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2018

## KIT 16- CHILDREN'S LIBRARY KIT

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## **KIT 16- CHILDREN'S LIBRARY KIT**

### **Kit 16A- Insect Adaptation**

This kit serves as an introduction to a variety of insect adaptations. Learn about how insects adjust to their environment with this selection of images and sounds of various insects. Insects communicate with sound, with visuals, they walk, run, fly, and sometimes even swim, some insects are capable of camouflage, and others are pollinators. This kit provides a book focusing on the chirping of crickets, the reasons they chirp, as well as how they do it as well as a variety of pictures of other insects and their different adaptations that allow them to survive in their environment. If desired there is also a link for cricket purchase for classroom observation.

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#### **→Kit 16A: Contents**

- Book
  - Laminated photos
  - Cricket Diagram
  - Link for live cricket purchase
  - Cricket Care Sheet
  - Cricket chirping link
  - Discussion
  - Activity
-

→ Book- **Chirping Crickets** by: **Melvin Berger**

Summary-- This book focuses on the sounds of the male crickets, heard almost anywhere in the warm summer months. These males will stay in one spot and call for the females using parts of his wings called the scraper and the file. Most of the females cannot make sounds, but she can hear his sound with her ears located under her front legs. She will then jump towards the sounds of the male until she locates him, mate, and then begin to egg laying. These eggs will then hatch into what are called nymphs; nymphs are smaller and lighter versions of the adult cricket except lacking wings. Each time they need to grow, the old skin is shed, and new skin is formed in a process known as molting. Molting will occur again and again, as many as 12 times, depending on how much food available. After the last molt they are now adult crickets with two pairs of wings. These wings are used for flying and in the males they are used for chirping. Both male and female crickets have three pairs of legs that allow them to hop very high and very far. They also have two big eyes, each made up of tiny eyes. Even with their large eyes, crickets still don't have such great vision and therefore they rely on their excellent hearing. There are thousands of different kinds of crickets that live around the world of all different sizes, living in different places, with different chirps, and of different colors.



→ Laminated Photos- A way to further demonstrate other insect adaptations, a way for them to live in all terrestrial environments in the world, communicate with members of their own species, and defend against predators.

**Photo 1** – A Walking Stick (*Lonchodes sp.*) exhibiting an adaptation of camouflage by resembling twigs and branches, they even walk slowly and sway with the wind to avoid being detected by predators (photo taken by Christian Ziegler of National Geographic).



**Photo 2-** A Cicada (*Neotibicen tibicen*) is shown shedding its exoskeleton in a process known as molting, an exoskeleton is an external skeleton providing protection to the insect (Photo courtesy of bugguide.net).



**Photo 3-** A Peacock Butterfly (*Aglais io*) is shown with an adaptation of wings that are used for flight as well as used as eyespots to deter, startle, and confuse predators (Photo courtesy of [butterflyconservation.org](http://butterflyconservation.org)).





**Photo 4-** A Northern Mole Cricket (*Neocurtilla hexadactyla*) is shown with an adaptation of legs that are equipped for digging that they use to burrow tunnels underground (Photo courtesy of bugguide.net).



**Photo 5-** A Honey bee (*Apis mellifera*) has an adaptation of being equipped with millions of tiny hairs on its legs that enable them to carry pollen. (Photo courtesy of Katherine Kornei of [sciencemag.org](http://sciencemag.org))





**Photo 6-** The Great Diving Beetle (*Dytiscus marginalis*) that lives in fresh water has an adaptation of legs that are adapted for swimming (Photo courtesy of Naturespot.org).



**Photo 7-** Shows an Asian Tiger Mosquito (*Aedes albopictus*) with a mouthpart adaptation called a proboscis that consists of 6 stylets giving the mosquito the ability to pierce the skin and obtain blood necessary for egg production (Photo courtesy of entomologytoday.org)

