In Deep Water: Corals in a Changing Climate, with Nadia Jogee (S02E01)
Not Another Science Podcast
February 3rd, 2021

Introduction

Intro music

[Tom Edwick] Welcome back to another science podcast. I'm Tom.

[Helena Cornu] Am I’m Helena!

[Tom] And we are back for Season 2, and boy do we have a cracker of an episode to get the ball rolling.

[Helena] And speaking of rolling balls… Today's episode is all about coralliths: mobile corals that roll around the bottom of the ocean.

[Tom] And our guest is the wonderful Nadia Jogee from the School of Geosciences. Her PhD is investigating the role of coralliths in the marine ecosystem, which hopes to shed light on how coral reefs might change as a result of human activity.

[Helena] She had some incredible stories for us about how she got into coral research, what her research involves day to day, and how this fits into the wider context of climate change. You are in for a treat, my friends.

[Tom] We also have a very special announcement to make, which is that this season, Not Another Science Podcast will be hosting a new podcast by Aaron De Verès. Aaron is a science communication intern at the Botanic Gardens of Edinburgh, and he has created a series called Plants and Our Health, which will air every Friday, with two episodes in the first week to get your botanical juices flowing.

[Helena] Plants underpin so many essential aspects of our society, everything from agriculture to medicine. They have had fascinating and really unexpected influences on humans that sometimes go unappreciated. So this podcast series will remedy that. Tune in for the first episode on February 12th.

Before we start, this podcast is sponsored by Greiner Bio One, supplying the laboratory, diagnostic and medical products to research institutions, higher education, the NHS and others across the UK. For details of the full product range visit www.gbo.com.

And now, on with the show!

Intro music ends

Main

[Nadia Jogee] Okay, I can hear you now. Can you can hear me? Oh, thank god! I can hear you, and you can hear me. Okay, we got it eventually.

So hi, my name is Nadia. I'm a PhD student in the School of Geosciences at the University of Edinburgh. That's so well practiced, isn't it?

I work on tropical corals. But I work on a particular type of coral called a corallith, which sounds a bit like you have a lisp, but it's a unattached free living mobile coral. So whereas most corals settle on hard substrate like a rock, and then grow in this sort of sessile lifestyle, so they experience very limited variations in temperature, lighting, those kinds of aspects of the environment.

Because these corals that I study are mobile, they get moved around by waves and fish and other animals moving them around. And that movement means that they experience lots of variation in light, temperature, all these kinds of things that would usually be quite stressful to a coral. So I'm trying to understand why is it that a handful of coral species can form these mobile corals? Because not all of them can. And then what ecological role they might be playing on coral reefs, particularly in the light of reef disturbances and recovery.

[Tom] Has the lockdown affected your fieldwork plans, Nadia?

[Nadia] Yeah, drastically. So I was supposed to be in Honduras last summer for two months, which obviously was cancelled. Fingers crossed, I'll get to go this summer instead. But there's… Obviously we're still planning you know, make it a plan B in case that doesn't happen, which, you know, who knows.

So I have some field data from my first year when I went out to Honduras, I was again there for two months, and collected a good amount of data for one field season. And I do have some pre existing data from some collaborators in the Maldives. So that's, that's also good. And then there's lab work as well. So I'm just going to be relying slightly more heavily on my lab work.

The lab stuff's still quite exciting. We're looking at the physiological aspects of coralliths. So I got some extra money through SAGES to do some work looking at CT scanning corals every month to look at their recovery from fragmentation and their skeletal growth, which would be quite cool. I don't know whether anybody has actually CT scanned live tropical corals anyway, so that will be fun.

[Tom] And how did you find yourself doing this kind of research? Were you always interested in corals in general, or like marine biology?

[Nadia] You know what I wasn't. When I was in high school, I was going to be a fashion designer. I was going to go to Central Saint Martin's, and I was going to do fashion and I was going follow in the footsteps of Vivian Westwood, and that's what I wanted to do for a long time throughout high school. But then I started art college. I did my A levels in English, business and art. And then I started art college. And I just really quickly realized that it was more of a hobby than something that I actually wanted to make into a career.

