't think any of us really believed it was even possible. It was so far out there that it seemed appropriate. But we're an amateur team in California doing this on the weekend in our spare time. Though other sanctuaries have been established since by similar groups of people, there wasn't a precedent set at that point in time, as far as I remember. So, I think most of us thought, "That's a great idea, Bob. We'll do what we can to help you." But it was pretty much if he hadn't persisted, it wouldn't have happened. He wrote letters, he got in touch with the Congress, our representatives, and I think Barbara Boxer was even involved. Whoever was in government then, he was in touch with them, at least letter writing and personal communication. So, Bob championed it and also provided the professional interface, if you will. Bob is a physicist by training, has a Ph.D., and just those titles helped open doors and they helped him with a little bit of credibility. Though, to be perfectly frank, I heard through back channels he was more persistent than some people really appreciated. So, he built a reputation of being pushy and persistent and doesn't give up, and I think it ticked a few people off in the process. That's probably normal.

JS: Within NOAA or within national marine sanctuaries?

BK: Yes. I see them as the same because I don't know the people he communicated with. But still, if he hadn't have done that, we wouldn't be sitting here today. With all due respect to the idiosyncrasies of Bob, I respect him because he actually did it and something came of it. I have to give him a lot more credit now than perhaps some of us gave him at moments in time during the process. So, the process started early in the 1980s, and Bob had a constant campaign both in publicity, getting stuff in the media, writing letters, and following through and continuing to petition the process, and that's what made it happen. The fact that we did the sonar survey too, that didn't hurt. But that was a side issue. But it helped to add credibility that maybe we could do a little bit more than go diving. We could provide pictures. We could provide samples. We could find species. Little by little by little we built up some credibility, and that was helpful.

TS: Basically, you just said what I was going to say. In the midst of all this marine sanctuary and all the things that we had to do, he still did all this science, this wonderful species, and the identifications. The incredible amount of energy that Bob had, it still amazes me to this day on how he managed to do this so well, as well as bounce these other balls over here. Because, as you know, there are all sorts of wonderful species identifications. The science involved is even deeper than the complexities of going and trying to create a marine sanctuary, which in and of itself was probably somewhat impossible to do. But to do that and all these other intricate, detailed aspects of what he had to do, it's a testament to a pretty special guy.

BK: Well, he kept in touch with a broad range of people. I think Jennifer pretty much knows the list of people. But Cal Academy and the herbarium over at Berkeley are probably the two primary groups that were supportive and helpful along the way and kept Bob in check, at the same time helped him out and provided references and connections when he was talking to somebody else.

TS: Then to do this incredible project with the marine sanctuary and then have enough energy to go to these other expeditions, which were full-blown expeditions in and of themselves, just easier because we now were a proven entity in our abilities to get things done. That kind of energy you don't find all the time.

BK: Well, I don't have it anymore. I don't have enough. [laughter]

TS: That is for the record?

BK: Yes. [laughter]

JS: [laughter] Well, what were your personal thoughts when you learned that this actually was

officially designated in 1989, knowing that you were a part of this from the very beginning, and now there is this national recognition of it as a marine protected area?

BK: I think we got a letter from Bob in the mail. [laughter]

JS: [laughter]

BK: I think we actually did get a letter from Bob in the mail, which was a copy of it.

TS: Yes. But for me, I'm absolutely blown away that it went this far. To think that at a marine sanctuary and people's jobs and all of this is we had something to do with, just blows me away, and my name is in something that will endure forever.

BK: To compensate for all the other things that you're naming. [laughter]

TS: That's not for the record.

BK: That's not for the record. So, I don't remember a particular feeling. I remember, "Oh geez, it's finally happened." But I think it was sort of an anti-climax at that point because there were so many promises of it happening earlier. I think it was originally going to happen in [19]86 or [19]87. Through a combination of legislative priorities and other stuff, it got put off. I don't remember all the details. I just remember it's like a legal battle. It takes forever, and you never know how it's going to turn out. So, when it finally happened, it was like almost a relief and, at the same time, very pleasant.

TS: When I was making my comments, it really wasn't until I came here and saw what had happened because of our efforts. That's what I mean. When it happened and mentioned before a federal marine sanctuary, "Oh, that's great. That's wonderful that something that important happened." But when I came here, that's when I was really blown away.

BK: So, I have something to say about the sanctuary group that's here now. To a large extent, the core group of the sanctuary office is the core group pretty much from the beginning. You, Jennifer, are one of them, and Dan and Dale and a number of other people are more recent but still fully dedicated. It was always my dream to work for you folks and continue some of the projects that we do. But I fully understand the challenges of budgets and stuff, and you push me off to do other things in a nice way. But you've always been so gracious and nice to us, it's almost hard to understand why you would do that because it's satisfying and it's very appreciated. It could have been a lot more contentious relationship, but it's turned out to be a much warmer and long-term for similar and common reasons, type relationship than it could have been and we ever imagined it could be. This is almost like a family between the office and the original team.

I'm pretty pleased with that. It takes a little bit of effort to do that. I think you and Dan and Dale have gone a long ways out of your way, in many cases, to make that happen. Whether you did it on purpose, just to drag us in here today, or whether you did it because you're just nice people, it doesn't matter. It's very much appreciated.