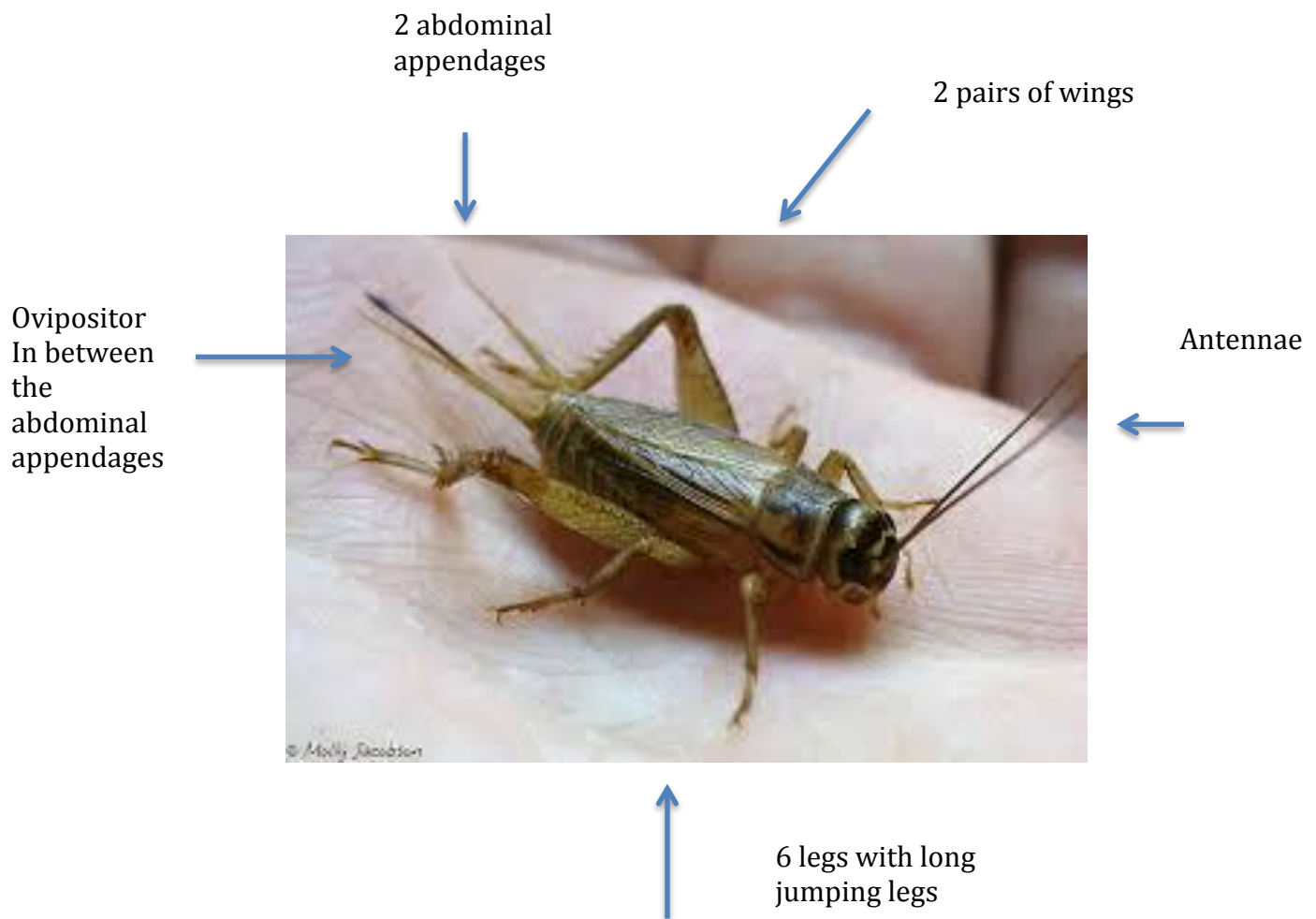


→ House Cricket (Photo courtesy of bugguide.net)

Order- Orthoptera

Family- Gryllidae

*Acheta domesticus*



→ Link for Purchase

Crickets-

**Carolina Biological Supply Company – Cricket  
12 pack Item # 143550, 100 pack Item #143552**

**[https://www.carolina.com/crickets/crickets-acheta-domesticus/FAM\\_143550.pr](https://www.carolina.com/crickets/crickets-acheta-domesticus/FAM_143550.pr)**

Kricket Keeper-

**Carolina Biological Supply Company- Kricket Keeper Item #674004**

**[https://www.carolina.com/crickets/kricket-keeper/674004.pr?intid=jl\\_pdpfam&jl\\_ctx=on\\_site](https://www.carolina.com/crickets/kricket-keeper/674004.pr?intid=jl_pdpfam&jl_ctx=on_site)**

House Cricket Food-

**Carolina Biological Supply Company- House Cricket Food Item # 143565**

**[https://www.carolina.com/crickets/house-cricket-acheta-domesticus-food-250-g/143565.pr?intid=jl\\_pdpfam&jl\\_ctx=on\\_site](https://www.carolina.com/crickets/house-cricket-acheta-domesticus-food-250-g/143565.pr?intid=jl_pdpfam&jl_ctx=on_site)**

# Crickets

## A CAROLINA™ Care Sheet

### Immediate Care and Handling

As soon as your crickets arrive, open the shipping container, remove the cups, and inspect them. Crickets are easy to keep. They are primarily herbivorous but accept a variety of foods. Fresh apples, pears, and lettuce offer moisture, while dry dog food provides high protein and cuts down on cannibalism. Crickets tolerate high temperatures: 27 to 32° C (80 to 89° F).

### Habitat Setup and Maintenance

Any clean container with about 3 cm of sand covering the bottom is suitable. If the container is at least 20 cm deep, you do not need a cover unless the crickets can crawl up on something and jump out. Cardboard containers, egg cartons, and peat cups provide good hiding places. Keep the sand dry unless you want to encourage your crickets to lay eggs. If the sand is dry, have a source of moisture available such as fresh fruits or vegetables.

### FAQ's

*Can crickets bite?*

No, crickets are harmless.

*Why do crickets chirp?*

Adult males chirp to attract females.

*Our crickets developed into adults and then died. What happened?*

The life span of an adult cricket is about 2 weeks, so your crickets probably lived out their normal life span. Did you observe the females laying eggs? If so, watch for the hatching of young.

