

## Ask a Biologist Vol 001 (Guest David Pearson)

### **Tiny Tigers -**

An interview with biologist David Pearson, an author and expert on tiger beetles. Did you know that tiger beetles can run so fast that they go blind and just what would it be like to be hunted by these tiny, but ferocious animals? These are a few of the questions that we learn the answer from our guest biologist.

### **Transcript**

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**Dr. Biology:** This is Ask-a-Biologist, a program about the living world, and I am Dr. Biology. Imagine being chased down by one of the world's fastest animals. If you are unfortunate to be caught and grabbed by their large, strong mandibles, well, the rest of the story would not be a pretty sight. Luckily, if you're not the size of a quarter, you have nothing to fear, because the animal I'm talking about is the tiger beetle, one of the best hunters and fastest animals in the world.

How fast are tiger beetles? I've heard they can run so fast that they go blind. We'll learn more about these colorful animals and their amazing speed from our guest scientist, David Pearson. Dr. Pearson is a research professor in the School of Life Sciences at Arizona State University, and an expert on tiger beetles.

Pearson is also a world traveler, and author of numerous books and travel guides. He recently co-authored a book titled "A Field Guide to Tiger Beetles in the United States and Canada," which is published by Oxford University Press. This latest book provides both experts and people new to the study of tiger beetles a wonderful collection of information about these insects, and includes a large collection of color photo illustrations detailing over 200 tiger beetle species out of North America.

Welcome to the show, David.

**Professor David Pearson:** It's fun to be here, Dr. Biology.

**Dr. Biology:** When I first walked into your office--and this is a couple of years back--the first thing I noticed was this wonderful, large world map, and it was filled full of these pushpins. Can you tell me about that map and the pushpins?

**David:** Well this is a way that biologists get to brag about their travels. It also helps the students who come in get interested in something I'm doing, and breaks the ice on helping us talk about a lot of things besides just biology. Those pins indicate places I've been, study sites I've been to around the world.

**Dr. Biology:** The other thing I was curious about, as a world traveler, one of the tools that you'd have is, you speak languages other than English. How many languages do you speak?

**David:** Well I'm not sure exactly about the definition of speaking well. I can communicate pretty well and teach courses in about five languages, and get in trouble in maybe three or four other languages.

**Dr. Biology:** Well what's your favorite language.

**David:** Oh I'd have to say Spanish is probably, after English, Spanish is probably my favorite language.

**Dr. Biology:** We're talking today about these tiger beetles, and the tiger beetles, when I look at your book, it has this large collection of just amazing images of the tiger beetles. And what's amazing about them are the colors. Some of them look like they've been chrome-plated, some of them look like they have an expensive paint job that you might see on a car; other tiger beetles have these patterns to them, which might be where they got their names. I'd like to know a bit more about the coloration and their importance to the tiger beetle.

**David:** The color of the tiger beetles, in the first place, is something that has attracted a lot of amateurs and professionals to study them. They're much like butterflies in some ways. They're more subtle, and you have to look harder to see them, but once you know, these colors help keep your interest up, especially if you're just beginning.

But the colors that we've found have several functions. One, of course, is that they help camouflage. We find that most species of tiger beetles have a color that very closely matches the background or the ground on which they run. Other species of tiger beetle have a color that is not quite so obviously camouflage, and as a matter of fact stands out like a sore thumb in being so bright, and we've found that these species of tiger beetle appear to be mimicking or looking like other, more dangerous, things like wasps and ants, and they are cheating more or less, but they take advantage of fooling the predators.

Also, we find that some colors actually help, light colors and dark colors, especially in making sure that these beetles can control their temperatures inside. If they're very dark, they can stand out in the sun and absorb the sun faster, or if they're very white they can reflect some colors that occur in some very hot areas by reflecting those waves of energy coming from the sun.

**Dr. Biology:** When I saw the map and all those pins, I couldn't help but believe that you can just about find tiger beetles anywhere in the world. Is there anyplace you can't?

**David:** In some ways it's kind of an excuse, it's a fun excuse to have to be able to run off to any part of the world, because tiger beetles occur everywhere except Hawaii, Antarctica, and a group of islands called the Maldives off the southern tip of India, and Tasmania. Sometimes wondering why they don't occur in these places is a little hard, but they do appear everywhere else. We have found them as high as 13-to-14,000 feet elevation, and as low as -200 feet elevation.

**Dr. Biology:** Wow. So how many species of...

**David:** Well right now--well, we're finding new species every year, but right now it's around 2, 600 species. So it's a fun number, because it is not overwhelming, it's a manageable number; on the other hand it is enough to actually use them to do some fairly sophisticated studies and comparisons especially.