It's a weird one that, because I often say to people as well: do what you really enjoy, and you know, but, and I liked art, and I liked textiles, and I enjoyed it. But I'm not that good at it. I kind of realized it wasn't my strength. So then I spent some time working in bars. And I realized I didn't want to work in bars for the rest of my life. So at about the age of 20-21, I was looking through jobs online. And I saw one for a monkey handler job at Monkey World. And I was like, well, not necessarily the monkey handler thing. But I was like, I really like the natural world. I've always really been really interested in it. And I was always one of those geeky kids that would go: "Oh, look, that's a fieldfare!", when everybody else would just be like, that's just a brown bird in a field, what are you on about?

So I realized actually doing something like zoology would be really cool and quite fun. So yeah, I went to uni to do zoology. And it wasn't until I did a year in industry as part of my undergraduate degree, and I did that at the Horniman Museum in London, that have an aquarium. And then that's when my love of everything fishy, and marine-y, overcame the fashion obsession.

[Tom' I was just gonna say, I think it's interesting that you're kind of forced to, like, choose a career when you're so young, you know, you're like 17-18 years old. "This is what you're gonna do for the rest of your life, so choose wisely."

[Nadia] Oh, totally. Yeah, I know. And I do think like, it's really important, I think, for young people to realize that things do change, and you don't need to be pigeonholed so early. And so I've just always, whenever I've had a fork in the road, or an option to make career-wise, I've just done what I felt sounded like the most fun. And it's kind of led me to yeah, this fun, slightly stressful, but fun point in my PhD. So yeah.

[Helena] Could you tell us — because I actually don't know that much about them — what is a coral?

[Nadia] Yeah. Again, so this is one of those questions that I get asked quite a lot,

Helena laughs

[Nadia] so it might sound a bit rehearsed.

[Helena] I was going to say — you'll think we're asking really boring questions, 'cause you have all your answers prepared!

Helena and Tom laugh

[Nadia] No! These are the questions that everyone wants to know, they're obviously the most interesting. Somebody once described a coral to me as: "is it a really smart rock or a really stupid plant?"

They laugh

And, I think it's a smart rock. So, it is an animal, and the animal itself is the polyp, which looks like a miniature anemone. And these polyps form a colony which secrete a calcium carbonate skeleton, which is what makes them really solid and rock-like. And as these polyps split asexually, and produce more and more polyps, you then get these huge colonies with millions of polyps all over them, and these really large structures.

But why people often think they are plants is because within the tissues of the coral polyps, they house symbiotic algae, which are single celled algae called Zooxanthellae that, both synthesize and produce sugars and their metabolites for the coral to use themselves. So yeah, it's this fantastic symbiosis between the animal coral and the algae and other microbes as well.

[Tom] So I was looking a little bit into the lifecycle of a coral. And one thing that kind of blew my mind was like, those mass spawning events. I don't know if you could tell us, why they all spawn at the same time and how this is dictated by, you know, environmental cues.

[Nadia] Yeah, I mean, so for people who aren't quite as familiar, basically, corals spawn synchronously, usually once a year, a few species can spawn a bit more than that, but it's usually once a year. And what they do is the polyps release these packets with eggs and sperm in them. They float to the surface, the waves break them apart, and then they fertilize and they form a larvae, which then swims off and will settle elsewhere and produce one those polyps that I was talking about before.

And obviously, an animal that's sessile, that can't move around and find a mate, they need to figure out a way that they can have this fertilization. And so for a long time, no one really knew what were the triggers. But an old colleague of mine at the Horniman Museum in London has done some fantastic work on closing the lifecycle of broadcast spawning corals in the lab. So he now has these corals that spawn in the lab every year at the same time that they do out on the reef. And basically what they've done to create that, it's and to do with the lunar cycles as well as yearly cycles of… Obviously, in the tropics, things don't vary too much, but there are still changes in temperature and in water currents, as well, is another aspect of that. And then also this lunar cycle that tells the corals when a month has gone by.

And it's the same for deep sea corals as well. Deep Sea corals also had these synchronous spawn events. But that's even weirder, because they don't get any sunlight. So how they know when to spawn, is still a bit of a mystery. We think it's to do with maybe hormonal signals. But yeah, that's, that's a real mystery. So that would be cool to figure out.