*Young crickets have hatched. How long will it take them to grow into adults?*

Temperature strongly influences their growth. At normal classroom temperature, it will take about 60 to 90 days.

*Our crickets died without producing any young. What went wrong?*

Assuming that you had male and female crickets together, your room temperature may have been too low. Crickets are much more likely to reproduce at higher room temperatures. Also, crickets may cannibalize their own eggs or young if food is scarce.

**Problems?** We hope not, but if so contact us. We want you to have a good experience. **Orders and replacements:** 1-800-334-5551 then select Customer Service

**Technical Support and Questions:** [caresheets@carolina.com](mailto:caresheets@carolina.com) © 2008 Carolina Biological Supply Company

→ Cricket Sounds

**<http://cricketcare.org/chirping/>**



## → Discussion-

This discussion is meant to further expand on the reason why insects do what they do, specifically, the reason why insect adaptations have evolved over time. First we read a book that discussed the life of a cricket, how they communicate, why they chirp, and their leg adaptation giving them the ability to jump high. Then we explored various images of other species and their adaptations to survive in their environment. In this discussion we will further elaborate on the definition of an adaptation.

Lead a discussion with the class about insect adaptations. Here is a list of question prompts to guide the discussion.

1. What is an adaptation?
2. What are some examples of insect adaptations?
3. Why are these adaptations important for insects?
4. What is a predator?
5. What is a skeleton? Where is your skeleton?

Insect adaptations are special characteristics, or adjustments used by insects giving them a better chance of survival. They come in various types depending on the species of insect being discussed. For example, all insects have an exoskeleton, an outer shell to provide protection, some insects have wings for flying, some use camouflage or cryptic coloration which gives them the ability to blend in with their surroundings and hide from predators. Others have adapted feet and legs for digging, running, swimming, or jumping such as grasshoppers with strong hindlegs that help them jump away from predators, or mouthparts that are adapted for eating specific foods. Communication adaptations also vary between species, crickets use their wings, bees do a dance, mosquitoes use antennae vibrations, etc.

## → Outdoor Activity

This activity is intended to mimic the life of a cricket by reinforcing to the children that the crickets do not have very good eyesight and that they rely on their hearing to locate each other.

### Instructions:

1. Blindfold children, or use something that will inhibit vision
2. Instruct one child to stand still and make one specific sound (child cannot move)
3. Blindfolded children must locate the source of the sound similar to crickets (crickets have bad vision but have a great sense of hearing and use their hearing to locate their mate).
4. Switch the child making the sound. Have fun!

## **Kit 16B- Mosquito Basics**

Learn about mosquito biology, mosquito breeding sites, how to protect yourself from being bitten by mosquitoes, as well as how you can help your local mosquito control decrease the amount of mosquitoes in your area. This kit provides thorough information on what a mosquito is, where it breeds, why it is dangerous, how we can protect ourselves, and how we can help control their numbers.

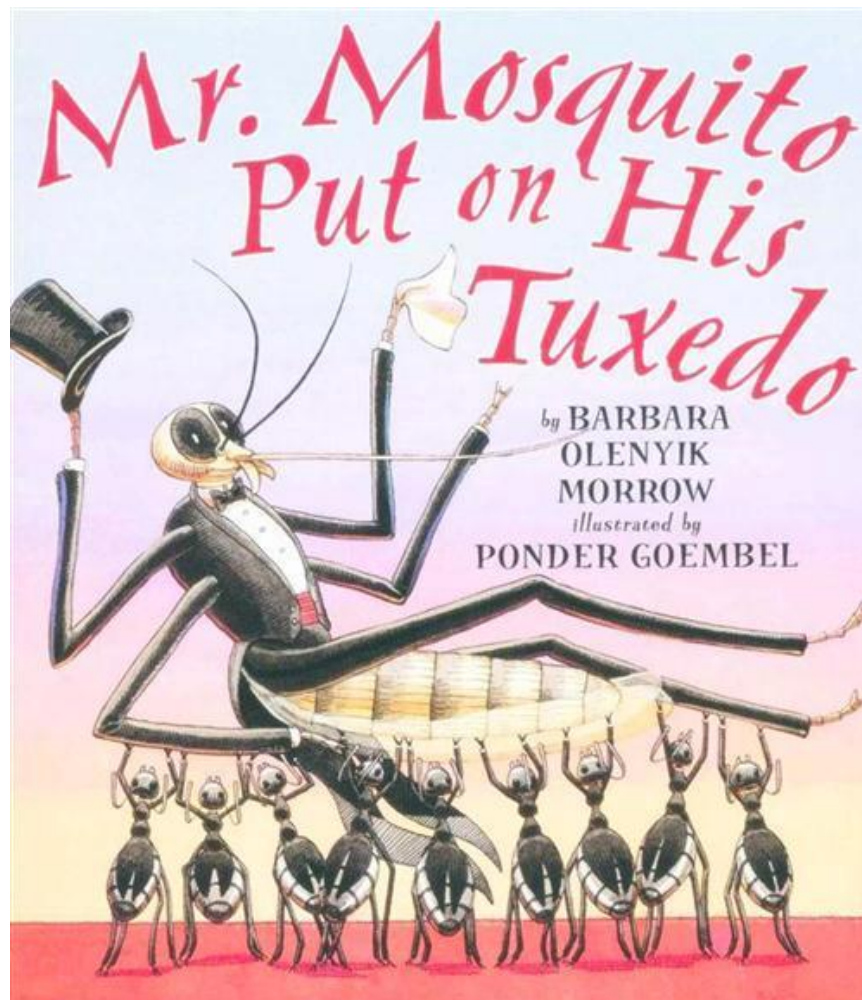
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### **Kit 16B: Contents**

