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Free Diving and El Nino 2014
Jennifer Stock, Francesca Koe, Logan Johnson

Jennifer Stock: You're listening to Ocean Currents, a podcast brought to you by NOAA's Cordell Bank National Marine Sanctuary. This radio program was originally broadcast on KWMR in Point Reyes Station, California. Thanks for listening!

Welcome to another edition of Ocean Currents, I'm your host, Jennifer Stock. On this show I talk with scientists, educators, explorers, policy-makers, ocean enthusiasts, adventurers and more, all uncovering and learning about the mysterious and vital part of our planet: the blue ocean. I bring this show to you monthly on KWMR from NOAA's Cordell Bank National Marine Sanctuary, one of four national marine sanctuaries in California all working to protect unique and biologically diverse ecosystems. Cordell bank is located just offshore of the KWMR listening radius off the Marin-Sonoma coast, and it's thriving with ocean life above and below the surface. The ocean holds so many mysteries to us: the habitats, the life, the mysterious ways it moves and mixes, its temperatures, its ability to absorb carbon dioxide. And as a species-- as humans-- we've made great strides on being able to enter it and see it below the surface with technology aiding greatly. Before scuba was invented we were limited by our breath to explore underwater, and this is how humans first accessed the sea, and today we still access the sea this way. If you've ever held your breath underwater before you have been free diving. It is the most natural and equipment-light way to explore the depths of the water. Free diving is diving underwater without air and when I think about free diving I think about the movie, *The Big Blue* from 1988, which was a fictional story about two competing free divers that were trying to break records of depth and time. It was quite an intense sport; it was my introduction to the whole idea of free diving even though there's a huge variety of it. There's a sled, and there's competition, and safety divers; and all sorts of interesting things and its just really brought me to wondering about the physiology of how humans can go underwater for so long and what we do; how do we survive; how our body adapts. There is some pleasure in it as well, as many people enjoy, and my guest today specifically. Today we're going to be exploring this whole range of free diving and exploring underwater by holding your breath. We're going to talk about the history, physiology, and all the interesting aspects regarding free diving when I come back with my guest, Francesca Koe. Stay with us.

My guest today is Francesca Koe and Francesca is a PADI scuba diver instructor-- Professional Association of Diving Instructors. She is a competitive free diver and also serves as a judge for an international organization for free diving. She is also the vice president of Team U.S.A. and U.S. Free Diving and an editor for the world's largest online free diving and scuba diving magazine: deeperblue.com. She's a long-standing board member for the Farallones Marine Sanctuary Association and served as a primary stakeholder representing scuba divers for the north central coast steady region for the California marine life Protection Act that put in place marine protected places along state waters of California. Francesca, welcome; you are live on the air.

Francesca Koe: Hello Jennifer; thank you for having me.

Jennifer Stock: Thanks for waiting for so long; its great to have you and I've had so much fun researching this wide topic of free diving and thanks for coming on the show. First, tell us a little bit about how you got into free diving. I know that you've been a long-time, avid scuba diver but free diving is kind of a whole 'nother level of going underwater. How did you, personally, get into this sport?

Francesca Koe: It probably all started a very long time ago when I wanted to go in the deep end with my older cousins and my big brother and older sisters. I was very small and not a great swimmer, and my very athletic and direct grandmother at the time; I asked her-- I was like, "Grandma, I want to go in with the big kids; I want to go in the deep end." In her very typical way she just directly pushed me in the pool and walked away. I think that she was trying to cultivate this comfort level of sink or swim, knowing full well that I had the capacity to handle it. Probably not too far out of reach, I have really panicked, but in seriousness: being in the water and living here in Northern California is one of my life's greatest pleasures. I came to free diving from my friends and being exposed to the activities that they were participating in and seeing the level of enjoyment and the different kind of interactions that they were having in the marine environment and with wildlife, and learning new techniques and improving one's own comfort and ability in the water really intrigued me. I think as I was entering into as far as technical diving as I could-- I had become a rebreather diver, I was doing a lot of expeditions. At that moment, friends of mine who run three diving training agencies invited me to come to the big island on Hawaii to participate in a women's only clinic. I jumped at the chance and I fell in love; I dove in and I fell in love. There's

something very liberating and relaxing about being in the water unencumbered and really just being present in the moment. As someone who had been teaching as an instructor for a long time and who had been doing a lot of technical diving and thinking about ppO2 monitors and stage bottles and decompression rates, it was really nice to bring it back to the basics. My first foray into actual training for free diving was about six years ago and I've just been hooked ever since.

