

## **Critical Edges**

### **Episode 1.2.**

#### **Wildlife Conservation in the Korean Peninsula**

KATHERINE HALL

Welcome to the Critical Edges podcast. In this podcast we explore critical edges that may seem distant and marginal at first glance, but which are in fact very much connected to, and even interdependent with our global society and politics. In our podcast, we discuss with different scholars who have, one way or another, addressed critical edges critically.

ELEONOORA KARTTUNEN

What can conservation research tell us about the past and future? And how can this be used to analyze important geopolitical dynamics in some of the Earth's most critical edges? In this episode, we are talking to Joshua Elves-Powell, a conservationist and doctoral researcher at the Institute of Zoology at University College London. Joshua's research investigates the conservation of large carnivores, with a focus on the endangered Amur tiger.

His work explores the challenges and opportunities for transboundary conservation in a very critical edge – the Korean Peninsula and the Demilitarized Zone, or DMZ, the strip of land that divides North and South Korea. His research also takes place against a backdrop of mass global biodiversity loss and accelerating climate change, both which are recognized as planetary boundaries and both of which have surpassed the Earth's safe operating space, threatening our planet's critical processes.

So, without further ado, this is Katherine and Eleonoora in the studio, and we warmly welcome Joshua to this podcast episode on conservation and geopolitics.

ELEONOORA KARTTUNEN

So, welcome Joshua, and thank you for joining us today in the podcast. You have done impressive work and research on conservation. As it is always fascinating to know about the roots of research, our very first question is, would you reveal to our listeners some glimpses on your personal background, and how did it lead to your career on conservation work and research?

JOSHUA ELVES-POWELL

It's a pleasure to be here. I guess, like a lot of your listeners, particularly those who are interested in the natural world, I always grew up interested in wildlife. I think I first wanted to be a paleontologist, and I've simply shifted my career from being interested in dead animals, to being interested in, hopefully, alive ones.

When it came to going to university, when I was trying to decide what to do, I decided to do geography, because I was really interested in the natural world, I was really interested in wildlife. And I was tempted to do a course like zoology but I was also interested in how human societies interact with the natural world.

So if we're interested in conservation, we're really interested in people, and the policy decisions that we make have such an impact for the natural world and for conservation. And geography seemed to be this halfway house for me, where I could indulge both of my interests. After this, I went off to go and study in the U.S., which was a fantastic experience.

So I'm originally from the UK, and I'd done my undergrad in the UK, went off to the US and then proceeded to work in conservation and in policy, before returning to university in 2019 to do a PhD. And that was based primarily in the UK, at the Institute of Zoology and then UCL (University College London), but also with Seoul National University in South Korea and the Tiger and Leopard Conservation Fund in Korea, who are a relatively small organization in Korea, but really at the forefront of tiger and leopard conservation across the Korean Peninsula. Because of course, these endangered big cats are very well known, from their populations in Russia and recovering in China, but there's very little focus on this historic portion of their range, which is in South, and of course, North Korea as well.

KATHERINE HALL

I guess a follow up question would be: why tigers?

JOSHUA ELVES-POWELL

Something you often get asked in talking to school groups is what is your favorite animal? And I don't think in my life I would ever have put tigers as my favorite animal. So why choose to study them for a PhD and why choose to work on their conservation?

I guess I'm really interested in all large carnivores. So this is a group of mammals, so they're all related to each other, they're all part of the carnivore. And the large carnivores are simply the largest members of the carnivore. So they include all of the big cats, for example. And unfortunately, worldwide, big cats are very much on the brink.

There have been some very good news stories in recent years, particularly with tigers. So there's been a lot of conservation attention on tigers, and numbers have increased, very gradually, and by no means is the tiger safe in the 21st century, but there have actually been some conservation gains, which is fantastic news. But worldwide, the picture for big cats is isn't isn't a good one.

And I'm particularly interested in large carnivores in temperate environments. So in Europe, in North America and in Asia, the regions where I've lived and worked.

And the opportunity came up to work on Amur tigers, which is a population of tigers that live in Northeast Asia. As I say, they were once much more widely distributed. There were populations across the Korean Peninsula into China, and by the late 20th century that really began to shrink that range, so it was reduced to just a very small population in the Russian Far East. And the same was also true of the critically endangered Amur leopard, which is a subspecies of leopard, again, found in Northeast Asia.