- Book
  - Laminated pictures
  - Word Search
  - Discussion
  - Activity
  - Checklist of breeding habitats
  - TED talk- “The loathsome, lethal mosquito” By: Rose Eveleth  
<https://www.youtube.com/watch?v=IkmjCmvfeFI>
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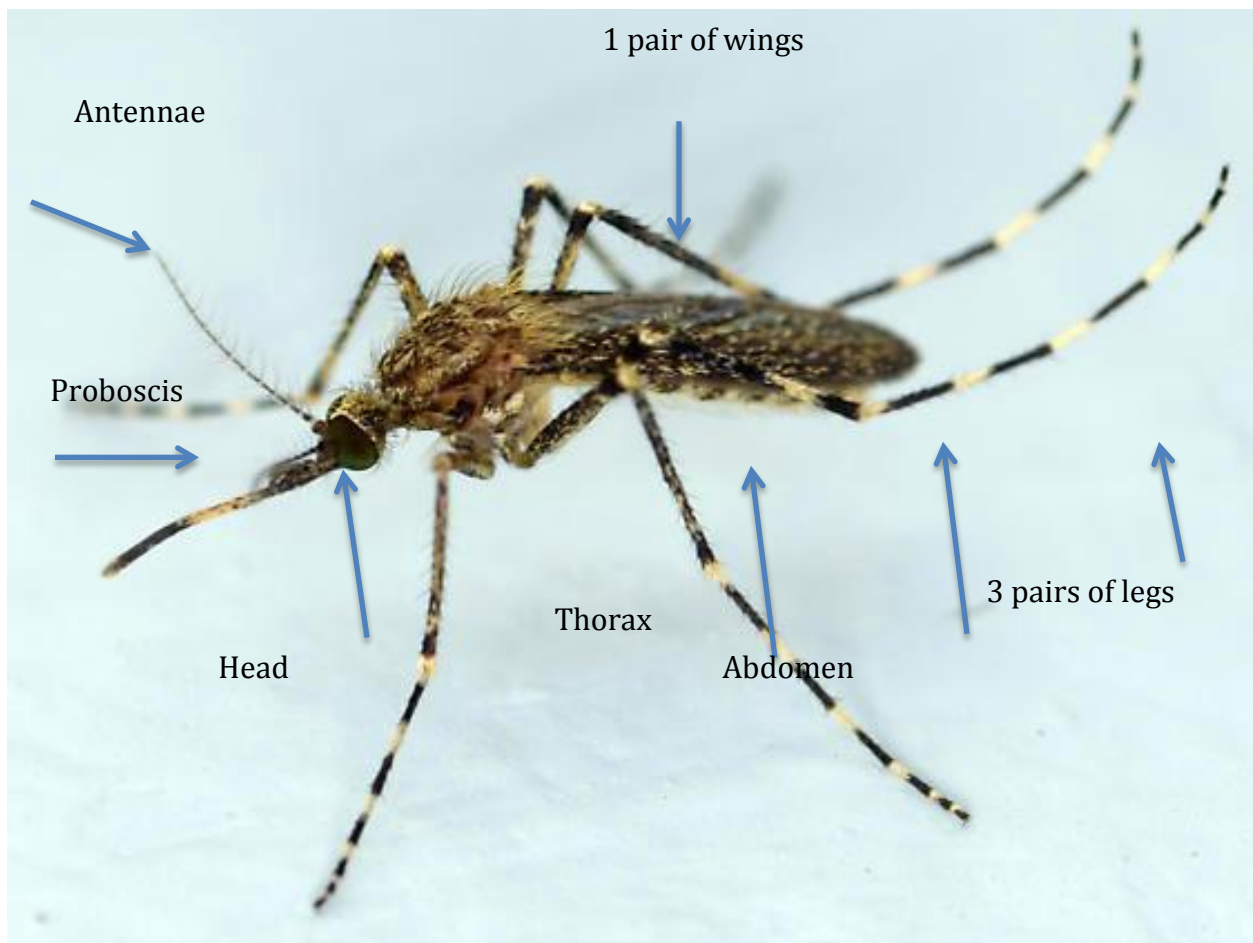
**Mr. Mosquito Put on His Tuxedo**  
**By: Barbara Olenyik Morrow**

Summary- This book hints at several different types of insects, from bees, to lice with the highlight being mosquitoes and their love of blood, biting mammals, and their status as a pest. The author also hints at the ability of the mosquito to send out a signal to summon his family with a communication method using pheromones.



