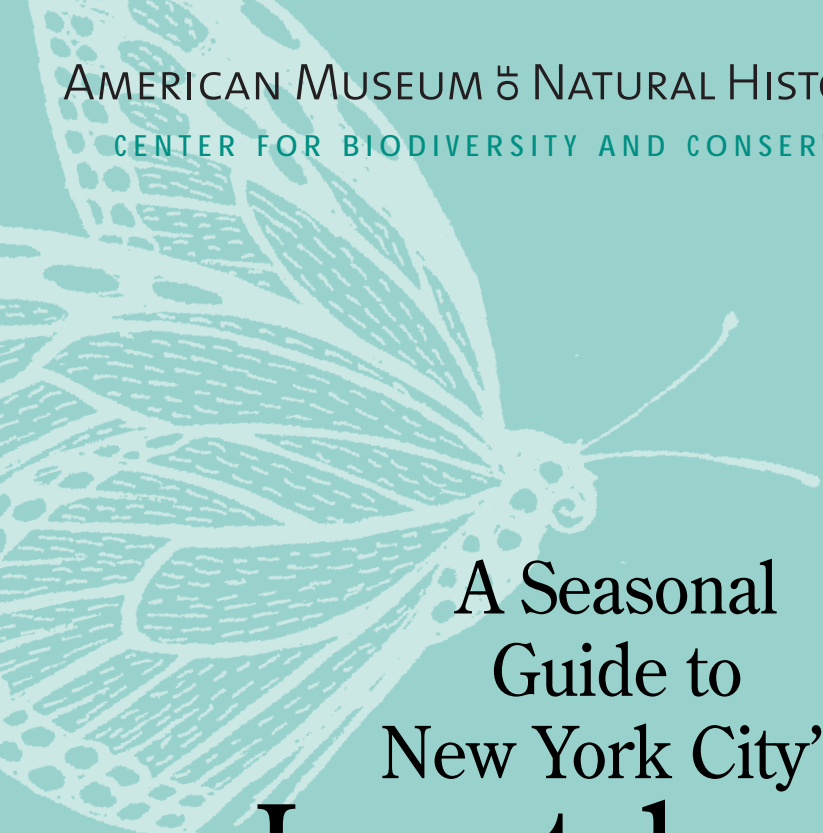


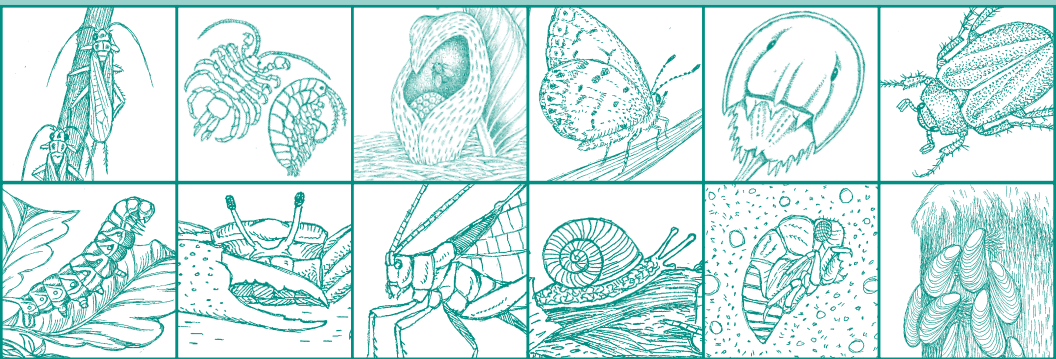
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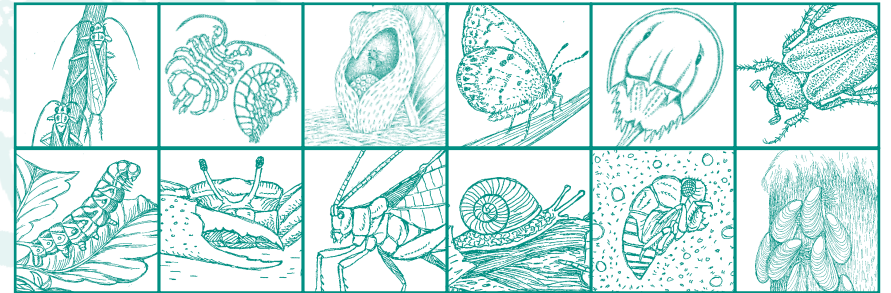
A Seasonal
Guide to
New York City's
Invertebrates



Elizabeth A. Johnson

with illustrations by Patricia J. Wynne

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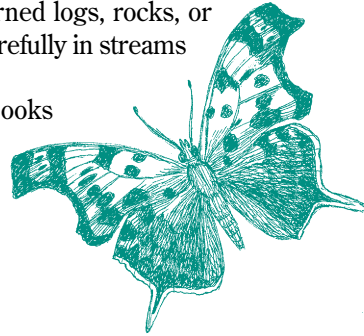
I N T R O D U C T I O N

Everybody knows “bugs,” such as spiders, ants, grasshoppers, bees, and butterflies. Officially they are known as invertebrates – animals without backbones. Lobsters and earthworms are also invertebrates, as are giant squids and dragonflies. There are millions of invertebrate species and, as a whole, it is estimated that they constitute 80 percent of all life on Earth, living just about everywhere – even on other animals (us, too!).

New York City is an amazing place to discover and learn about the remarkable lives of invertebrates, not only in summer but also in the coldest months of the year. This seasonal calendar provides an overview of when and where to see some of New York’s most common invertebrates, month by month, throughout the year.

R U L E S F O R E X P L O R I N G

- Keep your eyes open! Nature offers many unexpected surprises.
- Respect the animals’ homes. Replace overturned logs, rocks, or leaves you may have moved aside; explore carefully in streams or in estuary waters.
- Bring a hand lens, binoculars, and guidebooks (see list on page 37) for closer study. Or just explore, using your own senses. Either way, enjoy your adventures!



W H E N T O L O O K

Nature is unpredictable. Although many times a certain animal may be found at a site, it might not be there each time you visit. Good sightings depend on a number of factors, such as:

Season or Time of Year – Invertebrates are most active and abundant during spring and summer, but you can still find them in winter, especially during brief warm spells. Keep in mind that different species have different life spans and life cycles. Some live a day, others live weeks, some live only at certain times of the year, and others vary in number and distribution from year to year. Look for signs of invertebrate activity such as old nests, cocoons, shells, egg cases, shed skins, webs, galls, borings, or burrows.

Weather Conditions – You will see more invertebrates during sunny weather, but moisture conditions are important as well. In rainy weather, you should see more slugs, snails, worms, and millipedes. In dry weather, soil animals often congregate under rocks, logs, and boards but may burrow deeper and can be more difficult to find.

Time of Day –

Day: Most invertebrates that live on land, such as dragonflies, butterflies, bees, and wasps, are active during the warmest parts of the day, typically after 10 a.m. when their flight muscles have warmed up. During summer heat waves, however, insect activity often begins earlier in the day and ceases during the heat of the afternoon.

Night: Other invertebrates are active at dusk and during the night. Moths usually fly during these times. Mosquitoes are only active for a short time at dawn or dusk. Spiders build their webs at dusk to prepare for the night-time emergence of their insect prey. Katydid and tree crickets call at night, and most fireflies flash only at that time. In ponds and streams many invertebrates such as sideswimmers move closer to the surface of the water to feed at night, while hiding by day in the bottom of the pond or stream.

Tidal Cycles: In coastal areas, the timing of high and low tides determines when animals such as crabs and snails will be active. Scheduling your visit during low tide will allow you to see more invertebrates.

W H E R E T O L O O K

Explore all habitats, large and small. Look in woodlands, fields, streams, swamps, ditches, ponds, sand dunes, salt marshes, hedgerows, roadsides, rights-of-way, and even vacant lots. And in each of these habitats, look closely in, under, and around flowers, fruits, leaves, rotten wood, bark, leaf litter, mosses, fungi, dung, puddles, tree holes, and stream banks. Also inspect aquatic plants and rocks, as well as unoccupied animal nests and burrows. Sometimes you don’t have to go looking for invertebrates – horseflies, deerflies, mosquitoes, and arachnids such as ticks and mites might come to feed on you!

SPRING (MARCH - MAY)

The warmer, longer days of spring are most welcome after the dark, cold winter season. Each spring, at the time of the equinox (~March 20th), the axis of the Earth begins to tilt once again toward the sun. Daily temperatures inch higher, and daylight lingers longer each afternoon. Plants and animals respond to these cues, and activity returns to all habitats – pond and brook, marsh and coast, and field and forest.

Although days are progressively warmer overall, spring arrives in fits and starts, with mild sunny days interspersed with cool, blustery weather. The first invertebrates to be seen each spring are typically those that have overwintered as adults and are able to take advantage of a warm afternoon to become active for at time. Mourning cloak and comma butterflies emerge from their hiding places under tree bark to search for sap on which to feed. Other early spring insects, like carrion beetles and fruit flies, can be found clustered around flowers of the early-blooming skunk cabbage. Attracted by its maroon color and odor of rotting meat, the insects benefit from the flower's warmth, which can reach 86°F.

One of the earliest caterpillars to appear is the eastern tent caterpillar. In the fall, the moth lays her eggs in a glossy black ring around a twig of cherry or similar tree. The eggs hatch in the spring, just as the trees begin to leaf out. The newly hatched caterpillars are black, enabling them to absorb the heat of the sun. They bask together in tight clusters to conserve heat; their long silky hairs help reduce heat loss.

As the soil warms, earthworms, centipedes, and other invertebrates move upward toward the surface to become

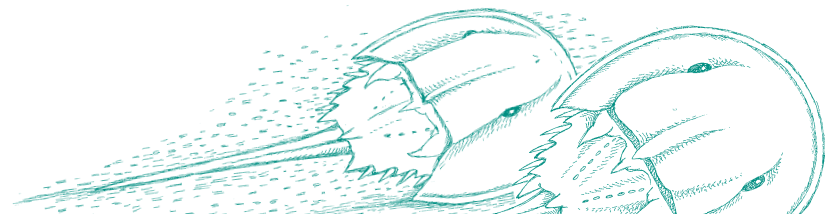
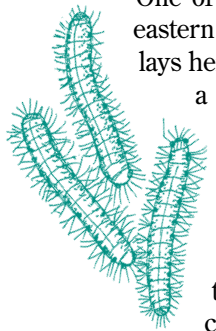


active again, while queen paper wasps, bumble bees, and carpenter bees emerge from hibernation and begin their search for nesting sites. Both bees are important early spring pollinators and can be seen collecting pollen and nectar from woodland wildflowers such as bloodroot, Dutchman's breeches, and trout lily. Overwintered egg sacs of insects and spiders warm up, and the young begin to hatch. Some spiders begin to make small webs.

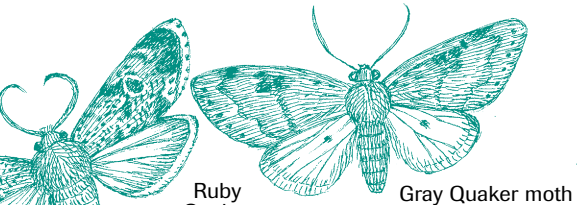
The city's ponds and streams are usually filled to overflowing with water from snowmelt and spring rains. Some of New York City's most unique springtime habitats are vernal ponds, which fill with water each spring and dry out by summer. Because they are dry for much of the year, such ponds lack fish and many other predators, allowing invertebrates like fairy shrimp to thrive. Fairy shrimp are small crustaceans that filter feed on phytoplankton, bacteria, and protozoa. Watch for them swimming upside-down at the water's surface.

