

## ***That's Wild* Season 2**

### **Croak Me Maybe | Frog Conservation in Singapore**

[00:00:00] **Elliott:** Hi everyone, and welcome to *That's Wild*, a podcast series brought to you by the National Parks Board. I'm Elliott and I'll be your host for this series, where we'll be talking to special guests from the nature community about topics surrounding biodiversity conservation in our City in Nature. In today's episode, we'll be talking about frog conservation.

Frogs are such fascinating creatures. These guys can leap large distances many times their body length, camouflage in the environment without a trace, and make a whole range of unique sounds, amongst other cool things. And so many of them are living right in our midst. I'm sure you guys have heard them around Singapore, but they're often harder to spot, let alone identify.

So with me today are Ing Sind, Ingg Thong, and Yin Xin, so I'll let you guys introduce yourselves. Welcome to the podcast!

[00:00:48] **Ingg Thong:** Thank you so much for having us, Elliott. My name is Ingg Thong. I'm one of the six co-founders of the Herpetological Society of Singapore, and I am also a zoologist.

[00:00:59] **Ing Sind:** Hi guys, I'm Ing Sind. I'm also another co-founder of the Herpetological Society of Singapore, and I'm also a zoologist. Side note, I'm also Ingg Thong's brother.

[00:01:08] **Ingg Thong:** Yes, there's that as well.

[00:01:10] **Yin Xin:** Hi, my name is Yin Xin. You can call me YinX. I'm from the National Parks Board Singapore, from the National Biodiversity Centre. And also outside of work, I'm also part of HSS.

[00:01:20] **Elliott:** Thanks for clarifying that. So I think that kind of clears things up for us. We're going to head into a very confusing podcast with both of your names sounding very similar.

**Yin Xin:** Convergent evolution.

**Elliott:** Yes. Convergent evolution. Yeah. So I thought we'd start off by asking – why do you guys love frogs?

[00:01:36] **Ingg Thong:** For me, the love for frogs came from seeing them in the field. The first herp we saw when we started herping was actually a frog. It was, I believe, the Masked

Rough-sided Frog. We saw it in the Treetop Walk, the Petaling Stream, and that was actually one of the first herps we photographed as well. So that kind of started the ball rolling, I would say.

[00:02:03] **Ing Sind:** For me, I recall as a kid, I think I was, like, five or six years old. I had this small pocket guidebook by Discovery Centre. It was called *Reptiles and Amphibians of Singapore*. And then on the cover, it's this Common Tree Frog—

**Elliott:** I know that one. Yeah, the small one.

**Ingg Thong:** Yes, that one, right? Yeah!

[00:02:17] **Ing Sind:** Yeah, so I always brought this around with me as a kid when I was walking around. Then I recall walking to the Botanic Gardens, and I actually saw one Four-lined Tree Frog sleeping on a leaf. And I was like, damn, I can identify it with this tiny book. And that's when I started liking frogs.

[00:02:34] **Elliott:** A bit like birds, right? They're kind of everywhere if you know where to look.

[00:02:40] **Ing Sind:** Yeah, if you pay attention. It's like a hidden gem, right?

[00:02:42] **Yin Xin:** I can't remember when I started liking them, but when people ask me this question, I'm like, what's there not to like? They are cute. They come in all kinds of colours. They make all kinds of calls. And they're just, you know, good vibes.

[00:02:56] **Elliott:** Yeah, they are good vibes. I think there's something about frogs that makes them so popular in meme culture also. I thought it was just my feed, because I get a lot of frog memes and I like frogs, so I thought maybe it's just my feed. But I realised in general, people get frogs on their feed. You know, like Instagram or TikTok all the time.

[00:03:12] **Ingg Thong:** I think the one that I'm most aware of is “It's Wednesdays, my dudes”.

**Elliott:** Yeah, the Budgett's Frog, right? That's pretty cool. Yeah, I think for me also... I don't know if y'all remember, but when I first started getting into nature stuff, I did reach out to y'all to learn a bit more about frogs. I don't know if y'all remember – we went to Bishan Park.