Jennifer Stock: That must be an amazing experience to be able to let go of all the technology-- just let it all go and really just be focused on being underwater and yourself in terms of managing your breath and comfort underwater. I can imagine that being a huge release. Although, for me, when I did my scuba diving dive-master training I did not feel freedom when I had to do the ditch and don underwater; I was terrified of this horrible exercise that I had to do. So, I have a lot more practice to do, I think.

Francesca Koe: Well, I think that speaks to-- there are different levels of comfort and arguably you could say that every human being has the technology in terms of their physical capacity, and in terms of their mental capacity. But, being trained, disciplined, and relaxed from a physiological standpoint, is one thing but from a psychological standpoint it's a completely different thing. I think that's where you see the distinction where mind over matter or understanding what it takes to feel comfortable has a lot more to do with your mental state of mind than your physical prowess.

Jennifer Stock: I've seen some research that that is a really big piece of this sport-- especially when it gets toward the competitive aspect-- is training your mind that you can overcome those natural instincts that your body says, "It's time to breathe.", but you have to really trust that your body is going to be okay. At least, that's what I was a reading about and a part of me wonders. It just doesn't seem right, though, to ignore your body saying, "I want to breath.". Let's talk a little bit about the physiological aspects of this, because there's a lot of interesting science behind it in terms of breath-holding, oxygen, and carbon dioxide. How is it that we can adapt to the water and do better underwater?

Francesca Koe: I'd like to break it down into three physiological stages. When you're talking about what happens to the body and its all-natural survival mechanisms, and instinctively what it does; how it responds and how it provides you with technology that you need,

so to speak-- without a scuba tank and without electronics. The first stage of that is being immersed in water. If folks were to try this at home-- if they were to place their faith in a sink-full or a bucket-full of cold water and just be still for a moment, they would find that their pulse and their heart rate would slow down automatically. That's because the brain is picking up signals from receptors that are under your eyes and in your cheeks, telling the rest of the body-- telling the airway-- that it's submerged so everything else in the system should slow down to conserve oxygen, because the body needs oxygen to metabolize to support all of the organs. The second stage of that is what we call constriction. Vasoconstriction is a pretty fancy, fifty-cent word meaning that your veins and your arteries contract. It happens in your arms and in your legs; it happens in anything that's sort of peripheral to the circulatory system. What it means is that your body is forcing blood to the core of your body so that you're using less oxygen in the muscles and your extremities and that the optimal supply of blood and important gases like oxygen goes to the essential organs. Namely your heart, lungs, and brain. This is a very clever system that we really have no control over; this is just happening naturally. Then, the third stage is what we call blood shift; that's an extension of this vasoconstriction. It's really what allows us as humans to dive really deep without damaging our lungs. In diving, as you know since you've gone through these courses in scuba, the deeper you go the more pressure is exerted on you and your body and everything that's descending. Our lungs have a minimum and a maximum flexibility limit and when they reach a certain depth there's going to be an enormous amount of pressure being applied to them. As they compress, due to that increase water pressure, the air space gets smaller, and smaller, and smaller. It maybe starts out at about the size of an orange and then you go down to the size of a lime and then maybe you go down to the size of a cherry or a blueberry. There's a limit to how small our lung tissues can go before they become damaged; in order to prevent that the capillaries inside the lungs, when we start diving deeper-- and these are the capillaries, by the way, which really conduct the important gas exchange between the blood and the alveoli in the lungs to allow for body function. Those capillaries actually get bigger and they fill with more blood to compensate and make that gas exchange even more efficient to allow that air space to continue to contract without tearing or stressing the lung tissues. These are all these things that happen to the body naturally in this phenomenon of humans free diving.

Jennifer Stock: That is incredible science in terms of all of this-- and this all the same stuff I assume is applied towards marine mammals and how they are able to survive at depths with such long, long dives. Is this called the marine mammal reflex?