Spring arrives more slowly along the coast because the cold ocean waters warm up only very gradually, and the tides bring these chilly waters back and forth into the marshes and onto the beaches twice each day. Crabs, clams, and mussels respond to the slowly rising water temperatures by digging out of the mud. Fiddler crabs don't appear above ground until the temperature in their burrows reaches 60°F. Other marine invertebrates, such as horseshoe crabs, return from their hibernation sites deeper off shore. These crabs spawn on evening high tides that coincide with the full and new moons in late May and early June. Females lay up to 80,000 eggs in clusters of 4,000 in nests along beaches that are protected from the surf.

Far to the south, in Mexico, monarch butterflies have mated and are also responding to increases in day length by beginning their long return flight to the north. Most of these butterflies live long enough to reach the southern United States, laying eggs on milkweed plants along the way. In turn, their offspring will complete the return trip to the New York area, typically arriving by early summer.

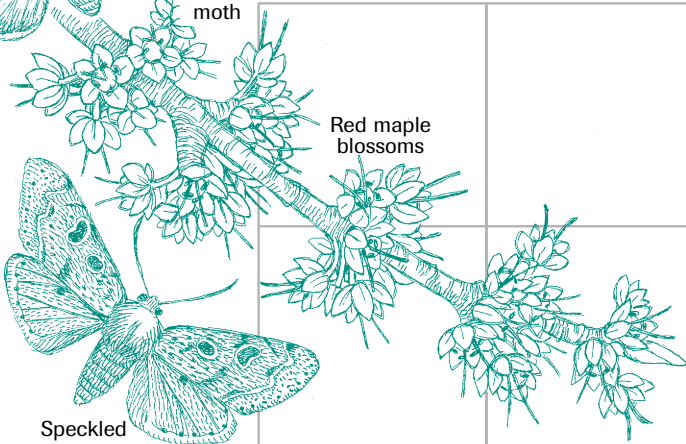


MARCH



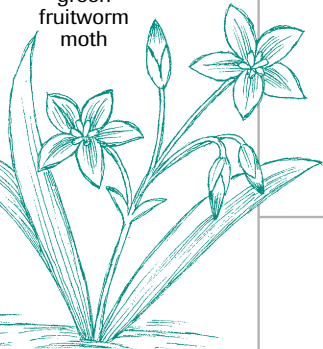
Ruby Quaker moth

Gray Quaker moth

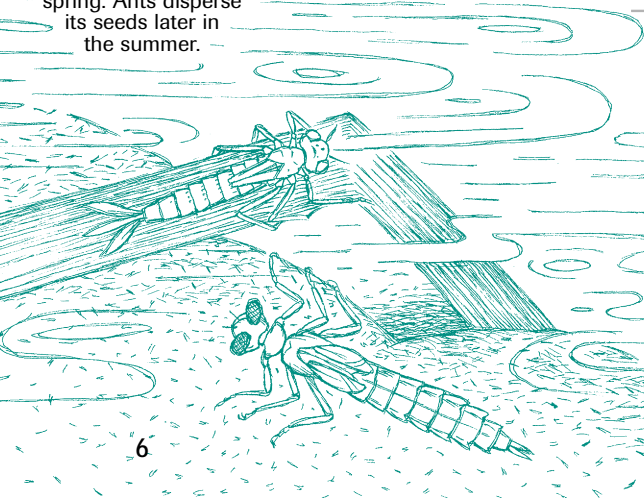


Red maple blossoms

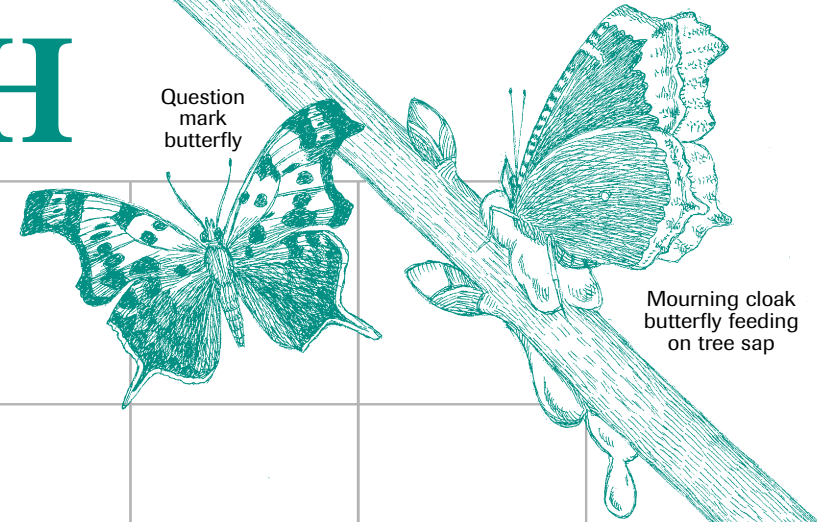
Speckled green fruitworm moth



Spring beauty is a wildflower that blooms in the early spring. Ants disperse its seeds later in the summer.



Damselfly and dragonfly nymphs are active under water. Search for them in the shallows of any pond.

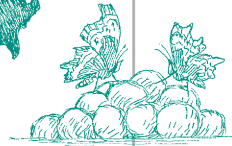


Question mark butterfly

Mourning cloak butterfly feeding on tree sap



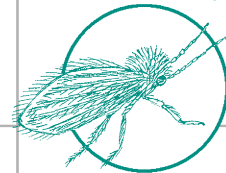
Eastern commas and other butterflies often feed on animal droppings for nutrients. Watch for feeding butterflies in wooded parks with horseback riding trails such as Forest Park, Van Cortlandt Park, and Prospect Park.



Fruit fly (enlarged view)

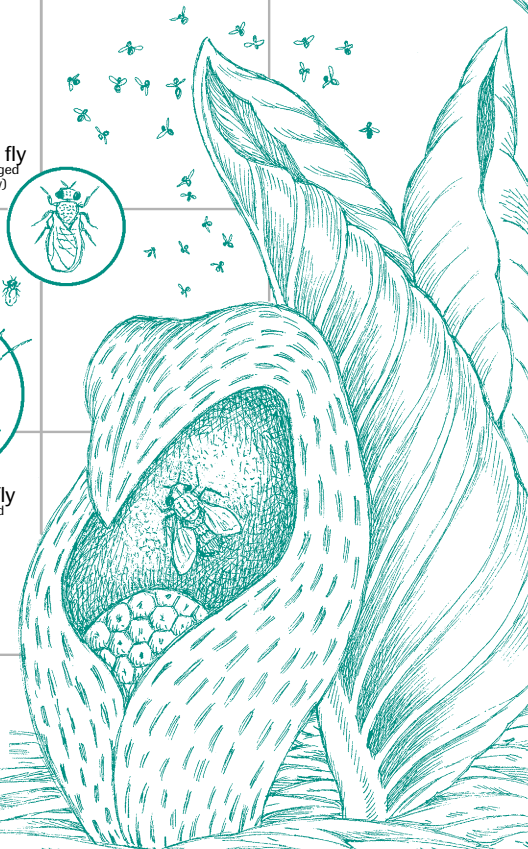


Fruit fly (actual size)



Moth fly (enlarged view)

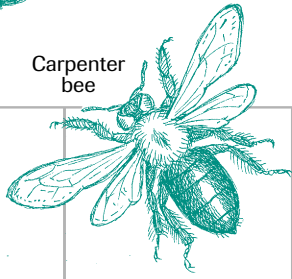
Moth fly (actual size)



Small mothflies, fruit flies, and larger flies are attracted to the smell and color of skunk cabbage flowers. Look for skunk cabbage in the wet woods of many borough parks, particularly Van Cortlandt Park, Pelham Bay Park, Forest Park, Prospect Park, and the Greenbelt.

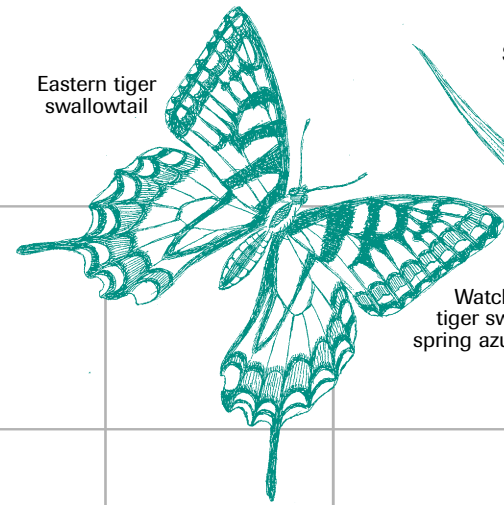
Tiny mining bees collect pollen from pussy willow blossoms, found in many park wetlands.

Carpenter bee

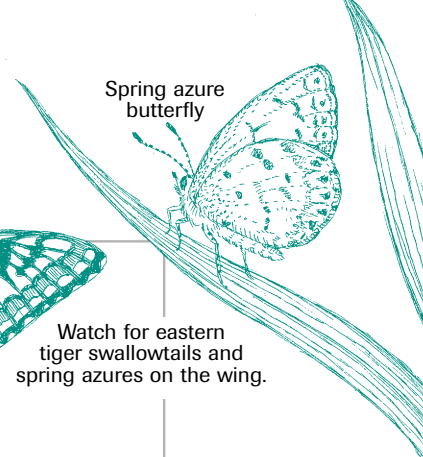


APRIL

Eastern tiger swallowtail

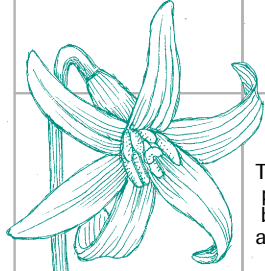


Spring azure butterfly



Watch for eastern tiger swallowtails and spring azures on the wing.

Trout lilies are pollinated by bumble bees and carpenter bees.



Ticks become active in warmer weather.

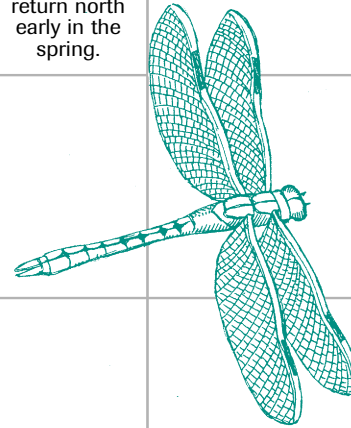


Dog tick

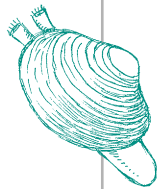


Black-legged tick

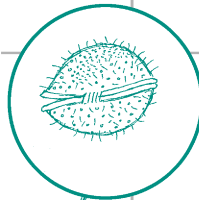
Green darner dragonflies return north early in the spring.



Fingernail clams (actual size less than 1/2 inch) can live two to three years.