**Ing Sind:** Yes, we went to Bishan Park, then we saw a Reticulated Python.

**Ingg Thong:** Yeah, we saw a Reticulated Python!

**Ing Sind & Ingg Thong:** Oh, yes yes!

[00:03:37] **Elliott:** Yeah. So for me, I'm not as into herps as you guys. I'm more of a generalist, but there's just something about frogs that sticks out to me. They're cute, as you said, and then they have this very peaceful kind of vibe. In general, people do kind of gravitate towards frogs. And then there is like this other group of people who think frogs are this slimy, kind of gross group of animals, and this probably comes from folktales and things like that. So in your experience in HSS and working in NParks, I guess you do interact with the public quite a bit as well – what are the common perceptions of frogs?

**Ingg Thong:** [00:04:18] So I would say because in HSS we deal with a lot of animal conflict as well, human-wildlife conflict, where a lot of people are generally very scared of reptiles, more specifically snakes. Thankfully frogs are actually an outlier in this situation where most people that we meet are, at the very most, indifferent. You know, we do know one or two people who are terrified of frogs, but they don't go after frogs the way they do snakes. They're just scared to see them and interact with them, but they don't necessarily want them dead.

[00:04:53] I would say the main issue that we have as a society facing outreach for frogs is the fact that – although yes, it's quite popular in meme culture and people are aware that they're around, it's difficult to get them interested in the conservation of frogs because not a lot of people in our experience understand the importance that frogs play within the ecosystem.

[00:05:19] **Elliott:** Right. And then following up on that, you know, what is the importance of frogs in our ecosystem?

[00:05:23] **Ingg Thong:** They are a great bioindicator. So they are a great indicator species of the health of an ecosystem. So the presence or absence of certain species can actually indicate the health of that particular patch of forest.

[00:05:35] **Ing Sind:** And, to add on to that, I think because they have such a unique life cycle where there's an aquatic component and a terrestrial component. So it actually shows how pristine your forest is. The forest streams need to be pristine, or like some water body needs to be pristine, and the terrestrial site needs to also be relatively intact.

[00:05:54] So if any one part of this reproduction cycle is broken, then you lose some frog species. But there are some species that have actually adapted to this, where they've removed the need for relying on water bodies, and they can just metamorph inside the egg. So they have a direct development from an egg to a froglet.

[00:06:11] **Yin Xin:** Yeah. And they're also important in the food chain. So first they control the insect population, which is their prey population that they eat. And they're also biomass for other predators; other things like snakes and birds also eat them. So they're also important parts of the food chain as well.

[00:06:24] **Elliott:** Right. I think that's the one that's most often forgotten, their role in the food chain. But you know, you guys mentioned bioindicators, they're quite sensitive to things. It also means that they are more sensitive to threats to their environment, and I guess fragmentation as well, because they're restricted to pools of water.

[00:06:42] **Ing Sind:** Yeah. And I think they are quite— I mean when it comes to dispersal abilities, they're not like a bird that can fly. Or even, like, even a large mammal, like pangolins. Okay, pangolins are not very large, but they're larger than a frog. Because the whole range of a frog is maybe like a few square meters. And they're not known to be highly dispersive.

[00:07:02] **Ingg Thong:** And I suppose not only that, because with fragmentation and habitat degradation, especially within Southeast Asia, the first thing to drop usually is the humidity within the forest. And a few, quite a few frog species, at least the ones that are found in primary rainforests require very high humidity. Which is why some places in Singapore or some species that are common elsewhere are a lot more difficult to find in Singapore. Yeah, it could be due to the humidity.

[00:07:30] **Yin Xin:** Yeah, exactly, because some of the habitats they require, for example, freshwater swamp forests, primary rainforests, these are very rare habitats in Singapore, actually.