Francesca Koe: That's right; it's called the mammalian dive reflex. They, clearly, offer much greater proficiency because as species that's where they are. They're spending all their time in the water and we as humans can adapt and become much more fluid in our free diving the more time we spend in the water. But, this is what's happening in all the marine mammals be them sea lions, dolphins, or sea otters. This is exactly what's happening in all of them as well.

Jennifer Stock: From what I understand that there are some body types that are more conducive to being able to free dive and dive for length of time and depth. Can you speak to that a little bit? Because when I was reading a little bit of the history and the Ama divers, the women in Japan, it seems like women have an advantage in terms of this ability to dive underwater. Is that because of the distribution of fat being different on women versus men? Can you speak to that a little bit?

Francesca Koe: Well, clearly I'm biased because I'm a woman of Japanese descent, so take that with a grain of salt. But, what I find fascinating about free diving is that you can definitely have folks who have a predisposition. In other words, they may have been born blessed with a large residual lung volume; they may have large hands and feet with large arm and leg spans, which are really useful when you're trying to propel yourself underwater with only your body. But, in terms of the physical characteristics, what's very interesting is that I have seen people who are in the most excellent physical condition-- very fit and streamlined-- and I've seen people who are, let's just say enjoying Häagen-Dazs a little bit more. The biggest distinction for those different body types is less the physiology and more the mental discipline. We spoke about this a little bit earlier-- and you'll see this especially in competitive free diving. Competitive free diving takes the form of both depth diving and pool diving, and we see this a lot in international competitions in terms of depth, where people are trying to dive as deep as they can in one of three disciplines. Either: swimming down with just their hands and feet, swimming down with the assistance of a monofin, or pulling themselves down a line and just using their hands. What we find is that there will be a whole set of people who will be restricting their diet-- watching what they're eating and just eating

things that will help their body and the metallization of oxygen; things like beets and dark greens, doing yoga, not drinking alcohol, and being very disciplined in that regard. And then you'll see other cultures-- in particular I'm thinking about a lot of Finnish divers from the Netherlands. They will continue their merriments-- eating what they want; drinking what they want, and they just have a very relaxed attitude. And you will see both sets of divers performing on par depths that are astounding, and each succeeding in their own way. I really attribute that to every person having a certain ritual and routine that they follow, and whatever gives them that clarity of mind and keeps them relaxed is what's going to result in the best performance. I happen to think that if you're keeping your system clean and you're not eating dairy or things that create more mucus that could create blockage in your sinuses, that's probably a good idea. And in general you can follow some common sense things but it really boils down to how people respond to dive situations and what keeps them the most relaxed, because the key is relaxation and minimizing the energy exerted so that you can make the most out of the limited one breath of oxygen that you have before you perform your dive.

Jennifer Stock: When I was on Catalina teaching students, and we would do snorkels-- this was something I had to do every single day, sometimes two or three times a day with a group of students-- and dive underwater and try to find interesting things to share with them. I remember at the beginning of the season after now diving for a while it'd be really hard to do and more stressful, and as time went on it got so much more relaxing and I could easily just slip down underwater and I felt so much more at ease. So, I really can relate to the idea about the mental aspect of that as well as just the regular exposure and practice becomes a little bit more a part of the background in terms of what you do. I miss those days of just being underwater half the day.

Francesca Koe: It's a great way to just have fun and recreate. I do want to mention-- just for anyone who is listening-- you were talking about this movie, *The Big Blue*, directed by Luc Besson and talking about the friendship and the competition between Enzo Maiorca and Jacques Mayol. The film was a real relic of the '80's, that's for sure. But, in terms of the way that they revealed the story, I just want folks to know that that is actually a true story. There absolutely was an Italian diver named Enzo Maiorca and a French diver named Jacques Mayol, and they had a very friendly rivalry and competition in terms of seeing who could go deeper and who

could get there first and who could stay longer. Back when their rivalry was taking place, the most common form of free diving for competitions was to ride a sled down. So, they were literally taking a weighted sled that was attached to a cable and they were wearing a wetsuit and sometimes goggles-- sometimes not-- and they were holding on to the sled, and the sled would descend, and they would try to get to a target depth. Maybe it was fifty meters; maybe it was sixty meters; maybe it was seventy meters, and they were doing this at a time where there was so little known about the sport and what the physiology impacts were and what would happen. They were really breaking new ground and exploring a whole new territory. The reason I bring it up is: A- because I want people to know that it's actually based on a true story; B- I want people to know that there was also a fellow named Bob Croft who was really the godfather of American free diving. Bob Croft, Enzo Maiorca, and Jacques Mayol were doing all of this extraordinary exploration and really being pioneers for the sport. Lastly, and perhaps most interestingly, the depths that they were achieving that they thought were really it; people couldn't go any further. The depths they were trying to achieve are now probably fifty percent of what is being achieved by people at the highest levels of competition with themselves being propelled only by themselves; not riding a sled and basically swimming down. The deepest constant weight, which is the discipline where people use the big monofin and then swim down-- the deepest record to date is one hundred and twenty-eight meters.