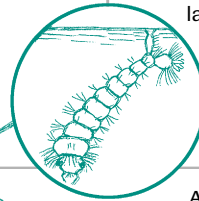
Ostracods (actual size 1/10 inch), also called seed shrimp, are related to crabs and lobsters.



Fairy shrimp swim upside down, filtering bacteria and plankton to eat.



Mosquito larva



Bee fly

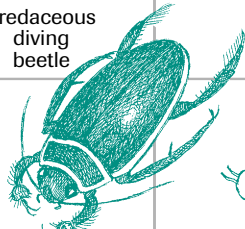


Bloodroot



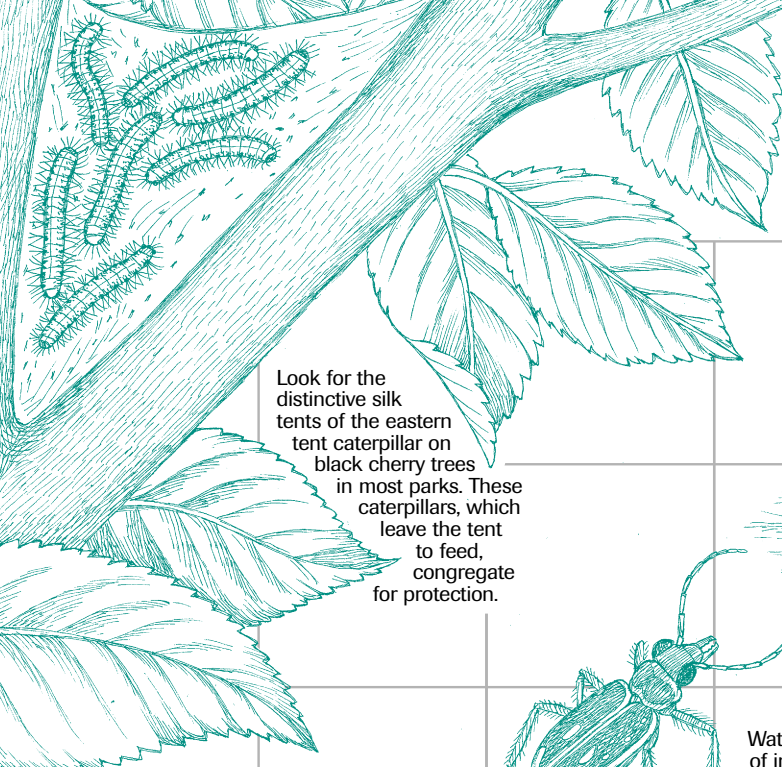
Vernal ponds can be seen at Van Cortlandt Park, Alley Pond Park, Cunningham Park, and High Rock Park.

Predaceous diving beetle



A bumble bee queen emerges from hibernation and a bee fly feeds on bluets. Bee flies are parasites, laying their eggs on larval bumble bees. Upon hatching, the larval bee flies feed on the young bumble bees.

MAY

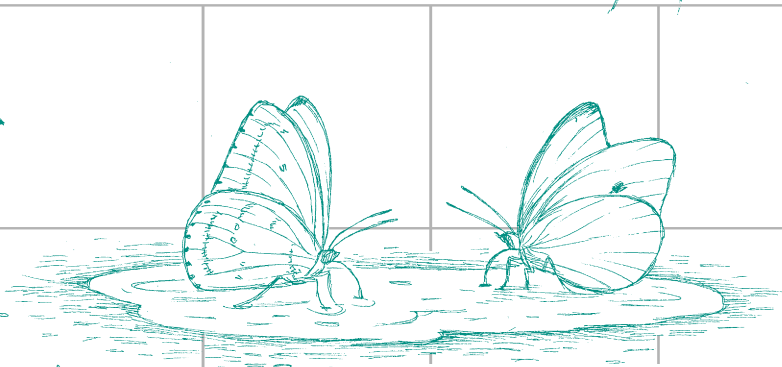


Look for the distinctive silk tents of the eastern tent caterpillar on black cherry trees in most parks. These caterpillars, which leave the tent to feed, congregate for protection.

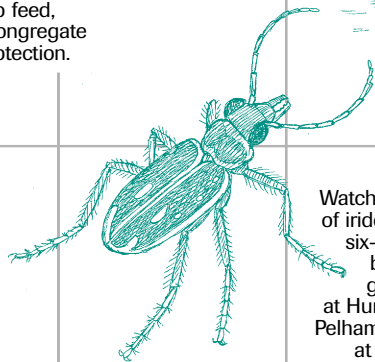


Adult mayflies and mayfly nymph

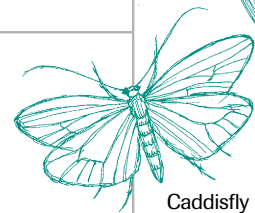
Ebony jewelwing damselflies flash their black wings along the Loch in Central Park and other wooded city streams.



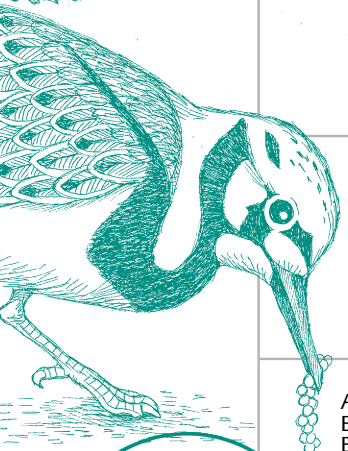
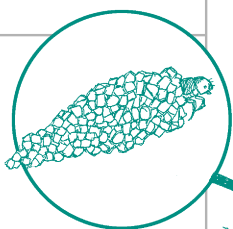
Many butterflies, like these cabbage whites, gather at puddles to drink.



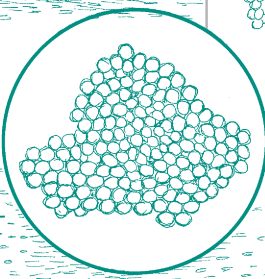
Watch for the flash of iridescent green six-spotted tiger beetles along gravelly paths at Hunter Island at Pelham Bay Park or at Jamaica Bay Wildlife Refuge.



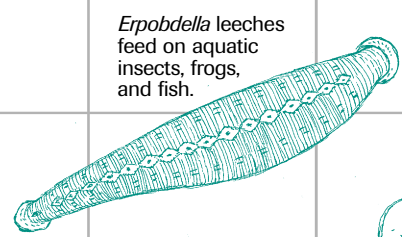
Caddisfly larvae find protection in pebble or stick cases, emerging as adults in spring.



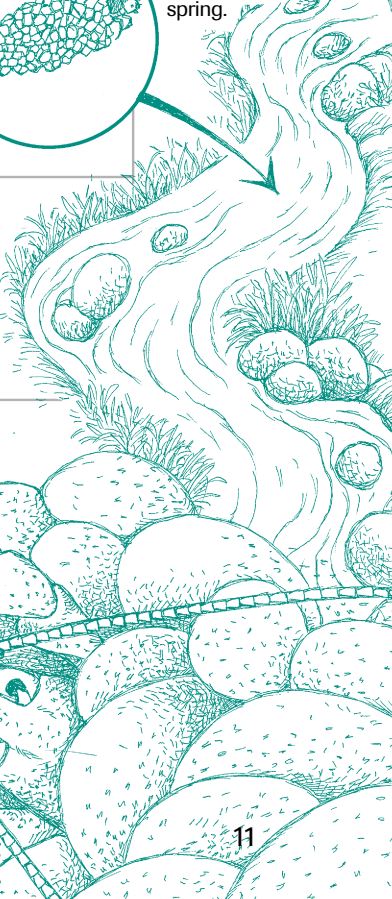
A ruddy turnstone feasts on horseshoe crab eggs. Visit Plumb Beach (Gateway National Recreation Area) and the Little Neck Bay shoreline to see spawning horseshoe crabs, especially in late May around the full moon. Horseshoe crabs feed on worms, small clams, and crustaceans.



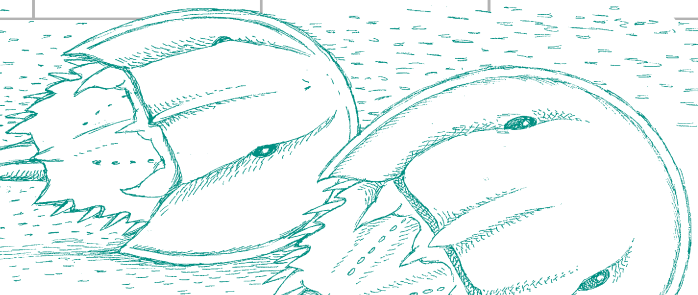
Horseshoe crab eggs



Erpobdella leeches feed on aquatic insects, frogs, and fish.



In streams, red swamp crayfish lurk between rocks, emerging by dark to feed on unsuspecting invertebrates.



SUMMER (JUNE - AUGUST)

Invertebrate activity is at its peak during the long, hot days of summer, with its abundant food and diversity of seasonal habitats. Bees and butterflies feed on nectar found in flowers, spiders build webs to catch unwary insect prey, mayflies emerge from the rivers to mate and die (often all in one day), cicada killer wasps hunt for cicadas, and centipedes and earthworms move through garden soils.

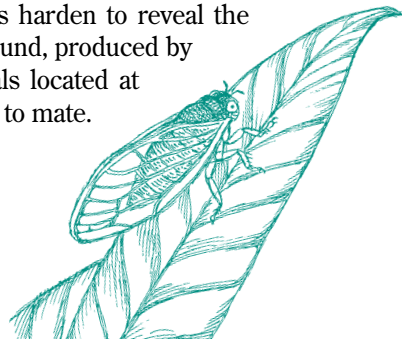


Summer nights are also alive with invertebrate activity.

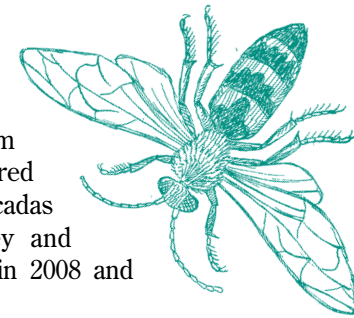
In June and July, woodland edges and fields are often lit by the flashes of fireflies, or lightning bugs. Actually neither flies nor bugs, these beetles use their glowing light to attract mates. Males usually fly around “flashing,” while females perch on vegetation or on the ground and flash back if ready to mate. Each firefly species has its own flash pattern. Its light, called bioluminescence, is produced by a chemical reaction within specialized cells in the beetle’s abdomen. By August, summer nights are filled with the first serenades of katydids and tree crickets calling from their leafy perches.

While invertebrates generally flourish in the warmth of summer, they can suffer or even perish during heat waves, especially when coupled with dry spells or drought. How do invertebrates deal with such extreme conditions when soil moisture declines, ponds dry out, and stream water levels drop? Some invertebrates aestivate (become dormant), burrowing deeper into the soil or pond mud to wait for rain. Others, like many butterflies, become active earlier in the morning, avoiding the heat of the day.

Annual cicadas, also called dog-day cicadas, seem to relish the warm temperatures, filling the air with their “drone” on the hottest of summer days. Beginning in mid to late July and continuing through September, mature cicada nymphs (larvae) emerge from the ground during the evening hours and crawl up a tree trunk or other object. There they shed their old skin, their wings unfurl, and their bodies harden to reveal the green-veined adult forms. The droning sound, produced by males using special organs called tymbals located at the base of the abdomen, attracts females to mate.

