Ornithologist studies bird lice for answers on pathogens and evolution

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When Jason Weckstein looks at a bird, he doesn't see just a creature with feathers that flies.

He sees the bird as a teeming community of tiny creatures, some of which live and feast on its feathers, or that roam more widely and engage in more general mayhem, including gorging on the bird's blood.

When he talks about these things, his eyes light up and he smiles with pleasure.

"When I'm in the field, when I'm out bird-watching, I think, 'Boy, I'd love to get the parasites off that host, '" he said.

Weckstein, 43, is an expert on chewing lice - about 4,000 of them are known to live on birds - and this year left the Field Museum in Chicago to become associate curator of ornithology at the Academy of Natural Sciences of Drexel University.

He brought with him a collection of 6,600 bird lice, ranging in size from as small as a grain of pepper, which might infest a tiny songbird, to half-inch louse, which lives on a hawk.

Mounted on microscope slides, whole or in minuscule parts - with an 5,000 more vials of lice stored in a minus 176 degree freezer - they represent a growing field of research that may help scientists understand how evolution works, and, eventually, how significant diseases such as

HIV and Ebola were able to move from animals to humans.

Studying how parasites move and evolve can help scientists understand "how pathogens are able - or not able - to move between hosts," said Weckstein, who views the bird-louse relationship as an arms race. A host evolves defenses against a parasite, and the parasite counterattacks over evolutionary time.

"Nothing in biology makes sense without evolution," Weckstein said. "It's one of the central things that tied all biology together."

But it still holds many mysteries. "That's one of the fun things about the work I do," he said. "I get to explore those mysteries."

Bird lice were once mostly the realm of taxonomists, who examined and dissected them to determine their correct position on the tree of life, then pretty much put them aside.

About 25 years ago, scientists realized that bird lice had more to offer science. Also, the tools to study them got better.

Now, scientists are using the tiny creatures and their bird hosts as model systems to address burning questions of ecology, behavior, and the formation of species.

"People used to think, 'Oh, you could never address that question directly,' " said Dale Clayton, a parasite expert at the University of Utah who praised Weckstein's research. Animals evolve so slowly that "it would take tens of millions of years."

Because lice reproduce 12 times a year, their DNA accrues differences much more rapidly, Weckstein said. So, from studying a bird's parasites, scientists can tell more about what's happening with the bird than if they

studied just the bird.

Scientists now think they can make new species of lice in the lab, but not in test tubes. They can bring the louse's habitat - birds - into the lab and watch events unfold more or less naturally.

Many scientists are either ornithologists or entomologists. Weckstein is both, so he can work on the interactions between birds and insects.

Because to budgetary constraints, the curatorial position had been vacant for about a decade. But after the academy's affiliation with Drexel in 2011, its finances improved.

Ted Daeschler, the academy's vice president for collections, praised Weckstein's versatility: "He's a young guy with National Science Foundation support, he works in the field, he works in the lab."

His enthusiasm is a plus as well, Daeschler said. "We understand that there's some very serious, hard-core science going on here, but if we can't communicate that to students and visitors, we're missing something."

Weckstein said his new position is "like winning the job lottery." The academy's ornithology collection, with 210,000 specimens representing more than 7,000 species, is recognized as one of the largest and most historically important in the world.

As associate curator, he'll lead the research program and teach at Drexel, plus work on building that collection of lice and birds.

He's worried that some parasites may disappear before we know exactly what their niche is and why they are of value.

Case in point: When researchers brought all the world's California condors into captivity to breed them and bolster a population on the brink of extinction, veterinarians treated the birds with a powder to kill the ectoparasites - those that live on the outside of a host. In so doing, they caused the extinction of a louse specific to the condor.

Weckstein grew up in Michigan, in a house with a small forest behind it. He became interested in the outdoors, and his grandmother bought him a collection of field guides.

"I started running around identifying everything," he said. Plants were easy. They held still. But gradually, he became captivated by birds and their diversity.

As a graduate student at Louisiana State University, doing work on the genealogy of toucans, he was preparing a specimen a researcher had brought back from Panama, and found a louse on it.

He put the louse in a vial and stored it in the freezer.

Then he began to wonder: What other parasites were on the bird? And what did that mean?

This year, Weckstein plans to travel to the Amazon to investigate the rich biodiversity of its birds and their parasites.

He and his colleagues will wake early each morning to catch the birds. By afternoon, he'll be collecting blood from them to look for blood parasites, then fumigating the birds and ruffling their feathers to remove the parasite corpses.

"We'll be trying to get at the whole community of creatures that live in and on the birds," he said.