

THE WARBLER

AN EDUCATIONAL WEEKLY



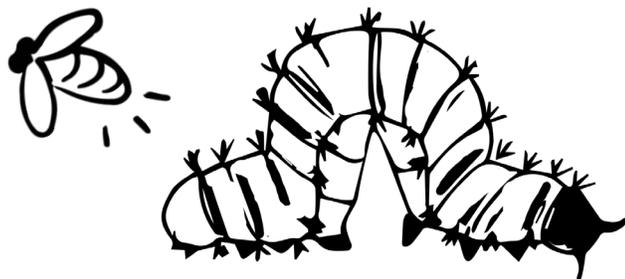
Dear Student, Artist, Thinker, Friend,

Most of the species we know about are insects. About 850,000 have been formally documented by science. More are still undocumented. Estimates for the total species diversity of insects range from five to fifty million. Insects are pretty much everywhere on land you might care to look, and make a living in more ways than you could imagine. There are species that scavenge on glaciers and if you held them would die from the heat of your hand. Some spend exactly seventeen years buried in the ground, sucking on tree roots. In one species, a mother gives give birth to only one son, who is her clone, and he consumes her, and will eat nothing else all his life. We could go on. The point is that insect diversity is a circus. It's the circus of life.

Well, a few years ago scientists began reporting evidence that insect diversity is collapsing. For example, over the last thirty years or so, the total weight of all of the insects in forest parks from Germany to Puerto Rico has fallen by 75% or more. As insect communities have gotten lighter, their species diversity has waned. Indeed, by bringing together data from more than 150 independent studies, researchers have estimated that over the last century insect species diversity has been decreasing by about 1% per year. It's the insect apocalypse.

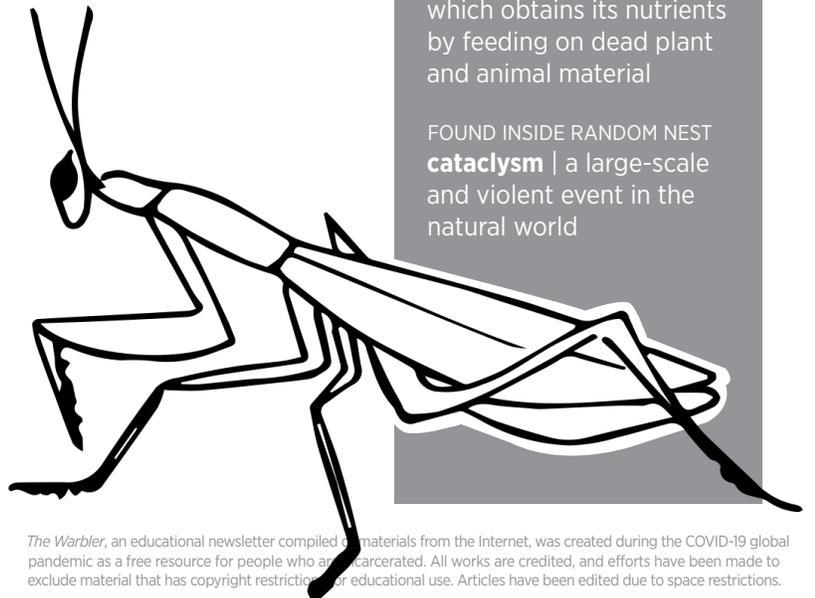
This issue of *The Warbler* has three short pieces written by students taking a course about insect diversity at Auburn University. We hope to leave you with a deeper appreciation for how insects help and hurt us, and for how all living things are tied together and for good or bad depend on one another.

 *Nate B Hardy, the students of Insect Diversity '21, and the APAEP team*



“Otherness is what I have always liked about bugs.”

SUE HUBBELL // American writer



NOVEMBER 2, 2022



WORDS INSIDE

FOUND INSIDE POEM

contorted | twisted or bent out of the normal shape

FOUND INSIDE “SOME BUGS ARE BAD ...”

boon | A thing that is helpful or beneficial

insectary | A place for the keeping of living insects

FOUND INSIDE “AQUATIC INSECTS | TYPES OF ...”

invertebrate | an animal lacking a backbone

littoral | situated on the shore of the sea or a lake

detritivorous | organism which obtains its nutrients by feeding on dead plant and animal material

FOUND INSIDE RANDOM NEST

cataclysm | a large-scale and violent event in the natural world

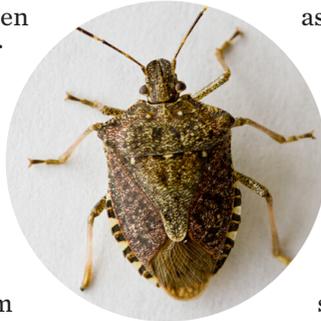
ECOSYSTEM

Insect Invasions!

