



After the Fact | [Scientists at Work: Exploring Chilean Patagonia's Fjords](#)

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TRANSCRIPT

[Sound of ocean waves]

Vreni Häussermann, 2011 Pew marine fellow and scientific director of Huinay Scientific Field Station: I have seen all this coast of Chile. And it was clear from the beginning that Chilean Patagonia is the most beautiful, the least known, the most exciting. It's just the place to be. So I came back several times for expeditions just to Chilean Patagonia. And since end of 2002, I'm living there.

Dan LeDuc, host: So, what's it like to get to a place where few people have lived and even fewer have ever explored? And what's it like to see that place start to change?

Vreni Häussermann, who's a Pew marine fellow, is the scientific director of the Huinay Scientific Field Station, located in Chilean Patagonia. That's a long way from anywhere. But she has watched this pristine and wild space become home to fish farms and begin to absorb other signs of civilization.

[Intro music]

[Sounds of nature in Patagonia]

From The Pew Charitable Trusts, this is After the Fact. I'm Dan LeDuc.

Patagonia—that area of land at the end of South America, is some of the world's most picturesque scenery and home to an array of unstudied species. A large part of what defines this area lies on the outermost western regions—the more than 80,000 kilometers of stunning Chilean coastline.

That's our data point for this episode, 80,000 kilometers (that's just under 50,000 miles for us Americans).



It's the most extensive fjord region in the world. And on this episode of our Scientists at Work series, we're talking with Vreni about how this isolated land is becoming less and less so.

Vreni Häussermann: In summer '95, I was in Patagonia first time and at that time, the roads were extremely small, just one-way roads, unpaved. And it was really an adventure to travel down there. Our car broke I don't know how many times. You felt like you won't get further because there's nobody to help you if you have a problem. It was very, very adventurous and remote. So this feels like a place that is—when you become a biologist, you dream of exploring new regions and discovering new species. And Chilean Patagonia is just the place to be if you want to be an explorer and a person interested in natural history of the region. It's unbelievable.

But on the other hand, you have these contrasts, because you have this extreme development and strong economic pressure nowadays. And you still have these areas where you feel like no human being has ever been there. And then you turn around a corner, and suddenly you see a three-story high floating salmon farming building. So there are extreme contrasts in Patagonia nowadays.

Within 10 years, we had huge changes in Patagonia. There has been lots of development. But still you can find these places where you feel like you're the only person in the world.

Dan LeDuc: What is it like to live there as a mother and a wife and having children in this isolated place?

Vreni Häussermann: A big part of my time I'm spending outside of Puerto Montt, because at the field station, the internet is so incredibly slow that I couldn't do any work on the computer, exchanging information with other scientists. So I'm spending about a week a month at the field station, where I just take care of the station running and the people who work for me there that they are fine. We talk about all the projects, what they have to do.

And then I have to go back to Puerto Montt to work in my office, because otherwise there would be no data getting anywhere from there. Because it's really impressive how slow the internet can be. Sometimes if you try to make a Skype call, you can't even send an OK, just these two letters.

Dan LeDuc: Wow.



Vreni Häussermann: So for my main work, I need good internet. And so unfortunately, I cannot be in the fjord so much. But when I am there, I really love it, because it's the most beautiful place on Earth for me.

Dan LeDuc: Describe the fjords. I mean, when I hear fjords, my first instinct is to say, oh, we're in Norway. But fjords exist everywhere that there are these deep crevasses and deep water, right?

Vreni Häussermann: Yeah, and where there have been ice fields. So a long time ago in Chile, they had these really huge ice fields that retracted. And by the retraction of the glaciers, these fjords filled with water. And now we have a huge fjord region in Chile, actually the largest in the world, because we have more than 80,000 kilometers of coastline.

That means if you would stretch it all out, you could wrap it twice around the world.

Dan LeDuc: Say that again so people really grasp what you were saying there.

Vreni Häussermann: Yeah, it's more than 80,000 kilometers of coastline has been calculated from the National Oceanographic Institute in Chile. And this means that we have a coastline of more than twice around the world, which we have very few scientists studying this. And so this is a huge task. And it's kind of logic that it's hardly known. There's very few inventories. We are discovering so many new species. We don't even know the basic oceanographic currents. There's so much information missing. But it's nothing we can get easily because of this huge amount of coastline. So it's one of the biggest tasks, I think, nowadays in science to understand this region, Patagonia, because only if we understand it, we can help to protect it and use it sustainably.

Dan LeDuc: And you know, we've been exploring the earth almost for as long as men and women have been living on the earth. And at this point in time, to be able to say there's still areas that we know so little about almost seems like, what's going on? This is so isolated that can we ever really learn about it?

Vreni Häussermann: Yeah, I mean, that's really the typical thing in Chilean Patagonia. We have a combination of several factors that make it difficult to explore. First, historically, we didn't have big cities in there. And the universities generally started doing inventories around their universities.