[00:07:47] **Elliott:** Yeah, and then talking about conserving frogs, apart from the reasons that you guys mentioned, like their importance to the ecosystem – why should we conserve them? Are there any cultural links to frogs? I don't know if we mentioned it before, but I guess, they eat insects, right? Pest control also plays into it a bit, but any cultural links to Singapore or the wider region?

[00:08:13] **Ingg Thong:** Frogs have always been very closely linked to rain. And in many, many cultures, not only in the region but across the world, they're often seen as bringers of rain. So whenever you have frogs calling, the immediate assumption is that it's going to rain, you know. So people associate... they think the frogs are the ones bringing the rain, when it's actually— it's kind of correct, but not completely correct, because frogs are able to, at least within the region, they're able to feel the drop in air pressure before rain comes. So that's why they actually start calling before the rain actually comes.

[00:08:49] **Elliott:** Right.

[00:08:50] **Ingg Thong:** And also I think in *feng shui* culture, there's the three-legged frog, where if you put it in the toilet, it brings money or something like that.

[00:08:58] **Elliott:** Is it the one with the coin in the mouth?

**Ingg Thong:** Yeah, the coin in the mouth.

**Elliott:** Oh I didn't know it has three legs, I thought it had four legs.

[00:09:02] **Ingg Thong:** Yeah, I think it's like a three-legged frog. Yeah, I think it has three legs.

[00:09:03] **Ing Sind:** And actually we have one species that's quite well known in Southeast Asia to be able to sort of predict the incoming storm. Because the Malayan Horned Frog, you always hear them calling 15 minutes or like 10, 15 minutes before a huge storm comes. Although that species is getting rarer and rarer.

[00:09:27] **Elliott:** Yeah. Unfortunately, here it's almost impossible to find. Is it in the nature reserves? I think it's deep in the nature reserves, in restricted habitats, yeah. So I guess this is one species that we have in Singapore, but I thought maybe we could go and explore the other different species there are in Singapore. So how many frogs species do we have here? I know you guys just released a poster, right? The HSS released a poster of all the frogs in Singapore.

[00:10:16] **Ingg Thong:** So Singapore has 24 species of native frogs and 5 plus 1 introduced species, depending on how you want to determine what introduced species is.

**Elliott:** Let's talk about the 24 native frogs then. Like what are some of the more common ones that people can find? You know, there are some that they can find around their homes, but then there are a lot that you would have to go out into nature to find. Do you have a favourite species? Do you have a few favourite species?

[00:11:29] **Yin Xin:** I think a common one is one that Ing Sind mentioned, it's the Four-lined Tree Frog. It's something that is really commonly found in both urban areas and also in the parks. And I think a lot of people can easily see them in the parks. And like for example, when we do our guided walks, usually the first place we will look is the toilet, because there will be one or two Four-lined Tree Frogs hanging around and we'll just point them out to the participants. So that's a great start to the walk.

[00:11:51] **Elliott:** Could y'all describe the Four-lined Tree Frog a bit? Because it's a podcast so the listeners will only be able to imagine what the frog looks like.

[00:11:58] **Yin Xin:** Yeah, so the ones in Singapore are actually quite varied. Some of them have lines on their back, that's why they're called the Four-lined Tree Frog. So they're brown with dark lines down their back. But some of them are also pale, they just kind of look brown.

[00:12:10] **Ingg Thong:** And some of them have a leopard print patterning on it, without any visible stripes on it. And others are like orange in colour with no stripes on it. And some are very pale, almost white with no stripes. Some of them have stripes. So the 'Four-lined Tree Frog' is a misnomer. Personally, I prefer to call it the Common Tree Frog, because it is very common and it can be found on trees. And it's a frog.

[00:12:37] **Yin Xin:** Yeah, they pose really nicely for photos. Because tree frogs, they have this nice pose where they, you know, hold on to the branch.

[00:12:43] **Ingg Thong:** Like a Spiderman pose. Ingg Sind what other ones do you have?