**Dr. Biology:** I was curious. I was doing some reading, of course, before we got to sit down and chat today. One of the things I read is that the tiger beetles can run so fast they go blind. Is that really true?

**David:** That's maybe a little bit of an exaggeration, but actually they do run fast enough that the neural system in their eyes, trying to interpret the signals coming from them, coming too fast--they run that fast. And as a matter of fact, the tiger beetle has to stop and reorient itself because it has run beyond its ability to see where it was going.

**Dr. Biology:** So how fast can a tiger beetle run?

**David:** Well, tiger beetles actually now have been clocked as, for their size, being the fastest-running insect in the world. If they were the size of a horse, and you were able to extrapolate the size and speed from that, they'd be running probably 200 or 300 miles per hour. So they are very, very fast.

**Dr. Biology:** If they can run that fast, what is it like for something that they are hunting?

**David:** They are totally predacious. They feed on other insects--ants and spiders, and there are numerous other types of insects running on the ground. Part of the name--tiger--comes from the fact that they do visually pursue these other organisms, and pounce on them, and tear them apart with their mandibles.

**Dr. Biology:** When they pounce on them, the descriptions I've heard are somewhat--since it's Halloween--gruesome; but how do they actually...

**David:** Well if you're a tiger beetle it's not gruesome, but sometimes watching it... They have these very large, long, thin mandibles that are almost like swords with little teeth sticking out of them, and they grab the prey item--an ant or a small spider--they start to crush it and tear it apart, and then they spit up their saliva, which helps to digest these insects outside their body even before they start to suck in the juices of the insect they're chewing on.

**Dr. Biology:** Well I can see how you got, or at least remain, interested in tiger beetles, but what got you started?

**David:** Well, I got started with tiger beetles back in Minnesota. I was actually a boy birdwatcher when I was very young, and in the middle of the day the birds would become very, very slow, hard to find, because they were becoming inactive in the heat of Minnesota, if you believe that. It is exactly that time when these tiger beetles become active, so it was a good way to fill in that hiatus in the middle of the day when the birds weren't active. After a while, the tiger beetles became more interesting than the birds.

**Dr. Biology:** As you have been studying the tiger beetles, besides understanding how and where they live, and how they eat, do they have other functions? Do they have some other story to tell us, so to speak?

**David:** A big part of why we're using the tiger beetles is because we do know so much about them. We know more about tiger beetles than most any other group of species, for instance in a tropical rainforest. There are 1000's and 1000's of species. We know a little bit about the birds and the butterflies and some of the plants, but still tiger beetles are still amongst the best known of all those groups. So we can use as what we call 'bio-indicators'. We can use them to understand the rest of the forest when there's not enough time to learn about the other species that are much harder to observe or are less well known.

**Dr. Biology:** You say 'bio-indicators'. What are they indicating to you then?

**David:** The bio-indicator is used in several ways. For instance, on a study in Madagascar, we were asked by the government of Madagascar to determine the boundaries of a border in the northeastern part of the island, using tiger beetles as one of the indicators to maximize the number of species that could be preserved given the boundaries of the parks. So we drew the boundaries of the park using tiger beetles, and in this case, butterflies, birds and lemurs as a way to have the smallest park still covering the most number of species. Again, because they're so well known, they could indicate for all the other species: the frogs, the orchids and the other animals and plants for which we didn't have enough information, and we would probably be assured that the park would maximize their numbers as well.

**Dr. Biology:** Since you've done, it looks to me like from your biography, and also from some of your publications, a lot of traveling, a lot of it in the rainforest, one of the things that I'm always curious about is if you have any interesting stories or events that occurred on some of your trips.

**David:** I've got lots of stories. I like to sometimes use these stories, especially with big classes because they are kind of gross. For instance, I'm apparently one of the only North Americans to ever come back from India with a worm called the 'guinea' worm, or 'fire' worm. It's the largest roundworm in the world; it's a meter long. It gets under your skin, and I could actually feel it like a piece of undercooked spaghetti when I was taking a shower against my ribs. What they do is release an enzyme that eats away at the exterior under the skin, and they then control human behavior. Every time that female worm wants to lay eggs, she releases that burning sensation, which is relieved immediately by water. So she tells you when she wants you to put your arm or leg in the water, and she keeps doing that for six weeks until all of her eggs are gone.