BY ALEJANDRA VELEZ CHAVEZ, AMELIA C. GRIDER, NATALIE WONG

Most folks in the southeastern US have run into fire ants and have left wishing they hadn't. Fire ants are just one of many so-called invasive species, that is, species that have invaded a new environment outside of their historical range. While many insect populations are on the decline, invasive insects are an exception. In fact, invasive species often out-compete native species and alter the invaded landscapes; thus, they are part of what is causing broad declines in native insect populations. They can also be pests on farms, and harm people directly – as in the bites of fire ants. While each invasive species is unique, almost all of them invaded in the same way: people moved them from one place to another; as we travel and trade we carry with us insect stowaways. Because of the problems they can cause, we end up spending a lot of time and money trying to keep invasive populations down. Let's look at a couple of local examples.

The brown marmorated stink bug was introduced to the US from Asia in the mid 1990's. Since then, they have spread to 43 states. They are hard to miss, since they invade homes in the fall to seek shelter for the winter. They don't damage buildings, but they do cause a lot of problems on farms. For example, in 2010, they caused an estimated \$37 million in damage for mid-Atlantic apple growers. Brown marmorated stink bugs feed on a wide variety of nut, fruit and vegetable crops and much of what they leave behind is unmarketable. Their broad diet has no doubt helped their spread; in most places they can find something to eat. Their spread is also due to the fact that they can tolerate a wide range of environmental conditions. They don't like it too cold, but global warming should allow them to extend their range yet further. As is true of all insect species, stink bugs are cold-blooded; their metabolism runs faster when it's warmer out. Hence, global warming will likely make the brown marmorated stink bug more of a pest in much of its current range, by accelerating its life cycle, and increasing the rate at which populations grow. In other words, when it's warmer, stink bugs grow up faster and start having kids earlier. To sum up, once brown marmorated stink bugs got a toe-hold in the US, it only took them a few decades to spread to almost everywhere and cause many new



problems for farmers. With global warming, it seems things will only get worse.

The brown marmorated stink bug is an example of how invasive insects can disrupt agriculture. Next let's turn to an example of how invasive insects can cause trouble for natural ecosystems. The emerald ash borer just might cause the extinction of ash trees in the US. In just a few years, in Michigan forests alone, it killed 25 million ash trees. Ash trees play a vital role in forest ecosystems. Their leaves are loaded with nutrients that feed dozens of insect species, many of which rely on ash almost exclusively. Ash seeds also serve as a food source for small rodents, ducks, and turkeys, while

the trees themselves provide shelter for a variety of bats, birds, and insects. Extensive ash mortality will make life hard for these species, and many others. For example, by killing ash trees, emerald ash borers change the structure of the leaf litter on the forest floor. In particular, when ashes die, the amount of litter decreases and the remaining litter is drier. This has negative impacts on the community of critters that lives in the leaf litter. Moreover, several species of invasive plants thrive in the gaps in the forest caused by the death of an ash. Thus, the killing of ash trees by the emerald ash borer hastens the spread of other invasive species. The full consequences of emerald ash borers on American forest ecosystems is hard to grasp, but there is no doubt they will be far reaching and profound. ●

Brown marmorated stinkbug

Image from Flickr.com. Photo by Chris Hedstrom via Oregon State University.

WORD PLAY A Rebus puzzle is a picture representation of a common word or phrase. How the letters/images appear within each box will give you clues to the answer! For example, if you saw the letters "LOOK ULEAP," you could guess that the phrase is "Look before you leap." *Answers are on the last page!*

			FEELING
EFFECTS	EFFECTS	SLEEV SLEEV	

ENVIRONMENT

Discovery and Decline of the Gulf Coast Evening Bee

BY ALAN SUNGHUN JEON, KELLY R. SCHLARBAUM, NICOLE J. BAKER

By one estimate, over 40% of insect species are currently at risk of extinction. The decline of insect populations is having complex and mostly negative effects on natural ecosystems and agriculture. Here, rather than try wrap our heads around the causes and consequences of insect decline in general, let's have a look at what's happened to one local insect species.

Consider the Gulf Coast evening bee, The Gulf Coast evening bee was not discovered until 1997. It has been found only on secondary dunes along the Gulf coast of Mississippi, Alabama, and Florida. Let's take a quick detour here to briefly explain what a secondary dune is. Primary dunes are formed by the direct deposition of sand from the beach. Secondary dunes are formed when wind moves sand from primary dunes further inland. So, the Gulf Coast evening bee is known only from these more inland dunes. Another thing that we know about its biology is that it is a monoleptic species, that is, it only gathers the pollen and consumes the nectar of one plant species, in this case, the Coastal Plain honeycomb-head, a member of the aster family. We don't know for sure where Gulf Coast evening bees make their nests, but we know that closely related species of bees nest in dunes, and we suspect that Gulf Coast evening bees do the same. In principle, their strict diet and nesting site requirements would make them especially sensitive to environmental changes. This seems to be born out by recent surveys. When they were first discovered, they were found at 15 sites along the Gulf Coast; today, they are now found at only six of those.