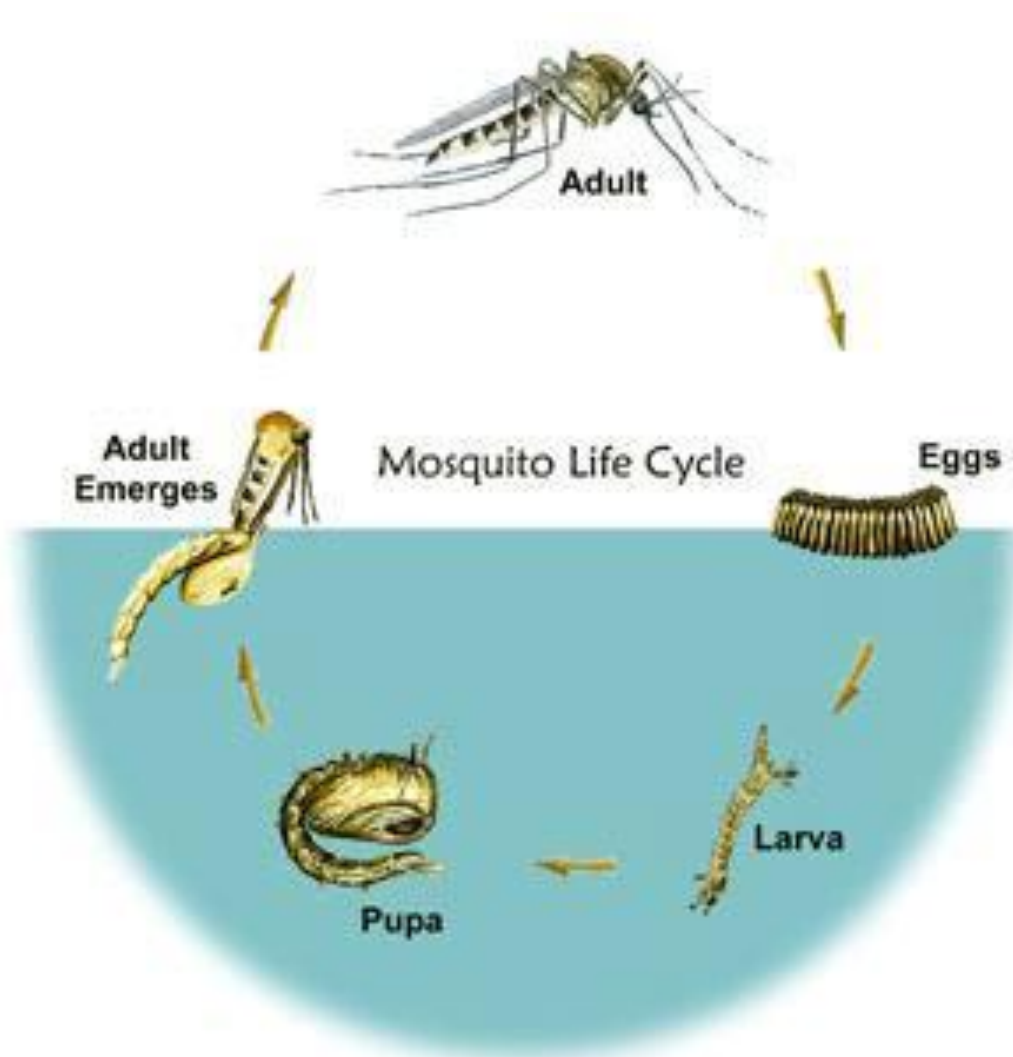
→ Laminated pictures

**Photo 1-** Labeled Parts of an adult Mosquito (*Coquillettidia perturbans*) (Photo courtesy of bugguide.net)



**Photo 2-** Mosquito life cycle (Photo courtesy of the American Mosquito Control Association)

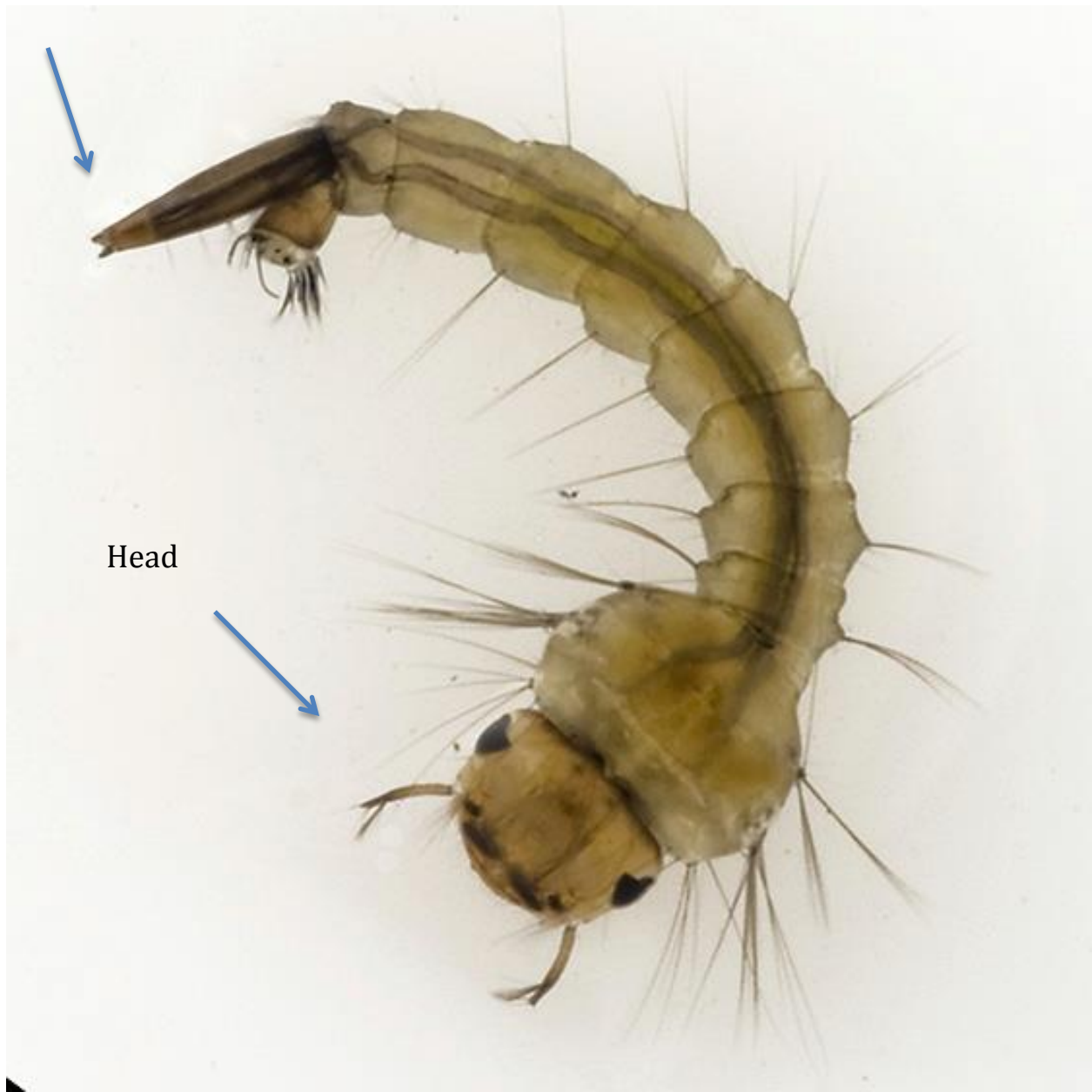
The adult mosquito will lay their eggs either singly or in a raft on the water surface or in the damp soil next to the water (depending on the species of mosquito). The eggs will usually hatch into larvae within 48 hours with water being a necessary part of their habitat. The larva will live in the water will shed their skin four times, getting larger each time, in a process known as molting. The larvae will use their siphon tubes to breathe while hanging on the surface of the water and feed on the microorganisms in the water. During the fourth molt, the larvae will change into a pupa, a non-feeding resting stage of development. When this stage is complete, the pupa skin will split and the adult mosquito will emerge resting on the surface of the water.