Jennifer Stock: Wow; that's just over three hundred feet! Three hundred and fifty feet, about! That's insane! I was going to ask: well, it's still a little bit of light down there; it's not completely dark.

Francesca Koe: Well, it depends! A hundred and twenty-eight meters is about four hundred and twenty-two feet and think about buildings like the Empire State building and then you begin to understand how deep these divers are going, and really how the mammalian dive reflex is kicking in to allow them to do that.

Jennifer Stock: So, this is interesting. You bring up a point that I want to make a distinction of. There is the free diving that's more recreationally used, such as photography underwater and people will dive down-- maybe not quite so deep-- just to be in a really neat spot for taking photographs without bubbles and the distraction, perhaps, to the environment and animals that might be around it. Also, spear-fishing underwater or just getting underneath and being suspended

underwater. And now there's this whole other aspect of free diving that you're talking a little bit about here that is to the competition. And it seems like the competitions are about utilizing our new knowledge about the physiology and training our minds and bodies to be able to go to depths, and it seems that they're kind of two totally different disciplines altogether in terms of enjoying this sport. Can you talk a little bit about the whole approach in terms of-- you mentioned there were three different kinds of competition: those that will dive down on their own, the monofin, and then the line dive. Is the sled no longer a thing anymore? You mentioned they pull themselves down and how do they get back up? Do they pull themselves back up? Swim back up or use their natural buoyancy; how does that work?

Francesca Koe: Sure! I'll just quickly go through that in terms of the International Association for the Development of Free Diving, which is basically the International Olympic Community of Free Diving; it's the governing sports agency. That agency recognizes three depth disciplines that are self-propelled. One is constant weight with a monofin, one is constant no fins; which is sort of a modified breaststroke swimming down and swimming back up, and all of these instances: if you're swimming down you have to swim back up. If you're pulling yourself down you have to pull back up, and free immersion is where you're pulling on the line with your arms. In the pool there are static apnea which is basically still holding your breath, dynamic which is swimming horizontally on one breath as many lengths of the pool as you can with a monofin, and then dynamic no fin which is the horizontal dynamic modified breaststroke, no fins on your feet. In terms of recreational free diving I think this is what's the most exciting-- especially here in California; we have prolific sea life, gorgeous coastlines, fantastic underwater and terrestrial parks that you can explore, and you get to increase your area of exploration by more than seventy percent when you walk to the water line and you get in. It's something that you can share with friends and family, and you can really experience the bounty and the beauty of California in ways that are indescribable unless you put a mask on and stuck your face underwater. If you're not interested in doing competitions, that's great; there's plenty to do here in California whether you're taking pictures or maybe you're hunting and gathering. You can participate in the eating of delicious seafood whether you're catching a fish or you're picking an ab or an urchin. It's just a really great way to bring yourself back to connecting with nature and really enjoying something that's so special where we live in a place

where the upwelling and the sea life and the different things that we get to see in our ocean; they just don't exist anywhere else.

Jennifer Stock: This is a global activity and a lot of the history of early access seems to take place in Greece, off of Japan, and some warmer water areas; it seems like a lot of these competitions happen in warmer water areas. Is there a difference in terms of the body response and cold water versus warm water? Because, it seems like most of the competitions, for the diving-deep part of this sport, is in warmer water. What's it like in cold water?