[Helena] But I think… So, most people will have heard of corals because of coral bleaching.

[Nadia] Yeah.

[Helena] So what is that? And how, why is that so important?

[Nadia] Yeah. Okay, so coral bleaching is, in a nutshell, it's when there's a disassociation of the coral and algae. And the coral itself, the polyps are actually clear, translucent. So when there's no algae, they just look white, because you can just see the skeleton underneath, because it's the algae that actually gives them any colour at all.

But what causes it? Has anyone ever said to you, eat lots of blueberries, they're full of antioxidants? Yeah? So like, antioxidants are really good because oxygen, which obviously seems like a really good thing, we need oxygen. But when we respire, we produce something called reactive oxygen species. So hydrogen peroxide is one of them, and that's the name that a lot of people recognize as being: "Oh! That's a bad thing." But most animals get these antioxidants from their diet. Or we also can produce some antioxidant enzymes, such as catalase, that neutralizes these reactive oxygen species. And that's important because reactive oxygen species can damage cell walls and DNA as well.

So corals, just like us, are producing reactive oxygen species all the time. And they usually are able to keep up with this reactive oxygen species by using their diet and these enzymes. However, when sea surface temperatures rise, and when irradiance and UV levels rise due to climate change, there's too much reactive oxygen species being produced by the algae when they photosynthesize. And the coral is just simply not able to keep up with quenching that amount of damaging oxygen. So as the last line of defense, they expel their algae. We're still not quite sure on that specific part of the process, but they get rid of their algae. But because the algae produces so much of their food — up to 99% for some species — corals can starve to death quite rapidly if the temperatures don't drop quickly. So yes, this is the process of bleaching; it's that dissociation of the algae from the coral itself.

[Tom] It seems like corals as a thing, they're just really sensitive to those kind of environmental changes. Could you tell us why that is?

[Nadia] Yeah, I mean, they've been lucky enough to evolve and live for, you know, millennia in fairly stable conditions. And obviously, some corals in different sub-geographical locations will experience more variation than others. But generally speaking, corals have adapted to this really stable environment that doesn't fluctuate too much seasonally or daily even. So they've evolved to live in these really high light, low nutrient environments. And any shifts away from that can really damage them very quickly.

So it's not just temperature as well, you know, high nutrients from land runoff into these ecosystems can also be just as damaging. So there's lots of things putting pressure on them. So yeah, it's a shame as I say, they've had the luxury of evolving in these really stable conditions for so long, and we've come along and just gone: “Well, not anymore! We're just gonna mess with ya.”

[Helena] So then, so then coralliths, is that a way that corals can sort of… If the environment changes, because coralliths are more mobile, are they more adaptable and can they perpetuate the corals if there's a big change in the environment?

[Nadia] So potentially, yes. Definitely, coralliths are formed by hardier species. The main genus that forms them that we found to date is *Porites,* and *Porites* are known as being a really hardy coral that almost seems to be honest, bulletproof in some circumstances, and quite often after these bleaching events, it's often *Porites* that remain in high abundances.

So yeah, coralliths, generally as I say, are more tolerant to these kinds of bleaching events and disturbance events. And what I'm trying to figure out is what effect might that have after these disturbances? Is it that we're just going to find these coralliths, are then, you know, taken over and there's a high abundance of them everywhere? Or are they playing a more minor role, are they sort of an interim sort of thing? So they might increase in number temporarily, but then eventually the reef can establish back to a pre-disturbance state. And that obviously takes long term data, and unfortunately a PhD of four years probably isn't going to gather that much. But hopefully, looking at these coral oddities that usually just get overlooked will encourage people to start looking towards these corals in the extremes to help predict what future coral reefs might look like.

[Helena] It's really interesting, because I hadn't… Well I had no idea that they could do that. And I guess, have they been studied that much before?

[Nadia] So they were first… Actually I had a really cool, nerdy day where at the start of my PhD, I went down to the…

[Helena] Love nerdy days

They laugh

[Nadia] I mean, who am I kidding myself? I was never going to be a fashion designer.

