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Let's Go Find a Bug

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Abstract

The insect world is largely a mystery to many people. In fact, large parts of the insect world are mysteries to even those that study them. With the help of an extraordinary camera man, a vision, and the spirit of adventure, we set off on an endeavor to bring the minute insect world to the everyday person. Please join us as we capture a small amount of the biodiversity of Southern California and bring it right to your front door. Let's go find a bug.

Introduction

There have been several grand undertakings within the past several years to capture the grand nature of the wild in a way that is both entertaining and informative to the everyday viewer. These documentaries often focus on a larger scale of life, dedicating the majority of their screen time to the animals that most people are familiar with such as elephants, lions, tigers, and penguins. Sometimes, one or two episodes will be dedicated to exploring the smaller parts of life, such as insects or fungus, but these episodes often do not do the smaller parts justice and end up leaving lots of the amazing aspects out of the narrative.

In an attempt to start capturing the innerworkings of the insect world, I have decided to enlist a cameraman and head out into Southern California's wilderness to try and capture remarkable insects on film. Our goal is to record three to four insects in each episode, provide close up footage of these insects to give the viewer a good idea of what they look like, and to present enough information to wet the viewer's appetite for more. Once we have the footage captured and the insects identified, I will write up a small biological summary for some of the insects that we discuss in our videos. These bio-summaries will serve as jumping points for our social media platforms and will provide a good access point to more information than what is presented in the videos.

Materials and Methods

To begin the project, I examined several different localities that would allow for the capture and release of insects within the scope of California law. After discussing potential locations with the film crew, we decided on our locations and began preparations. Our filming was done on a Canon EOS Rebel T6i. A macro setup was rigged using telephoto tubes and a Nikon D3600. Entomological information was researched in anticipation of the insects that were expected to be found. The *Field Guide to Insects and Spiders of North America* by Arthur Evans was mainly used for entomological information gathering and on the spot research. An aerial net from BioQuip was used for the majority of the trips as the main collecting resource. Variously sized vials, both plastic and glass, from BioQuip were also used in the containing of our specimens.

When hunting for insects, nothing is truly predictable, except with well studied and documented individuals. The insects we were hunting for did not fit this description as most were non-pest species of no economic importance. Therefore, scripts were not used as we could not determine for certain what insects we would come across on any given excursion. Editing was done using Adobe Premier and was performed by Brickful Inc.

Each excursion was meant to be edited into a single episode. Our explorations occurred throughout the summer during the months of May-September mostly on the weekends. My

camera man and I would normally be on the road early in the morning to arrive at our location for the day a few hours after sunrise. Insect collecting began as soon as we arrived and did not stop until we either captured four insects and had enough footage to produce an episode at least ten minutes long, or we found nothing of interest within the first four hours of searching. Footage was given to Brickful Inc. for processing and editing at the end of September.

Once each episode had been compiled, several insects were selected to serve as representations of the project and to be written about in a more descriptive manor. The information was arranged in a way that is geared towards the general public and is meant to be published online with minor adjustments and addendums. These social media blurbs have been included in the results section of this paper. Links to each of the ten episodes have also been included in the results section.

Pictures were added to the footage of the finished episodes in order to help facilitate the exchange of information to the audience. These photos were part of a publicly available domain and were retrieved from Wiki Images.

Results

Below are the links to our Instagram page and our Facebook page to demonstrate what our outreach and information sections look like and how they would supplement our videos on YouTube.

Instagram: https://www.instagram.com/letsgofindabug/

Facebook: https://www.facebook.com/letsgofindabug/

Below are the ten episodes of season one. Episodes range in length from about six minutes to over twenty minutes.

Episode 1: Mammoth

Episode 2: Cleveland

Episode 3: Backyard Part 1

Episode 4: Yucaipa Night

Episode 5: The Honey Bee

Episode 6: Equipment

Episode 7: Lytle Creek Night

Episode 8: Monrovia

Episode 9: Backyard Part 2

Episode 10: Lytle Creek Day

Below are the bio-summaries for the 23 selected insects out of this project.