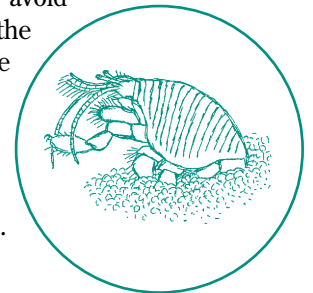


Annual cicadas usually live for three to five years, spending most of their lives underground feeding on plant rootlets. The adults emerge for only a few weeks. In contrast, periodical cicadas (of which there are seven species) live underground for anywhere from 13 to 17 years. These cicadas have black bodies with red wing veins and bright red eyes. Locally, periodical cicadas occur in Staten Island and parts of New Jersey and Connecticut. Mark your calendar for emergences in 2008 and 2013, typically in late May and early June.



Along the coast, calico crabs flourish in the warming ocean waters, while rock crabs move offshore to their preferred cooler waters. Although water temperature is important, the daily movement and reach of the tides have a greater influence on the activity of many coastal invertebrates. The sandy beaches on New York City’s coast contain a variety of animals. Mole crabs and sand fleas live right along the water’s edge. Farther up the beach, the highest tides deposit a line of leaves, seaweed, broken shells, and other debris called the wrack line (or strand). This debris is home to small burrowing beach fleas, isopods, beetles, and numerous visiting flies, all serving as an important food source for shorebirds. Well away from the water’s edge, in the dunes, tiger beetles dash over the sand.

The rocky coast at Pelham Bay Park harbors a different suite of invertebrates – barnacles, mussels, and sea stars find refuge in the tide pools that form among the rocks. Each actively feeds when the tides are high, then closes tightly or retreats as tidal waters recede, to avoid drying out in the hot summer sun. At low tide in the coastal marshes, mud crabs and fiddler crabs emerge from their burrows to feed or mate. Hermit crabs scavenge for food and for the perfect unoccupied snail shells to call home. Salt marsh snails hunker down in the mud at the base of marsh grasses, climbing back up the stems to feed as the tide returns.



JUNE



Mosquitoes



Red-winged blackbird

Lo moth

Ipsilom dart moth

Gem moth

Yellow underwing moth

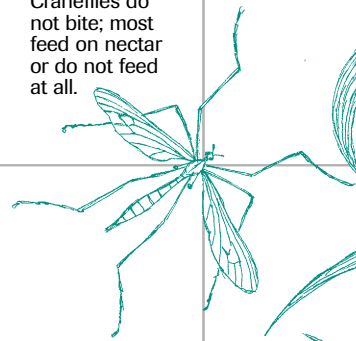
Bent-line carpet moth

Many insects are attracted to lights.



Watch for clusters of tiny brown ants (about 1/16 inch long) at the edges of sidewalks and grassy lawns citywide. Battles between "warring" pavement ant colonies may last for hours.

Craneflies do not bite; most feed on nectar or do not feed at all.

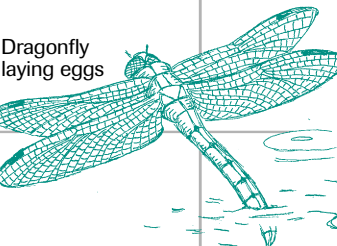


Mating damselflies

Cattails

Adult caddisfly

Dragonfly laying eggs



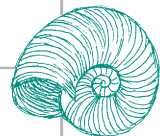
Green frog

The eastern floater mussel filters plankton from the water.

Whirligig beetles cluster in a group to confuse predators.

Caddisfly larvae graze on algae and other small organisms.

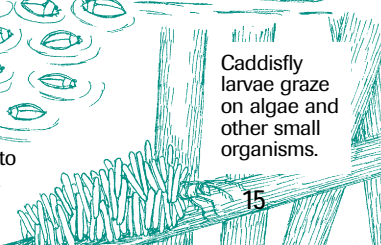
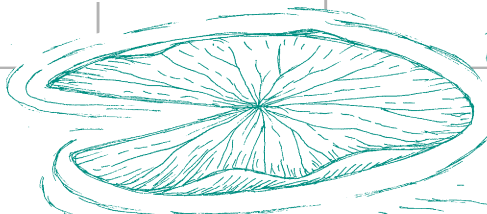
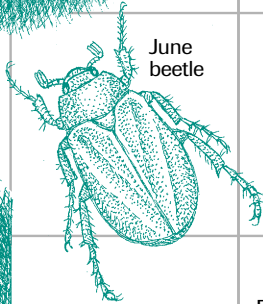
Look for these and other invertebrates in wetlands and along lake and pond edges of Van Cortlandt Park, Prospect Park, Kissena Park, Seton Falls Park, and Spring Pond in Blue Heron Park.



Ramshorn snail shell

Fireflies are active at night. Each species flashes with a distinct pattern to attract a mate.

June beetle



JULY

Annual cicadas begin calling, even from street trees on hot days in late July. Search for their shed skins on tree bark.

Explore a milkweed patch in an old field. Good places to search are the meadows at Orchard Beach at Pelham Bay Park, Vault Hill in Van Cortlandt Park, Jamaica Bay parks, Blue Heron Park, and the Greenbelt.

Ichneumon wasp

Crab spider sitting in wait for unsuspecting prey

Monarch butterfly caterpillar and egg

Spittle bug

Leafhoppers

Gray hairstreak butterfly

Milkweed bug

Hummingbird clearwing moth feeds on nectar in bee balm.

Female cicada killer wasps capture, paralyze, and carry cicadas to underground burrows, where the wasp deposits an egg on the cicada. Upon hatching, the larva feeds on the cicada. Watch for wasps in late July in places where there is sandy soil for burrowing, such as the 102nd Street meadow in Central Park and along Healey Avenue next to Bayswater Point State Park.

Japanese beetles feed on many kinds of plants, including poison ivy.

Lady beetles eat many garden pests. Did you know that most of our lady beetles are not native but were introduced for pest control?

Tomato hornworm, the larva of the hornworm sphinx moth

Bumble bees pollinate squash and tomatoes.

Vegetable and flower gardens host a variety of invertebrates. Observe them in your community garden or visit the Central Park Conservatory Garden, Riverside Park, New York Botanical Garden, Wave Hill, Brooklyn Botanic Garden, and Staten Island and Queens Botanical Gardens.

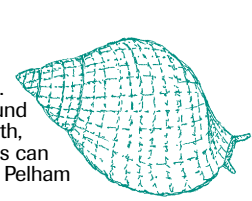
Slugs and snails emerge at night to feed.

AUGUST

Seaside dragonlet dragonfly



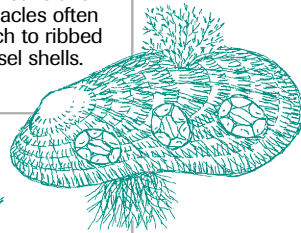
Dogwinkle. Usually found farther north, these snails can be seen at Pelham Bay Park.



Oyster drills feed on oysters by drilling a hole in their shell and sucking out their soft body parts.



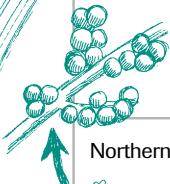
Bryozoans and barnacles often attach to ribbed mussel shells.



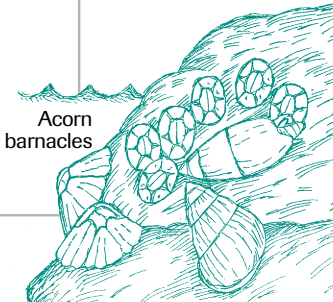
Fiddler crabs use their larger claw to defend territory and attract a mate.



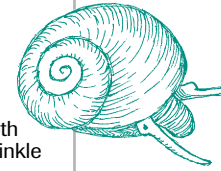
Northern bayberry



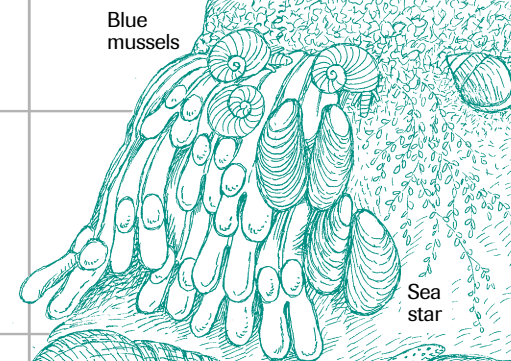
Acorn barnacles



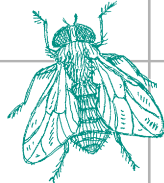
Smooth periwinkle



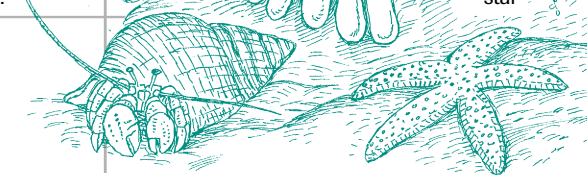
Blue mussels



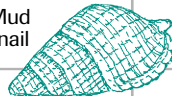
Adult greenhead flies spend their larval stage in salt marsh mud.



Hermit crabs carry around an empty snail shell in which to protect themselves.



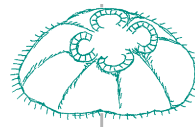
Mud snail



Sea star



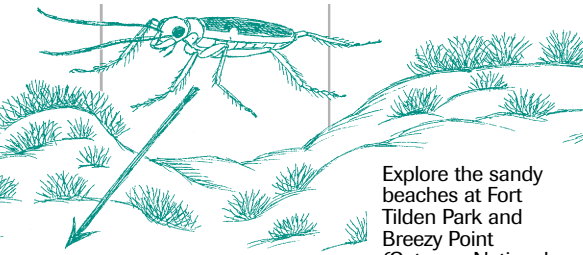
Moon jelly. These small jellyfish, which give a mild sting, often show up in large numbers at end of summer.



American beach grass



New York City's best and most accessible rocky coast is found at Twin Islands at Pelham Bay Park. Best time to search is at low tide.

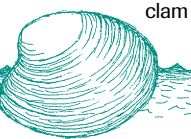


Beach tiger beetles dart among dune grasses.

The wrack line harbors beach fleas and many different kinds of flies, an important food source for shorebirds.

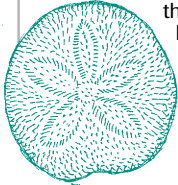
Explore the sandy beaches at Fort Tilden Park and Breezy Point (Gateway National Recreation Area), Rockaway Beach, Conference House Park, and Wolfe's Pond Park.

To see life in the salt marsh, visit Jamaica Bay and other areas in Gateway National Recreation Area, Marine Park Nature Center, and Broad Channel from the East 12th Road boardwalk.



Surf clam

Sand dollars are rarely seen, but they do live in New York's ocean waters.



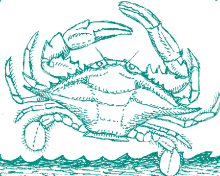
Mole crab



Coquinas burrow on ocean beaches.



Blue crab, a highly mobile predator



FALL (SEPTEMBER – NOVEMBER)

As the summer season winds down, days shorten, nights become cool, and plants go to seed. Some invertebrates respond to these cues by either migrating or preparing for the coming winter, but for many, the fall season marks the end of their brief lives.