So yeah, I went down to the library. And if you ever get a chance, the Edinburgh University Library has a specials collection. And they have first edition copies of [the Challenger expedition]() books and scientific reports. And it was so cool. I was sat there with a book, one of these big books in, like, a cushion, with white gloves on, turning the pages. I felt like something like, you know, like a TV documentary type thing.

Because, and the reason I did that is because in these scientific reports, there is this mention of the scientists in 18-... Oh, I forget the date now, but it's around the mid 1800s. And they've arrived at this island, and there's local savages, and it's all very colonial. But they mention that looking down into these shallow waters, that there was these balls of *Porites*. And so they mentioned them in passing all the way back then and since then, kind of got forgotten about a bit. And then in the 1970s, a guy called {Blin}, he looked at them and started describing them. And since then people have observed them and sort of described them. And we know that they exist now in all major reef systems around the world, even in the Mediterranean, but no one's actually looked at their ecological role that they might play until my supervisor came along, in 2017. And they published a paper that looked at this ability that corals have in the Maldives of getting, as they get bigger and bigger, because they're hardy, they can exist on these unstable substrates. So sand and rubble, that normal corals won't be able to attach to. And then as they get bigger and bigger, they eventually become so big, so like, you know, big boulders sort of size, like a meter across, that they're too big to be moved by waves, or fish. And at that point, they encrust back onto the reef. And they have this sort of stabilizing ability, and they can form new habitats.

So that's one ecological role that my supervisor observed. And that's what sparked the interest for my PhD. So I've been looking at them more recently, again in the Maldives, and in Honduras. And in the Maldives, on a different site, what we're finding is that after disturbance, the main corallith-forming species in that area has increased its coverage by 458%. Which is incredible, for species that only grows on average one centimeter a year. So it's like it… That's impossible. It must be that it was already there in the system as these free living coralliths that we know there was hundreds of. And when the competition after his mass bleaching event has occurred, and the competition has been reduced, all of a sudden, these tiny little coralliths have gone: "Wow, I've got an opportunity now, encrust back onto the reef." Now what effect that might have long term, who knows, but one thing that they could potentially be doing at least is preventing the invasion of macroalgae, which has been a big problem in many coral reefs after disturbances, that we see these phase shifts to big swathes of macro algae. So yeah, so who knows what effect they're gonna have. But again, I may have waffled a bit there.

[Tom] It's more content, it's great!

They laugh

So are people kind of thinking about using them in a kind of restoration context?

[Nadia] Yeah, I mean, I definitely think it's early days for that. The process that I was explaining that my supervisor observed in the Maldives, I mean, for a coral to get to sort of a meter across, like I say they grow about a centimeter year. So we're talking like, you know, a long time, hundreds of years in some circumstances, to get that big. So this is definitely not providing a quick fix for that stabilizing and reef expanding mechanism. But as I've shown in the Maldives is this five year data set, where we've seen it increased by 480% of this one corallith-forming species. That's a really short temporal scale. So, yeah, we could…

But in terms of restoration? I don't know, I think it's an interesting question. Because for example, some of the coralliths that I found in Honduras were in shallow water that was only about five inches deep at midday. And the temperature of that water can reach like 40 degrees, which is ridiculously hot for a coral that usually lives at… Most corals, we think, like about 26 degrees. So I guess when we're thinking about these big disturbance events, say, for example, the entire main bulk of the reef was wiped out on Utila, where I do my research, but these small little corals that are sort of, you know, ticking away in these really extreme environments, who knows? It could be those that reseed the reefs of the future, I don't think it would be in our lifetime. I don't think we're talking on that sort of timescale. But potentially, in the long run, yeah.

[Helena] Could it be… 'Cause you said there's only a certain subset of corals that form coralliths? So could that be a problem? That actually, it's only… it would only be a subset that would reseed the new reefs?

[Nadia] Yeah, definitely. And not even just thinking about coralliths. When we think about, you know, all corals, the ones that are going to survive these big disturbances are going to be just a very small subset of the coral diversity that's out there. And when we're thinking about what we should be conserving on reefs, you know… I think, you know, previously, we used to think a lot about species-centric conservation and, and trying to protect individual species. But I think most people have realized, unfortunately, that's just not practical, on the sort of, like, the challenges that we're facing and how rapid things are deteriorating, we need to think more broadly. So on coral reefs, people are thinking more about protecting functional diversity, the actual functions that create a dynamic and healthy reef.