Francesca Koe: The reason for warmer, more tropical destinations for some of these competitions has to do with being able to provide safety and redundancy in the competition. You really want to have places that are protected so there's no current, and you want to have places where there's great visibility so that you can see the divers and see what's happening. There are always auxiliary systems: re-breather divers, scuba divers along the way, sonar systems to track the divers. But having good visibility is-- there's really no replacement for that so those are some production, logistical reasons for having them come in places where the weather can be more predictable. You can have amazing visibility here in California and along the North coast; it's just less predictable. If you want to get the depth that these divers are achieving you have to go pretty far offshore, which creates a logistical headache when you're trying to facilitate tens, if not hundreds, of divers. There actually is a benefit in terms of cold water because it kicks in the mammalian dive reflex sooner. In terms of "technically, is it better?", colder temperatures definitely speak to certain reactions that are more useful. But in terms of other things like current and visibility, it's a little less desirable because it's less predictable. However, I will say that for spear-fishing or things like abalone diving, you can't do that with the kinds of-- whether it's certain sea bass or lingcod; you're just not going to get that in the warmer temperatures. I, as a recovering scuba instructor, always like to remind people that when you learn to dive in cold water, you're prepared to dive anywhere. And the inverse is not true; if you can handle yourself in cold water you can handle yourself in the mild, easy, three hundred foot vis' water that you're going to get in the Caribbean. If you learn in those conditions and then you come here to California it's going to be a little bit of a rough ride.

Jennifer Stock: Definitely agree with that! For those tuned in, you're listening to KWMR in Point Reyes Station, in Bolinas and San Geronimo

Valley, and live on the web at kwmr.org. I'm talking with Francesca Koe and we're talking about free diving and the many aspects of this incredibly interesting, challenging sport. Tell us a little bit about places you like to go in California and how do you do it? Do you get on a boat? Do you start at the shore? Maybe, talk us through how you prepare to go diving.

Francesca Koe: Sure! Before I answer that, let me just-- before we get to the top of our hour-- give some resources to the folks who might be listening in who are either already participating as divers or who are curious and would like to learn more. We have a lot of great resources here in the North coast and we've got a lot of great instructors and a lot of people participating. Just a few sites to check out if, if anyone is interested are: freediveblog.com, which is a blog written by Erin Magee, a former US National record-holder and resident in Cloverdale who runs clinics up and down the Sonoma and Mendocino coast. You can learn more about her clinics and her classes at pacificcoastfreediving.com as well. Then, for people who want to learn more about where some good hunting spots or where they can spear certain species of fish, you can always check out norcalunderwaterhunters.com. Of course you can always go to the deeperblue.com forum and we have a whole Northern California section where there's always an active conversation going on. In terms of what I like to do, we-- again -- are really blessed to have access up and down the coast. When it comes to depth training, physically I like to go to points South that are a little more protected. There's a beach south of Monterey towards Carmel called Monastery beach and you will actually be at a hundred or two-hundred yards off of the canyon. You'll get as much depth as you want there, and there's a group of divers-- Monterey Bay Free Divers-- on Yahoo! Groups and they organize weekly and bi-weekly trips out there so that you'll always have a dive buddy. That's an important attribute to remind folks that you should always be diving with a buddy, if not multiple buddies. Then, along the North coast if you're hardy and you like to hike there's a fantastic hike down-- are you familiar where Elephant Rock is in Point Reyes?

Jennifer Stock: Yes.

Francesca Koe: Okay; so, A: it's beautiful and even if you don't want to get in the water it's a fantastic hike, but if you're in good physical shape and you have good cardio, stamina, and you're willing to hike down the side of a mountain, it's a really pretty, spectacular spot. The

beautiful thing about the Sonoma coast and Mendocino is that there are plenty of really great spots to get in the water whether you're in Salt Point park and you're going to Gerstle Cove or you're going in at Fort Ross or any of the parks at Sea Ranch. I, in particular, like the Mendocino Headlands because it offers a lot of coves that when you're getting a northwest swell there're a lot of protected coves that you can get into and otherwise it would seem the whole coastline is blown out. Typically this is mostly shore diving where you're driving to a spot and packing our gear, and some spots we pick because we're feeling a little lazier and we want less of a hike, and other spots we pick because we like to make a day out of it and bring a picnic and hike and do the whole thing.

Jennifer Stock: What type of wetsuit do you wear? Is it a pretty thick one for free diving and a weight belt or how do you determine your wetsuit if you're just going to be free diving versus scuba diving?