So why would you travel far if the things close to you are not known? So there were very few people going into Patagonia to do research. And then the traditional methods of doing marine research was coming with the big boats, the expeditions in the 18th and



19th century. And so they came. And in the fjords, they had to maintain a lot of distance to shore, because they were afraid of damaging their boats because it was so steep. And so they were in the middle of the fjord, and their sampling was taking grab samples just in the center of a fjord. But there's where we have soft bottom, and there's not a lot of diversity. The diversity is on the steep, rocky walls. But with a big boat, you cannot go there.

So then they were looking in the intertidal and walking around. But in the fjords, we have a freshwater layer. So there's a low diversity on the top. So the high diversity is below 15 meters in the shallow, subtidal, where there's lots of marine life, lots of cold-water corals and very colorful life. And you cannot get it unless you go either diving or have a machine, a robot, that you can send down. These were just not the methods that were used traditionally.

So nowadays we have these possibilities. But it's very slow, because we are just starting to do these kinds of inventories. And also it's a lot of work, because it takes a lot of time to do a dive or to send this robot down. So it's very time-consuming. And as I said, it's twice around the world, the coastline. So I think that factors made it really difficult to explore Chilean Patagonia historically.

And then of course, we are in an area of extreme weather conditions. We have extreme rainfalls, extreme storms. The further south we get, the wilder it gets. The exposed coast can be accessed a couple of days a year in many regions, because the rest of the time, the storms are so strong, you cannot even go there.

So that explains why for example, in 2015, we found about 350 dead sei whales—these are big baleen whales—on the shores weeks after they died. And nobody has discovered them. That shows—I mean, where in the world can this happen that you have hundreds of dead whales for weeks, and nobody sees them?

Dan LeDuc: And no one knew they were there. Yeah. And did you just happen upon them? Did you have any sense that something had happened, and you needed to find out, or did you just see them?

Vreni Häussermann: We just saw them, because we went to this very, very remote area in central Patagonia, because we have never been there. And we just decided that here, OK, we have to start going to these places where it's very difficult to go. And so we made this expedition and then by coincidence just arrived when all the whales died.

So that kind of shows how remote and how difficult to access it is. And also, the fact that we had to take satellite pictures to look at the mortality instead of just going there shows that it's so extremely difficult and time-consuming and expensive and logistically



challenging to go to these places that it is easier to take pictures from space to look at dead whales.

Dan LeDuc: That's amazing.

Vreni Häussermann: For me, that was really also another eye-opener. It's like, we have to look at Patagonia from space, because it's too complicated to really go there and look what's happening.

[Music transition]

Vreni Häussermann: Here we come to the special things of fjords. Because in fjords, we often have species from the deep sea that live in shallow water. And this is something that helps us, because like this, we can study these animals that we normally don't get to while diving, for example. And normally we need a submarine to get there. So that's why Huinay has turned into an area where people come to study these cold-water corals. And it's an attraction for scientists studying cold-water corals. And also it's an attraction for scientists studying ocean acidification, because we know that the oceans are getting more and more acid every year. And at the end of the century, we will have a pH that we have now in the fjords.

So we basically have a laboratory for studying what will happen in the future. And that's a very interesting situation, because we can try to understand how do the corals deal with that. How can they live in a place where they are not supposed to be able to live? And so we're trying to really understand the physiology behind it and what is happening there.

Dan LeDuc: Help us understand that a little bit better where you talk about the acidity of the water and the pH levels that you just mentioned. What you're finding there is an environment that allows us to sort of see the future.

Vreni Häussermann: In the fjords, we have conditions that are calculated to be in the oceans in 2100.

Dan LeDuc: Where we think the oceans are headed is already happening in the fjords.

Vreni Häussermann: Right. So we have a very special condition in the fjords. Basically, it shows us the future of the oceans in other places. So we can do experiments not in the lab but really in the fjord to understand what happens also to other animals under these specific conditions. And so it gives us many possibilities of maybe seeing what the key problems are of species living in these very acid conditions.



And what we are seeing, for example, is that corals need a lot of energy to be able to stand this. And if they have enough food, they can stand much more acid conditions than they could with less food. But this could also make it tricky in other places where there's less food available. But it's a very good place to really understand what will happen in the future to the oceans.

Dan LeDuc: To make sure we understand, is the acidity there something that has evolved over time? It's not the natural acidity of this location, right?

Vreni Häussermann: I suppose it's the natural state. I mean, of course as everything in Chilean Patagonia, we don't know how it was before—

Dan LeDuc: Because we weren't around. We weren't around even 50 years ago to know, let alone 100 years ago.

Vreni Häussermann: Because nobody looked at it before.

Dan LeDuc: Right.

Vreni Häussermann: But it seems to be the natural state of these fjords. And so it gives us a very good possibility to study this kind of state. But I mean, this problem we have in Chilean Patagonia, for example, also with the fish, with the freshwater fish. We have all these salmon in Patagonia all over, and they're not normally distributed in the southern hemisphere. So we have all these species of salmon, the trout, everything all over the rivers in Patagonia. And we don't know the original Chilean fish fauna, because nobody looked at it before.