[00:12:54] **Ingg Sind:** I'm a very, very huge fan of the Masked Rough-sided Frog. It has a very, very nice call, but I guess we'll go into calls later. It's a swamp forest species, so it likes inundated stagnant pools of water. It has a very beautiful tadpole. The tadpole looks like an eel and has no pigment, so it's just a bright pink elongated tadpole. Very cool looking. And the males actually have like this enlarged humeral gland, so it looks like it has massive biceps.

[00:13:30] **Ingg Thong:** Yeah, that's really, really cute.

[00:13:32] **Elliott:** Haven't noticed that yet, but yeah, that's one of the frogs that you hear a lot more often than you see, right?

[00:13:38] **Ingg Thong:** Oh yeah, for sure. Personally, I really like the Black-eyed Litter Frog. Yeah, it's so cute. And they have such an adorable call as well. It sounds like a rattling gun. I love how, when they're calling and when they're active, they're kind of propped up on their forearms, and they look very nice and almost stoic. And then like the second you shine a light on them, they just crouch down.

**Elliott:** And they think you can't see them, right?

**Ingg Thong:** Exactly.

**Yin Xin:** They'll just freeze up.

**Ingg Thong:** Even though they have huge eyeshine.

[00:14:13] **Yin Xin:** Yeah, they have really lovely black eyes.

**Ingg Thong:** Yeah.

[00:14:16] **Elliott:** Any recent discoveries or observations or findings that excite you guys the most?

[00:14:26] **Ingg Thong:** So the most recent addition to Singapore's list of frogs would be the Subaraj's Paddy Frog. We share a lot of species with the surrounding area, like Peninsular Malaysia, or Borneo, or the Riau Islands. The Subaraj's Paddy Frog is special because it was described from Singapore. So in Singapore, we found a population of frogs that we realised was actually different from all of its other closely related species, and we actually helped describe it. And we named it after our mentor, Subaraj Rajathurai, he's one of the pioneer naturalists in Singapore. Unfortunately, he passed in 2019.

[00:15:24] **Elliott:** Right, and what were the special characteristics about this frog species?

[00:15:30] **Ing Sind:** Okay, so that whole group is quite messy.

**Elliott:** Oh, the group of frogs?

**Ing Sind:** No, the genus *Micryletta*. They all look the same. Honestly, if you look at the research paper, there are so many that were recently described in the past four years. They look very, very similar to each other. The main differences would be, I think, definitely molecular. Because when we found it, we actually thought it was *Micryletta inornata*, which was from Sumatra.

Then subsequently in 2020, a paper was published restricting *inornata* to Sumatra only. So everything outside of Sumatra was probably something different. So then it kicked off a race. So people in Thailand, Malaysia were describing quite a few new species. Then we realised like, hey, okay, we should actually take a look at the population in Singapore to see if it's allied to any of the ones in the region. Then we realised it actually was not comparable to any of the other populations. Then that's when we decided to describe it as a new species.

**Nature Nuggets (Recommendations segment)**

[00:14:29] **Elliott:** It's time for Nature Nuggets! In the spirit of our podcast title, *That's Wild*, we wanted to ask our guests to recommend something wild that they've come across or enjoyed and that you can check out yourself too.

**Ing Sind:** So I've actually brought two copies of *The Amphibian Fauna of Peninsular Malaysia*. While it does say Peninsular Malaysia, it probably includes Singapore as well. This is quite an uncommon and rare book that was published in 1975 by P. Y. Berry.

So she was a Malaysian author doing research on frogs in Malaysia. And you can actually look through the book, and you can see all these really nice illustrations. And when you actually take a look at the photos included in the book, you realise why the illustrations are so lavish and detailed.

It's because at that time, in 1975, photography equipment had been quite poor, and most of the photos were just in black and white. And it's probably not very clear for readers to see anatomical differences. And so, the main differences in distinguishing different species apart are illustrated quite beautifully in this book.