Snakeflies

Snakeflies have an amazingly distinct look to them. Their elongated prothorax gives them a distinctly snake-like look and they have been observed to strike at their prey like a snake (Triplehorn and Johnson 2005). Snakeflies are predatory and feed on smaller arthropods in both the larval and adult stage (Gullan and Cranston 2014, Evans 2008). Snakeflies are considered a beneficial insect, particularly in crop growing operations as they will consume pests such as aphids and leaf hoppers (Evans 2008, Riedl 1993). These insects are holometabolous, which means they have a pupal stage (Evans 2008, Riedl 1993). Snakeflies are in the order Raphidioptera and are very similar to the lacewings in the order Neuroptera. Depending on where you get your information from, Raphidioptera may be a suborder of Neuroptera or it might be its own separate order (Gullan and Cranston 2014, Evans 2008, Triplehorn and Johnson 2005). These insects occur only in the Northern Hemisphere, and in the United States, are only found in the Western States (Gullan and Cranston 2014, Evans 2008, Triplehorn and Johnson 2005).

Cuckoo Wasp

The cuckoo wasp might be one of the most metallically colored wasps in the world. Their colors can vary from green to blue to even red (Evans 2008). Similar to most female species in the order Hymenoptera (bees, wasps, and ants), cuckoo wasps can deliver a sting if handled carelessly. Compared to other insects, their stinger is relatively small. Cuckoo wasps have another defensive behavior to make up for their lack of an incredibly painful sting: they can roll into a ball (Evans 2008, Triplehorn and Johnson 2005, Houston 2011). One of the reasons why this is so effective is that their exoskeletons are incredibly dense, which means that curling into a tight little ball essentially creates a shield that protects it from the outside world (College of Letters & Science Field Station 2009). This insect earns its common name from the way it raises its young. Female cuckoo wasps will lay their eggs in leaf cutting bee nests where the larvae will kill all of the bee larvae, eat the provisions, and then mature through a complete metamorphic cycle into adult wasps (Evans 2008, Triplehorn and Johnson 2005, Houston 2011, College of Letters & Science Field Station 2009). Different species of cuckoo wasps are parasitoids of different species of insects, some of which include the sawflies, mud dauber wasps, and even stick insects (Evans 2008, Triplehorn and Johnson 2005, Houston 2011, College of Letters & Science Field Station 2009). These insects are considered parasitoids because they kill their hosts through their own life cycle.

Tarantula Hawk Wasp

Species of the tarantula hawk wasp family Pompilidae can be some of the largest wasps you will ever wish you never encountered. While the majority of the hawk wasps range in size from 15-25mm long, there are some species which can get as long as 40mm (Triplehorn and Johnson 2005). With their long legs, they can look even larger than they really are. Other than their unbelievable size, many members of this family can be distinguished thanks to their coloration. Most species have a darker color to them and their wings have a smoky or yellowish appearance to them (Evans 2008, Triplehorn and Johnson 2005). A less ideal way to distinguish

tarantula hawk wasps from other insects is by their sting. These wasps are one of the top insects in the world that can deliver an incredibly painful sting. This sting is described as "instantaneous, electrifying, excruciating, and totally debilitating" by the Schmidt Pain Index (Schmidt 2004). In fact, the pain is so intense that it is best to recommend to the person who has just been stung to "lay down and scream" as there is no way to aid in the immediate and intense pain an afflicted person experiences and during such an experience is more likely to harm themselves by running and flailing wildly than simply laying down and waiting for the pain to cease (Schmidt 2004). Tarantula hawk wasps are holometabolous, just like all insects in the order Hymenoptera. This means they go through a pupal stage before they reach their adult stage. During their larval stage, these wasps are parasitoids of tarantulas. Females can often be found searching along the ground for the tarantulas that will eventually become the host to their offspring (Evans 2008, Triplehorn and Johnson 2005). The encounter between predator and prey is rather famous, with the wasp and tarantula performing a sort of "dance," the spider raising up and attempting to intimidate the wasp while the wasp circles its prey until it finds an opening and delivers its paralyzing sting to the underbelly of the spider (Ebeling 1996). Adults actually feed on nectar from flowers, it is only the larvae which feed on the tarantulas (Evans 2008, Triplehorn and Johnson 2005, Mowbray). These insects occur in the Southern half of the United States and can be found down through Mexico (Evans 2008).