Several factors are believed to be responsible for their decline. The most important is probably habitat loss via the development of beachfront real estate. On top of that, invasive plants such as beach vitex and cogon grass are further degrading the habitat by taking over the sand dunes, crowding out Coastal Plain honeycomb-head, and possibly reducing the suitability of the dunes for nesting sites. Another potential cause of Gulf Coast evening bee decline is unintended exposure to insecticides and herbicides. As these chemicals become more widespread along the coastal region, populations of Gulf Coast Evening Bees may become further endangered.

Gulf Coast evening bees are further threatened by rising sea levels due to global warming. To reiterate, these bees live and reproduce exclusively in sandy areas within a few thousand feet from the shorelines. As water levels continue to rise, and significant weather events such as hurricanes intensify, the remaining habitat of the Gulf Coast evening bee may soon be under water.



Image from John Bente, Florida Department of Environmental Protection, Florida Park Service.

In March of 2019, the Center for Biological Diversity submitted a petition to the U.S. Fish and Wildlife Service to provide protection to the Gulf Coast evening bee under the Endangered Species Act. The Gulf Coast evening bee is just one of many native pollinators under stress from intensified land use and climate change. And the pollinators are just a subset of the insects that play important roles in ecosystems, and provide us with valuable services, and are undergoing precipitous declines. ●

Resources

Listed below are a few organizations able to offer support, community, and engagement for persons who have been or are currently incarcerated. Please contact them with concerns or questions you might have. These organizations are primarily volunteer organized and operated, so please allow time for response. We would also love to hear from you. Feel free to write to us at **APAEP**, 1061 Beard-Eaves Memorial Coliseum Auburn University, AL 36849

OAA (Offender Alumni Association) Based out of Birmingham and able to offer resources for individuals currently incarcerated and those who have been released.
1000 24th Street South
Birmingham, AL 35205

FIGGN (Formerly Incarcerated College Graduate Network) supports persons who have been or are currently incarcerated and are involved or looking to get involved in post-secondary education (college). They offer access to job and internship opportunities, job fairs, and other educational resources.
600 Park Offices Drive, Ste 300 #54
Durham, NC 27709



MATHEMATICS

Sudoku

#267 PUZZLE NO. 3074684

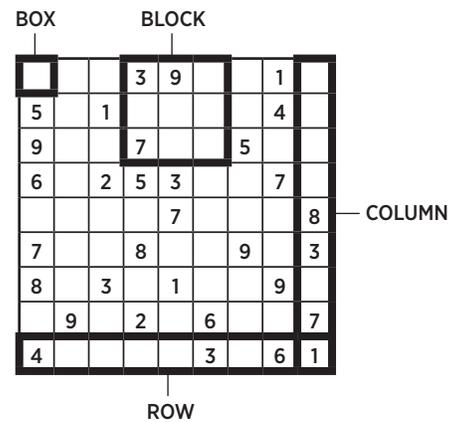
		9	6	2		3		
2	3	5		8	4		9	
4		6						
			4	3			8	
1								
	8				2	7		1
6			1					
						9	4	5

#268 PUZZLE NO. 4976429

	9			6	8			
			1	8	3	7		
5		1		7				
		3						
						4	2	
	1			6			8	
	6				2	3	9	
2		4						5
			4					

SUDOKU HOW-TO GUIDE

1. Each block, row, and column must contain the numbers 1-9.
2. Sudoku is a game of logic and reasoning, so you should not need to guess.
3. Don't repeat numbers within each block, row, or column.
4. Use the process of elimination to figure out the correct placement of numbers in each box.
5. The answers appear on the last page of this newsletter.