[00:17:49] **Ingg Thong:** So I have here two books. One is called *The Field Guide to the Frogs of Borneo*, and the other one is called *The Field Guide to the Snakes of Borneo*. These are great guidebooks because Singapore shares quite a fair amount of species with not only Borneo but Peninsular Malaysia as well. So, these books are great if you want to learn more about our local species.

But not only that, you can learn about what's found in Borneo and the immense amount of biodiversity over there. And it helps that the photos are amazing in these books as well.

[00:18:44] **Elliott:** Right. And are these books quite readily available or do you have specific sites that people can go to order them?

**Ingg Thong:** You can find it on Amazon. I'm pretty sure Kinokuniya has them as well. I don't think Popular has them.

[00:19:03] **Yin Xin:** My recommendations are not guidebooks. Mine are some natural history books that I greatly enjoy. These are like, my favourite ones. So the first one is *The Rise and Fall of the Dinosaurs* by Steve Brusatte. He's a palaeontologist, and he talks about the evolution of dinosaurs from before what dinosaurs are termed as in taxonomy. He goes from how they evolved, and then how they went extinct, and now are found in birds. And then

because his book was so well received, he moved on to study more about other things, not just dinosaurs.

He actually moved on to study about mammals. So he wrote a sequel called *The Rise and Reign of Mammals*. This is more about how mammals evolved and then ended with humans. So these are two natural history books that I really, really enjoyed.

**Elliott:** Alright, thanks guys. Definitely going to check some of these out. But for now, let's hop back into our main convo.

[00:21:01] **Elliott:** I think we touched a bit on threats, but I'd imagine that one of the reasons why some of these frog species are getting rarer is because there are increasing threats to their existence. So I was wondering whether we could touch a bit more on what are the major threats that frogs in Singapore face?

[00:21:20] **Yin Xin:** Yeah, I would say habitat loss and fragmentation.

**Ing Sind:** I would add maybe potential pollution of streams and stuff like illegal dumping of waste chemicals and stuff.

**Elliott:** Right, I guess those are the threats, but what conservation efforts are there in Singapore to try and address these threats?

[00:21:42] **Yin Xin:** So for NParks, we have the Species Recovery Programme that was started in 2015. So this was part of the Nature Conservation Master plan. We identify species that are of conservation significance. Usually, those that are threatened, so like Vulnerable, Endangered, Critically Endangered species. Currently, there are around 120 plant and animal species that are under this programme. So we came up with a species action plan, and the aim is to try to increase their population and try to improve their conservation status.

[00:22:15] So one of the species that was identified was the Cinnamon Bush Frog. It's a very, very beautiful frog. It's kind of reddish, orange in colour. Unless you scare it, then it becomes a little bit more yellow. But yeah, usually it's like this beautiful reddish colour and they have the cutest call. It goes like "pip pip pip pip pip".

Very, very cute. Yeah. So besides it being very cute and very charismatic, their conservation status is Vulnerable. Yeah, the Cinnamon Bush Frog is classified as Vulnerable under the Singapore Red Data Book. So the Singapore Red Data book is a list of all the native species that can be found in Singapore, and their conservation status as assessed by experts. So we

have different experts looking at different taxa of animals and plants. And then the latest one is the Singapore Red Data Book 3. So you can access it on the NParks website.

**Elliott:** So the statuses in the book are applicable to Singapore's context, right? It's not the global context, yeah?

**Yin Xin:** Yes, yes. So there were efforts to try to translocate the Cinnamon Bush Frog to other areas. In 2017 and 2018, there were trials carried out to translocate it to rainforests in the Singapore Botanic Gardens. So, what NParks did was to create artificial phytotelms. What these frogs need for breeding, they need these micro habitats called phytotelms.

So these are naturally occurring tree holes that get filled up with rainwater, and then things like leaves fall into it, and then the frogs actually use those to breed. What NParks did was to create artificial ones. So you get some logs, then you go and make a hole and let it fill up with rainwater, and let the leaves drop in.