Migration is the movement of animals from one locale to another in response to changes in environmental conditions. Many species of birds migrate, and so do many invertebrates. Probably the most famous long-distance insect migrant is the monarch butterfly, which flies over 3,000 miles from New York and areas north to the mountains of central Mexico. The butterflies that emerge here in the fall begin to fly south in late August and September, often congregating to rest and feed along the coast near Jamaica Bay and Breezy Point. Some dragonflies also migrate south for the winter, although biologists aren't sure exactly where or how far they go. Researchers at Rutgers and Princeton Universities are now using radio transmitters to track the fall movements of green darner dragonflies. Along the coast, horseshoe crabs and sand shrimp migrate from estuaries and shoreline habitats to deeper waters for the winter.

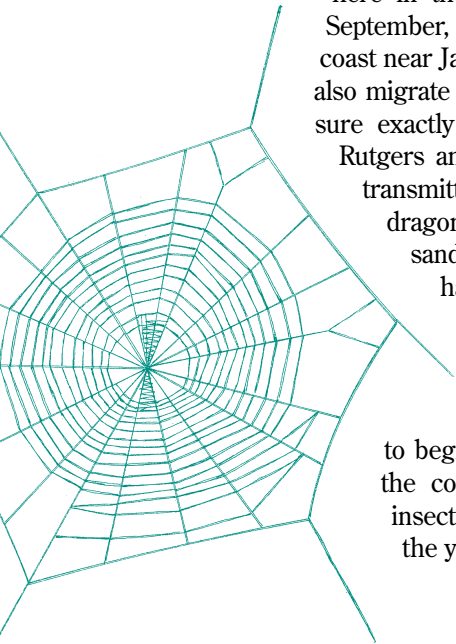
For social wasps, such as yellow jackets, paper wasps, and hornets, fall marks the end to life in the colony. For example, in the spring, a queen yellow jacket wasp lays eggs to begin a colony that grows during the summer. As the colony expands, worker wasps hunt for other insects such as flies, spiders, and caterpillars to feed the young larval wasps. The adult wasps also search



for nectar and other sugar sources to feed themselves. As food becomes scarce in the fall, wasps scavenge whatever they can get – including food from your picnic table or garbage cans, overripe fruit, or even pet food that's placed outside. With the onset of the first frosts, only new queens will survive the winter, hiding in leaf litter, under bark on trees, or in the basements and walls of people's homes.

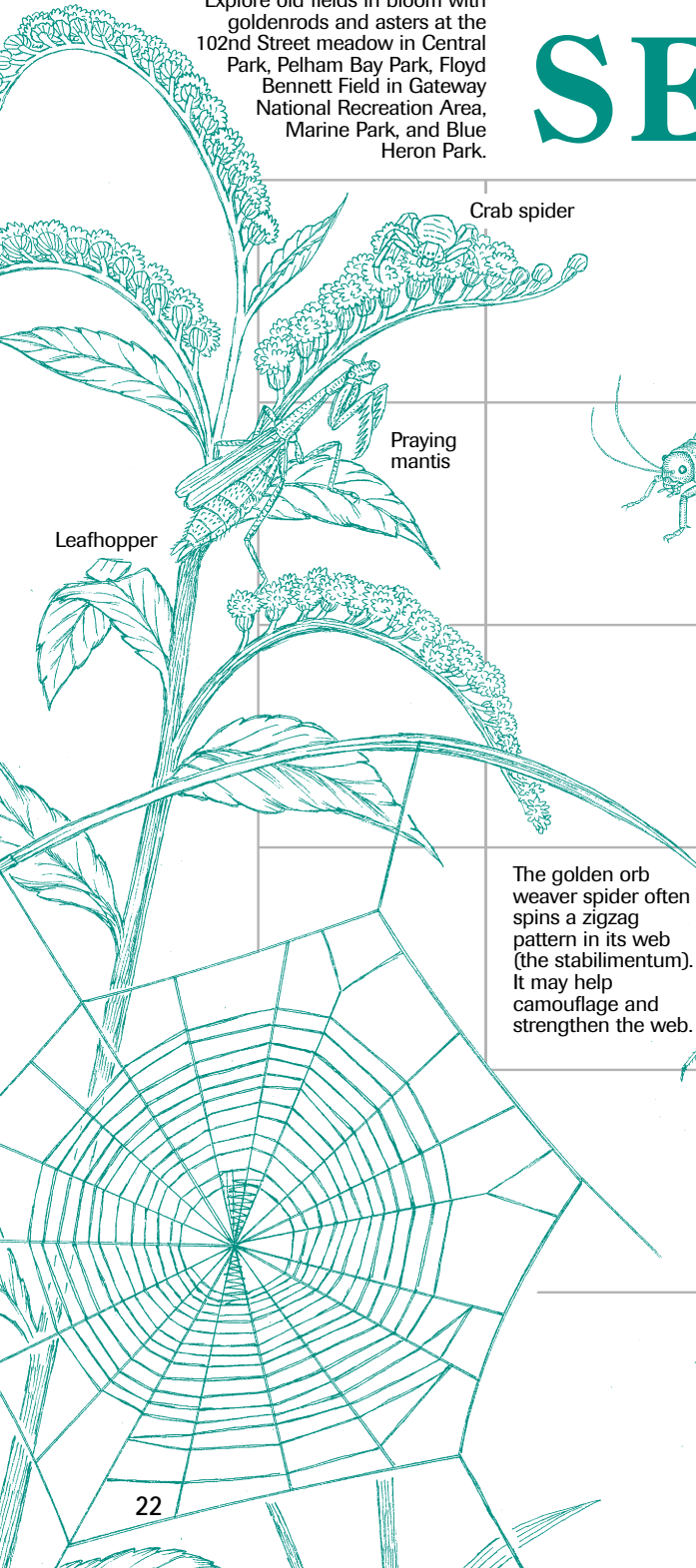
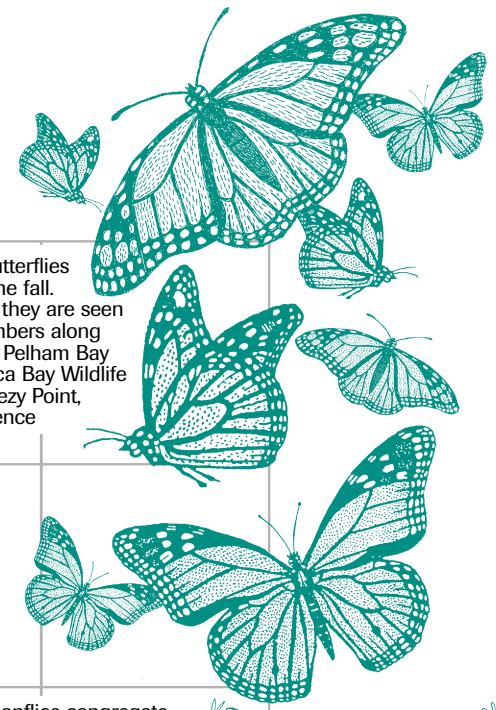
Fall is also the time that trees and smaller plants lose their leaves, building up a thick layer on the forest floor. This blanket of leaves provides protected places for seeds to germinate and for insects and other invertebrates to overwinter. What happens to these leaves each year? Over time, earthworms, millipedes, and snails “chew” larger leaves into smaller fragments, which provide food for springtails, mites, and other soil invertebrates. Finally, bacteria and fungi chemically convert the smallest bits into nutrients that enrich the forest soil and can be consumed by still more living things. Prowling through the leaves and soils are predators – ants, centipedes, spiders, and beetles – which feast on the variety of smaller invertebrates.

Just as ocean waters are slow to warm in the spring, they retain their warmer temperatures late into the season, helping to keep New York City's climate a bit milder than inland regions until later into the fall. This tempering effect, coupled with the “urban heat island” effect (buildings and pavement absorb and retain heat) gives New York City a milder climate overall. Since plants are able to bloom later into the fall, many invertebrates have a food source that allows them to survive a bit longer. Eventually, a killing frost arrives, ending the growing season until next spring.



Explore old fields in bloom with goldenrods and asters at the 102nd Street meadow in Central Park, Pelham Bay Park, Floyd Bennett Field in Gateway National Recreation Area, Marine Park, and Blue Heron Park.

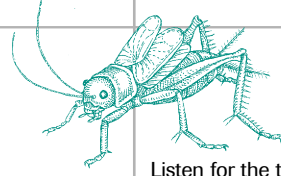
SEPTEMBER



Crab spider

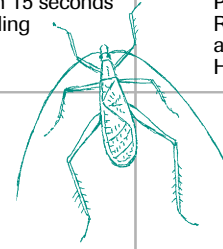
Praying mantis

Leafhopper



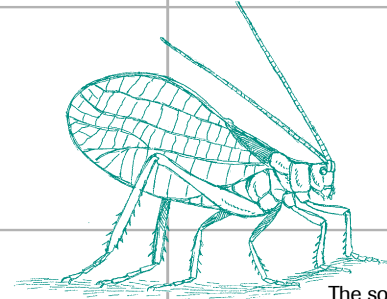
Listen for the trill of the field cricket.

Did you know that you can estimate the temperature by counting the number of snowy tree cricket chirps in 15 seconds and adding 40?



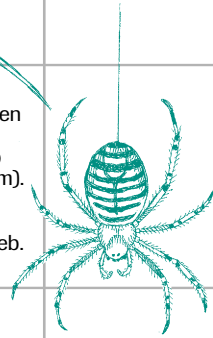
Monarch butterflies migrate in the fall. Some years they are seen in large numbers along the coast at Pelham Bay Park, Jamaica Bay Wildlife Refuge, Breezy Point, and Conference House Park.

Green darter dragonflies congregate to feed over open grassy fields, such as at Prospect Park.

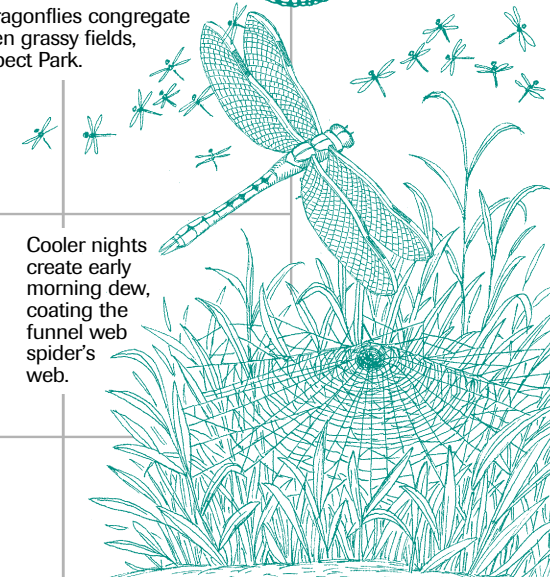


The sounds of katydids and snowy tree crickets slow down with colder fall temperatures. Listen for these anywhere in the city with trees; especially good are Inwood Hill Park and Cunningham Park.