And so for me, it was an opportunity to work on quite an incredible species and rather group of species. But also to do so in the context of Korea, which is somewhere that I've been visiting for the past 12 years. And so it was really nice to actually be able to contribute to conservation there.

ELEONOORA KARTTUNEN

Would you describe for us your creative methodologies for data collection in these places, which are so difficult to access?

JOSHUA ELVES-POWELL

So one of the main challenges, obviously, for conservation of any of these species is lack of data, or lack of information. Despite the fact they are so charismatic, there's so much conservation and attention, and particularly on Amur tigers and Amur leopards. These big flagships of conservation in Northeast Asia.

They're actually really hard species to survey in many ways, and there are particularly notable data gaps, perhaps most of all, concerning North Korea. So we know what happened to big cats in South Korea. The Amure tiger persisted until the 1920s, possibly the last individuals were killed by Japanese trophy hunters in 1924.

But the Amur leopard managed to persist through the end of the Second World War, Korean independence, the Korean War, and right up until 1970, which is quite remarkable to think about, considering that South Korea is a relatively small country with a high human population density. And this is one of the rarest big cats in the world. But unfortunately, the last few individuals were killed in the far south of the country, and that was the last big cats that were lost from South Korea in 1970.

Fortunately bears managed to persist, a small population of Asiatic black bears in just a single national park, and there has since been a very successful restoration program there.

The situation in North Korea is almost completely unknown. There have been occasional sporadic surveys, particularly focused on tigers in North Korea. But the last survey was in the 1990s, so there hasn't been anything for the past 25 years.

And North Korea presents obviously immense challenges for any scientific research. One is practical in terms of access restrictions, particularly access restrictions to certain areas of the country. So there's very little opportunity for scientists to conduct surveys in North Korea that are not sporadic in nature.

The other main challenge for scientific work in North Korea is the nature of the North Korean state itself. So the North Korean state has been engaged in a fairly high profile nuclear weapons program, it's the subject to extensive sanctions, including by the UN Security Council, and there are also severe human rights abuses in North Korea. And these have been very well documented by the UN, including a major landmark report which came out in 2014.

And this means that any researcher who would be looking to work in North Korea has to be conscious of where any, for example, finances are going. This impact, for example, of paying for a permit, which you might not think of in most countries, actually comes with fairly important ramifications in the case of North Korea.

So what we wanted to do in our work was that we wanted to fill some of those knowledge gaps, some of those data gaps, but we wanted to do so in a way that was ethically responsible, and was alert to some of these major ethical challenges, and also scientific practical challenges as well.

So what we decided to do was that we would take approaches which were grounded in local ecological knowledge. So this is the knowledge of local communities about the ecosystems and wildlife in their local area that they're familiar with. And it's an approach which has become more and more popular in conservation science. But we wanted to apply it with former residents of North Korea, that is, North Korean refugees. And the reason why this needed to be applied with former rather than current residents of North Korea is that it would be almost impossible to conduct these sorts of surveys, which require engaging with community members inside North Korea itself.

And the thought process behind this was that it would be an interesting scientific test to see whether these approaches work with refugee populations. And that's also widely applicable to populations elsewhere in the world who've been displaced, whether that is by natural disasters or human conflict.

North Korean refugees or defectors who are now outside of North Korea might actually have valuable information about the wildlife they had seen or the environments that they had witnessed and particularly environmental change. It's a surprise, I think, for most people that there's actually quite a large North Korean refugee population outside of North Korea, particularly in northern China, in South Korea, obviously, and in the US as well.

So for this approach, what we wanted to do was interview North Korean refugees. And obviously that comes with its own challenges because North Korean refugees would be considered a vulnerable survey population. The North Korean state has a habit of targeting particularly high profile North Korean defectors, including with violence and intimidation. Many North Korean refugees have family members who are still inside North Korea and would be potentially vulnerable for targeting or repercussions. And of course, any approach which identified specific regions or specific settlements in North Korea where refugees were coming from, where their home settlements were, would, of course, be identifying potentially information that could be used for further surveillance of their settlements.

So instead, what we were looking to do was to implement a fully anonymized approach, which essentially meant that there was no information that could be collected involving an individual's name, current location, previous location, anything to do with their background which might identify them. And this was really intended to keep those participants and also our team safe, but it involved us having to kind of challenge some of our assumptions as scientists about what sort of information we might actually need as data. And large carnivores offer an opportunity to do that, because obviously, these species, even for the two bear species which are native to North Korea have incredibly large home ranges.

