(Jessica) So hello everybody and welcome to "What Do Scientists Do?".

My name is Jessica and I'm joined by our very special guest today could you introduce yourself give us your name and your pronouns?

(Suchinta) Hi everyone my name is Suchinta Arif and my pronouns are she/her.

(Suchinta) So I am a coral reef ecologist so I study coral reefs

(Jessica) So I feel like lots of us have seen coral reefs in movies and documentaries and stuff but what is a coral reef exactly?

(Suchinta) That's a great question. So coral reefs are ecosystems that are underwater and they're characterized by reef building corals so these reef building corals are actually made up of coral polyps which are these tiny one-inch animals related to jellyfish and sea anemones and they live in large colonies of hundreds and are held together by calcium carbonate. And once they die off the calcium carbonate remains so over time they build up into these larger coral reef structures. So these tiny one-inch animals are responsible for some of the largest coral reefs in the world so the largest one we
know of is actually in the Great Barrier Reef which spans about 1,600 miles and it's so large that it can actually be seen from space.

Jessica: That's so cool. I'm curious have you ever gotten to visit the Great Barrier Reef?

Suchinta: I haven't but it's definitely on my to-do list.

Jessica: Yeah that would be pretty cool. I remember I was super into the great barrier reef as a kid. So you mentioned that coral reefs are like these big structures made up of all these tiny things that have calcium carbonate. Calcium carbonate what is that? Does anything else in the ocean have it?

Suchinta: So calcium carbonate it's kind of like limestone and lots of creatures use it to make their shells. So for example anything with a shell often has calcium carbonate in it.

Jessica: Super cool okay yeah so it's that like hard stuff that you see in shells and little coral polyps also have it.

Suchinta: So my favourite thing is how biodiverse
it is. So when something is biodiverse it means there are lots of different species living there

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at the same time. So coral reefs are actually one of the most diverse ecosystems in the world

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and for that reason people often refer to it as rainforests of the sea.

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So about a quarter of all ocean species depend on coral reefs at one point

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or another even though coral reefs make up less than one percent of the earth's total surface.

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So they're home to a range of animals including fish, sea turtles,

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birds as well as marine mammals and plants.

(Jessica) Yeah so I'm picturing them kind of like

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the cities of the ocean like all this all these different species all living together

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even though some of them maybe some of them live farther away from the coral reef and

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maybe they come there to feed and stuff like that?

(Suchinta) Exactly so some will live on the coral

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reefs the entire time whereas others may spend a short amount of their time there so when

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they're

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younger they might use coral reefs as shelter and then when they're adults they don't live there

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and others will come in and out. So there's a huge diversity of animals that use them

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for shelter, for food and at different levels.

(Jessica) That's super cool they're like a really
important ocean hub. What do coral reefs do for us? How do they help us as humans?

(Suchinta) So this is a really great question so coral reefs offer many ecosystem services and what

that is is that is essentially services that we get from ecosystems so an estimated 1 billion

people actually depend on coral reefs for these ecosystem services. So these include fisheries

so as I said there are lots of fish that live in coral reefs so a lot of local communities

as well as people abroad depend on coral reefs for their food and local communities also depend

on fisheries for their income. Coral reefs also provide shoreline protection so they

create a natural barrier between the ocean and land so they can provide erosion control,

they can limit flooding, they can limit the negative impacts from storms and storm surges

and of course they also help us through tourism as well as recreation. So if any of you have ever

been snorkeling on a coral reef you know how much fun that is and how meaningful that experience is.

(Jessica) So it sounds like they're pretty important is there

anything that might be threatening them? (Suchinta) Yeah they're actually a pretty
vulnerable ecosystem right now uh one of the things that's impacting them is climate change

so when you have increasing temperatures this can actually lead to something known as coral bleaching so what this is is corals are they actually live with an algae known as Zooxanthellae and they live within their tissues and they provide the coral with food, oxygen as well as removing waste whereas the coral provides them with the compounds needed for photosynthesis

as well as shelter. So because both of these organisms are benefiting from their relationship this is known as a mutualistic relationship and when you have severe heating events often the algae the Zooxanthellae will leave the coral and this will turn the coral white. And this is known as coral bleaching and when this happens the coral becomes more vulnerable to dying off and it's often very hard to recover back into a healthy coral state.

(Jessica) Yeah so that sounds like it's not a great situation for the coral reefs then.

(Suchinta) So one of the main things we can do collectively is to be conscientious about how we tackle the current climate crisis.
So try to limit our waste and our carbon footprint as well as vote for those who are in power who
are making policy decisions to try to shift our society into a more sustainable way of living.

(Jessica) That sounds all super important a lot of that stuff is maybe things that it feels like you
can't do until you're an adult and it's true that you can't vote until you're an adult but is there
anything that you could do as a kid to help?

(Suchinta) So one of the things you can do
is when you're buying seafood for example just to make sure that they
have been caught sustainably because overfishing is also another threat to coral reef
ecosystems.

(Jessica) That sounds manageable to me. So
you talked about all this stuff with coral reefs - how do you go and study them?

(Suchinta) So one of the main ways we understand what's happening with coral reefs and how
they're
being impacted by these different threats is to actually go underwater and survey them.