Francesca Koe: I have what is called an open cell neoprene wetsuit; all of my free diving suits are open cell, which are a little bit softer and more malleable than a typical scuba or surf suit, which is a little tougher and less flexible. You can decide what you can tolerate, in terms of temperature; depending on what the activity is I'm either wearing a three, a five, or a six mm suit. A three mm suit if it's really warm out and we're not going that deep and we're going to be swimming out far so I'm going to be getting hot; I'll wear my three mm. If I'm going to be in the water for a whole day of activity I might pick the five mm or the six mm; all of these are suits that have hoods so you're really staying pretty warm. I have never been cold in my six mm, open cell suit; in fact, usually the opposite-- I'm usually too hot. In terms of weight, what you want to do is have enough weight so that when you get to a certain depth you're going to be neutrally buoyant. Typically, depending on which suit that I wear, I'm wearing in a range from eight pounds to fourteen pounds of weight. Just because it's more comfortable for me I wear some of it on a belt around my hips sitting really low below my diaphragm so that my breathing is not restricted at all, and then sometimes I wear a neck weight just because I'm used to it from my competition diving; just so that I have the weight distributed and I have a better trim in the water.

Jennifer Stock: I've never heard about neck weights before.

Francesca Koe: We make them out of the inner tubes for bicycle tires, and we put lead shot in them and it's something that you'd want to learn from an experienced diver and try out. Some people don't like it, it's uncomfortable for them, but if you are used to it it's a nice way to distribute the weight. The other thing that's important is the placement of the weight belts, as I was mentioning to you. A lot of people will cinch it really tight along their waist. Because you're trying to access as much of your residual lung volume as possible, and you're trying to get a deep breath from your diaphragm, the lower you can wear your belt, the better so that you're not restricting that muscle.

Jennifer Stock: Nice; that's good to know. We just have about three or four minutes left and I'm curious just when you get to the spot that you want to be to go down for a little bit, what do you do to relax? To get ready and get some equilibrium before diving down? I've heard about people almost hyperventilating but I know that it's really dangerous. Can you just talk a little bit about what you do at the surface to help you prepare to go down for a little bit?

Francesca Koe: Sure; we definitely do not recommend any kind of hyperventilating as that's a bad idea because when you remove carbon dioxide from your body, the mammalian dive reflex doesn't kick in as soon as it should. You don't want to do anything to prohibit that, you naturally want that to be available to you. You always have a plan-- before you even get in the water you make a plan: What is our entry point? What is our exit? What are the conditions? Do we need to have a different exit plan depending on if the conditions change? Who is being "buddied" up with who? Are there two of you, three of you, four of you, and how are we going to rotate because it's always one up and one down; you don't all go down at the same time. You always want to be a back-up to one another. Then, when you're heading out I typically take a float either because we're going to be collecting abalone or urchin, if it's in season, and/or just so that we can hold our stuff if we've got extra gloves, cameras, or water. It's nice to have a float, just something to all congregate around. I typically just like to assess where I am, so I'll put my face in the water which kicks in that immersion phase of the physiology where your sensory receptors are saying, "Hey body, you're submerged. Let's slow the heart rate down". And I'll breathe through my snorkel and look and see-- it may be a "split pea soup day" so there may not be a lot to see. You're just taking your time and acclimating to your surroundings, and if it's a better vis' day you can see what's going on beneath you. If it's a not

as good vis' day you're just calming yourself and preparing yourself for the dive. Typically, even on the days where it's not great vis' here in California, I find that usually when you dive down and you get below a certain layer-- whether it's plankton or turbidity from wind or a storm-- usually at depths there is an increase of visibility. It might be minimal but usually when you can get through the top layer there's an increase-- even if it's only five foot vis'.

Jennifer Stock: When you're down below, what's the signal to come up?

Francesca Koe: It's a combination of things. It may be the objective-- maybe I'm trying to get a really great shot of an anemone and maybe I've gotten it right away so I come back up. Every diver is going to have a different level of ability, so for some people being down four, ten, or twenty seconds is enough and they come back up. For other people who are more comfortable in the water-- maybe they've spent more time, maybe they're spear fishing-- they're going to be down there for a minute checking out a reef or checking out specific rocks to see if there are any fish. For me, it depends on the conditions, how I'm feeling that day, and I really just listen to my body and I also listen to my training. Training is so important and I feel very privileged to have been trained by the best: Performance Free Diving International is a great training agency and there are a lot of great training agencies in the United States. Free Diving Instructors International is also another great agency, but you're really listening to your body that day and what your energy levels are. And, know that you're not responsible just to yourself but you're responsible to your buddy who you're diving with. You don't want to put that person in a situation where they're having to do something because you stayed down a little bit too long.