And then you try to translocate the tadpoles from another location into rainforests in the Singapore Botanic Gardens, and that worked pretty well. So now we have a breeding population in Singapore Botanic Gardens, and there are trials to introduce a population to Pulau Ubin as well. That's currently ongoing. So that's one of the successes of the Species Recovery Programme.

**Ingg Thong:** Yeah. It'd be really cool to see them on Ubin, because I mean I don't know if there are any records, but I think they might have occurred there in the past as well. At least when it was more of a lush island, but it would be really cool to find them there.

**Yin Xin:** Yeah, it'd be cool. So now we're seeing if it will work, because the forest in Ubin is a lot different from the forest we have in the... mature rainforests that we have in Singapore.

**Ing Sind:** Also one more point about the phytotelm breeding frogs – quite a lot of them require primary to mature secondary forest, because that's when you get really massive trees and when branches break off, it forms this tree cavity. Very young forests lack those large trees and just don't have the phytotelms. So it's a really good initiative that they are creating artificial ones. That's actually removing that limiter on the population, so a lot of them can start breeding in artificial phytotelms.

**Elliott:** How about you guys?

[00:23:11] **Ingg Thong:** So for HSS, we do have a few initiatives. The main one being the Frog Call Library. So that was an initiative that I started in 2016. Trying to compile all the frog calls of all the frog species in Singapore.

We do also have a roadkill database, but that is for both reptiles and amphibians. We're trying to study the impact of roadways adjacent to forested patches and to see the incidences of firstly, how many roadkill species are reptiles and amphibians, and whether or not there's a particular species that's more impacted by it.

And of course, we do have outreach programmes for frogs as well. We attend things like the Festival of Biodiversity. I'm sure the three of us have definitely volunteered, we've given up many hours for the outreach of frogs. Or not given up but like, willingly volunteered.

**Yin Xin:** Willingly put in.

**Ingg Thong:** Yes, willingly put in.

**Yin Xin:** Lovingly put in.

**Ingg Thong:** And of course, we have our posters and occasionally we give talks as well.

[00:24:24] **Elliott:** I'm seeing a lot of potential in this Frog Call Library for like, producing nice soundscapes or maybe you want to remix it in with some popular pop songs. But besides that, what's the importance of the Frog Call Library for research and maybe wider conservation?

**Ingg Thong:** So it's the same thing with building a species list, right? The first thing you do when it comes to conservation is you need to know what's in an area. And for the Singaporean context, we didn't actually have an established Frog Call Library. We had a few here and there, but not one consolidated one where it had a majority of the species.

And actually most of the frog calls that I had, I actually had to go on record and either learn the calls myself or have them taught to me by mentors. So they knew the calls, but they didn't have it recorded or didn't have it written down anywhere. So it's very, very important to catalogue the advertisement call.

The advertisement call is basically usually made by male frogs. Of course, there are exceptions where both males and females call. It's the main call that is used to attract mates and establish their territory.

So within frogs themselves, there are, I think, about 12 different call types. The one that's studied the most is actually the advertisement call because that conveys the most information. And it's used in research papers to actually differentiate closely related species because they are the most distinct one and it's the one you hear the most often.

The rest of them are kind of like defensive calls or when the frog gets attacked and when it's calling as a warning call, where it's a lot more difficult to study. So advertisement calls are the ones that are studied the most and the ones that give the most information.

So it's important both for research because it allows us to detect more frog species and more frog individuals, but it's also important for things like environmental impact assessments where you might not see the frogs during visual surveys, but you can actually hear them, so it confirms their presence at those sites.

**Ing Sind:** I guess that would help with rapid assessments, like if there's a small window of time, you might not be able to look at everything, but you can detect them by your ear and you can just confirm that the species occurs in this area. It also helps with distributional records because it allows you to leverage on a lot of citizen scientists to go out and listen for frog calls.

And let's say it's a very common species that's drastically declined across the region and nobody hears it, then that would be an indication that maybe there's something going on, and potentially scientists can go and investigate what contributes to such a decline.