Cicada

Cicadas might be the most well known for their high-pitched chirping, or screeching depending on how you hear it, that permeates through the summer. There are many species of cicadas in the world, perhaps some of the most well-known here in the United States are the 13 and 17-year cicadas which occur in the Eastern half of the U.S. California, on the other hand, has annual cicadas which occur every year, or nearly every year (Evans 2008). Cicadas are in the order Hemiptera in the family Cicadidae. These insects are some of the largest Hemipterans in the world (Triplehorn and Johnson 2005). Cicadas are hemimetabolous, which means they go through an incomplete metamorphosis, which means they do not have a pupal stage. The nymphs of many cicadas are usually found in the ground feeding on the roots of various plants (Hahn 2001). These nymphs look very similar to the adult cicadas, but they do not have wings, which is usually the easiest way to tell if something is an adult Hemipteran or not.

Water Strider

Water striders probably got their common name from their ability to "stride" across the water's surface. For most insects, large bodies of water can be dangerous. Most terrestrial insects do not have the ability to safely swim through water in any fashion. However, water striders have adapted to living on the water's surface, always a few hairs away from death. The tarsi, or toes, of these insects are covered in a dense coat of fine hairs which act as a water repellent and keep the insect afloat (Triplehorn and Johnson 2005). This coat of fine hairs makes it extremely difficult for the tarsi to get wet, but if they do, the insect will no longer be able to float on the surface and will drown (Triplehorn and Johnson 2005). This is one reason why these insects are more often found in quieter waters such as ponds, lakes, and slow-moving streams (Triplehorn and Johnson 2005). Water striders have shortened forelegs which they use to capture prey that lands on the water's surface (Evans 2008, Triplehorn and Johnson 2005, Texas A&M AgriLife Extension. Field Guide to Common Texas Insects: Water Striders.). These insects belong to the order Hemiptera and go through an incomplete metamorphosis. This means they do not have a

pupal state. The nymphs appear similar to the adults, but the nymphs do not have wings and are usually smaller than the adults. Nymphs are predacious and live on the water's surface like the adults do.

Backswimmer

Backswimmers probably got their common name because they are usually found upside down in their watery habitat as they swim around and search for prey. Backswimmers are, like the water strider, an insect which lives in an aquatic domain. However, unlike the water strider, backswimmers actually live under the water's surface and can swim. Backswimmers are Hemipterans and are in the family Notonectidae. These insects are predacious and can deliver a painful bit if handled improperly (Evans 2008, Triplehorn and Johnson 2005). Backswimmers go through an incomplete metamorphosis which means they do not have a pupal state. Instead, their nymphs molt several times until their final molt occurs, which is when they turn into the adult state. Backswimmers share a very similar body shape and ecology with the water boatman insects (Triplehorn and Johnson 2005). One key difference is their first set of legs. Notonectidae have longer legs that look like their other two sets of legs (Triplehorn and Johnson 2005). Water boatman have front legs that look like little scoops, their front legs are short and stout and do not resemble their other two sets of legs (Triplehorn and Johnson 2005). In order to breathe while underwater, as all insects must breathe, backswimmers use air pockets located at the tip of their abdomen to hold an air supply while they are underwater (kind of like a scuba tank) (Bryant). Males of some species actually stridulate (make noise sort of like a cricket) by rubbing their front legs against their mouthparts (Evans 2008, Triplehorn and Johnson 2005, Bryant). These sounds can be used for courtship as well as for other types of communication (Evans 2008).