And so actually information that identifies, for example, a very specific location where a bear might have been sighted for example, and that applies anywhere in the world, is only relevant for that point in time. It's unlikely to be relevant in six months' time, in a year's time. So actually it was an opportunity for us to challenge some of those assumptions, while at the same time, looking to keep all of our participants safe. And it was very successful in the end. I'm very pleased to say.

#### ELEONOORA KARTTUNEN

So, if you look at the growing tensions in the current geopolitics and if you remember the challenges brought by Covid, being aware of the possibility of new pandemics, how essential do you find developing these types of remote methodologies?

#### JOSHUA ELVES-POWELL

Remote methodologies can be really useful in all forms of ecology and conservation, because lots of the regions of the world which we might be most interested in, are also some of the most difficult to access. And they could be difficult to access for all sorts of different reasons. That could be that there are physical challenges, it's physically very difficult to go into certain areas, or it could be human challenges, there could be a political restriction on access to certain areas, particularly border regions, militarily sensitive areas, human conflict, obviously, and instability proves a kind of major obstacle to scientific research around lots of the world.

And so having these remote approaches is very useful. It's very useful to be able to test them, it's very useful to be able to develop them.

And, of course, we can use satellite based remote sensing as well. But that only gets you so far, even if you're using those approaches to survey, for example, forest cover, which is something that satellite base data is regularly used for, and you can obviously do that remotely, there's still a need to go and, what's known as "ground truth" your results. Essentially to confirm on the ground that what you're seeing in the satellite images and what you're classifying as forest cover really is forest, that there really is some forest there. And so there's always this need, even if you're very adept at using remote sensing based techniques, there's still a need for some field data. And that's where these alternative methods of collecting field data, that may actually be remote in nature as well, as in this case, prove really useful.

ELEONOORA KARTTUNEN

I'm wondering if you had any moments when you wished you could access the actual field? What are the benefits and limitations of these remote measures versus field work?

JOSHUA ELVES-POWELL

As someone whose background is in field work, I think I always want to be able to be in the field. And there's a couple of different reasons why that's the case. For a start, these remote methods are very useful, you can elicit a huge amount of valuable information, but from the position of an ecologist or a biologist, there's nothing quite like having that verifiable data that you have collected in the field. So one is it is a kind of scientific reason for why you'd want to do as much fieldwork as possible, naturally.

And the other is a personal and possibly rather selfish reason, which is just that it's incredibly good fun. I think most biologists, despite all of the difficulties, and they might not think this at the time, when it's wet and it's cold and it snows, and what else they're facing. But I think all field biologists really like field work. Or at least the majority of them do. And that's why they do their job. Unfortunately, there are some regions of the world where, because of all sorts of different reasons, that isn't responsible to do.

We've already talked about some of the challenges that you'd have to consider in the case of North Korea, and the implications of the work that you were doing. And I think anyone looking to do that work as fieldwork would need to have a very serious conversation with himself about what benefit is the work I'm doing bringing, versus what is the potential negative impacts of the work I'm doing. And that's a question that I don't think science asks itself enough. That's not just the case for field biology, but science more broadly. And the way we think about scientific research and the value we place on it.

KATHERINE HALL

So your research has been focusing on a very critical edge, the Korean Peninsula. So can you tell us a bit more about the Korean Peninsula itself as the location of your research? What's happening there and why is it such a critical location?

JOSHUA ELEVES-POWELL

Korean peninsula, for those of you who maybe are listening in Europe, just to give you a bit of sense of scale and context, it's roughly about the same size as Great Britain, so the the largest of the British Isles. But of course, it's now divided into two countries. So since Korean independence and kind of the two separate developing spheres of influence, the Korean peninsula began to be split into North Korea, which was, communist aligned, and South Korea, which was aligned particularly with the US and its allies.

And at the end of the Korean War in 1953, this question was left unresolved, and a demilitarized zone, which is referred to as the DMZ [diːˌɛmˌzi], or being British, I would say the DMZ [diːˌɛmˌzɛd], that divides the two countries. And this is a very narrow strip of land that includes territory controlled by both South Korea and by North Korea.

It's quite widely visited by tourists to South Korea, and it's developed something of a reputation, in recent years, as a wildlife haven. And the reason for this is that because of its nature, there's been relatively little development in this narrow strip. So it acted as a de facto national park, it's probably the best way to think about it. So you've got these two distinct countries with this narrow strip that goes between the two.

