Connor Butler, from the Royal Parks led us on a walk to look for beetles and other invertebrates in Bushy Park.

Connor is one of the engagement managers for The Royal Parks, but he is especially interested in insects and studied dung beetles. He led us on a walk to highlight the key intriguing aspects of beetles and some other invertebrates that we came found in Bushy Park.

He started by sharing with us, the life-cycle of a stag beetle. All beetle larvae have jaws, big heads and legs, whereas if it was a fly larva, like a maggot then it would have a smaller head and no legs. These larvae will take up to 6 years growing and developing fat reserves. The larvae are C shaped and are part of a larger group known as scarab beetles.

On the side of the larvae, they have holes which leads to tubes, called spiracles, which is their breathing system. They expand and contract to draw in and expel air. You can find the stag larvae underneath deadwood. The Greater Stag-Beetle prefers standing deadwood, whereas the Lesser Stag-beetle likes wood that is lying down. This is why we do not collect deadwood from the Parks, and in some cases, we even bury it to encourage and create the right habitat. If you have a garden and you need to cut down a tree, it is useful to leave the stump and some standing wood above it if you can, to encourage stag and other beetles.

When they get large enough, they will turn into a pupa. which is like a chrysalis or a cocoon, then they will develop into an adult. The adults emerge, they won't eat, live off their fat reserves to find a mate and will only live for a few months. They are a good food source for birds, and you'll quite often find parts of stag beetles left behind after the birds have eaten them. It is typical of beetles to have predatory / feeding larval stages whereas the adults are short lived for mating.

Picture Left: Female Greater Stag Beetle

Like all invertebrates beetles have a hard exo-skeleton instead of an internal one, which they need to be shed as they grow. They then pump up the soft underlayer and then this hardens to form the next protective external skeleton. We started to look under some logs and came across some woodlice. Woodlice don't change their exo-skeleton all-in-one go. They shed the top half first and let this harden and then they shed their bottom layer. As a result, they quite often have an exo-skeleton that looks like a mis-matching suit. Some species of woodlice also carry their live young with them! They carry them in a pouch at the bottom of their body called a marsupium. Woodlice are often infected with a bacteria called Wolbachia. And this is only transmitted through the female offspring and the bacteria controls the breeding cycle of the woodlice to only produce females. In fact, it causes infected genetic males to develop into functional females as well. As a result, some species of woodlice only produce through a process called pathogenesis, which is similar to cloning themselves. The species only undergo sexual reproduction when they are environmentally stressed. This gives them a chance at some form of genetic mutation / diversification, which could help them adapt to changing circumstances.

Insects see their world in a different way to us, they see more in the yellow to ultraviolet zones, outside our range of colours. So they can see things that we can't. Flowers often have patterns on them in the ultraviolet range that guide them to a food source. But they can see less well in the red area of the spectrum. For example, the horse-chestnuts trees have white blossoms that turn to white and red once they have been pollinated to dissuade the bees from visiting them.

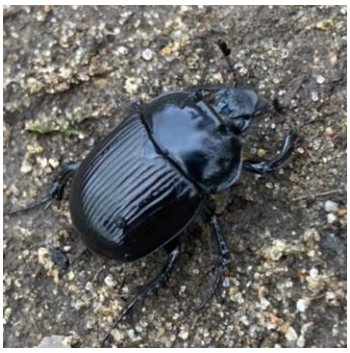
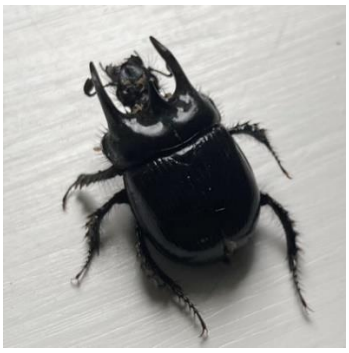
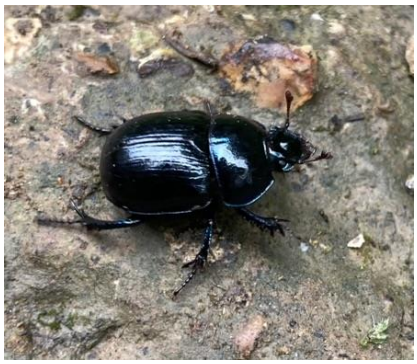
Some of the best plants for invertebrates are oak trees and hawthorns that can be found in this park, not only do they provide food, but they also provide good habitat as they get older. The holes and crevices can support hundreds if not thousands of species. Hawthorns can become veteran from150 years old, whereas Oaks will be much older. For example a rare beetle called the Cardinal Click beetle was found in Hawthorn in Bushy Park.