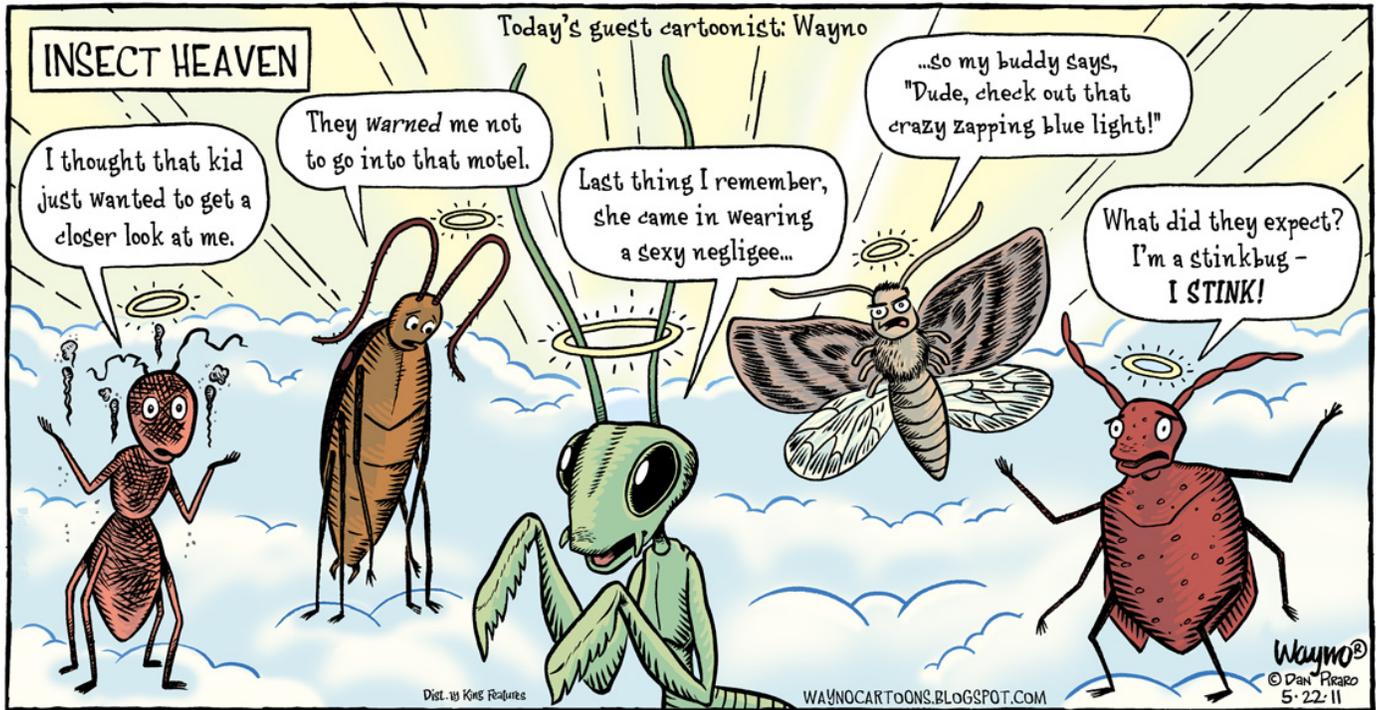
What the example will look like solved

2	4	8	3	9	5	7	1	6
5	7	1	6	2	8	3	4	9
9	3	6	7	4	1	5	8	2
6	8	2	5	3	9	1	7	4
3	5	9	1	7	4	6	2	8
7	1	4	8	6	2	9	5	3
8	6	3	4	1	7	2	9	5
1	9	5	2	8	6	4	3	7
4	2	7	9	5	3	8	6	1



“I loved being outside. We’d hold lightning bugs in our fingers and pretend they were diamond rings.”

LORETTA LYNN // American singer/songwriter



DID YOU KNOW?

Houseflies find sugar with their feet, which are 10 million times more sensitive than human tongues.

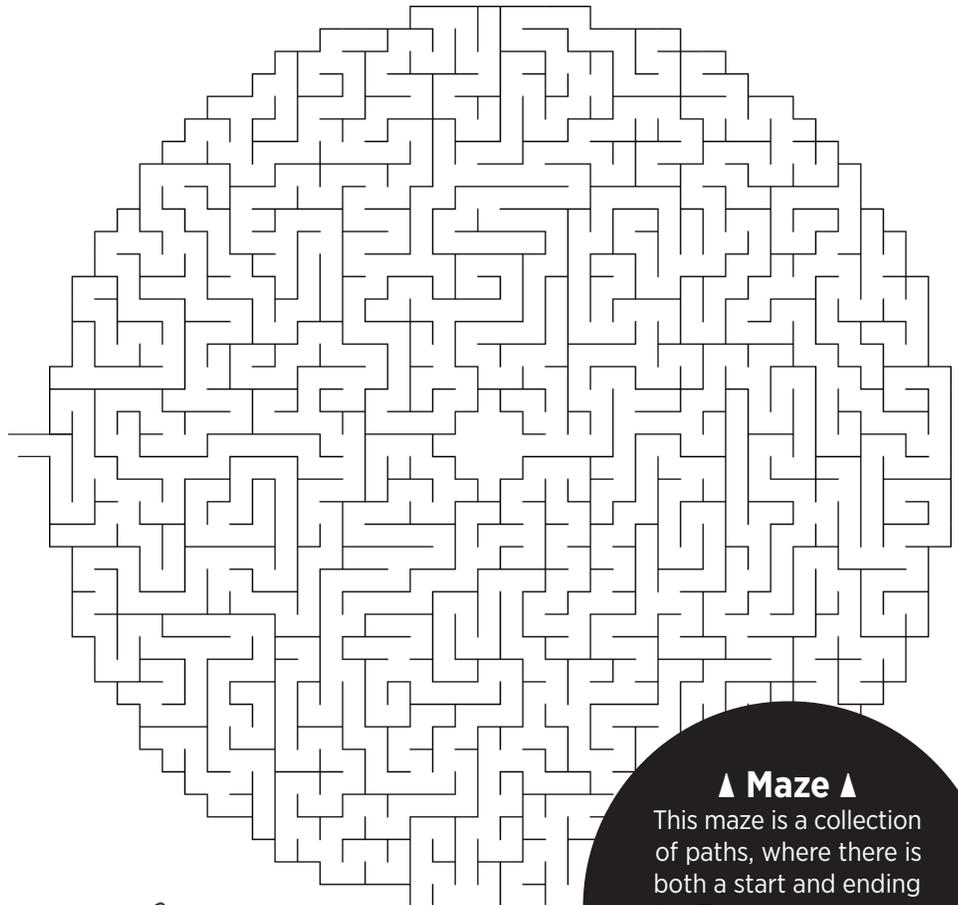
Ticks can grow from the size of a grain of rice to the size of a marble.

