Welcome to HMSC Connects! where we go behind the scenes of four Harvard museums to explore the connections between us, our big, beautiful world, and even what lies beyond. My name is Jennifer Berglund, part of the exhibits team here at the Harvard Museums of Science and Culture, and I'll be your host. Today, I'm speaking with Andrew Williston, who manages the Museum of Comparative Zoology's Ichthyology collection, an assemblage of one and a half million specimens of dead, preserved fishes. I've been working with him recently on our upcoming exhibit on sharks—which will be fantastic, by the way-- but I wanted to talk to him today about the other ways collections are used. And the reasons why they're valuable not just for public viewing, but for science and education. And generally, why collections matter in the first place. Just a heads up that due to the COVID-19 outbreak, this interview had to be conducted by phone, so the audio quality isn't perfect. Apologies for that. Here goes. You first became interested in fish because you were interested in sharks, is that correct?

It's one of the things I was interested. I would say going back, I've always been interested in fish, whether it was going to a pond or going to the ocean. I was always really fascinated thinking about what was under the surface and what kind of mysteries were down there, and especially fish. There was something about these big, active, swimming animals that was exciting and curious to me. And I definitely think once I started to look at fish more academically and learn just how broad fish diversity was, sharks just exploded the whole concept of fish diversity. So, what I always kind of preconceived as being this relatively simple, powerful predator, I looked at the diversity of sharks. There are almost 400 different species, some of which were not more than a foot long. Some of which were well over 30 feet long. And yeah, that was so incredibly exciting to me--that big mystery under the water was so much bigger than I had ever imagined.

Did you collect when you were a kid? How did you get into collections?

I did collect as I was, when I was a kid.

Neat. So, what did you collect?

I think my first collection ever was debris that I found on the side of the road.
Jennifer Berglund 03:16
What kind of debris?

Andrew Williston 03:18
Like really crazy stuff that only a kid would pick up, like broken windshield wipers. And this was not for any environmental purpose. It was just like I was driven to collect.

Jennifer Berglund 03:33
So you were really, like, born for this profession?

Andrew Williston 03:36
I don't know. My parents were probably happy that even if I was picking up junk on the side of the road, at least it wasn't dead fish back then.

Jennifer Berglund 03:49
Yeah, that would have been a--that would have been a pretty stinky collection.

Andrew Williston 03:53
Yeah. Yeah, and I think I moved into more sophisticated things like baseball cards. I would go through the baseball cards and sort them, put them into catalogs. And, you know, repeatedly check on what I had, so. Yeah, I think I've always been into collecting. And it's just gotten increasingly more sophisticated and scientific. And I've been really fortunate to be able to merge that with one of my other interests, which is fish and ichthyology.

Jennifer Berglund 04:24
So do you have, so you mentioned baseball cards and things, so do you have collections at home?

Andrew Williston 04:29
Like wildlife collections?

Jennifer Berglund 04:31
Any kind of collections. Do you collect things?

Andrew Williston 04:35
Now, I really don't have any collections at home. Collecting is really limited to work.

Jennifer Berglund 04:40
You scratch that itch entirely at work.

Andrew Williston 04:42
Yes. I think living in a small apartment, just life has no room for collecting.

Jennifer Berglund 04:50
Yeah, that'll squash that dream pretty quickly.

Andrew Williston 04:53
Yeah.

Jennifer Berglund 05:06
Why do we collect? Why do we collect natural history specimens in particular?

Andrew Williston 05:12
I really don't think we can pin it down to any one reason. It's just like how we are driven to compile knowledge and thoughts into books and then put books into libraries. We need some kind of tangible examples of what we know about the natural world. I think that's what collections are all about. And the examples of what we can do with those tangible examples of the natural world are constantly changing. I think the classic explanation is always just to describe what's out there. And we're certainly still doing that with fish, whether it be bony fish or sharks. We're still just naming new fish and sharks,

Jennifer Berglund 05:51
And that's not unique to your collection at all. I mean, that's, that's unique across collections in the Museum of Comparative Zoology and and across natural history collections around the world.

Andrew Williston 05:58
Yeah, I can identify several fish on the shelves in our collection, which are almost certainly new species. And we just don't have the trained expertise with the time to name those fish and to write up formal descriptions of what those animals are.

Jennifer Berglund 06:15
And that's not unique to your collection at all. I mean, that's, that's unique across collections in the Museum of Comparative Zoology and and across natural history collections around the world.

Andrew Williston 06:25
Throughout the world. And I mean, you look at biodiversity hotspots like Brazil, right, I think there's more and more ichthyologists being trained in Brazil to keep up with the massive number of discoveries of new fauna, but there's a lot of undescribed fauna. And so that's just one of the reasons why we have these collections and we need these collections is to understand species, which is kind of the fundamental unit of our natural world. But to understand evolution, and how all these things relate on a huge timescale. And also we can make discoveries that help us technologically, if that's understanding how fish interact with the fluid around them, and understanding how fishes scales or shark scales might make it more efficient to move through the water for a submarine, or a boat. That's something that really impacts our lives significantly. And conservation. To know not only what lives were currently, but to know what has lived where in the past. It's having a specimen in the museum as a permanent record of our world. We have specimens from the 1850s from rivers in Brazil, that aren't there anymore. We have specimens from the 1850s from rivers in Boston that don't exist anymore.

Jennifer Berglund 07:49
Wow.
Andrew Williston 07:50
So these are just some of the reasons why collections are really needed and valuable to us today.

Jennifer Berglund 07:58
They're time capsules from the past.

Andrew Williston 08:00
Time Capsules is a great way to put it.

Jennifer Berglund 08:02
And in that way they kind of connect us to our past.