Whirligig Beetle

Whirligig beetles are one of the most eccentric insects you are likely to ever find. Similar to the water strider, these beetles are most often found on the surface of the water. When disturbed, however, they can dive below the surface for a short period of time. They most likely got their common name thanks to the way they move around on the surface of the water. These insects like to swim in circles on the water's surface, a motion that is often described as gyration (Evans 2008, Triplehorn and Johnson 2005). Whirligig beetles are in the order Coleoptera in the family Gyrinidae. Beetles are holometabolous, which means they have a pupal state. Eggs of whirligig beetles are often laid on aquatic plants (Evans 2008, Triplehorn and Johnson 2005). Larvae are predacious and feed on smaller aquatic arthropods (Evans 2008, Triplehorn and Johnson 2005, Texas A&M AgriLife Extension. Field Guide to Common Texas Insects: Whirligig Beetle.). Adults will scavenge on insects that land on the water's surface (Evans 2008, Triplehorn and Johnson 2005, Texas A&M AgriLife Extension. Field Guide to Common Texas Insects: Whirligig Beetle.). These insects have a similar body shape to other aquatic insects but can be distinguished by their laterally divided compound eyes (Evans 2008, Triplehorn and Johnson 2005, Texas A&M AgriLife Extension. Field Guide to Common Texas Insects: Whirligig Beetle.). Whirligig beetles' compound eyes are split so that half can see above the water and half can see below the water (Evans 2008, Triplehorn and Johnson 2005, Texas A&M AgriLife Extension. Field Guide to Common Texas Insects: Whirligig Beetle.).

Water Boatman

Water boatman share an incredibly similar physical appearance and lifestyle to that of the backswimmer. Both of these insects are in the order Hemiptera and both of these insects live underwater. Water boatman are in the family Corixidae and are distinguishable from the backswimmer by their front pair of legs (as well as some other features) (Evans 2008, Triplehorn and Johnson 2005). Corixidae have scoop-like front legs which are shorter than their other four legs (Triplehorn and Johnson 2005). Water boatman, though aquatic, do not have gills and must rely on getting air from the surface to be able to dive and swim through the water (Triplehorn and Johnson 2005). These insects feed on algae and other small organisms that live in the water (Triplehorn and Johnson 2005). They will use their scoop-like front legs to stir up the water to help make feeding a bit easier. There are a few species which are predacious and feed on larger aquatic organisms (Triplehorn and Johnson 2005). These insects, like the backswimmers, will deliver a painful bite if handled incorrectly (Evans 2008, Triplehorn and Johnson 2005). Water boatman go through an incomplete metamorphosis, which means they do not have a pupal state. These insects can be found throughout North America (Triplehorn and Johnson 2005).

Dragonflies

Dragonflies are perhaps one of the most common insects found around lakes, streams, and ponds. These insects are in the order Odonata along with the damselflies. Dragonflies can be distinguished from damselflies by several characteristics. Dragonflies are usually larger than damselflies, their abdomens and wings are often wider than the damselflies'. Dragonflies will usually perch with their wings outspread to their sides while damselflies will usually perch with their wings held together up over their thorax (Evans 2008). Odonates cannot fold their wings back over their abdomen like a beetle or a Hemipteran can. Dragonflies go through an incomplete metamorphosis. Although the dragonfly is a terrestrial insect, their larval stage is entirely aquatic. Dragonfly nymphs, known as naiads, are predacious and will feed on vertebrates like small fish and tadpoles as well as on other invertebrates (Evans 2008, Triplehorn and Johnson 2005). Naiads have an extendable part of their mouth which acts as a type of harpoon (Sabet-Peyman 2000). This specialized mouthpart shoots out and snatches their prey faster than lightning (Evans 2008, Triplehorn and Johnson 2005). Dragonfly naiads have internal abdominal gills, which is one of the defining characteristics between the dragonfly and damselfly naiads (Evans 2008, Triplehorn and Johnson 2005). Damselfly naiads have external gills at the tip of their abdomen which make it look a lot like a fan (Evans 2008, Triplehorn and Johnson 2005). Dragonfly naiads usually molt between 9 and 17 times, after which they will crawl out of the water and molt for the last time and transform into the adult stage (Triplehorn and Johnson 2005, Bybee 2015). Adults, like the naiads, are predatory and will often catch and eat their prey while flying (Evans 2008, Triplehorn and Johnson 2005). Dragonfly legs are specially adapted to performing this task and are not very useful for walking (Triplehorn and Johnson 2005). Male dragonflies will often mark out a territory along the edge of the water (Evans 2008, Triplehorn and Johnson 2005). The best spots go to the largest dragonflies (Evans 2008, Triplehorn and Johnson 2005). Dragonflies can be found everywhere on earth except for Antarctica (Bybee 2015).