**Photo 3-** Mosquito Larva. The siphon is what a mosquito larva breathes out of when it submerged it water. Without water the mosquito lifecycle will not be able to complete. If you see these little guys in standing water in your back yard, dump it!

siphon



## → Word Search

According to the WHO (World Health Organization), of all disease transmitting insects, the mosquito is the greatest menace. The mosquito is capable of spreading malaria, dengue, and yellow fever, together responsible for millions of deaths and hundreds of millions of cases every year. According to the AMCA (American Mosquito Control Association), mosquitoes cause more human suffering than any other organism. Over one million people die from mosquito-borne diseases every year.

### Mosquito Transmitted Diseases

C	B	U	K	Y	O	W	R	I	K	X	E	I	I	M
H	T	X	W	M	E	B	K	Q	S	Y	A	U	H	M
I	Y	U	I	N	M	L	L	Y	C	S	E	M	P	L
K	O	U	O	D	A	D	L	N	H	W	D	D	Y	Q
U	U	O	R	M	C	D	P	O	C	S	H	N	W	O
N	W	N	V	R	Q	B	B	P	W	H	H	E	D	J
G	C	R	Q	C	H	Z	J	H	D	F	S	Q	D	C
U	E	N	H	Z	I	P	V	J	L	T	E	T	K	V
N	P	U	T	Y	T	N	I	R	N	M	W	V	T	B
Y	R	Q	G	V	Y	U	D	I	D	Z	A	P	E	L
A	F	I	B	N	J	Y	L	T	D	L	Z	Z	N	R
K	F	Z	G	J	E	E	A	I	R	A	L	A	M	V
I	Y	J	D	M	K	D	A	M	R	G	K	S	F	J
Z	A	B	S	E	T	S	K	L	F	Q	X	P	J	X
M	Y	E	F	R	L	X	Q	S	M	I	S	S	F	I

