

Presenter: Dr. Chris Burwell - Senior Curator of Insects (Biodiversity Program)**Topic: Tortoise Beetles**

Hi there. My name's Chris Burwell. I'm Senior Curator of Insects at the Queensland Museum and today I'm going to talk about some of the adaptations of tortoise beetles. Now, first I'm going to talk about the **adults** and why they get their name tortoise beetles. So tortoise beetles are a type of leaf beetle which is a big group of beetles - many, many species. But tortoise beetles are quite distinctive because they're actually quite **flattened** and their **wing covers** are expanded around the edges. So the wing covers are the hard forewings that protect the hind wings in beetles and because they're spread out at the sides, they look somewhat like a turtle or a tortoise. So that's how they get their common name. They look a little bit like lady beetles but they're actually not that closely related.

Now this strange shape to the **wing covers** in tortoise beetles is a structural adaptation to protect them from predators: things like ants that might wander along on the leaf and try to pick them up. They can clamp their body down onto the surface of the leaf and protect their legs so that an ant can't actually grab them and take them away.

But the amazing adaptations that tortoise beetles have don't actually correspond to the adults. It's the **larval stages**; it's their grubs that are really amazing. Now they belong in that group called leaf beetles and they get that name because they feed on leaves. Tortoise beetles in particular just basically feed on the surface of the leaves, out in the open where anything can attack them. So they actually need quite a lot of adaptations to protect them from predators and parasitoids. The larval stages of most tortoise beetles are actually kind of oval, flattened grubs and their first adaptation that they have is **camouflage**. Many of the species, including the ones that I've brought in here today, are actually coloured to match the colour of the leaves that they're feeding on. So, the ones that we have here are a beautiful green colour. So they're actually very hard to spot when you look for them on the leaves. The other trick that they have is around the outside of their bodies, they have a whole series of little **spikes** that stick out. Now it's not so much protection from spiky edges being caught on the mouths of something trying to eat them. It's more a case of disrupting their outline. So if you've got an oval-shaped grub sitting on a leaf, it casts a shadow and it makes it much easier to see but if you have a spiky outline, it makes those shadows a bit softer and it's actually difficult to pick them up.

So if we have a close look at the larvae, you can see that there's this other weird brown thing that sticks out the back. And what they do is, they have a pair of **long forks** on the back end. Now you can't actually see them in the grub here, because it's covered in the skins that it's cast as it grows. So every time it sheds its skin, instead of just leaving the skin behind, it actually builds up on the little fork at the back end. Now it doesn't do that by accident. What it can do, is that little club of skins at the back, it can actually move that around to anywhere over the body. It can flex it up over the body so that if an ant tries to nibble at the front end, it lifts up the skins and tries to dislodge it and move it away by **swinging the skins back and forth**. But the most amazing adaptation that these tortoise beetle larvae have is what they do with their **waste products**. They actually use their waste products to protect them from predators and parasites.

So here we've got a larva looking down a video microscope and we can actually look at some of those responses that I talked about. So here we've got a larva sitting on a leaf and you can see that it's got these amazing spikes that come around the edge that help to disrupt that oval outline so that it doesn't cast as many shadows on the leaf. And you can see here that this is the final stage larva. It's as big as it's going to get. It's going to turn into a pupa soon and we can tell that because it's got one, two, three, four cast skins all in a row along the back end, forming that club. And you can see here that when the larva first hatches out of an egg, because it doesn't have a skin on the back end to use against predators, it actually adds a little blob of its own poo to help club anything that might try and pick it up and take it away. So if I just poke the larva at the front end with the pair of forceps, hopefully it will **respond**. There we go. It can flex those skins all the way over the back and try and dislodge my forceps. If I go and do it on the other side, it should shift it over to the other side. There we go.

So these amazing beetles, both as adults and larvae, have a whole host of adaptations that increase their survival rate for living a dangerous life, exposed on a leaf.

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