Damselflies

Damselflies are almost as common a sight around ponds, lakes, and streams as their larger counterpart, dragonflies. Damselflies are often smaller, thinner, and more fragile-looking than the more robust dragonflies, which is probably where the damselfly got its common name

(Bybee 2015). The adults of these insects are predatory and will catch their prey while flying (Triplehorn and Johnson 2005). Damselfly naiads are also predacious (Evans 2008, Triplehorn and Johnson 2005). Naiads will use their modified mouth parts to harpoon their prey in the water (Evans 2008, Triplehorn and Johnson 2005, Sabet-Peyman 2000). These naiads have external gills located at the end of their abdomen, a characteristic which helps to separate them from dragonfly naiads (Evans 2008, Triplehorn and Johnson 2005). Like the adult forms, damselfly naiads are often thinner than the larger, often more intimidating dragonfly naiads. Damselflies go through an incomplete metamorphosis, which means they do not have a pupal stage.

Fig Beetle

Fig beetles are part of a group of beetles that all look very similar and are often confused for one another. Some of these beetles can have many common names, making the task of identifying and discussing them rather difficult. For specificity, we will be discussing the species *Cotinis mutabilis* (Evans 2008). These beetles are rather large and have a metallic green coloration to their elytra (the hard shell covering their wings) (Evans 2008). They have a lighter band that traces the outline of their elytra (Evans 2008). One of the beetles that this insect is often confused with is the Japanese Green Beetle, *Popilia japonica* (UCIPM). However, the actual Japanese Green Beetle mostly occurs on the East Coast of the United States (Evans 2008). Fig beetles go through a complete metamorphosis, which means they have a pupal state. Their larvae are actually quite large and are usually a whitish colored grub that feeds on grass and other roots underground (Evans 2008, Triplehorn and Johnson 2005). Adult beetles are rather clumsy and will often run into walls, trees, and even crash into people as they fly around. Adults consume soft fruits and sap and can be found in abundance on fruit trees with over-ripe fruit (Evans 2008). Fig beetles can be common in backyards, especially when they first emerge in the spring (UCIPM).

Monarch Butterfly

Monarch butterflies are one of a select group of insects that have the ability to make large-scale migrations (Sourakov 2017). There are two main groups of monarchs that make two separate migrations: those that migrate on the East side of the Rocky Mountains and those that migrate on the West side. The group that migrates on the East side of the Rockies makes their migration starting from Southern Canada and end up in Central Mexico in a very specific mountain range (Sourakov 2017). The group on the West side of the Rockies makes their migration from the mountains and end up on the West coast of California and down further South along the coast (Sourakov 2017). The monarchs on the East side of the Rockies make the Southern trip in one generation. That is, the same butterflies that start in Canada end in Mexico where they overwinter. When spring comes around the following year, the monarchs start their journey back. However, the monarchs that started in Mexico only go so far as the Southern United States, about a third of the way back to Canada. Here, they will mate, lay their eggs, and die. The next generation to grow up in the Southern states matures, makes its way up about another third of the way to Canada, then mate, lay their eggs, and die. This third generation matures, goes all the way back up to Canada, where they mate, lay their eggs, and die having completed the migration. Several more generations will occur before the winter returns and they monarchs must migrate all the way back to Mexico again (Sourakov 2017). Monarch butterflies go through a complete metamorphosis, which means they have a pupal state, known as a chrysalis. Monarch larvae, or caterpillars, eat milkweed plants which give them their horrible

taste (Sourakov 2017). These larvae are readily distinguishable by their yellow, white, and black stripes as well as their characteristic tentacles, of which they have two near their head and two near the end of their abdomen (Evans 2008, Sourakov 2017). When the larvae pupate and finally emerge into their adult form, the toxins sequestered from the milkweed plants are still present in their bodies, making the adults just as distasteful as the larvae (Sourakov 2017). This defense mechanism is one of the reasons why there are many other insects which mimic the coloration of the monarch. If you have milkweed plants, it is likely that you will see monarch butterflies visit your backyard from time to time.