Approximately **2,000 silkworm cocoons** are needed to produce one pound of silk.

Insects have been present for about **350 million years**, and humans for only 300,000 years.

Ants can lift and carry more than fifty times their own weight.

About one-third of all insect species are **carnivorous**, and most hunt for their food rather than eating decaying meat or dung.



▲ Maze ▲

This maze is a collection of paths, where there is both a start and ending point. The player starts from the start point and follows a path of their choice, which leads to the end point.



Source: <https://womenshistory.si.edu/spotlight/buginfo/fun-facts-bugs>

ART + CULTURE

Insect

BY ANNIE FINCH

That hour-glass-backed,
orchard-legged,
heavy-headed will,

paper-folded,
wedge-contorted,
savage—dense to kill—

pulls back on backward-moving,
arching
high legs still,

lowered through a deep, knees-reaching,
feathered down
green will,

antenna-honest,
thread-descending,
carpeted as if with skill,

a focus-changing,
sober-reaching,

tracing, killing will.



Annie Finch is the author or editor of more than twenty books of poetry, plays, translation, literary essays, textbooks, and anthologies. Finch holds degrees from Yale University, University of Houston, and Stanford University. She has taught at several universities, most recently the University of Southern Maine where she served for nine years as director of the Stonecoast MFA Program. She lives on the coast of Maine.

WRITING PROMPT

Throughout this short poem, the poet uses hyphenated compound words, like “orchard-legged” and “wedge-contorted” to describe or create an image of an insect. They never state what kind of insect this is or exactly what it’s doing while they’re watching it. But from the clues and imagery that is used, it seems likely the insect is hunting its prey. Using this as a prompt for a poem, short essay, illustration, or blog, choose an insect and describe them in a way that creates an image in your mind of an activity they might be participating in.

Word Search

A	R	E	W	M	O	V	E	M	E	N	T	E	H
N	W	D	E	D	N	E	C	S	E	D	A	E	N
T	I	F	I	Y	T	I	S	R	E	V	I	D	O
E	N	E	A	N	A	C	R	E	E	E	L	T	I
N	D	A	S	A	S	C	A	D	G	M	I	S	T
N	S	T	O	T	C	E	D	N	C	R	R	A	R
A	R	H	E	E	E	G	C	R	E	T	Y	R	O
E	O	E	A	G	H	T	G	T	G	R	S	N	T
E	R	R	B	A	C	K	W	A	R	D	S	S	N
T	C	I	N	V	C	I	D	A	E	O	V	F	O
I	H	N	T	A	W	S	E	I	O	E	R	R	C
N	A	G	I	S	R	N	R	O	C	A	T	C	T
N	R	O	T	R	A	C	I	N	G	R	A	I	A
A	D	O	N	O	N	G	N	I	R	E	W	O	L

- | | | | |
|------------|-----------|----------|------------|
| INSECT | DIVERSITY | TRACING | MOVEMENT |
| SAVAGE | DESCENDED | ANTENNA | ORCHARD |
| CONTORTION | BACKWARDS | LOWERING | FEATHERING |

HISTORY

Some bugs are bad. Most are on our side.

BY CASEY O'NEAL, IVY THWEATT, AND ANTHONY CUMINALE

Insects account for more than half of all known living species but they are going extinct at an alarming rate. By recent estimates, insect species diversity is shrinking by about 1% per year. At that rate, in fifty years we will have lost around half of all insect species, and a quarter of all living species of any kind. No doubt, many insect species wouldn't be missed. For example, the extinction of many mosquito and cockroach species would be a boon for public health. But most insects are not pests, and many provide us with valuable goods and services. These are referred to as beneficial insects. Here we consider two benefits we stand to lose by broad insect decline.

The first is pollination. If insects stopped carrying pollen from one flowering plant to another, most plants would stop developing fruits and reproducing. The majority of our fruit and vegetable crops would fail. Well, as is the case for insects in general, insect pollinator populations have been shrinking, and this is already having major impacts on farms. Whereas in the past, farmers could have their crops pollinated for free by local insects, these days they need to rent honeybees, and that's getting expensive. Almond orchards are a good example. In 1994, almond growers in California – today a \$10-billion industry – paid \$35 per honeybee colony. In 2021, the price was up to \$200 per colony. To try and restore natural pollination services, the USDA partnered with researchers at the University of Vermont to reintroduce native bees in an almond orchard in 2018. The researchers placed artificial nesting boxes in the orchard to provide nesting habitat that had been destroyed by the orchard. They then released captive-bred native blue orchard bees. After optimizing where to put the nest boxes, they were able to restore native pollination to a point that increased profits by \$2,800 per acre, and decreased the demand for rented honeybees by one half. Of course this only scratches the surface of the true value of insect pollinators, but hopefully it gets the point across. Natural ecosystems contribute to our economic systems.