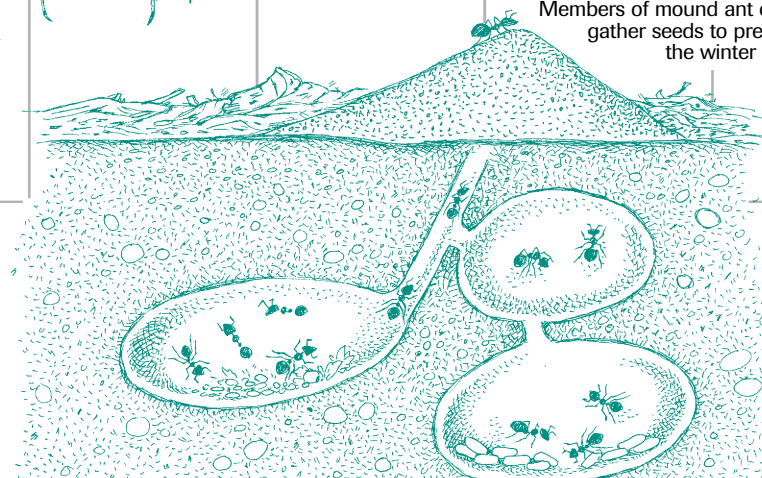
The golden orb weaver spider often spins a zigzag pattern in its web (the stabilimentum). It may help camouflage and strengthen the web.



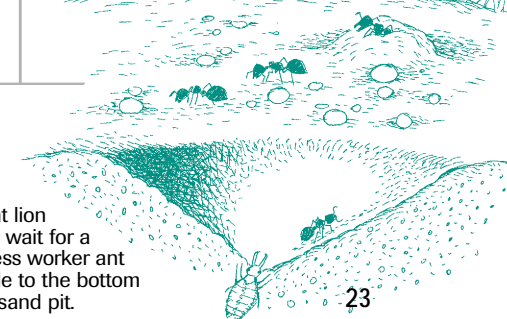
Cooler nights create early morning dew, coating the funnel web spider's web.



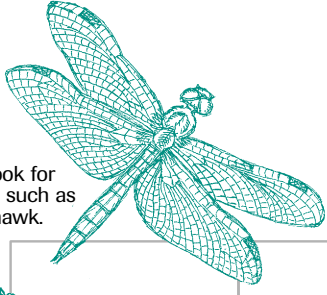
Members of mound ant colonies gather seeds to prepare for the winter months.



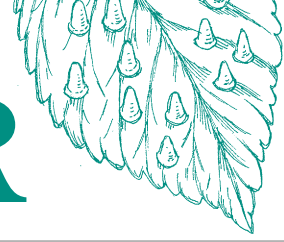
An ant lion lies in wait for a careless worker ant to slide to the bottom of its sand pit.



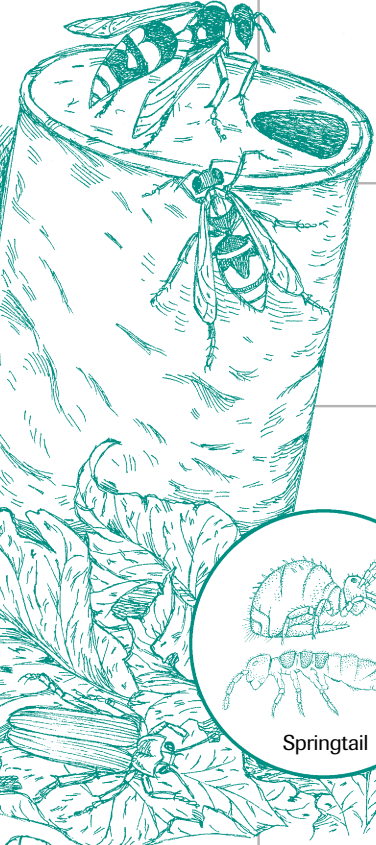
On frosty mornings in mid to late October, look for late flying dragonflies, such as the autumn meadowhawk.



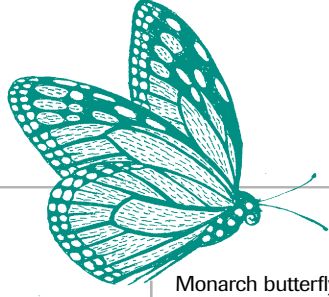
OCTOBER



Witches' caps seen on witch hazel leaves, home to the witch hazel cone gall maker aphid.

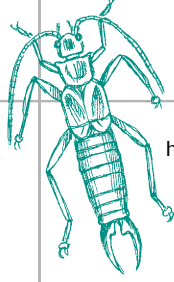


Fall webworm caterpillars make a large web around a branch of maple, hickory, or birch, and then feed on the leaves within.



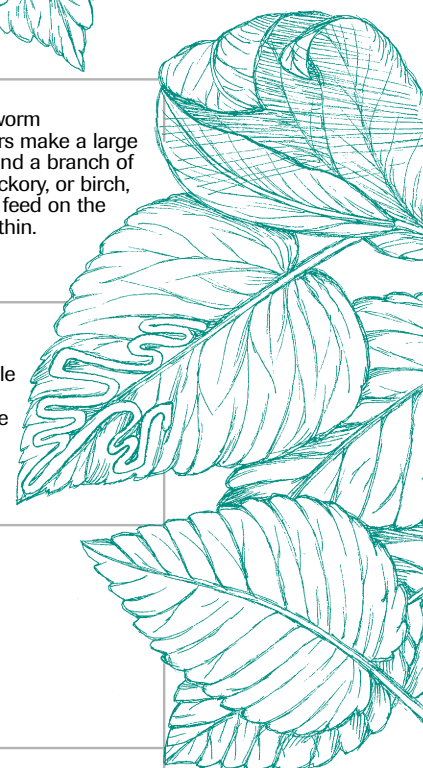
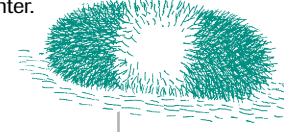
Monarch butterfly migration continues.

Leaf miner larvae nibble their way inside white snakeroot leaves.

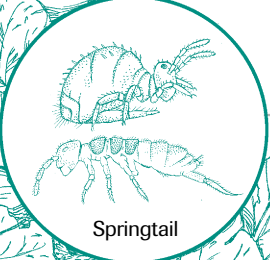


Earwigs hibernate in leaf litter.

Woolly bear caterpillars search for thick leaves in which to overwinter.



Wasp colonies are at their greatest size in the fall, so yellow jackets and other wasps are more often encountered at this time. Observe them where fruit trees have dropped fruit or near picnic sites in almost any city park.



Springtail



Carrion beetles arrive to lay their eggs on the carcass of a mouse. The bodies of dead animals don't last long on the ground because they are fed upon by larval carrion beetles and fly maggots.

Ground beetle

Fallen leaves pile up on the forest floor, supporting an important community of organisms. As soil temperatures cool, these animals retreat deeper into the ground to spend the winter.



Sowbug

Snail

Millipede

Earthworm

Slug

Mourning cloak butterflies move to protected places to spend the winter.

NOVEMBER

Glossy egg case of the eastern tent caterpillar moth

Millipede

Animals of the forest floor retreat deeper into the soil as temperatures grow colder.

Praying mantis egg mass

Stag beetle larva

Yellow jacket wasp

Cicada nymph

Carpenter ant

Snail

DO NOT DISTURB

Termite

Luna moth cocoon in the fallen leaves

Bumble bee queen

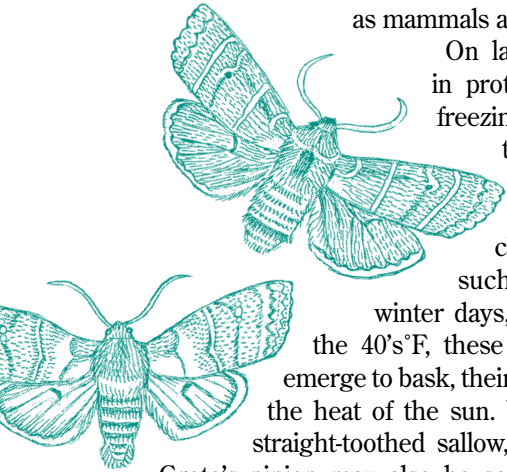
Bald-faced hornet

Queen yellow jacket wasps, bald-faced hornet queens, carpenter ants, bark beetle larvae, and termites often spend the winter in rotting logs.

Bark beetle larvae

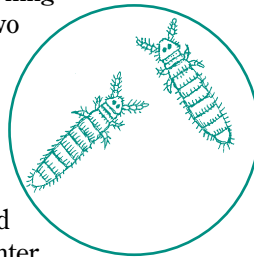
WINTER (DECEMBER – FEBRUARY)

During our winter season, the axis of the Earth tilts the northern hemisphere away from the sun, reducing both the amount and intensity of sunlight. For this reason, winter brings shorter days and colder temperatures, often with snow or ice. How do insects and other invertebrates cope with these conditions? Most are small, without any insulating fur or feathers, and cannot generate their own body heat as mammals and birds do.



On land, some adult invertebrates overwinter in protected shelters. One way they withstand freezing temperatures is by secreting chemicals that act as antifreeze to prevent the formation of ice crystals in their bodies. The comma and mourning

cloak butterflies are two such insects. On milder winter days, with temperatures in the 40's°F, these butterflies may even emerge to bask, their dark scales absorbing the heat of the sun. Winter moths such as straight-toothed sawfly, Morrison's sawfly, and



Grote's pinion may also be seen on mild, humid winter nights, insulated by dense hairs on their bodies. A flightless insect called the snow fly, a type of crane fly whose summer relatives resemble giant mosquitoes, remains most of the winter in leaf litter or under logs and stones. Occasionally on mild, sunny days, however, they too can be seen crawling over the snow in search of mates. Because they resemble little spiders, snow flies can be difficult to identify. Snow fleas, a species of springtail, often crawl up from their mossy shelters and can be found jumping on the snow's surface near the base of trees. Visit the forested and streamside areas of most city parks or natural areas on a mild winter day, and you may have a chance to find these unusual insects, and more.

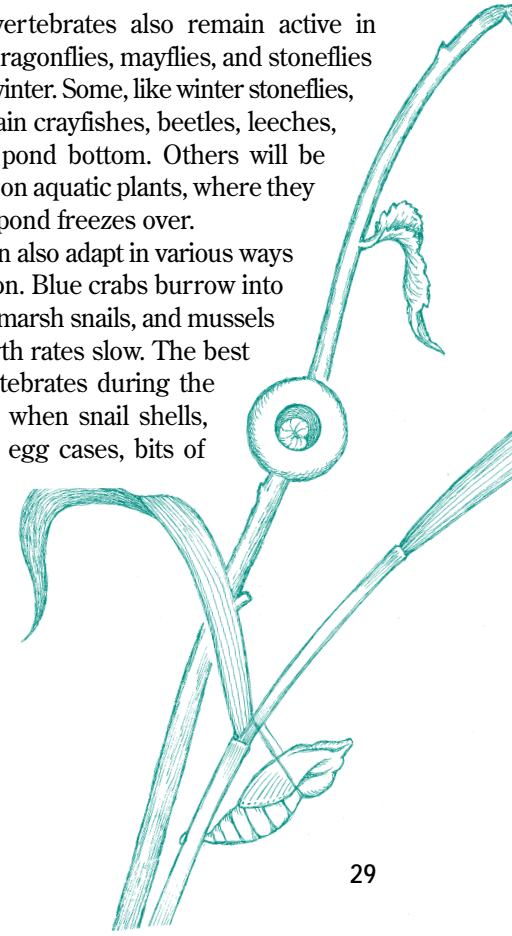
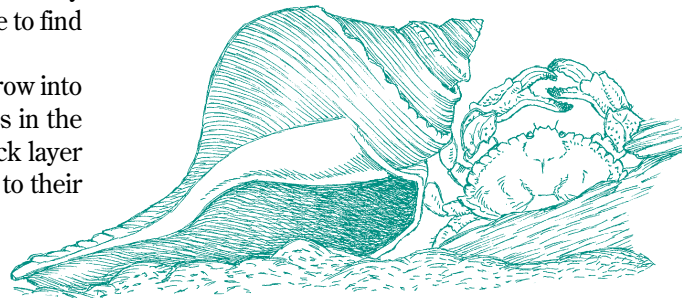
Other insects – for example, queen bumble bees and wasps – burrow into the ground, deep below the frost line. Ants retreat to sheltered places in the soil or under tree bark, as do some fireflies. Snails hide beneath a thick layer of leaves, secreting a mucus layer that hardens and seals the opening to their

shell, protecting them from cold and moisture loss during the winter. Many invertebrates take advantage of their human neighbors, seeking shelter in our homes and other buildings. In late fall, lady beetles, boxelder bugs, and cluster flies move indoors, often hiding in attics and crevices in the walls. They do no harm, and in spring they return to the outside world.