Jennifer Stock: Well, Francesca, we're just about out of time here. I have another guest coming on for the rest of the show but thank you very much for talking us through the physiology and the experience. I was really visualizing along the way, especially for California; the "pea soup water", diving through it, and seeing stuff. It's really an amazing opportunity to do and I really appreciate your recommendation for people to get training in this before trying it on their own. And, of the websites you gave us, are any of these really good for finding out about training? You said maybe pacificcoastfreediving.com would have training?

Francesca Koe: Yes; for local training pacificcoastfreediving.com is a great resource. They can set up classes, they have classes running frequently, and if they don't have a class running in your neck of the woods or on the dates that you need it they can recommend other instructors who can help. That's pacificcoastfreediving.com.

Jennifer Stock: Any last thoughts you want to share about free diving the audience?

Francesca Koe: Just that I highly encourage everyone to participate. It's something you can do-- this also probably just because I'm biased but the older that you get, I find that the better you get at free diving. In terms of participation it's low impact and you can enjoy it well into your golden years.

Jennifer Stock: That's wonderful; thank you so much, Francesca. I really appreciate you calling in today and have a great afternoon.

Francesca Koe: Okay, thanks. Bye.

Jennifer Stock: We've been just listening to a talk with Francesca Koe and she is a free diver, scuba diver instructor, involved in many different aspects of the sport of free diving, and recommended a couple of websites: freediveblog.com, pacificcoastfreediving.com, norcalunderwaterhunters.com-- probably more for the spear fishing and collecting aspect, and deeperblue.com. Those are all great places to learn more about this incredibly interesting sport and the aspects of diving underwater. We're going to take just a quick break and actually when we come back I'm going to be speaking with Logan Johnson about what's happening with El Nino in the Pacific. I've heard a lot about the news that we may have an El Nino coming this year and there are a lot of scientists monitoring this, so we're going to talk a little bit more about what's happening with El Nino when we come back in one minute. This is Jennifer Stock and you're tuned to Ocean Currents; stick with us.

We're going to switch gears a little bit here, and talk a bit more about some conditions that are setting up in the Pacific Ocean. With me on the line here I have Logan Johnson, the warning coordination meteorologist for NOAA's national weather service based out of Monterey. Logan, welcome; you're live on the air.

Logan Johnson: Good afternoon; thank you very much for having me.

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Free Diving and El Nino 2014
Jennifer Stock, Francesca Koe, Logan Johnson

Jennifer Stock: We've been hearing a lot about El Nino in the media and I wanted to go straight to the source. NOAA is a leading agency that monitors this oceanographic phenomenon and I'm wondering if you could give us an update of what's happening with El Nino this year.

Logan Johnson: Sure, I'd be happy to do that. We are expecting El Nino to develop this year and in fact, conditions across the equatorial Pacific where we monitor water temperatures are indicating that El Nino is very close to beginning already at this point. We do have a very high probability of an El Nino being ongoing by the time we get into the Fall and Winter seasons of this coming year.

Jennifer Stock: Just as a quick back-up for listeners: El Nino is basically unusually warm sea surface temperatures that make their way up the coast here in California; it's the opposite of La Nina which is unusually cool temperatures. The last strong El Nino I think we had in California was 1997 and '98. I think that's where there's a lot of certainty right now is: "Do we have an idea how strong this event could be for the Pacific?" I know Californians are really dying to get some rain.

Logan Johnson: That's correct; we all want to see the rain, so the question when we talk about El Nino becomes not just, "Is El Nino going to happen?", but as you mentioned, "How strong is that El Nino expected to be?" That's what's a little bit less certain at this point. We're very certain El Nino is going to develop, but it's a little bit trickier to figure out exactly how strong that will be until it gets started. As it begins to get started here over the next couple of months, we're going to get a much better sense of how strong the El Nino is going to be. Like you mentioned, the strong El Nino event in the late 1990's really stands out in the minds of a lot of Californians because it was a very wet, stormy winter season with a lot of incidences of flooding and mudslides and things like that. But that's not to say that El Nino is going to produce that type of conditions. In fact, no two El Ninos are exactly the same. As we go into this winter season, there's no indication that says it's going to be a strong El Nino on the order of the late '90's. It could be a weak El Nino or a moderate El Nino, and in those cases the impacts could be a little bit different than what we'd see in a strong El Nino year.