[00:35:28] **Yin Xin:** The Frog Call Library is a super good resource, and now all surveyors can learn from it. It's really amazing that we have this, actually. Because if you don't have a mentor to basically go down with you to identify the frog and teach you, 'oh, that's the call of the frog' – we now have it in the Frog Call Library. So for birds, there's a lot of resources out there like Xeno-Canto. People can just learn the calls on their phone. They can learn the calls before they go to the field, or they can verify when they're in the field.

But with the Frog Call Library, there's something like that that the surveyors and other people in the EIA field can also learn in Singapore. So yeah, it is a very, very important resource.

About the point on how usually you hear the frogs first before you see them – when you're in the field, you're protecting the environment, you're trying to conserve, you don't want to go bashing into the forest to cover all ground to visually identify the frog. So being able to hear the frog call, you don't actually have to walk so much into the vegetation. You can stick to your transect and you can hear and detect the calls from a very far distance away. So that actually helps in conservation.

[00:28:41] **Elliott:** Now you have acoustic – I don't know if you call them traps or whatever, but they're like camera traps, but just for sound.

**Ing Sind:** For soundscapes, yeah.

**Elliott:** Could you use that to monitor frogs?

**Ing Sind:** It's like soundscape analysis. Because when you record a soundscape, it's not only just frog calls, you have katydids, you have birds, you have ambient noise.

So it's very hard to quantify what sort of noises are ecologically important. But for frogs specifically, so far there is no easy way to actually identify what calls are in a soundscape recording. Somebody has to manually go through and listen, or at least search the recording for the spectrograms.

[00:31:06] **Elliott:** And how has the experience been like, compiling this audio library?

**Ingg Thong:** It's been interesting. Basically, what's happening a lot of the time is I usually go to areas that are accessible by members of the public at night. You don't go into nature reserves past 7 and some other restricted areas you're not allowed in at all.

So I go to those accessible areas like Botanic Gardens or Mandai and places like that. It largely involves me standing in the dark, with a recorder pointed at a frog that I may or may not be able to see. And I literally just stand in the darkness for up to about 20 minutes.

And okay, I usually kind of give up at the 10-minute mark because if the frog is not calling by then, it's not going to call, because I might have disturbed it with my light or maybe my footfall disturbed it. So that's generally the experience of compiling the frog calls. It's just me in the dark pointing –

**Elliott:** Not particularly glamorous, I guess.

**Ingg Thong:** Yeah, I suppose, yeah.

**Elliott:** Have you freaked anyone out? Like has anyone come across you in the dark?

**Ingg Thong:** No, not really. But the thing is, I always have to have someone with me. So most of the time, it's Ing Sind, my brother.

**Ing Sind:** He's always asking me to shut up because I'm making a bit of noise and it affects the recording. So I can't even move. I have to be standing there in the dark with him for like 10 minutes.

**Yin Xin:** Just two people standing in the dark with a mic pointed at a frog.

[00:32:39] **Ingg Thong:** So because in the past when I've tried recording frogs, there are people off in the distance. They've found some snakes and they're shouting in the background and I can literally hear it in the recording, so that recording wasn't usable.

So in the past, I went out with more people, maybe like three or four people to record frogs. But the ideal number is actually one. If I can do it safely by myself, I would, but I would not encourage anyone to go in the forest by themselves. Always have someone with you. So Ing Sind is there, basically to make sure I don't die. Or if I break something then he can actually just call emergency services or something like that.

**Ing Sind:** Yeah, but so far he hasn't—

**Ingg Thong:** Thankfully. Yes. Nothing like that has happened.

**Yin Xin:** Yeah, always do fieldwork in pairs or more.

**Elliott:** Is the intention of the Frog Call Library to become something like Xeno-Canto, where it's open to contributions and things like that, and wider than just Singapore?