The environment for both countries and the DMZ separately is rather different. So in North Korea, for example, although it's very mountainous, much like South Korea, there seems to be much less recovery of forests than we've seen south of the border. So the entire Korean peninsula was fairly heavily denuded by the end of the Korean War. Huge amount of ordnance was used during that conflict, and there had been quite high levels of deforestation prior to that anyway. And whereas South Korea implemented a really extensive program of afforestation, which was incredibly successful. Visiting South Korea today, you'll notice just how forested those mountain slopes are, and there are a lot of mountains in South Korea.

North Korea is very different in that regard and far more of the slopes across the country, as I say, are deforested. And this has quite significant impacts for North Korea's human population, because that means that flooding in North Korea is a fairly serious, and often life threatening, issue.

By contrast, wetland cover in South Korea has suffered in recent years as a result of land reclamation. There've been entirely new towns which have been built on reclaimed wetland areas. Famously, South Korea's main international airport, Incheon Airport, is on an area that was previously a set of small islands and wetlands. By contrast, North Korea's wetlands have managed to remain fairly intact, which is very positive because this is an area which is incredibly important for migratory birds. It's part of the eight East Asia-Australasia Flyway.

So you've got slightly different pictures on either side of the border. And then as you say, you've got the DMZ in the middle, and a lot of hope has been placed around, that this might, for example, be able to, to support, say a leopard population in the future, or some sort of population of these native, but incredibly endangered species. And unfortunately, I think that hope is a little misplaced. It's such a narrow strip, it's such a small area that there's no way it could support, in its own right, for example, a self-sufficient, functioning Amur leopard population. But what it does seem to be really beneficial for is, again, migratory birds. So it's approved really excellent for crane migration, for example. And it's now very popular for bird watchers in South Korea to go to the DMZ.

But there's still an absence of information, I think it's fair to say, because of the military situation, it's meant that there hasn't been a huge amount of survey work that has been possible to do. Some of the military forces who've been stationed along the border have recorded some information on wildlife, for example, that they've seen. And there have been some camera track records in recent years of Asiatic black bears in the DMZ, which is very encouraging, because the population in South Korea, is still very small, of this species. But yeah, the hopes of it being able to, for example, support a leopard population in the future, are unfortunately a little too optimistic.

KATHERINE HALL

Can you give us an overview of what is actually happening in terms of tiger populations in North Korea, and how tiger populations in North Korea actually give us an idea of what is happening geopolitically and socially in North Korea?

JOSHUA ELVES-POWELL

So I think it's first important to say that we don't know for certain what the situation is in terms of any of the native big cats for North Korea.

Our research seems to suggest that individual tigers have been sighted inside North Korea up until fairly recently. The last record we were able to collect of a tiger being sighted along the border between China in North Korea, it should be said, was from 2020. This fits with what we know from the Chinese side of the border.



So, tiger and leopard populations in China are beginning to recover, with population numbers increasing and beginning to spread, from the border with the Russian far East, including into the provinces of north east China, which border North Korea. We also have some information on big cats appearing to approach the North Korean border, both from tracks and sign based data and also from camera track data. So it makes perfect sense that individual animals would cross the border.

At the moment we don't have any evidence that there is a functioning population that has managed to persist in North Korea. As I say, it was over 100 years ago, 100 years ago last year that the large tigers were lost from South Korea. We do think that tigers persisted quite a lot longer than that, well beyond the end of the Korean War in North Korea. But there aren't any recent records to suggest that tigers are, for example, breeding in North Korea. What our research also shows, unfortunately, is that any animals that do cross the border from China are at fairly severe risk of being poached.

North Korea is not a party to the Convention on International Trade in Endangered Species (CITES), which is the major international piece of wildlife law that regulates international trade in these highly threatened and highly protected species. And even species which are protected under North Korean law appear to be traded both by the state and on the black market by individuals.

And the reason why a tiger, for example, would be at risk in that situation is that a tiger is potentially a highly valuable animal. In a situation like North Korea, where economically the vast majority of the country's population lives in relatively dire straits, there has been, in the past 30 years, major famines in the country, severe shortages of food and medicine and basic goods, that an animal that is potentially so valuable to exploit, would be targeted by individuals with the capacity to do so. And, we certainly know that from other species in North Korea, that researchers have revealed, are regularly being poached in the country. So really the conservation of big cats in North Korea is also linked to the country's economic and political situation, which is obviously fairly extreme.