Insects also provide valuable pest control services. Pest insects reduce the productivity of farms and are a threat to global food security. For the better part of the past century, to control their insect pests, farmers have relied heavily on chemical insecticides, a practice that is expensive and unsustainable. Moreover, the heavy use of insecticides has diminished popula-



tions of many insect species that could provide free and natural pest control. We call such species natural enemies. As a concrete example, hornworm caterpillars – which are a pest on tomato and several related crops such as peppers and potatoes – are attacked by parasitic wasps. In the picture on the right, those white things are parasitic wasp babies; they'll ride along and slurp out the caterpillars blood and guts until it's dead. Well, when farmers use chemical insecticides to kill hornworm caterpillars, they also kill the parasitic wasps. In that way, farmers become ever more dependent on insecticides for pest control, and end up having to pay for an increasing share of a service which used to be at least in part provided freely by nature.

A group of Canadian researchers has been investigating the use of so called insectary plants to prop up local communities of pollinators and pest controllers. Insectary plants are just flowering plants that are not sprayed with pesticides, and thus provide food and shelter for pollinators and other insect species. The researchers found that keeping a few insectary plants on farms was enough to significantly boost natural pollination and pest control, and thereby overall farm profitability.

So there you have it. Two ways in which insects benefit our economies, and therefore two ways in which we can be hurt by insect decline. And also a couple examples of some small changes that we can make to protect beneficial insect populations and make our economic activities more sustainable. ●

Hornworm caterpillar with parasitic wasp eggs.

Photo by Dr. David Held, Auburn University.

“I spent my childhood in northern New York State, and like many kids, bugs and other critters fascinated me.”

ROMULUS WHITAKER
// Indian herpetologist

FEATURE

Aquatic Insects | Types of Water Insects

BY NICK A. ROMERO | *Animal Wised* | May 30, 2022

Insects are the most diverse animals on the planet, of which more than a million species have been identified. Estimates indicate there is still between six to ten times this amount yet to be discovered. With such a wide distribution and diversity, they have inhabited practically every biome on the planet, including water. If we are to think of insects, we don't normally associate them with being under water. For this reason, *Animal Wised* presents our list of aquatic insects. We share these types of water insects and present their known behaviors and characteristics.

What are aquatic insects?

Aquatic insects, also known as water insects, are types of invertebrate animals which spend at least some of their life cycle in water. Some of these species may only carry out their developmental stages under water while they become exclusively terrestrial once they reach maturity.

Do insects live in the ocean?

When we discuss aquatic insects, we are almost exclusively refer to freshwater insects. Relatively very few marine insects exist. If they do, they tend to live in littoral or intertidal areas near the shore. It is believed that there are not any insects living in the open water because their respiratory system prevents them from diving sufficiently to evade predation.

How do aquatic insects breathe?

All animals need to carry out respiration. They take oxygen from their environment and then distribute it throughout their body. However, not all animals do it in the same way. The process of respiration varies from one group to another due to the various adaptations animals have developed to better interact with their environments.

Generally speaking, insects do not have lungs. Rather, they have holes in some areas of the body that are known as spiracles through which oxygen enters. Air then passes to branched structures called tracheae which then diffuses oxygen to the various tissues.

In the case of aquatic insects, a series of adaptations or peculiarities have been developed to be able to breathe underwater. Water insects can have an open or a closed tracheal system. Depending on which they possess, their method of breathing underwater can vary:

Open tracheal system | the respiratory structures

necessarily have to come into contact with the air to take in the oxygen.

Closed tracheal system | the spiracles of the insect do not need to be in contact with the air because they can take oxygen from the water.

In the open tracheal system, aquatic insects can breathe in one of the following ways:

Through a structure called a siphon | the animal draws from the water to take in air, while the rest of the body is submerged.

Using villi on the abdomen | they come into contact with the surface air and diffuse oxygen to the spiracles.

Breaking submerged plant parts | some water insects can breathe by taking accumulated oxygen directly from plant tissue.

Capture an air bubble | the animals rises to the top to capture an air bubble. This bubble surrounds the insect and they can breathe while inside. When the bubble is about to end or bursts, they repeat the process.

In the case of the closed tracheal system, aquatic insects breathe:

Through their skin | because the oxygen present in the water enters the animal's body through diffusion to reach all tissues.

Gills | although we associate them more with fish, some water insects have extensions of tracheal system which reach out to the external tissue. They allow oxygen to be obtained very efficiently.

Characteristics of aquatic insects

Aquatic insects have a series of characteristics to be able to lead a complete or partial life in water, on or

“I love all kinds of insects, and I've heard Australia has some really interesting bugs.”