**Ingg Thong:** Right now we have started going overseas and you know, when we go overseas for our herp trips just for fun, for holiday, we do occasionally record frogs, but we don't do it as regularly as I would like. Definitely, it would be great to be able to receive calls from other people. But currently, it's actually hosted on SoundCloud, so I think we would need to get our own domain and all that kind of stuff.

**Ing Sind:** I think one of the issues that we sort of face, especially for frogs, is that there are a lot of taxonomic splits. So if you don't record what you actually know is a certain species, and it gets split, it could be confusing, where you can attribute different calls to different species by accident. And there are some calls that are very, very slightly different. I recall, I think we were doing a survey, then there was a katydid that sounded like a very rare frog.

[00:38:14] **Yin Xin:** Oh my goodness we wasted at least half an hour looking for the Inger's Dwarf Toadlet that did not exist there. Yeah, because the Inger's Dwarf Toadlet, the call mimics

insects, so it really sounds like some insects like katydids. So it really sounded like the frog. And we were so confused because we were like, we know this species doesn't occur here. But why are we hearing this call? And we were so disturbed, and we were even betting each other. I was betting 50 dollars that it was not there. Anyway, we were so disturbed, because where is the frog that is calling? So we were literally around the area, trying to make a clear recording so we can compare the... what's it called?

**Ingg Thong:** The spectrogram.

**Yin Xin:** The spectrogram. So we were trying to make recordings to compare the spectrogram with the actual frog call that we know and then trying to make a clean recording. And at the same time I'm trying to look for this frog, whether it's even there. And then we spent I think half an hour walking up and down that same stretch. And eventually, we found a katydid making the sound and we saw the katydid make the sound and we were like, "Oh...". But yeah, it really sounded very, very similar and we were so confused. We were sending it to each other because we were all on different surveys. So my group was sending it to them and we were sending it to other people to verify, "Can you tell what this is?" We were in a panic. But after that, we realised that it was the katydid, and we were like, oh, okay, that was very anticlimactic.

**Ingg Thong:** And I suppose this kind of lends to the fact that not all survey expertise is equal. Because if you look, if you were to put it into a sound programme and actually look at the spectrograms themselves, the calls between the Inger's Dwarf Toadlet and the katydid are actually very different in terms of kilohertz. So I think it was a difference of about 4 kilohertz, which is distinct enough that you would not mix them up if you actually looked at the spectrogram. But because, you know, none of us have perfect pitch, and none of us— it's a small enough difference that without a reference call, they can be mistaken for each other.

**Yin Xin:** So the spectrogram is a visual representation of what the call would look like visually. So it's like squiggles of lines that will show the kilohertz and decibels.

**Elliott:** It's a bit like the heart rate monitor at hospitals, right?

**Yin Xin:** Yeah, they visualise the sound into something visual for you to differentiate.

**Ingg Thong:** And actually, I have a... when they were trying to record the frog, some people were—

**Yin Xin:** They were making noise, they were talking, as usual, like what you said. You're trying to record a frog, and some people were calling about a snake. And so somebody was talking in the background, then I was like, “shhhh”, and then in the spectrogram—

**Ingg Thong:** Yeah so you can see a wall of red, it's just Yinx going, “shhhh”.

**Yin Xin:** My “shhhh” was very angry on the spectrogram.

**Ingg Thong:** So I cut it out.

**Yin Xin:** Just a “shhhh”. Yinx’s “shhhh” spectrogram.

**Elliott:** That's some really insightful information and I really enjoyed talking about frogs with you guys. I think people should be talking about frogs all the time. They're really cute and deserve to be treasured.

[00:44:38] **Elliott:** Thank you for listening to this episode of *That's Wild*. If you'd like to hear more, please tune in for more episodes on Spotify, Apple Podcasts, and YouTube. And if you like our content, don't forget to show your support by hitting the follow button and giving us a five-star rating.

**Ingg Thong:** Thank you so much for having us and thank you for listening!

**Ing Sind:** Yep!

**Yin Xin:** Thanks everybody. Bye!