Jennifer Stock: What are some of those impacts that we might see if it's weak?

Logan Johnson: Looking back, historically, at what we've seen across the bay area during weak El Nino years shows that the rainfall those years tends to be a little bit more variable. There have been quite a few very dry years that occurred in weak El Ninos, so there have also been some wet years that have occurred in weak El Ninos. Things get to be a little bit more variable but on average El Nino years we actually end up with a little bit less than normal in terms of rainfall across the bay area.

Jennifer Stock: As the summer goes along, when do we get a little bit more of an idea or do we ever get an idea in terms of this strength-- that it's being weak or strong? Does that just present itself as time goes by or do you have a good forecast as time goes by where you can determine it'll be stronger or weaker?

Logan Johnson: What we have, as far as strength, is we're monitoring what's going on right now, and we're watching how quickly the water temperatures are warming-- how far above normal they already are-- and then we have computer models that take what's already going on and project that out in future over the next several months. Typically, in the summer season it's really about August that we start to get a pretty good sense of how strong that El Nino is actually going to end up being. This current point is still developing, it's still a little bit uncertain. Some of the computer models last month were beginning to hint that we're looking at a weak to moderate El Nino, but it's also important to say that nothing has really come out in showing us that it's going to be a strong El Nino, so I think that we should look for something more on the order of a weak to moderate El Nino, and over the next month or so we're going to see those expectations becoming a lot more accurate as the computer models get closer in time.

Jennifer Stock: Fantastic; do you have a website that you'd recommend people to be able to keep up with more timely updates regarding El Nino? I know that there's a monthly update and there's one coming up this week where there will be more updated information. Which website would you recommend?

Logan Johnson: You're correct; there's an update coming on July 10th and that's the official update on this provided information on what's happening and where things are going. That's available from the Climate Prediction Center; that's CPC. If you just Google CPC, that's part of NOAA and they are the people that monitor El Nino conditions. They have a lot of technical things on their website, but they also

do have some non-technical things that the general public or people who aren't as familiar with weather and climate terms might find useful.

Jennifer Stock: All right, and is elnino.noaa.gov still an active website?

Logan Johnson: Yep; elnino.noaa.gov is a great website resource as well. In addition to what's just going on this year, they have some really cool tools to help you to visualize what goes on during El Nino and the impact that you see on the weather across the United States as well.

Jennifer Stock: Fantastic; thank you! We will stay posted for all of us here, we need to continue to deepen our water conservation efforts, no matter how strong our El Nino is, it's not going to save us. But, thank you so much for the update on what's happening right now.

Logan Johnson: All right; thank you very, very much and glad to provide that.

Jennifer Stock: Thanks, Logan and have a great afternoon.

You heard it there; this is what we know right now. Definitely a weak El Nino, a weak to moderate being predicted. We don't know how intense this El Nino might be; I've definitely been watching it closely because of the rain aspect but it's very important for us to remember to deepen our water conservation efforts, no matter what the outcome is with this weather. And, stay posted; I'll definitely keep you updated on my shows in the next few months, and it certainly will be welcome rain that comes along with this warm weather, warm water system. Well, I'm out of time here today for Ocean Currents. We talked earlier with Francesca Koe about free diving and all the aspects around exploring underwater without technology, and just a quick little recent update there on El Nino, which could greatly impact us here in California with the weather, water conditions, sea conditions, and the wildlife that's around. I know that I'm hosting two wildlife-watching trips in August and I'll be curious to see how the water conditions will be affecting the presence of wildlife, because they drastically affect the presence of wildlife based on the prey in the water and all the ocean conditions. We'll be watching and I'll keep you posted. Ocean Currents is part of the West Marin Matter Series, which is always the first Monday of every month, and I post the podcast of the show-- reruns of the show-- on our website: cordellbank.noaa.gov where you can catch past episodes. I have about eight years of

shows now with many, many different topics so keep posted there for catching up on past episodes, and thanks for listening and supporting KWMR.

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