Stink Bugs

Stink bugs can come in many different colors and can even be found in several different shapes. These insects are notorious for releasing a foul smelling chemical from their exoskeleton when threatened, which is probably where they got their common name from (Triplehorn and Johnson 2005). These insects are Hemipterans in the family Pentatomidae. They go through an incomplete metamorphosis, which means they do not have a pupal state. Nymphs look very similar to the adults, except they do not have wings. Pentatomid nymphs may not have the same coloration or the same pattern as the adults do, which can make identifying the nymphs very difficult. Many species of Pentatomidae are herbivores and can become serious pests of crops and cause extensive damage (Triplehorn and Johnson 2005). However, there are some stink bugs that are predacious and will feed on other arthropods making them a beneficial insect (Evans 2008, Triplehorn and Johnson 2005). Stink bugs can be found in your backyard.

Harlequin Bug

Harlequin bugs are a type of stink bug, just mottled with reds, oranges, blacks, grays, and whites, which is probably where this insect got its common name from. These bugs are in the order Hemiptera in the family Pentatomidae. Harlequin bugs are hemimetabolous, which means they do not have a pupal state and the nymphs look very similar to the adults except without wings. These insects are herbivores and they use their piercing sucking mouthparts to suck the juices out of their host plant (Evans 2008, Knox 2015). Harlequin bugs can be pests on crop foods and can cause serious damage if not properly and appropriately controlled. Like other Pentatomid species, harlequin bugs can be found in your backyard, especially if you have vegetables or other plants it likes to feed on. These insects are common in the Southern half of the United States (Evans 2008, Knox 2015).

Ladybug

Ladybugs are as close to a staple of backyard entomology as any insect could be. Ladybugs are not actually bugs at all, they are beetles in the order Coleoptera in the family Coccinellidae. There are lots of different patterns that can be found on different species of ladybugs (Evans 2008). Some have spots all over their elytra, while some have no spots at all (Evans 2008). Still others have red spots on a black background (Evans 2008). Ladybugs go through a complete metamorphosis, which means they have a pupal state. This pupal state looks very different from the adult ladybug and can be confused with other insects. The larvae look nothing like adults, as most Coleopteran larvae do. Ladybug larvae are elongate and are often colored a dull blue-gray with orange-yellow spots (Evans 2008). Adults in Southern California of some species will migrate into the mountains during the summer to search for food and to prepare to overwinter there (Evans 2008). These ladybugs are often caught there to sell in

nurseries for people to take back and release into their yards (Evans 2008). However, these ladybugs do not like being displaced against their will, and when they are released will most likely just fly straight back to the mountains and provide no help to your garden whatsoever (Evans 2008). Adults and larvae that are found in the garden feed on aphids and other small arthropods and are generally considered a beneficial insect (Evans 2008, Triplehorn and Johnson 2005). Some species of Coccinellidae are actually herbivores and can be serious pests of crops (Evans 2008, Triplehorn and Johnson 2005). Ladybugs can often be found in the backyards of most people in Southern California.

Wind Scorpion

Wind scorpions are not actually scorpions, and they are most certainly not insects. These arthropods are in a spot all of their own in the taxonomic hierarchy. What makes them particularly terrifying is their chelicerae which are used to rip apart their prey when they feed (Evans 2008). These have the appearance of massive fangs that sit at the front of their mouth. Wind scorpions have a very distinguishable movement to them: they will hold their front two legs up as they run around in a zig zag sort of fashion (Evans 2008). These two front legs aren't actually legs at all, they are the pedipalps, which just adds to their horrific appearance (Evans 2008). These arthropods are predators and feed on smaller arthropods.