Some adult invertebrates simply die when the cold weather arrives, leaving their offspring to survive in a protected dormant stage as eggs, larvae, or pupae. For example, the praying mantis lays hundreds of eggs in a foamy mass that hardens into a tough case, insulating the eggs for the winter. Woolly bears (caterpillars of the Isabella tiger moth) find protection under thick layers of leaf litter, and polyphemus moth pupae are sheltered in their cocoons during the winter.

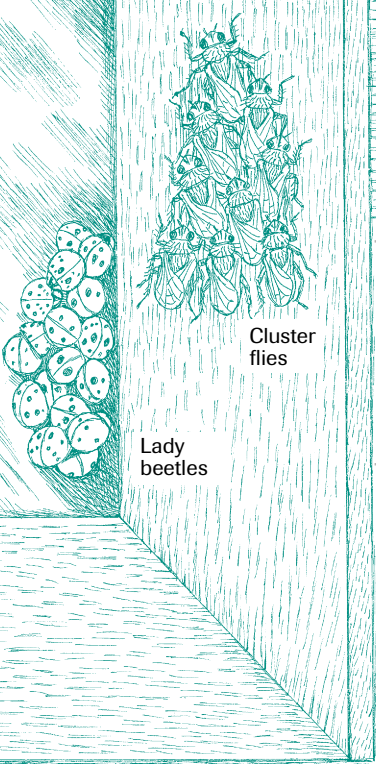
Despite the cold and ice, many invertebrates also remain active in streams and ponds. Immature nymphs of dragonflies, mayflies, and stoneflies feed actively and continue to grow over the winter. Some, like winter stoneflies, emerge in January to mate. In ponds, certain crayfishes, beetles, leeches, and clams may hibernate, buried in the pond bottom. Others will be active along the pond margins or clustered on aquatic plants, where they can find good oxygen supplies even if the pond freezes over.

Invertebrates of estuaries and the ocean also adapt in various ways to the colder conditions of the winter season. Blue crabs burrow into the mud in coastal bays. Spider crabs, salt marsh snails, and mussels become dormant (inactive), and their growth rates slow. The best way to find and learn about coastal invertebrates during the winter is to visit the beach after a storm, when snail shells, crab carapaces (shells), channeled whelk egg cases, bits of redbear sponges, and parts of other marine animals wash up on the beach.



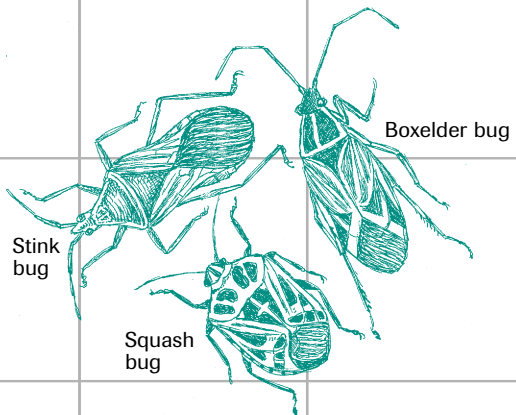
DECEMBER

Many invertebrates seek shelter and may overwinter in buildings or under windowsills and eaves.



Lady beetles

Cluster flies



Stink bug

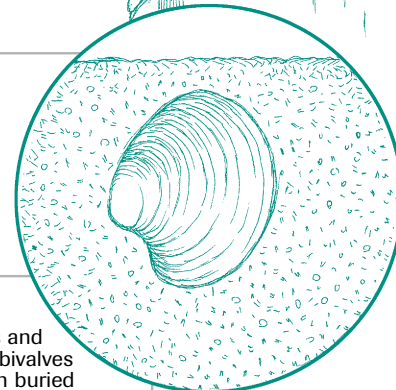
Squash bug

Boxelder bug

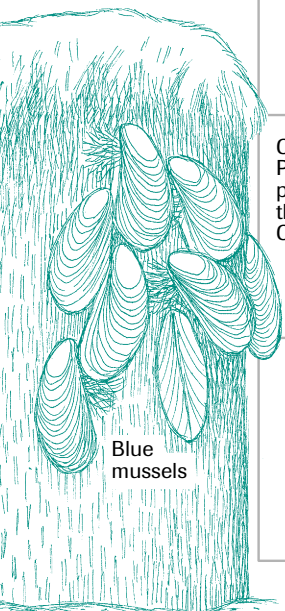


Honey bees huddle together in their colonies. They feed on stored honey, and they move constantly, generating heat to keep warm.

Acorn barnacles



Clams and other bivalves remain buried until warmer temperatures arrive with spring.



Blue mussels

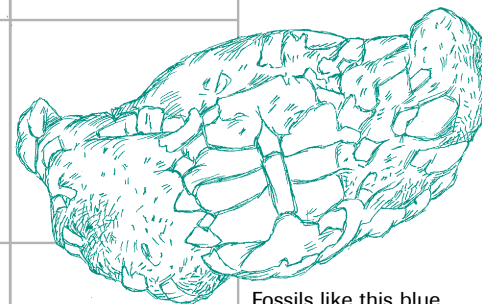
Check the pilings along Battery Park and other marinas and fishing piers along the south shore, or visit the jetties at Pelham Bay Park and City Island Bridge.

Winter storms wash shells and the remains of many invertebrates up on the beach. Visit Rockaway Beach, and beaches on Staten Island.

Common sea star

Surf clam

Red beard sponge



Whelk egg case

Fossils like this blue crab concretion (a hard, solid mass of accumulated minerals) are sometimes found washed ashore.

Jingle shell

Channeled whelk

Calico crab

Sand dollar

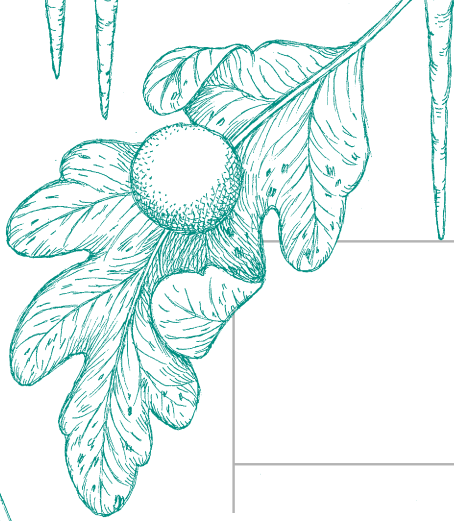
Coquina shell

Little surf clam

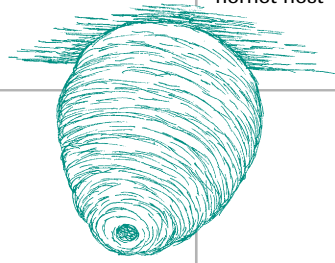
Boat shells

JANUARY

Oak apple gall harbors a tiny wasp



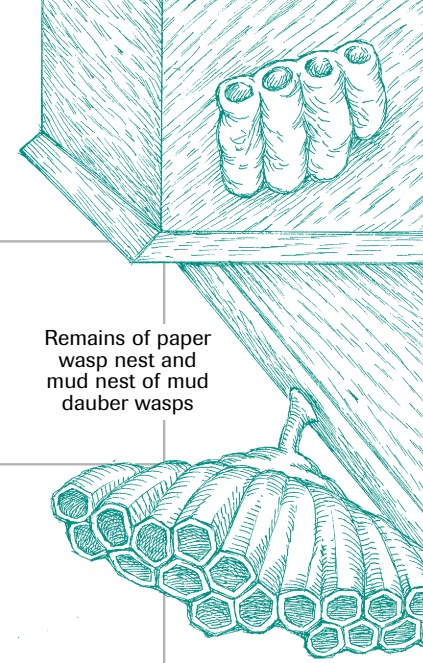
Bald-faced hornet nest



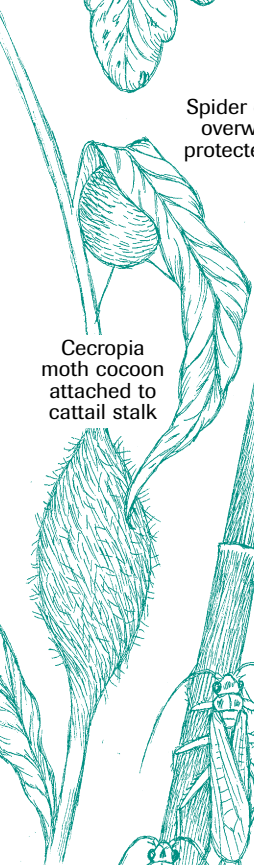
A bagworm hangs from a cedar tree. In the spring, the moth inside will crawl around, with its protective cover of silk and clipped leaves, in search of a mate.