AURORA //
Finnish singer

Setae (stiff structures resembling hair or bristles) keep air near and water away.





around. Among these we can mention:

- ▶ Some species have hydrodynamic bodies, making them good divers.
- ▶ In certain cases they have modified paddle-shaped hind legs. Some also have the addition of setae, a hair-like appendage which helps to swim.
- ▶ There are diving aquatic insects need to go to the surface to breathe. Others are swimmers, so they remain constantly submerged. Others are known as grabbers as they strongly attach themselves to some rocky or vegetable substrate in the water.
- ▶ They can be herbivorous, detritivorous or carnivorous animals, depending on their food source.
- ▶ As generally happens with non-aquatic insects, they reproduce by means of eggs from which a larva emerges. The larva then undergoes metamorphosis, and several other stages to finally form the adult.
- ▶ From an ecological point of view they are important for food chains within aquatic ecosystems.
- ▶ They have a waxy cuticle in the case of freshwater insects as it protects them by preventing excess water entering the body. However, in submerged respiration, this excess water is regulated by a constant and dilute excretion of liquids.
- ▶ Some semi-aquatic insects have the ability to walk on water. They do not break the surface tension of the water and can subsequently be supported by it.

Examples of aquatic insects

As we mentioned at the beginning, insects are a very diverse group within the animal world. It is important to remember that some species live their entire lives in water, while others have a short terrestrial period in their adult form. In these cases, they are also usually considered aquatic, because their greatest development is carried out submerged in water.

Certain examples of aquatic insects are:

- Giant water bugs (*Belostomatidae*)
- Great silver water beetle (*Hydrophilus piceus*)
- Predaceous diving beetles (*Dytiscidae*)
- Microcaddisflies (*Hydroptilidae*)
- Alkali fly (*Ephydra hians*)
- Small water striders (*Veliidae*)
- Whirligig beetles (*Gyrinidae*)
- Burrowing water beetles (*Noteridae*)
- Squeak beetles (*Hygrobiidae*)
- Haliplids or crawling water beetles (*Haliplidae*)
- Riffle beetles (*Elmidae*)
- Water boatmen (*Corixidae*)
- Water striders or pond skaters (*Gerridae*)
- Backswimmers (*Notonectidae*)

While some species of ant like places with a lot of moisture, none are considered aquatic insects. ●

RANDOM-NEST

Ancient Insect Graveyards Reveal an Explosion in Bug Diversity 237 Million Years Ago

BY ELIZABETH PENNISI | SCIENCE.ORG | SEPTEMBER 5, 2018

Two enormous fossil troves in China have yielded clues to a mystery: how insects became the most diverse members of the animal kingdom. The discovery reveals an explosion of diversity after a mass extinction event 252 million years ago, coinciding with a similar diversification of the plants that many insects feed on.

The mass extinction, known as the Permian-Triassic extinction, was a triple whammy of massive volcanic activity, global warming, and asteroid impacts that wiped out more than 90% of marine life and 70% of land animals with backbones. Many kinds of insects, including primitive beetles, “true bugs” with plant-piercing mouthparts, and giant cockroaches and dragonflies, flourished before this event, but researchers were not sure which survived the cataclysm. Fossils that might answer the question are scarce, partly because insects lack durable parts like shells and bones.

Paleontologists Zheng Daran and Wang Bo of the State Key Laboratory of Paleobiology and Stratigraphy in Nanjing, China, and colleagues identified five sites in northwestern China that were about the right age to yield clues. Two of them—ancient lakebeds filled with layers of sandstone and other sedimentary rocks, 2300 kilometers apart—proved to be insect bonanzas, with impressions of wings, larval cases, and other insect remains. The team collected 800 fossils from the two sites.

Working with Chang Su-Chin from The University of Hong Kong, Wang, Zheng, and their colleagues dated the sandstone, determining that the sites were 237 million to 238 million and about 230 million years old. The older site was more diverse, with insects from 28 insect families in 11 major insect groups.

Overall, the findings suggest some types of insects—including beetles and cockroaches—survived the great extinction event, whereas others evolved after, Labandeira says. His own work on ancient plant-insect interactions, including patterns of plant damage, support this result, showing that insect biodiversity during that time period stemmed from a mix of survivors of the extinction and newly evolving species

The sites underscore that this burst of evolution took place much earlier than researchers had thought, particularly for water-loving insects. Among the remains are fossil dragonflies, caddisflies, water boatmen, and aquatic beetles. Until now, paleontologists had thought such aquatic insects didn’t diversify until 130 million years ago. These insects—which include both predators and plant eaters—helped make freshwater communities more complex and more productive.