**Dr. Biology:** I'm hoping you're worm-free now.

**David:** I am worm-free now, but it was still a great experience.

**Dr. Biology:** Switching just a little bit, because we're talking to usually young scientists, when did you first realize you wanted to be a scientist or a biologist?

**David:** Well I was very lucky. I don't know what it was: having the right teachers, right parents, right genes. I'm not sure what it was. I knew when I was about six or seven years old that I wanted to grow up to be a birdwatcher. And I told my parents and my teachers this is what I wanted to do. Of course, they told me right away that I couldn't make any money doing that so I could think of that as a hobby. But again, I had to decide fairly soon that it was my life, and if I made a mistake, at least it's my mistake.

Now they pay me to travel around the world. Maybe not watching birds so much, but doing much of that same kind of thing. I also understand that there was a lot of luck involved there, of getting the right people to encourage me to pull out what talents I do have.

**Dr. Biology:** If you weren't a biologist, would there be something else you would like to be?

**David:** I think that if I weren't a biologist, I'd probably make my living being a photographer; maybe nature photographer that would be really fun. I think also perhaps being a travel agent or a tour guide, that would be kind of fun as well.

**Dr. Biology:** That probably comes from these travel guides that you've been writing for so long.

**David:** Yeah, part of it. I can see the downside too. I think I prefer doing it the way I do it, but I could probably lead a tour every once in awhile and have a lot of fun, especially depending on how excited the people were that I was able to share this information with.

**Dr. Biology:** Do you have any concerns with eco-tourism?

**David:** Yeah. I've worked a lot with eco-tourism around the world, from Africa, Southeast Asia to South America. What we've found is that there's a fine line between eco-tourism and eco-terrorism. A lot of people who claim that they're running lodges in a very 'green' way, and that they're very concerned about the ecology, it ends up that the green is more the color of the money. Eco-tourism is probably one of the only ways that I've seen that really works, especially in rainforests, of using the rainforests for a long term, in a solid, economic way that doesn't destroy the forest - if it's done right. But in many cases, people become greedy and selfish, and they can even destroy the forest using eco-tourism.

So we've worked a lot in trying to get a good balance there between solid economic returns, but for the long-range and having some kind of control either through the people who own the lodges or the tourist themselves, empowering them to be able to comment to the lodge owners what does and does not work for maintaining good eco-tourism.

**Dr. Biology:** Again, since this is our Halloween edition, and our first edition, one of the things I'd like you to do is give a play-by-play view of what it would be like if you're getting hunted down by a tiger beetle and the final moments of the prey.

**David:** That would be pretty, pretty grim. There actually was a movie back in the 1950's; I think it was called 'Them'. It featured tiger beetles as enlarged marauding insects

invading civilization. First of all, they can run probably 10 to 20 times faster than you can, at least. They've got very good eyes. Probably the only way you can escape them is by standing still and not moving because they don't perceive still things; they perceive movements more than anything else. That would be very difficult seeing that thing coming at you with these big monstrous mandibles and big eyes and be able to stand still, but if you learned to do that you could probably escape them.

Otherwise, you can anticipate being grabbed by those large mandibles and spat upon, those enzymes breaking you down and being torn apart very quickly.

**Dr. Biology:** Well I'm glad I'm not small enough to be lunch for a tiger beetle. I have one more question. To young scientists out there, what advice do you have for them?

**David:** What I've learned, especially in teaching non-majors here for the last 10 or 15 years, is that I believe that virtually everybody has got a talent lying inside them - a passion, an obsession. And very often, the problem is pulling that out, discovering what it is. How someone discovers what their passion, what their obsession or talent or interest is sometimes difficult, and you never know what's going to do it. It could be a class you took, a teacher you had, a book you read, a movie you saw, someone you talked to, a radio program, or a TV program. I encourage students to try and expose that obsession and bring out that passion. The sooner they can do it the better they are. And if they could end up having someone to pay them to do, for the rest of their lives, something they do as a hobby anyway, just think about what kind of fun they would have and how much fun they rest of the world would be.

**Dr. Biology:** Well David Pearson, I'd like to thank you for visiting with us.

**David:** Thank you for inviting me. I've enjoyed it.

**Dr. Biology:** You've been listening to Ask-a-Biologist, and my guest has been research professor, David Pearson, from the ASU School of Life Sciences. The Ask-a-Biologist podcast is produced on the campus of Arizona State University. And even though our program is not broadcasted live, you can still ask your questions about biology using our companion website. The address is [askabiologist.asu.edu](http://askabiologist.asu.edu), or you can just Google the words "Ask a Biologist." I'm Dr. Biology.