But, having said that, functional diversity is ultimately supported by biodiversity. And if there's only a small subset of corals that are surviving, it could just be that there's, that's just one functional group, and we lose a whole other functional group, you know. So, again, the work that I'm looking at, in the Maldives, where we're seeing this big burst growth of *Porites rus*, the corallith-forming species, on those reefs over the five years, we've actually lost practically all of the branching corals, which… Branching corals are a really important habitat-forming morphology of coral. So yeah, it's, it's going to cause problems, I think, if just a subset of species are surviving, for sure.

[Tom] And when it comes to restoration, what are the kind of things that people are working on? I've seen some crazy things like 3D printing new reefs and stuff like that.

[Nadia] Yeah, I mean, it's not necessarily an area that I would say, I'm an expert in. But yeah, there's definitely lots of work, really valiant efforts of restoring reefs. So as you mentioned, like 3D printing reef frameworks is one. Because obviously, it takes hundreds of 1000s of years to create a reef naturally. If we want to enjoy reefs, then we don't have that luxury of time, so trying to headstart the growth of coral reefs by creating structures and frameworks for corals to attach to it, obviously, is a great idea and lots of people are trying it, with, you know, varying success.

And I think one of the issues at the end of the day is declining… Like climate is still changing. And if we are only able to restore the reef using corals that are already struggling, it's a problem. There is therefore some really cool work — and I like the idea of, I keep hearing this phrase "super corals", which I'm not a huge fan of the term super coral, necessarily, but I do think that the idea of sort of creating crosses, genetic crosses of corals that are already more tolerant of climate change, or by trying to sort of infect the corals with hardier strains of algae. Because, as I sort of mentioned before about the bleaching, it's to do with the algae producing that oxygen. Different strains of symbiotic algae have different tolerances to thermal stress. So if we can create these sort of, as I say, super corals, that house these more tolerant algae or that are already from genetic strains of corals that are more resilient, that can keep up with that reactive oxygen stress, then those are the species that we… Those are the individuals or the strains or the species that we should be using.

But again, Helena, as you said that still leads to that thing of we're only going to be… We can't do that for every single species and every single functional group, it’s… I think they're kind of maybe like a bit of a, you know, a band aid, like, stick a patch on it for a bit, it might help for a while. But I think in the long term, we need to tackle climate change if we really want to protect coral reefs.

[Helena] This is a bit of a tangent, but I was curious ‘cause you mentioned it. How much crossover can there be between different species? Does that makes sense? Like, could you just take a random polyp and a random algae, and they will, will that work?

[Nadia] Yeah, I still think there's a lot of work that needs to be done in that area. But there are a set number of algal strains, and we do know that they can associate with multiple different species. And, for example, one individual of coral, sometimes they house just one strain of algae, which is quite worrying if it's one that's not particularly heat tolerant, and the sea surface temperatures rise. Or you could get an individual that has two or three symbionts. And you might find that they have one that's dominant, and then they bleach, and then suddenly they, post-bleaching, there's another strain that's dominant, so they can do what we call ‘shuffle’ their algal strains so that they can adapt to this change in temperature better than ones that have limited numbers of algae. So yeah, so. But how, how that association occurs? We're not, we're still not quite sure. But yeah, it's definitely lots of cool research going on.

[Tom] And I guess, just like us, they have complex microbiomes, that, you know, just insane amounts of diversity.

[Helena] Absolutely, yeah, exactly. So this is the thing, like a lot of the lab work that's going on looking at this production of tolerant strains of algae, and you know, mixing them with the corals that are tolerant, it's all great, but… It might work in a lab, but transferring that to the wild is a different question, because they are… Corals are what we call, what we often term holobionts, which is more that it's an amalgamation of the coral, the algae, bacteria, viruses, you know, there's a whole host of things. And I think just being in water already means that you're in a, you know, a less sterile environment than if you're in air. I mean, I know, since COVID, we're all a bit more concerned of the virus spread around by the air. But when you're in the water, like it's… You can't avoid bacteria or viruses, they are everywhere. It's a whole other level of complexity to add to the problem when we think about that.