CHIKUNGUNYA  
DENGUE  
MALARIA  
WESTNILE  
YELLOWFEVER

## ZIKA

### → Discussion

This book introduced quite a few pest insects to us, from lice to cockroaches, to mosquitoes. Here we will discuss what the word pest means to you. According to the Department of Health, is any animal or plant that has a harmful effect on humans, their food, or their living conditions. Since mosquitoes are capable of transmitting the diseases covered in the word search above by their desire for blood discussed in the book, they are considered a pest insect. To protect ourselves from mosquitoes we can wear long sleeve pants and shirts, stay indoors with screened doors and windows, or use DEET bug spray. Additionally, to prevent mosquito breeding, we can get rid of their habitats. The lifecycle of a mosquito was discussed in photo 2, photo 3 showing what to look for in the standing water in your backyard, and photo 1 showing the adult mosquito with the proboscis, the mouthparts used to suck blood.

Question prompts for class discussion:

1. What does the word pest mean to you?
2. Why do we have to protect ourselves from mosquitoes?
3. Why do mosquitoes bite?
4. What can you do to protect yourself from mosquito bites?
5. What is the best way to prevent mosquitoes?

→ Activity

After a cute introduction to mosquitoes with Mr. Mosquito, this activity serves to provide a real educational purposeful experience.

Instructions:

1. Use attached checklist
2. Have children (with the aid of an adult, if necessary) locate and check off which items on the check sheet they have at their homes that can potentially breed mosquito larvae.
3. Hang the checklist on your refrigerator to remind your family to dump the water after every time it rains!

**Standing water plus 7 to 10 days equals MOSQUITOES!!**

→ Checklist of breeding habitats

### Mosquito Breeding Habitats



Containers – buckets, flowerpots & saucers, trashcans & lids



Gutters, downspout extensions



Ornamental/fish ponds, birdbaths



Tarps, canvases, boat covers



Toys, kiddie pools, tire swings, sandboxes, basketball bases, etc.



Unused pool



## **Kit 16C- Entomophagy**

Do you want to introduce a new food group to your students? Learn about the types of insects consumed around the world and the history of insect consumption. This kit provides various kid-friendly recipes that include, you guessed it- INSECTS! There are also various other recipes and pictures of what others eat around the world and the benefits to consuming them. Explore new foods and learn about entomophagy, the practice of eating insects by people.

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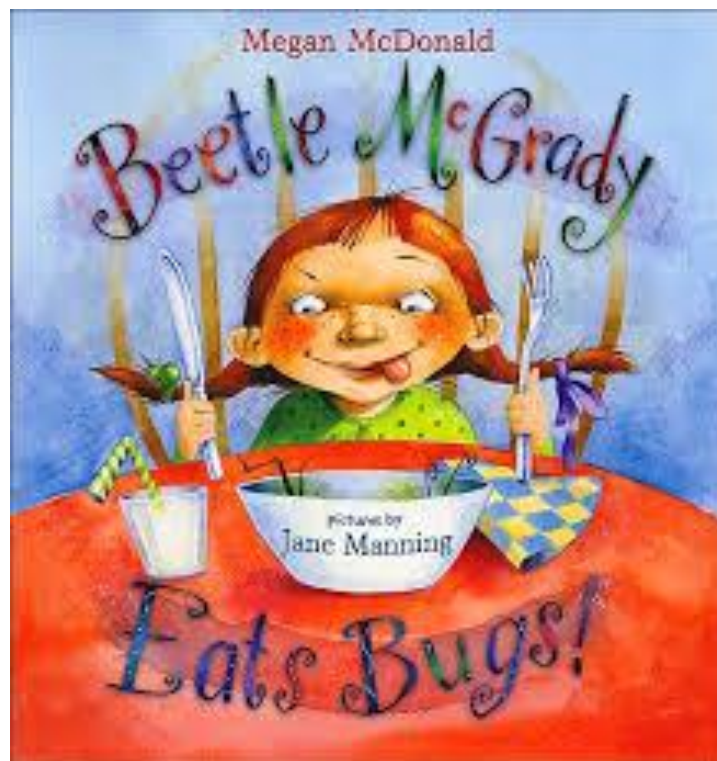
### **Kit 16C: Contents**

- Book
  - Discussion
  - Laminated Kid friendly recipes
  - Laminated pictures of insects used as food
  - Where to purchase insects to eat?
  - Nutritional Value Chart
  - TED talk
-



→ Book

Beetle McGrady  
By: Megan McDonald



→ Discussion

(Source: <https://www.pbs.org/newshour/science/bugs-for-dinner> and the Global Food Bank)

Here is a list of question prompts for a class discussion.