So there are various different survey methods that are available - I'll describe one very briefly
and
this is known as a transect survey. So these are kind of fun so what you do is you dive
underwater.
to a coral reef site and you put down a transect line which you can think of as a measuring tape

and then a researcher who's diving will swim across this transect line and they'll look
to the left of them and they'll look to the right of them and they'll note down in their underwater
pencil and paper all the different species that they see and they'll also collect information such
as the size of different fish species that they see as well as environmental variables such as
the temperature of the water that day how deep the coral reef site is and so on. And this is often
standardized so that the data can be trusted.

(Suchinta) Cool so in order to be someone who
researches coral reefs you have to learn how to scuba dive right?

(Suchinta) Not necessarily so there are a lot of different kinds of coral reef scientists
some of them are very good at scuba diving and collecting that data whereas others like myself
depend on that data and then focus more on the analysis aspect. So now that we have
all of this data how do we answer these questions that we have through statistics and analysis.

(Jessica) Cool and what are some questions that - or some things that you've been able
to explore with data from these coral reefs?
(Suchinta) So one of my main projects that
I've had the privilege to work on data that was collected for a long time on coral reefs in Seychelles. So researchers - not myself - collected data across 21 reefs from 1994 to current day. And they collected all of the important data such as how much coral reefs there were at a site, what species were there, how deep these corals were and so on.

And in 1998 there was a climate-induced bleaching event that led to about half of these coral reefs turning into macroalgae systems. So after the bleaching happened the corals died off and in its place there were macroalgae instead. So the entire ecosystem shifted and this is known as a regime shift. But what's interesting is that the other half of the coral reef sites recovered back to a healthy state. So because we had all this long-term data we wanted to answer the question: well why were half of these recovering and the other half didn't? And with this data I was able to find out a few different things. So what we found was coral reefs that were deeper were actually more likely to recover and that's because when you have a heating event deeper coral reefs are more protected. Also coral reefs that were more structurally complex so their reefs were
there were more reef structures were actually better protected as well and were more likely to recover. And that's because they provided more shelter and more habitat for a diverse amount of fishes which actually ate the macro algae preventing them from taking over later.

And another interesting thing we found was that coral reefs that were dominated by branching coral which are these very pretty corals but are fragile to bleaching events were of course more likely to turn into algae-dominated systems. (Jessica) Cool so it kind of gives you an idea of which kinds of coral reefs might be more vulnerable right? So that you can keep an eye out? Is that the main thing that you would use this for? (Suchinta) Exactly so this can help us answer questions about where should we strategically place marine protected areas. So of course marine protected areas are sites where you limit the amount of fishing and destructive human practices so you try to allow the ecosystems to recover and stabilize and thrive. So what this study is showing that is that if you're creating a marine protected area for coral reefs you might want to prioritize reefs that are deeper that are structurally more complex and that have
more resilient coral species growing in them. (Jessica) That makes complete sense that sounds

like it's super useful data. It's wild that took - was that 35 years worth of data

or was it just from the 1994 to 98? (Suchinta) No it was 1994 and it's

we're still collecting data today. So there was actually a second bleaching event that occurred

in 2016 and we're currently trying to answer more questions with that so it's still ongoing.

(Jessica) Well I look forward to seeing what you find out from all that data because it

sounds like it can be super useful. Do you have any cool future projects that you're working on?

Yeah so we actually have a global data set that believe it or not was collected mostly by
citizen scientists so not necessarily researchers themselves and I'm trying to look at how different

variables so different factors such as how deep corals are or how close they are to

human society might be impacting the ecosystem services that we get from them across the world.

(Jessica) That's super cool I love citizen science. Do you have - in general we've talked

a lot about coral reefs I know you've done more than just study coral reefs - do you have a
favourite science thing that you've ever done?
(Suchinta) So my favourite science thing is

actually what got me into the marine ecosystem world and it was when I was an undergraduate

student at the University of Toronto I decided to take a few field courses at Bamfield Marine
Sciences Centre which is all the way in British Columbia and it was really my first time being

immersed in the ocean and learning from marine scientists as well as enthusiastic

marine ecology peers. And it was a delightful time and really it's what made it click for me. I was

like okay I'm going into marine science.
(Jessica) That's super cool is that

the one that's on Vancouver Island?
(Suchinta) Yes it is and it's very remote

uh so you really get a very unique immersive experience I highly recommend it.

(Jessica) Yeah that sounds amazing um I'm sure it's beautiful there as well.

Thank you so much for joining me today Suchinta do you have anything cool that

you're working on that you would like to promote?
(Suchinta) I do so because the thing that got me

into science were these kind of co-curricular immersive experiences I actually with my
colleagues started my own scientific outreach organization. We're known as Diversity of Nature so we provide free and immersive outdoor experiences geared towards black indigenous and people of colour youth across Nova Scotia and we have a lot of fun activities coming up this year including a Halifax shark week that you should look out for that will be out sometime this summer. (Jessica) That sounds like so much fun.

Halifax shark week? Amazing just no explanation needed sounds like a fun time. So yes if you're interested in more of the work that Diversity of Nature does you should definitely check it out I will definitely put your website and everything up along with this podcast so that you can see what they're up to they do lots of very cool things in the Halifax area and Atlantic Canada. And as always a big big thank you to everybody listening for more science fun you can check out at @scientistsdopod on Twitter or Instagram or you can find our past episodes at bit.ly/whatdoscientistsdo . To learn more about Diversity of Nature you can check them out on Twitter @diversityofnat that's diversity of n-a-t or @diversityofnaturens on Instagram. You can also check out their website diversityofnature.com.
Thank you so much for listening and I'll see you next episode. Bye for now!

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