KATHERINE HALL

I was very interested to read your paper on forest area changes that have happened over about the past four decades, and what that could actually tell about the socioeconomic conditions of North Korea at the time. Could you tell us some more about your findings from that research?

JOSHUA ELVES-POWELL

Of course. So we'd be really interested in forest cover in North Korea for lots of reasons. I mean, as I've mentioned already, this is important for North Korea's human population because there's a direct impact, for example, on the severity of flooding in North Korea.

This is a kind of major and fairly regular occurrence in North Korea, there was quite extensive flooding very recently there. But it's also really important for the country's wildlife as well.

So obviously forests provide habitat for a diverse range of species, including all of the mammals that I'm most interested in. And so it's really important to try and understand what's happening to North Korea's forest. There have also been international programs that have, over the years, aimed to support forestry in North Korea during periods where the geopolitical situation was possibly slightly improved, or where those programs worked were possible. And so it's useful for us to know whether they have had any success.

In tracking what's happened to North Korea's forests, unfortunately, we found that the picture in recent years has been one of continued decline of overall forest cover in North Korea. We identified the 1990s as a potentially very important time for North Korea's forests, because there was a shift in this period. And so combining both remote sensing satellite based data and interviews with North Korean refugees, we were able to identify that what seems to have happened in the 1990s is that as the North Korean economy collapsed, that led to a breakdown to their public distribution system, which was intended to supply North Koreans with all of the food and basic goods they required.

And as that began to break down, there was also a big push from the government at the time to increase food production, very obviously. And so that led to a lot of cropland expansion in the west and south of the country, which are the areas which are the least mountainous. So North Korea is incredibly mountainous as a place, but the least mountainous areas tend to be to the west and the south. While at the same time, in those northern and northeastern provinces, the areas which have the highest mountains and are the most remote and isolated, potentially the most important for large carnivores, they also border China and Russia, which have extended populations of these species, deforestation rates seem to have increased.

So the areas where forest cover persisted was being cleared as an economic resource by the state and by local communities and family members in order to create areas of field that they could cultivate. So they weren't supposed to do this, this was an illegal thing to do, but as a survival mechanism, it was an opportunity that you could produce some of your own food, to help keep your family alive. And at the same time, the areas that had been cleared to the south and the west of the country were then being planted up with crops.

And this presents a fairly major risk to opportunities for carnivore recovery in North Korea. As I've mentioned, these are species that have quite large requirements in terms of space. The prey populations that they rely on needs to be fairly extensive, and that is all made more difficult by the loss of North Korean forest.

KATHERIN HALL

I suppose that as conservationists who are working in quite extreme environments and in very critical edges, we are often asked to justify why we should be doing research on biodiversity. So can you tell us why the research of tigers and so-called charismatic megafauna is very important in these contexts, not only from an environmental perspective, but also from a geopolitical and social standpoint as well?

JOSHUA ELVES-POWELL

So there's a few different reasons why Korea might be of particular interest for conservation and particularly the conservation of these kind of large and charismatic species. The tiger alone is hugely symbolic in Korea. So it's the national animal of South Korea. It has long had an association with the Korean Peninsula. Dating as far back as the 17th century and the early Korean independence movement in the early 20th century, has long associated the tiger with Korea. So this is something which is incredibly important to the countries involved and to many Koreans. So tigers are often referred to in Korean as *the Korean tiger* or *the Pektusan tiger*, which is a particular sacred mountain on the border between North Korea and China.

So there's social reasons why we might be interested in conservation of these big cats, but it also has an impact far beyond Korea itself. So, as I mentioned, tiger populations and leopard populations, fortunately, have made some recovery elsewhere in their range, particularly in Russia and especially in recent years in China. And a lot of effort and attention and funding has been put into this, including the establishment of entirely new protected areas.

But of course, the tri-border area between these three states – Russia, North Korea and China – exists, and big cats don't know the difference between these different countries, they don't know when they're crossing political borders. And as we've talked about big cats that where to stay in North Korea would be at risk, quite serious risk of being killed. And this poses a direct threat to China's, for example, conservation intentions in the northeastern provinces.