1. What is entomophagy?
  - Consumption of insects as food.
  - Not just the adult insect, also the eggs, larvae, and pupa.
2. What are the benefits?
  - Insects are high in protein, and some are also high in fat.
  - Some are also believed to have medicinal qualities
  - Rich in minerals, vitamins, and other macro and micronutrients
  - Of the 1.1 million identified species of insects, 1,700 are edible
  - Sustainability food source with much less of an environmental impact than raising cattle.
  - Insect do not spread diseases to humans in the way that cows and pigs do during consumption
3. What other foods do people eat that came from a living being?
4. Should you collect bugs from your backyard and eat them?
  - No. They could be contaminated with pesticides.
5. How can insects be consumed?
  - Raw, fried, roasted, steamed, toasted, barbequed, baked, made into flour and baked, coated in chocolate, put in sauces.
6. Did you know that insects are a staple food for many other people around the world?
  - Food security is a problem in underdeveloped countries

→ Recipes

Recipe 1 – **Chocolate Covered Crickets**  
(By [www.smallstockfoods.com](http://www.smallstockfoods.com))

**DO NOT EAT IF YOU HAVE ALLERGIES TO SHELLFISH\***



**Ingredients:**

- 1 cup whole roasted crickets
- 1 cup high-quality chocolate chips

**Instructions:**

1. Melt the chocolate chips, following the instructions on the package. (Using a microwave is usually easier than doing it on the stovetop.)
2. Drop in a handful of crickets and gently stir them around, coating them well in chocolate.
3. Scoop up the crickets with a spoon and drop them on wax paper. Give each cricket some space; don't let them cling to each other.
4. Drop a new handful of crickets into the chocolate and repeat, until all crickets have been coated and are on the wax paper.
5. Store in the fridge until its time to eat them.

Recipe 2- **Chocolatey Chip Mealworm Cookies**

([www.entomofarms.com](http://www.entomofarms.com))

**DO NOT EAT IF YOU HAVE ALLERGIES TO SHELLFISH\***



Servings: 24 cookies

**Ingredients:**

1/2 cup butter  
1/2 cup brown sugar  
1/2 cup organic white sugar or coconut sugar  
1 egg  
1/2 teaspoon vanilla  
3 tablespoons applesauce  
1 cup all purpose flour  
1/2 teaspoon salt  
1/2 teaspoon baking soda  
1/2 cup oats  
1/3 cup **Protein2050 Mealworm Flour** (30g)  
1/2 cup chocolate chips

**Directions:**

Preheat oven to 375°F

In a large bowl, cream together butter, egg, sugars, vanilla and applesauce.

In a separate bowl, combine dry ingredients. Whisk in Mealworm Flour. Add mixture to wet ingredients using a spatula to fold in. Add your chocolate chips while mixing. Do not over mix.

Using a teaspoon drops the batter onto parchment paper covered or greased cookie trays. Bake for 10 minutes at 375°F

→ Insects commonly eaten as food

**Photo 1-** Mealworms





**Photo 2-** Field Crickets (Photo courtesy of bugguide.net)



**Photo 3-** Palm Weevil, the larvae of the Red Palm Beetle (Photo courtesy of the Global Food Bank)



**Photo 4-** Bee Larva (Photo courtesy of bugguide.net)





**Photo 5-** Termites are eaten straight out of the mound in places like Kenya (Photo courtesy of bugguide.net).



→ Where to purchase insects as food?

1. EntoMarket - <https://www.edibleinsects.com/>
2. Treehugger- <https://www.treehugger.com/green-food/guide-buying-edible-insects.html>
  - Provides a list of several companies that sell insect food products, such as protein bars, protein powders, plain roasted insects, flavored insects, chips, etc.
  - Companies include- Exo, Naak, Crik Nutrition, Aketta, Bitty, Tinksect, Griopro, uKa Protein, Entomo Farms, and Rocky Mountain Micro Ranch
3. HotLix- [www.hotlix.com](http://www.hotlix.com)- insect lollipops, chocolate flavored insects, etc.
4. Rainbow Mealworms – [www.rainbowmealworms.net](http://www.rainbowmealworms.net)
5. Fluker Farms – [www.flukerfarms.com](http://www.flukerfarms.com)

→ Nutritional Value Chart (Source: [www.smallstockfoods.com](http://www.smallstockfoods.com))

<i><b>Insect</b></i>	<i><b>Protein (g)</b></i>	<i><b>Fat (g)</b></i>	<i><b>Carbohydrate (g)</b></i>	<i><b>Calcium (mg)</b></i>	<i><b>Iron (mg)</b></i>
Cricket	12.9	5.5	5.1	75.8	9.5
Dung Beetle	17.2	4.3	.2	30.9	7.7
Giant Water Beetle	19.8	8.3	2.1	43.5	13.6
June Beetle	13.4	1.4	2.9	22.6	6.0
Red Ant	13.9	3.5	2.9	47.8	5.7
Silk Worm Pupae	9.6	5.6	2.3	41.7	1.8
Termite	14.2	N/A	N/A	N/A	35.5
Weevil	6.7	N/A	N/A	N/A	13.1

Compared to...

<i><b>Insect</b></i>	<i><b>Protein (g)</b></i>	<i><b>Fat (g)</b></i>	<i><b>Carbohydrate (g)</b></i>	<i><b>Calcium (mg)</b></i>	<i><b>Iron (mg)</b></i>
Lean Ground Beef	27.4	N/A	N/A	N/A	3.5
Broiled Cod	28.5	N/A	N/A	N/A	1.0

→ TED talk

“Should we eat bugs?” by- Emma Bryce  
<https://www.youtube.com/watch?v=rDqXwUS402I>