Lacewings

Lacewings can be found in both green and brown colors as well as a giant spotted variant (Evans 2008). All lacewings are in the order Neuroptera. Green lacewings are in the family Chrysopidae while brown lacewings are in the family Hemerobiidae. Green lacewings have a more aerodynamic look to their shape compared to their brown lacewing counterparts. Lacewings are predacious, both as the adult and as the larva, though the larva is generally considered to be more efficient and predacious than the adults (Evans 2008). Eggs of lacewings are set atop a thin stalk (Evans 2008, Triplehorn and Johnson 2005). This is designed so that the emerging larva does not eat all of its siblings, because they will do that if they get the chance (Evans 2008). Lacewing larvae have been known to stack carcasses of their prey on their backs in order to disguise their scent and shape and appear as little of a threat as they possibly can (Triplehorn and Johnson 2005). Lacewings go through complete metamorphosis, meaning that they have a pupal state. Green lacewings and brown lacewings can be found in your backyard, especially around lights at night.

Web Spinners

Usually, web spinning is considered a spider's specialty. With the exception of some caterpillars, there really aren't that many insects that have the capabilities to produce their own silk to form webbing. The insects in the order Embioptera are some of those rare insects. Using their front two forelegs, Embiopterans can spin their own silk (Evans 2008). This silk is used to build (usually) large galleries where they live and raise their young. These galleries are usually built under rotting trees, in rock crevices, or other places that are usually well hidden and protected. Web spinners are part of a handful of insects that demonstrate parental care that aren't social like bees, ants, and wasps. This means that the adults will stick around with their young and take care of them until they are capable of taking care of themselves (Triplehorn and Johnson 2005). Web spinners go through an incomplete metamorphosis, so the nymphs look like the adults. Females and nymphs do not have wings and are often confined to the silk galleries.

Males do have wings and will use them to fly, rather clumsily, in search of a mate. These insects have the ability to deflate their wings in order to facilitate an easier time in traveling through their silk galleries (Evans 2008). Males can be found around lights at night. Embiopterans feed on fungus (Evans 2008).

Honeybees

The honeybee may be one of the most important sources of pollination in the entire world. These insects have been successfully used in commercial pollination efforts thanks largely to the fact that they create hives that can be moved from place to place. Honeybees will always return to their hive at night, which is part of the reason why these insects are so portable. Honeybees have a dark face, a fuzzy light-colored thorax, and a striped abdomen. Honeybees have a rather complex social system with several different jobs that an individual honeybee employs through her life. The queen bee and the drone are the only bees in the hive that have one job: reproduction. A worker honeybee can be a nurse, house keeper, guard, or forager. Nurse bees typically take care of the brood (the larvae and pupae). House keeping bees are usually in charge of keeping the hive clear of parasites, pests, dead bees, and anything else that would clutter the hive. Guard bees stand watch at the hive entrance and dissuade any potential threat to the hive. Forager bees go out every day and search for pollen and nectar, collect what they can, and return to the hive. Forager bees will perform a waggle dance whereby the bee will inform the rest of the colony if a particularly good food source has been found. Honeybees pollinate the plants they visit while they are collecting pollen and nectar. These insects can deliver a painful sting if threatened or handled improperly. Unlike wasps, honeybee workers can only deliver one sting, which kills them in the process. People who are allergic to honeybee venom can die from one sting, depending on how allergic and how severe the reaction is. Honeybees go through complete metamorphosis, which means they have a pupal state (mentioned above). Larvae are fed by worker bees and are kept in brood chambers which are built in the classic hexagonal shape found throughout the beehive. Pupae are also monitored by worker bees. When it is time for an adult to emerge from its pupa, a worker bee will often help it out of its cell. Honeybee hives can be up to 80,000 bees strong, all controlled by one queen (Evans 2008). Hives can be infested by several different parasites, including the Veroa mite, and can be attacked by funguses, viruses, and other disorders that have the capacity to completely destroy the hive.

Mantids

The praying mantis is often portrayed as the pinnacle of insect predators. With its massive eyes and its lightning reflexes, the mantis is indeed a predator with incredible capabilities (Evans 2008, Triplehorn and Johnson 2005). The front two legs of the mantis are modified to help it capture and hold onto its prey (Evans 2008, Triplehorn and Johnson 2005). These sorts of legs are referred to as raptorial and can be found on other insects like ambush bugs and toe biters. The mouthparts of the praying mantis are designed to rip and chew through its prey. Some of the larger mantises in other parts of the world have been known to attack, catch, and eat hummingbirds. Males of most species are easily differentiated from females as males' wings are usually longer than their abdomen (Evans 2008, Triplehorn and Johnson 2005). Females' wings usually do not cover their entire abdomen and their abdomen is usually noticeably wider towards the end than it is closer to the thorax. Eggs are laid in an ootheca, which appears like a brown spray foam, for some species. Other species might lay oothecae that have a different shape or color to it, but all of them will contain the mantis's offspring. Mantises