[Helena] And could you tell us a bit more about the lab work that you do? Like, how does your field work and lab work complement? And what is it, like, how much can you abstract the coral from the environment that it's in?

[Nadia] Yeah, I mean, for sure. Like, like I just mentioned, it's a really tricky thing to try and recreate those exact conditions. If we were in the tropics, it would be great. We could have flow through aquarium systems, so I was using natural seawater all the time. But unfortunately, we're not. So we do have to, you know, keep that in mind when we're interpreting our results.

But the work that I'm mainly working on is, as I previously mentioned, it's just a handful of species that form coralliths. And trying to figure out why that is. Is it to do with the species being more tolerant of mechanical stress? So as you can imagine, they're being rolled around, they’re being nudged by fish, and that's quite abrasive, you know, corals are… Coral, rubble and sand is a pretty abrasive substrate to be rolled around on. So is it that they can recover from wounds more quickly? Is it that they're structurally… their skeletons protect the polyps better than other species? Or then on the other side of things, is it that they're able to adapt to change in light environments more rapidly than or readily than other species? Because, as I mentioned at the start, coralliths as they're rolling around, they experience changes in lighting all the time. So they could be one minute buried by sand or under a bit of underhang, be in almost darkness, and all of a sudden, bam, they're in bright light. And again, the way that the individuals adapt to that or react to that is something that I'm interested in.

[Tom] And what is life like out in the field? I mean, it must be amazing, just being able to just be living in that kind of tropical area and just scuba diving and all that.

[Nadia] Yeah. So, you know, you asked me before about how I became a marine biologist. Well, I used to work on amphibians as well. So when I was doing my undergraduate and for a little bit after my undergraduate, I was working on frogs. So that's what originally took me to the Horniman Museum because they do have a frog collection there. And then this fork in the road came where I'd been working with frogs and I've been working with corals and I was a little bit like: Okay, do I want to work in a forest or beach?

She laughs

You know how I said, when there’s a fork in the road, pick the one that you found most fun? Yeah, I definitely did find being by beach a lot more fun. But yeah, no, it's great. Utila is this fantastic little island, and there's a really good sense of community there. Honduras has a lot of social, economic issues, and you do, you can feel that you can definitely see that.

And it's, you know, I always try and keep in mind that, I'm from this Western University, this, you know, position of privilege that I get to go there and do research on their reefs. So, it's really important to me that I also bring that knowledge to the local people. You know, a lot of people in Honduras, particularly on the mainland, as soon as you move away from the coastline, they have no idea, you know, what a coral reef looks like, or, you know, what they have, and, you know, and want them to be super proud of it, and to know what they have. And yeah, so that's cool. But, ya know, being in Utila is great. We get to go diving four times a day, and you know, see lots of cool stuff. Yeah.

[Helena] I wonder actually, because we found you because you did the talk for… Is it InterSci? Erm, anyway. You didn't talk. And that's how we heard about you, and you have your website, you do lots of science communication and stuff like that. How did you get into that? Was that something that you've always wanted to do on top of your research?

[Naida] Yeah, I mean, I enjoy it. I enjoy talking about corals. And I like, especially… So I used to work, I used to be a zookeeper. And so what did Chester Zoo and London Zoo, and one of my favorite things was always whenever there was kids in and like, you know, little kids, and they're just fascinated, and I loved it. So I've always really enjoyed telling people about how amazing stuff is.

But also like it, I do feel a sense of duty as well to do that. At the end of the day, I'm paid by the taxpayer. And they kind of should know where I'm spending their money. And it's not just on these really fun excursions to Honduras, you know, I am doing proper research. It's not all fun.

She laughs.

[Helena] Do you have any advice for people who might be considering a PhD in general? We tend to ask people, what are their favorite and worst things about their job or their or their research.

[Nadia] I mean, my favorite thing about my work, I'd be lying if I didn't say it was the fieldwork, like, you know, it's obviously it's incredible. So that is fantastic.

But aside from that, obviously I love teaching, and so the tutoring and demonstrating that I get to do as a PhD student is really rewarding. I love talking to people about my work. So I do enjoy that.