So this is something that is not only of interest for Korea itself, but is also of interest for its neighbors as well. And in terms of kind of thinking about the bigger picture here, it's also important for the international community, because these are species that, as you say, regularly rank on the top of charismatic species, species that members of the public, including the areas that don't have tigers and don't have leopards like the UK, like the US, want to see conserved and want to see protected.

And of course, South Korea represents incredible potential in that way because South Korea is stable and democratic. It's a close ally of many European countries, many North American countries.

And, this is an opportunity to support conservation within that context, which is very exciting.

And it also has some important lessons as well, and particularly looking at this from the perspective of Europe. So as I mentioned, South Korea is very similar, in many ways to many European countries. It has a very similar human population density, it's a very similar size, it's a very similar sized economy, so on and so forth. And if, for example, bears say can be successfully restored in South Korea, as is in the process of occurring, that's a very positive lesson for many European countries. I mean, the equivalent is the UK restoring bears to the Lake District.

So it is a region that does get overlooked. Korea is much smaller than its neighbors, China, Japan and Russia, but it's absolutely a region where there should be more attention on conservation here.

KATHERINE HALL

As a conservationist, I very much appreciated your answer. And when you're up to your knees in freezing mud, well, maybe not enjoying it in the moment, you're always dreaming about it when you're sitting back in front of your computer. So I think that is something we can certainly say.

JOSHUA ELVES-POWELL

Definitely quite fun.

KATHERINE HALL

So, Joshua, what is the future of research in critical edges in these very extreme locations? Extreme because of their geopolitical and social contexts.

JOSHUA ELVES-POWELL

So I think this is an area where we are likely to see increased research in the future. As we continue to develop these new methodologies and approaches for collecting data and collecting information. But also as human pressures increase so dramatically on the natural world, which makes these areas, which are sometimes overlooked, even more important for biodiversity conservation. Because the factors of being overlooked, as I say, in a way, acts as a form of, de facto, protection. And so there's going to be increased interest, I think, in the future in research there, and in conservation there.

KATHERINE HALL

And what is the future of biodiversity conservation in the Korean Peninsula?

JOSHUA ELVES-POWELL

Hopefully very positive, but that depends very heavily on the political context in the Korean Peninsula going forward.

In South Korea, there is increasing interest in wildlife, in conservation, which is really very encouraging. I would like to see more focus domestically in terms of domestic policy, in terms of universities that are, for example, offering courses in ecology and conservation science, and also internationally.

Of course Korea has had a huge impact in terms of its contribution to global popular culture in recent years and that looks set to increase. So hopefully some of that will filter through into interest in Korea's really quite remarkable natural history, remarkable wildlife and other areas of this incredible region of the world.

The political situation, as I say, particularly, in relation to North Korea, would dominate a lot of what the future holds. But there are things that other parties can do now. A lot of the impetus will be on Korea's neighbors, particularly China, because of its unique relationship with North Korea and its unique ability to put pressure on the North Korean state. And whether China is willing to leverage that to, for example, encourage the North Korean state to disengage from illegal wildlife trade would have a huge impact.

I think we're clear that we would like China to engage with the issue of North Korean wildlife trade. But at the same time that has to be handled sensitively. Because, particularly in terms of cross-border trade, across the North Korea-China border, these are many of, of course, this is the border, and therefore potentially many of the routes that are being used by North Korean defectors and refugees who are mostly trying to get to South Korea. And there is a need for China to engage on that issue much more sensitively in the future. There would be a huge amount of good which would come from China, for example, facilitating North Korean refugees to reach South Korea.

And so we're aware that, for example, increased surveillance of the border at the current time, would likely have, for example, humanitarian consequences. But we would like China to engage with the issue of North Korean illegal wildlife trade and particularly to put pressure at a state level on the North Korean state to disengage from this. But as I say, as ever, it will be the political context which will decide the future of biodiversity conservation on the Korean Peninsula.

KATHERINE HALL

Joshua, thank you so much. This has been really very fascinating and also inspiring as well. We really wish you good luck with your future research, we will be interested to know where you are heading, having just completed your PhD now. But thank you once again for your time and good luck.

ELEONOORA KARTTUNEN

Thank you.

JOSHUA ELVES-POWELL

Thank you very much, it was a pleasure to speak with you guys.

HANNA LAAKO

Thank you for listening to the Critical Edges -podcast. We are Hanna Laako, Vadim Romashov, Eleonoora Karttunen and Katherine Hall - researchers at the University of Eastern Finland, who explore and inhabit many critical Edges.

VADIM ROMASHOV

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