Andrew Williston 08:07
It connects us to the past, and it can connect us between different kinds of disciplines. Certainly, our collection has inspired art. We have artists come in to look at our fish, to make drawings based on the fish, and to make sure that the drawings that they're making are as scientifically accurate as possible. Science and art are certainly not always separate disciplines, even though they can be portrayed that way. And I think one certainly informs the other. Observation has always been key to understanding biology. And I think as we have better imaging technologies, we're getting back towards this merger of art and science again. If you look through pictures in biological journals, or if you look through some of the things in the popular press, you're seeing how beautiful nature really can be on a large scale and on a microscopic scale.

Jennifer Berglund 09:01
Yeah, especially, I'm just thinking of George Lauder's lab, the Curator of Ichthyology, and how he's been getting these sort of microscopic images of the denticles, or the shark scales. And they're just these beautiful patterns. I could see them inspiring art.

Andrew Williston 09:19
Yeah, it's one of the things that I think about when I talk about art and science merging. It's incredible. You don't even imagine when you're standing five feet away that there's this whole microcosm of texture. And it's really spectacular, the detail that we're seeing.

Jennifer Berglund 09:40
Can you talk about collections in terms of their value to students and advancing their learning?

Andrew Williston 09:48
Well, I think having a collection on campus is an incredible asset. First of all, Harvard is really impressive in the fact they have a lot of the ology classes—the zoologies. So ichthyology, ornithology, you know for birds, herpetology, and having collections really allows us to bring some of the rarest of the rare to those classes. I know the students in ichthyology are able to look at things like deep sea angler fish,
Jennifer Berglund  10:21
What are deep sea angler fish? They're so super cool. You have to describe them.

Andrew Williston  10:26
So, a deep sea fish that have a bioluminescent, basically fishing rod on the top of their head to lure and prey closer to their mouths, things that live 2000 meters under the deep. In one semester, a student is able to explore these things and get exposure to these, where in an entire lifetime, most people do not get the chance to see one of these animals.

Jennifer Berglund  10:54
Right. And this is from collections that are built up over lifetimes.

Andrew Williston  10:59
Yes. We have many lifetimes and generations of fish to draw from to look at these things. And this also includes sharks. We can pull out sharks and put them on a dissecting table, and students can see sharks, potentially even dissect sharks to see the internal anatomy, and it just goes so much further beyond the surface of the topic of zoology. It's an incredible asset for them. And also inspiring. Bringing students through the collection and seeing the breadth of life is an incredible opportunity. We also get to welcome graduate students and undergraduates into the collection to do research. We've had undergraduates do projects that have explored the bite force of deep sea animals.

Jennifer Berglund  11:45
Wow. How did they do that?

Andrew Williston  11:48
Well, I mean, this is something that would normally be impossible because we can't go into the deep sea to look at some of these animals and test how strong they bite, but we've had an undergrad who took one of our specimens, CAT scanned it, did a Micro-CT at extremely high resolution, 3D-printed the cranial skeleton, so the head and the jaws, of the Viper Fish, and put motors onto the jaw.

Jennifer Berglund  12:12
Motors?

Andrew Williston  12:14
Yeah. And they essentially created a robot deep sea fish to test the bite force.

Jennifer Berglund  12:22
That's amazing.

Andrew Williston  12:24
And so by taking the animal out of the ocean and putting it into the collection, they were able to make a robot and make some kind of simulation of what it might be like in its actual environment.
That's so cool. So cool. Can you reflect a bit on how you personally have learned by observation of real objects that are stored in the collection, or real specimens, rather? What kind of personal observations have you made that have sort of changed your own understanding?

Andrew Williston 12:55
I guess my biggest observation and my big personal takeaway is that biodiversity is broader than I ever thought. And our understanding of the natural world is still so limited. I mean, that's a really big question. Personal takeaways. Maybe I don't think enough about personal takeaways when I'm in the collection.

Jennifer Berglund 13:21
No, I mean, I think that's a really good answer though. I mean, it's kind of, because you probably have a lot of personal takeaways, a lot of small, you know, observations. But that's kind of a, that answer is a way to sort of encompass at all. I mean, because you are taking care of this giant collection, you know, it makes you really understand the scale of biodiversity you're dealing with. In your mind working on this exhibit. What do you hope visitors will come away with? What do you hope they come away understanding about sharks?

Andrew Williston 13:57
So, I guess sharks, to me, and talking about sharks with other people, I have always seen people have a really sharp first reaction. And whether that be a good reaction that they love sharks and they're excited about sharks, or that they're terrified of sharks, or if they feel that they already know everything about sharks, people tend to have a knee-jerk reaction toward sharks. And I hope one thing that people get out of this exhibit is to move past whatever their initial reaction is. So, if an initial reaction is that they're afraid of sharks, and that sharks are dangerous, I hope they learn that sharks can be big predators that might be dangerous to humans in certain circumstances, but at the same time, not all sharks are dangerous. I hope that could be a takeaway. If they love sharks, I hope that they learn to love sharks more, and it builds their sense of wonder toward sharks. But no matter what their reaction is, I hope it's one step beyond their initial reaction to the word shark.

Jennifer Berglund 15:06
That's a really good takeaway. I think that's mine too. That's what I hope they come away with from the exhibit for sure. Well, Andy, thank you so much for doing this. This has been amazing.

Andrew Williston 15:18
Yeah.

Jennifer Berglund 15:22
Today's HMSC Connects! Podcast was produced by me, Jennifer Berglund and the Harvard Museums of Science and Culture. Special thanks to Andrew Williston and the Museum of Comparative Zoology for their time and expertise. See you next week!