JS: That is nice to hear. [laughter]

BK: Now, I'm being a little frivolous there. No, I sincerely want to thank you guys for continuing to at least keep in touch so we can share stuff. I think we will continue to feed each other stuff along the way in a positive way.

TS: I hope so.

JS: Thank you very much. That is really nice. I cannot imagine the sanctuary existing without really knowing these people. That is one of the reasons why this project started, is just to hear all this because it is the backbone of what the sanctuary is and what Cordell Bank is. Especially this last cruise, it was a really nice marriage of what we are trying to do now and the history of...

BK: It's an update of the past. Let me say something I think is evolving here. My perception of the sanctuary is it's moved beyond just resource preservation. It's moved to research and starting to connect heavily with the climate change research that's going on in so many other fields. I don't think that was the original plan. I think the original plan was just to protect it, study it, get insights to it. But we're finding Cordell Bank and the surrounding areas and the other marine sanctuaries are tied in to not just the sanctuaries but the land and the atmosphere and the climate of the rest of the world. Everybody in this area is looking at change in the environment that they're studying, and the marine sanctuaries are part of that. I didn't actually realize that as clearly as I did last weekend when I saw the marine sanctuary climate office at Crissy Field. There's an actual building dedicated to it with people in it, I guess on the weekdays. I knew there was a research program going on.

JS: Yes, that is fairly new.

BK: But it's more than a trivial commitment.

JS: Yes. Well, based on your experiences and what you have seen in these last thirty years, what are your biggest concerns in terms of the future protection of Cordell Bank and potential harm that could come that way?

TS: Well, when you see all the problems that other people in other areas are happening and the drilling of oil and all of these things, it's just fantastic that some area can be protected. The fact

that it can be protected from the fishermen, which are probably the biggest enemy of a place like Cordell Bank, you put down your nets and drag it across you. That'll be gone for longer than our lives, for sure. So, that's probably, to me, one of the most important things because we put so much effort into finding the beauty, taking pictures of the beauty, sharing that beauty with other people. If I ever went there or heard that somebody had dragged a net across it and it was gone, I don't know what I would do. It would be devastating.

BK: It's not because it's important. I just don't spend too much thinking about the challenges and the pressures on the area, because I'm assuming that the sanctuary system will do its best to take care of that. So, I'm not worried about that. What I'm interested in in the future of these offshore sanctuaries is a more engaging way for people to visit them other than just on a boat or in a book. Now, I think technology can help with this. We've talked about this before, but I think the technology is continuing to make it easier. So, I look forward to ways of the virtual tours at the level that remote sensing, whether it's sonar or side scan photography, live video immersed, ways of bringing people to appreciate this. In the redwoods, we can go walk in them if we would like to walk anyway. In the ocean, we really don't have many options. There's very few ways to get there. So, they're really out of sight, out of mind. I know, Jennifer, that's a continuing challenge for you. But I see that as one of the challenges to raise the awareness in a way that people can get into in the way that the short-attention-span people, teenagers, and kids are these days. How do you make them appreciate it or how can you help them appreciate it? That actually is where I'm concerned, because what is the biggest problem? There's not enough funding. How do you get funding? You got to have more people interested in getting funding. So, that's what I think the problem is, or that's what I think we should all work to within the limits of our abilities to do in years to come. I know there's an awful lot of other practical details, but that's the one that I think about.

JS: That is good. That is great. I think we are good. I got everything.

DL: I just have more of a personal question to you two of hearing about your experiences at Cordell Bank, which I can only imagine.

BK: I wish you were there.

DL: [laughter]

TS: Yes.

BK: You should have come out on the boat.

DL: [laughter]

TS: Really.

DL: But where does that fit in the realm of your lifetimes as an adventurer, as an experience? Where does Cordell Bank sit in your...

TS: Well, Bill and I have had a lot of adventures over our lives, projects before and after Cordell Bank. But to actually be here and knowing that we were part of this, to me, this is one of the most important things we've ever done.

BK: Yes, I'd have to agree. As far as significance to a larger group of people beyond our friends and community that we revolve in, this probably has had the most impact. Certainly, as I mentioned earlier, it's impacted my profession and my career in a big way, which is a good thing because there's no longer retirement in this world. [laughter] But I agree with Tom. We've had some impact beyond our local community. I think that's significant, and we had a really good time doing it besides all the work.

TS: It brings other people to realize that there's an extension of what they see around. This is part of the world.

BK: So, it hasn't always been that wonderful. So, to put it in perspective, this was a real slog for a number of years because balancing jobs and relationships and time off and stuff, it seemed important enough to do, but at the time we couldn't really fully justify it. We did it because we wanted to. So, we're looking at it from ten thousand feet, but remembering some of the little details that just didn't go so smoothly and problems that we had. But I think, all in all, they were worth it.

TS: Absolutely.

BK: So, I think that's what matters. [laughter]

JS: That first dive kept you there.

TS: [laughter] It was epic.

DL: Well, shall we call that it?

JS: Yes. Is there anything else that has not been touched on?

TS: I think we've stepped upon everything.

BK: I think we should go find the next pinnacle that we haven't discovered yet.

TS: There you go.

JS: All right. I like the sound of adventure.

BK: New species, more deep-water corals.

TS: A new set of legs. [laughter]

BK: Thank you, Dewey, and Jennifer.

DL: Yes.

JS: Thank you very much.

TS: Really.

DL: Well, thank you for spending your time and coming out here.

[end of transcript]