go through an incomplete metamorphosis, which means they do not have a pupal state. The nymphs look like really tiny adult mantises except they do not have wings. These insects are very predatory and are not above eating each other if the opportunity presents itself (Evans 2008). Some species of mantises like to sit around flowers and other areas of high insect activity and ambush their prey when they least expect it. These insects can be found in your backyard if you are lucky enough to find them, they usually blend in very well with their surroundings (Evans 2008).

Hummingbird Moth

The hummingbird moth is one of the rare insects that looks and functions almost exactly as its common name implies. When this moth is flying, it resembles the way a hummingbird flies (Triplehorn and Johnson 2005). To feed, these moths will hover up to their choice flower, drink the nectar, then hover over to their next choice flower (Triplehorn and Johnson 2005). These insects seldom land while they are feeding. Hummingbird moths are also known as sphynx moths and are in the family Sphingidae in the order Lepidoptera. The caterpillars of this moth are those big green ones with the red or black horn you find eating your tomato plants (Evans 2008). The coloration of the horn will help you differentiate which species is making your tomato plant its home. These insects go through a complete metamorphosis, which means they have a pupal state, also known as the cocoon.

Ironclad Beetle

Perhaps one of the most well defended insects in the world is the ironclad beetle. These beetles are so named because of their extremely dense exoskeleton. Their common name could also be due to the fact that their elytra are fused giving them an "ironclad" exoskeleton. Either way, these beetles are well defended from the outside world. Ironclad beetles are fungivores, feeding on the fungus that grows on tree bark (Evans 2008). As with all beetles, these insects are holometabolous, meaning that they have a pupal state. Ironclad beetles will tuck all of their appendages into slots on the underside of their exoskeleton, giving them even greater protection against threats (Evans 2008). These insects are notorious in the entomological community for giving collectors and curators a difficult time when trying to pin them. In some cases, the exoskeleton may be so thick that the utilization of a drill may be needed to get the pin through the specimen.

Velvet Ant

Velvet ants are capable of delivering one of the most painful stings in the insect world. Their venom causes so much pain that people used to think it had the potency to kill cows, which is where their common name of "cow killer" comes from (Evans 2008). These ants are actually not ants at all but are a species of solitary wasp where females are wingless and quite fuzzy, hence "velvet" and "ant." Males of almost all species are winged and use their wings to fly around and search for females to mate with. Females, once mated with, will search for a ground-dwelling bee nest, invade, and lay her eggs. Once the larvae hatch, they become external parasites of their host Hymenopteran (Evans 2008, Triplehorn and Johnson 2005). The many different species of velvet ants come in all sorts of shapes and patterns (Evans 2008, Triplehorn and Johnson 2005). Some species have so much sexual dimorphism that it is almost impossible to pair a male and female of the same species without looking at very minute characteristics.

Discussion

Throughout this project we have displayed many different types of insects that can be found in Southern California, representing an incredibly small amount of the biodiversity that can be found here. We have learned many things from this project. For future episodes, we will attempt to mimic other documentaries and portray our specimens without the interruption of a host onscreen. Narration will be played over the video in order to explain what the audience is viewing, but there will not be an actual person on screen with the insect. We will try to capture these insects in their natural environments more often in order to capture the natural behaviors of our specimens. Our range will expand to include more of the West coast of the United States as well as some of the Southern states.

The social media aspect will continue to grow, through the use of Facebook, Instagram, and Twitter to help generate an audience from the millions of people we have the potential to reach. This first season will most likely not be published to a public website as, after viewing the final product, the team has decided that this first season will represent our first step and does not properly convey our intended goals. The bio-summaries will be posted in time to our social media platforms with additional pictures, and the layout will be copied in future seasons and episodes.

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