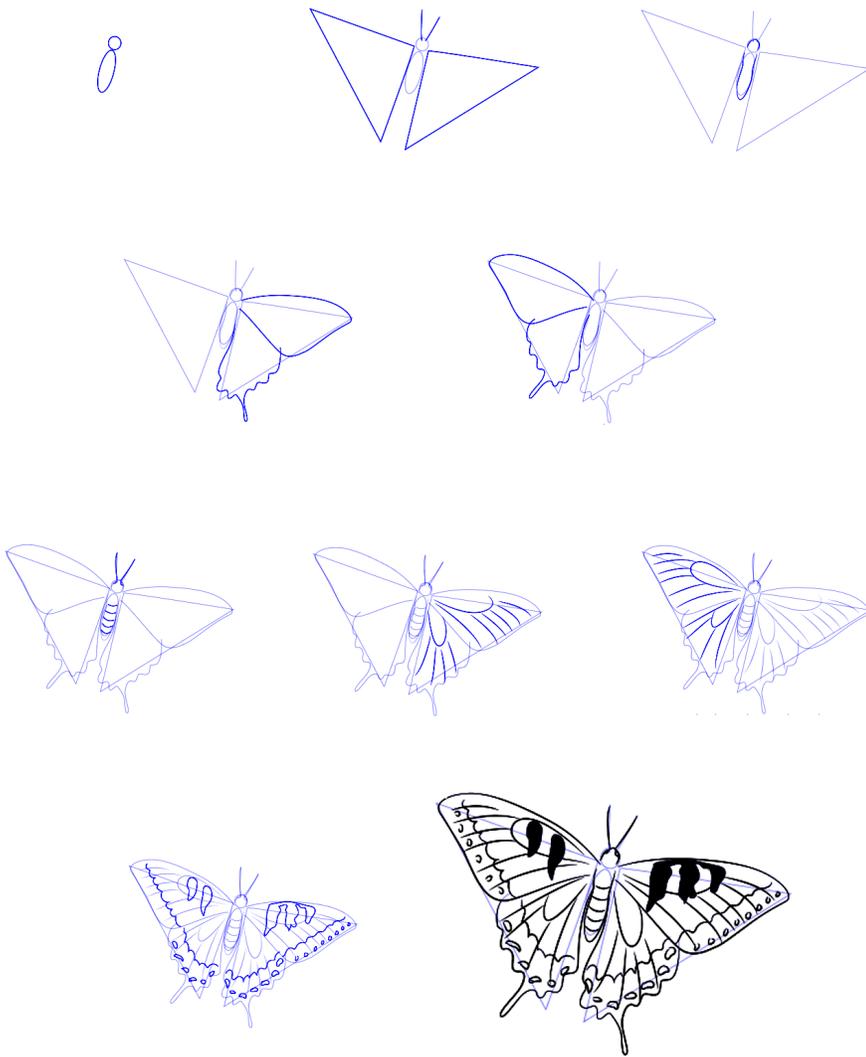
This earlier date for the expansion of insect diversity aligns it with the explosion in plant diversity happening at that time. As pollinators and pests, the insects helped spur further plant evolution and vice versa. And together, they helped yield the flora and fauna of today.

In northwestern China, paleontologists uncovered hundreds of insect fossils in two massive fossil troves.

Photo by Daran Zheng



HOW TO DRAW A SWALLOWTAIL BUTTERFLY



drawingtutorials101.com



WORDS OF ENCOURAGEMENT

Diversity has been a buzz word in many contexts over the past few years because of its importance in advancing society. We all have a unique perspective and wisdom we can pass on through what we write. Placing your thoughts on paper, whether that is for yourself only or for others to see is always valuable because it makes your experience tangible. Your perspective is valued here. We hope you enjoyed this week's edition of *The Warbler*, and hope you have a great week.

Taylor and the APAEP Team

Answers

SUDOKU #267

8	1	9	6	2	5	3	7	4
2	3	5	7	8	4	1	9	6
4	7	6	9	1	3	2	5	8
9	6	7	4	3	1	5	8	2
1	5	2	8	7	6	4	3	9
3	8	4	5	9	2	7	6	1
6	4	3	1	5	9	8	2	7
5	9	8	2	4	7	6	1	3
7	2	1	3	6	8	9	4	5

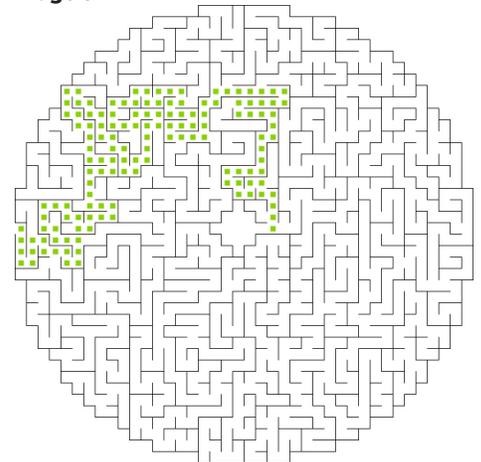
SUDOKU #268

3	9	7	5	2	6	8	4	1
6	4	2	1	8	3	7	5	9
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7	2	3	8	4	5	9	1	6
8	5	6	3	1	9	4	2	7
4	1	9	2	6	7	5	8	3
1	6	8	7	5	2	3	9	4
2	3	4	6	9	8	1	7	5
9	7	5	4	3	1	2	6	8

Page 2 REBUS PUZZLE

1. Side effects
2. Short sleeves
3. Feeling left out

Page 5 MAZE



UNTIL NEXT TIME 