The worst things about my research? So I have to, I have obviously corals in the lab. And some of the stuff that we're doing in the lab can be a bit tedious. So there's this freshwater vat that I need to fill that then feeds into the saltwater to keep the salinity stable. And that takes about six hours to fill. And that's pretty tedious. So that's a bit dull. And it was fine before COVID, because I just used to turn the tap on and go to the office and do stuff. But now it's like this whole thing, that I have to go in and do it. So that's not great.

I'm not a huge fan, I must admit of being my own boss kind of thing. I’m much better, when I worked in the zoo, it was like you have to clock in at this time, you have to leave by this time. You do these tasks in the morning, these in the afternoon, and then you go home and you don't have to think about it. Whereas now it's like, well, come in when you want, to leave when you want, work when you want, manage your time. And I'm pretty well organized, but it's still like, especially when it comes to the evening times and you get that guilt of should I be working? Should I be doing this? I find myself reading like coral reef textbooks as my nighttime read.

[Tom] *Laughs.* Just a casual read.

[Nadia] I'm not a huge fan of… I think most people would probably disagree with me, and would say: “I love being my own boss, the flexibility, it's great!” But personally, I think I'm more comfortable with rules and regulations.

They laugh

[Tom] I mean, I think that's kind of everything that we were wanting to ask but I don't know if there's anything in particular you'd like to highlight or?

[Nadia] If people are interested in corals and coral reefs in general, or how they might be able to help. Obviously for most people in the UK, feeling like they have a direct impact on a tropical coral reef is a difficult one to envision. But even just like reading about them and being aware of what's going on and being aware of how it affects people who live closely to them is really important. And if you really still feel like you can't relate to them then Scotland has many deep sea reefs. They are a really vital part of the food chain in the area. So yeah, just be just being aware of stuff, but also obviously like limiting, you know, your footprint on the planet. Obviously, we all could do with being a bit better at that, I certainly could do with being better at that. I know, no one's perfect, but there are obviously a lot of changes that we make. But also vote for politicians that are going to make a difference. That's, I think that is probably the main thing that you could try and do, in my opinion. Other than that, no. It was lovely chatting to you!

[Tom] *Laughs.* Yeah, thank you so much for joining us. This has been really fun.

[Nadia] Okay, guys, well have an enjoyable evening.

[Tom] Thank you for joining us.

[Nadia] Thank you. Thank you for inviting me. Yeah, it's been fun.

Outro

Outro music plays.

[Helena] Thank you so much to Nadia for coming on the show. If you want to find out more about her, she has her own website: nadiajogee.wordpress.com. And she's also on Twitter @NadiaJogee and on Instagram @Nadia_Jogee.

[Tom] This podcast is brought to you by the Edinburgh University Science Magazine. This was the first episode of our second season, and I'm so excited about what we have in store. In each episode, we'll explore fascinating themes and ideas, talk to awesome researchers about their work and find out about the science being done by our very own staff and students here at the university.

[Helena] If you have any feedback for us, or if you'd like to get in touch with a question suggestion, you can reach us on our Facebook page at Edinburgh University Science mMdia or at Twitter @eusci that's at E-U-S-C-I. You can also drop us an email at eusci.podcast@gmail.com and you can find the show notes and the latest issue of the magazine at eusci.org.uk. The latest issue has just come out and it is so good. If you would like to be featured on the podcast, please get in touch and keep an eye on our social media for more information.

[Tom] This episode was hosted by me, Tom Edwick and my partner in crime Helena Cornu. The podcast manager is Alix Bailie. The podcast logo was designed by EUSci chief editor Apple Chew, and the awesome podcast episode art was designed by Heather Jones, our social media and marketing genius.

[Helena] Thank you for listening and until next time,

[Tom] keep it science.

Outro music ends.

Post-outro shenanigans

[Tom] Bongos!

[Helena] I really like the bongos.

[Tom] A lot of my friends have commented on the bongos saying they're a nice touch.

[Helena] Really? Okay, oh cool. I love them. I was just like… 'Cause I was only gonna use them for the one episode and I was like, you know what? Bongos everywhere! Everybody needs more bongos!

[Tom] We can all do with more bongos in our life, for sure.

Helena laughs