Beetles are the most common group of insects and animals in the world. They make up 40% insects, 25% animal species! Here in the UK there are 4,000 beetles versus only 60 butterflies. To identify them you need to capture them as many of the species are recognized by very small differences, such as the shape of their genitalia. The penis evolves at a faster pace and creates a locks and key mechanism for specific mating for that species!! This can only be done under the microscope. We also need to take genetic sampling and have samples over different time frames to see important changes.

Connor is running a citizen science project on Dung Beetles in the park. They set pitfall traps, which is a small cup put into the ground with dung to attract the beetles so they can be identified. As there are 60 species of dung beetle in the UK, each with their own preferences, so it is important that these traps are placed in different habitats around the park. The largest dung beetle is a Dor beetle, but the most common one in Bushy Park is the Minotaur. This has large horns on the male and will use these to compete with other males for the right to mate.

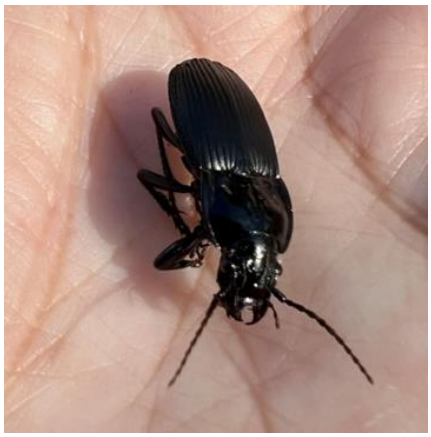
They are three types of dung beetle; there are Rollers, which we see on African wildlife documentaries but cannot be found in the UK. Then there are Tunneller's which drag poo into their tunnels where there are less flies. And there are dwellers which live in the dung and creates holes in the poo which helps to break it down. The beetle eggs are laid in the poo, which is rich in organic matter and a good food source for the developing larvae. Leaving food for your young is seen as parental which is not common in the insect kingdom. The dwellers, of which there are 40 species and are very

small and can only be identified under the microscope. Mites hitch a ride on the dung beetles to infect the fly larvae in the poo on which they feed. Pictures below left to right: Dor beetle, Male Minotaur and female Minotaur Dung Beetle

All insects have 2 pairs of wings in different forms. Flies only have one pair of flying wings, the second pair has developed into clublike gyroscopes sensors, called halteres. In beetle the first is the hard protective case and the second pair are the flying wings and have to unfold when the wing case is lifted. Most beetles can fly, though they're often very clumsy fliers. Some groups however have lost the ability to fly, such as ground beetles, whose wing cases are fused shut. We looked at a Cockchafer specimen which had its wing case pinned back to show the wing. They need these wings to fly to the top of trees or other structures in a mass gathering to find a mate.

Picture below – left to right: Ground Beetle, Cockchafer




Next we spotted galls made by the parasitic wasps that lay their eggs on oak trees. The oak reacts to encapsulate the egg and this then protects the larvae as it grows from other predators. The tree pumps in tannins but the wasp have evolved to be resistant to this. There are various species of gall wasp and the oaks produce a different shape gall to each type e.g. Knopper gall, Marble gall and oak apple. The wasps are very small rather like a midge, so not like the larger yellow wasps. Some species have complicated life cycles, they alternate generations between the type of gall they produce and which types of oak they use (Turkey and Pedunculate). The marble galls, because of the tannins they contain, were used to make the first permanent ink that was used to write early documents such as the magna carter.

Connor then produced a specimen from his bag. This was a queen hornet, which had come from the park. The new female queen hornet leaves the old nest and mates with males to store up sperm. She will then set-up a new nest and then produce all workers who are females. At the end of the year she'll produce more males and the process will start again. This is similar to ant colonies, where all the work is done by the females. Only when the colony is big enough will the queen produce some males to start new colonies elsewhere.

Connor really engaged the group with these unbelievable facts of the insects we find in the parks. A huge thanks from the Friends of Bushy and Home Parks for sharing your knowledge and showing us your many specimens.

NB All pictures were taken by Rebecca Harvey in Bushy Park