There's probably many species have already gone extinct. Others are the most threatened fish species in the world because of the competition with the salmonids. And we just don't know how it looked before, because nobody looked at it. So this shows us how poor our knowledge is about this part of the world.

And if you go diving, when I was diving the first time 20 years ago, there was a very, very high diversity and very colorful life. And nowadays, in many places at least, diversity is very reduced. Abundance is reduced up to 75 percent. And there's many species we just hardly can find anymore.

So there have been lots of changes going on. But these changes are silent, are slow. So it's a shifting baseline. And everybody who comes there says, "oh, it's so beautiful. It's incredible." And it's still incredible, but when I think about how it was 20 years ago, it was much, much more diverse and much more abundant than it is nowadays. But it's changing so slowly and silently that we hardly realize it.



Dan LeDuc: And much of that change you think is from the human intrusion of roads and salmon farms and other fish farms?

Vreni Häussermann: That is the most reasonable explanation, because I mean, the diversity wouldn't disappear by itself. So clearly there must be human impacts. But the problem we have in Chilean Patagonia is we have all these different impacts overlying. We have small-scale fisheries. We have shellfish harvesting. We have lots of salmonid farming. But then we also have maybe natural cycles. We have climate change.

And so for us as scientists, it's very tricky to say exactly what activity is the reason for which changes. But we clearly also see eutrophication, that's basically when—what's happening all over the world that we get more and more nutrients into the systems. And so for example, if we have a fjord, and then we have the salmon farms in the fjord, they give food to the salmon, but part of it falls on the ground. And then the dead salmon fall on the ground. So we get additional nutrients into the system that have not been there before. And in general, there is a tendency, the more nutrients we have in a system, the less diversity we have. And so I guess the eutrophication can be led back to the salmonid farming, because that's the only activity that brings nutrients in the waters. There's very few cities in Patagonia. So it's still not so much wastewater is coming from cities. But it's really, really tricky to understand what is happening and why.

Dan LeDuc: There's rapid change occurring and very little baseline data to compare it to, right?

Vreni Häussermann: Right. I think that is the main problem. I mean, if we would have had baseline data, we would see in which region were which changes, because the activities weren't also starting simultaneously. But nowadays, basically we have all activities everywhere. And even if we have marine protected areas, they are generally multiple-use areas, so we have still all activities in the protected areas.

So there's no real way for us to do studies where we understand the cause of the changes, because we are lacking reference areas. We need areas without human impact. And we hardly find these anymore.

And since Chilean Patagonia is so diverse, I cannot understand what's happening in northern Patagonia if I have one little reference area in central or southern Patagonia, because we have so many overlying physical gradients that basically every part of a fjord is different and has different life. And we would need reference areas in all these kinds of different areas to be able understand what happens in each area. It's not one thing, Chilean Patagonia. It's at least 13 to 15 different regions.



And even within these regions, we have huge differences. We have a strong gradient, for example, from the protected fjords to the channels to the exposed coast. And then we have gradients of salinity, of sedimentation impact, of saltwater, of currents, of waves. And all this is overlaying in such a complicated pattern that we really cannot even predict what we will see if we go diving a couple of hundred meters next to a place we know, because it can look completely different.

Dan LeDuc: That close?

Vreni Häussermann: That close. So it's really—it's, like, exciting in one way, because you feel like you're exploring something new. You're the first one to see something. But it's also frustrating, because you feel, how can I ever understand what is where? And how can I then protect what is rare and what is worth protecting?

Dan LeDuc: And what do you think would be useful, larger marine protected areas with limited uses in those areas? Or what other things would be useful to help preserve this environment for more study?

Vreni Häussermann: I'm convinced that we definitely need marine protected areas, highly marine protected areas, because as long as we don't understand what is going on and what effects our activities have, we must follow the precautionary principle. And that means we have to take large areas out of use. And until we understand that there is a way and how we can find a way to sustainably use these areas, because we don't want to see that it's all being destroyed until we understood how we could have done it sustainably. And we need many of these highly protected marine protected areas in all the different subregions of Chilean Patagonia.

The difficulty is that these are under high economic pressure, and this is clear that it's always difficult to protect something that is already in use. And so I think it's very important to sit together with the industry and also with the government to decide about how we could find a way to save this part of the world that I think is a heritage not only for Chileans but actually for everybody on the planet. Because Chilean Patagonia is a very, very unique place on Earth. And even if you live far away, and you just think about it, I think you feel like you want to preserve it for the next generations.

[Transition music]

Dan LeDuc: You can check out more resources from Pew's Patagonia conservation efforts, including photos from the region, at our website, pewtrusts.org/afterthefact.



And here's a quick production note: For the month of August we'll be taking a look back at some of our favorite episodes. We hope you'll enjoy listening and revisiting those topics.

In the meantime, we're working on new episodes and will be back with those in September.

Thanks for listening, I'm Dan LeDuc.

[(Female voice over closing music) "After the Fact" is produced by The Pew Charitable Trusts.]