Remains of paper wasp nest and mud nest of mud dauber wasps



Spider egg sacs overwinter in protected places

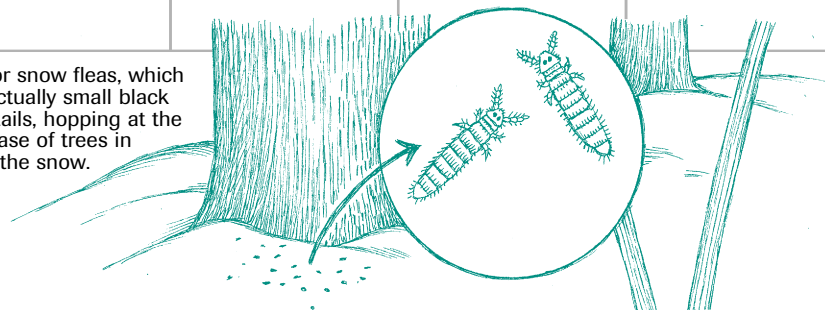


Cecropia moth cocoon attached to cattail stalk

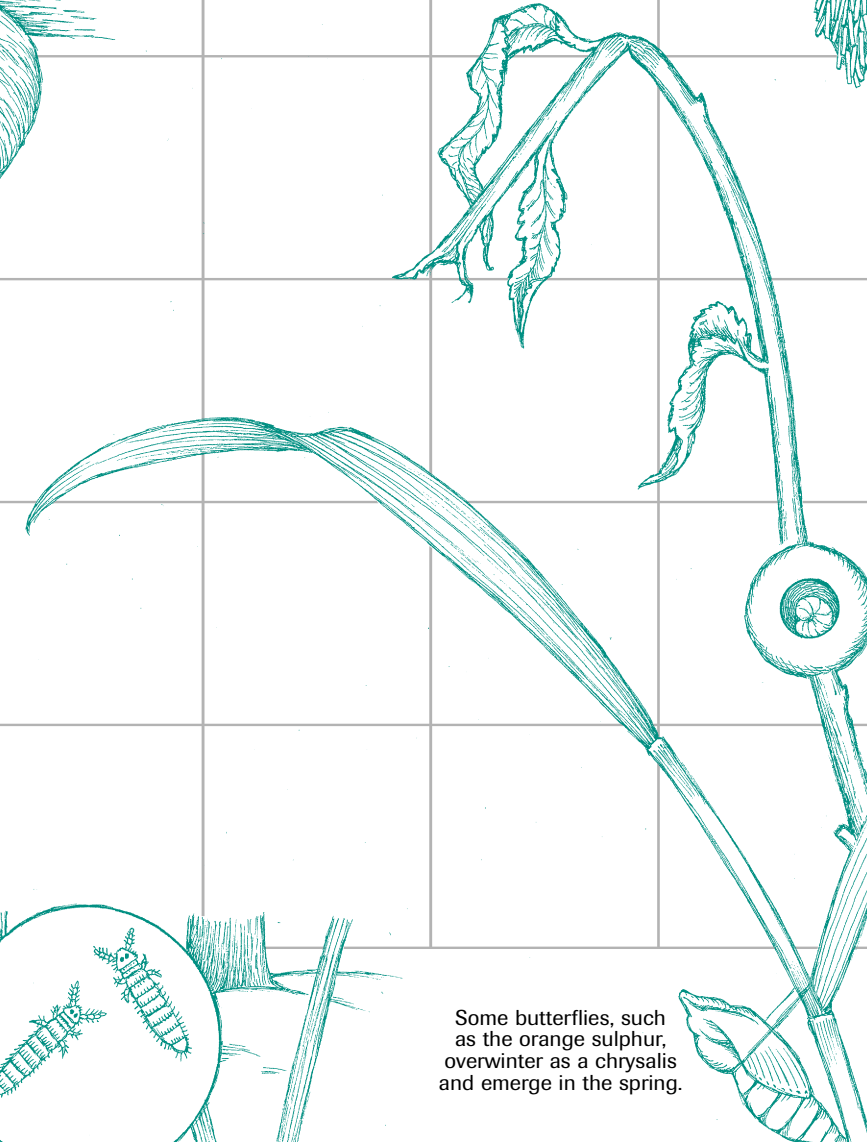
Winter stone flies emerge from streams to mate on cold winter days



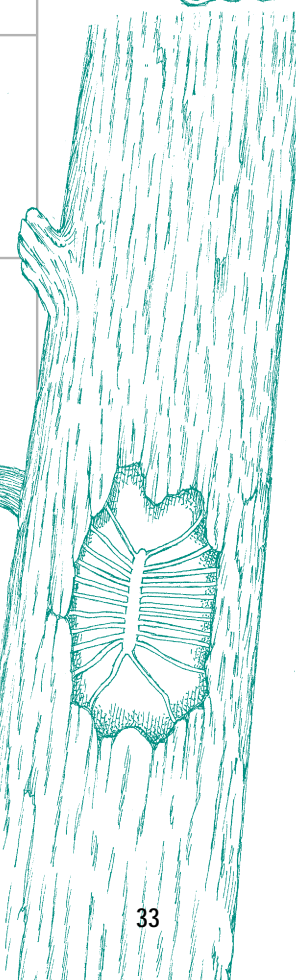
Look for snow fleas, which are actually small black springtails, hopping at the base of trees in the snow.



Goldenrod ball gall, home to a tiny gall fly larva

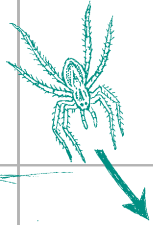
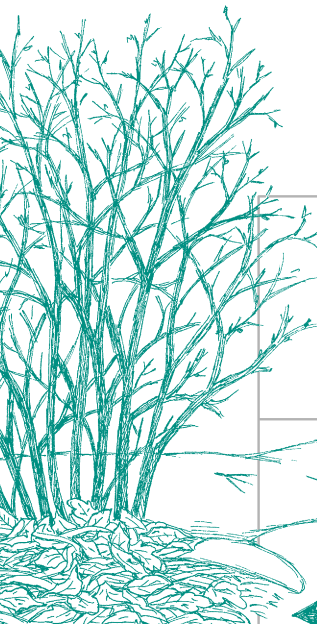


Signs of past engraver beetle activity (tunnels for egg chambers)



Some butterflies, such as the orange sulphur, overwinter as a chrysalis and emerge in the spring.

FEBRUARY



Pirate wolf spiders can be seen walking on snow; hackled weaver spiders seek shelter in leaf litter.

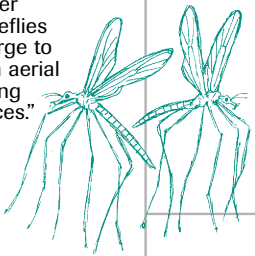


Adult scorpion flies emerge in winter.

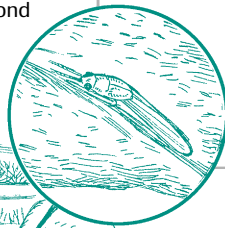


Scorpion flies

Winter craneflies emerge to fly in aerial mating "dances."



A water strider overwinters at the pond edge.



Some caddisflies emerge as adults in the winter.

Grote's pinion moth

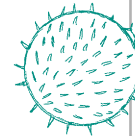


Some moths are active even in winter.

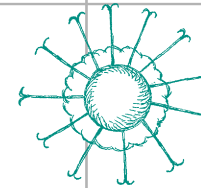
Morrison's sallow moth



Straight toothed sallow moth



Freshwater sponges and bryozoans overwinter as tiny, single-celled "buds."



Mussels and snails are usually dormant in the winter, while many aquatic beetles, isopods, and amphipods remain active. However, with a deep freeze, even the beetles and other invertebrates will rest at the bottom of the pond.

Predaceous diving beetle

Water boatman

Eastern elliptio mussel

Water scavenger beetle

Amphipod (side-swimmer)

Isopod

WHAT YOU CAN DO TO PROTECT INVERTEBRATES

- Respect invertebrates. Do not disturb them, and replace any logs or rocks that you move.
- Observe the rules of parks and natural areas. Stay on the trails, and tread lightly on soil to avoid compaction. Many bees, wasps, and soil animals nest underground, and invertebrates find shelter or they overwinter there.
- Minimize the use of chemicals such as herbicides or pesticides, in and around your home or apartment and in natural areas or community gardens.
- Plant native plant species in your gardens, and create a backyard habitat. Even a roof garden or balcony with a few potted plants can attract insects such as bees and butterflies. Visit local nurseries or check Internet sources for plants suitable for the New York City region that provide appropriate nectar sources.
- Do not use bug zappers. They are not effective against biting insects, and end up killing many beneficial ones.
- Keep New York's natural areas clean by not littering and by cleaning up pet waste. Minimizing pollution keeps our waters clean, which is critical to freshwater life in streams and ponds as well as to life in estuaries and the ocean.
- Respect "unmanicured" nature. Insects and other invertebrates need undisturbed natural habitat. Let fallen logs, thick leaf litter, and hollow twigs remain in place – they provide important nesting and overwintering sites. Tall grass and low overhanging trees shelter adult fireflies and other insects during bad weather, and these plants provide protected places to rest. Wait until spring to tidy up your garden so that beneficial garden insects have places to hide undisturbed in winter. The driftwood, bits of shells, and seaweed that wash up on our beaches provide important habitat for a variety of coastal animals.
- Minimize the use of artificial outdoor lighting. Use outdoor lighting only when needed, or replace bulbs with low-pressure sodium bulbs or yellow fluorescent bulbs. Life evolved in response to predictable day and night cycles and altering them can alter invertebrate behavior. For example, outdoor lights interfere with fireflies' luminous signals and may cause some species to flash less if the night sky is too bright. Artificial lights at night can also make invertebrates like moths more susceptible to predation by bats or spiders.
- Encourage federal, state, and local agencies and other organizations to protect natural areas in New York City. Even small remnants of natural habitats provide important microhabitats suitable for invertebrates.

LEARN MORE ABOUT INVERTEBRATES

Books

- Bertness, M. D. 2007. *Atlantic Shorelines: Natural History and Ecology*. Princeton University Press, Princeton.
- Golden Guide Series (insects, butterflies and moths, spiders, insect pests, seashore life) Golden Press, New York.
- Johnson, E. A. and K. M. Catley. 2002. *Life in the Leaf Litter*. American Museum of Natural History, New York City.
- Marshall, S. A. 2006. *Insects: Their Natural History and Diversity*. Firefly Books, Ltd., Richmond Hill, Ontario.
- Peterson Field Guide Series (Insects, Butterflies, Moths, Caterpillars, Atlantic Seashore), Houghton Mifflin Company, Boston.
- Waldbaum, G. 1998. *Insects Through the Seasons*. Harvard University Press, Cambridge.

Web Resources

- BugGuide: <http://bugguide.net/node/view/15740>
- Discover Life: www.discoverlife.org/
- Insects and Invertebrates of Long Island:
<http://www.newsday.com/other/special/naturalworld/ny-nw-dad-main-0608,0,6183654.story?coll=ny-nw-bottom-promo>
(Search the database for insects or invertebrates.)
- What's That Bug?: www.whatsthatbug.com/

Organizations

- Center for Biodiversity and Conservation: cbc.amnh.org
- New York Entomological Society: www.nyentsoc.org
Meetings are held the third Tuesday of the month at the American Museum of Natural History at 7 p.m.
- North American Butterfly Association: www.naba.org
- The Littoral Society: www.alsnyc.org
- Xerces Society: www.xerces.org

***Also, contact New York City's Department of Parks and Recreation as well as other environmental organizations to find out about special workshops and nature programs about invertebrates.

MAP OF PLACES MENTIONED IN THE TEXT

BRONX

- 1 City Island
- 2 New York Botanical Garden
- 3 Pelham Bay Park
Twin Islands
Hunter Island
Orchard Beach
- 4 Seton Falls Park
- 5 Van Cortlandt Park
- 6 Wave Hill

BROOKLYN

- 7 Brooklyn Botanic Garden
- 8 Broad Channel
- 9 Gateway National Recreation Area
Breezy Point
Floyd Bennett Field
Jamaica Bay Wildlife Refuge
Plumb Beach
- 10 Marine Park
- 11 Prospect Park

MANHATTAN

- 12 Battery Park
- 13 Central Park
Conservatory Garden
102 St. Meadow
the Loch
- 14 Inwood Hill Park
- 15 Riverside Park

QUEENS

- 16 Alley Pond Park
- 17 Bayswater Point State Park
- 18 Cunningham Park
- 19 Forest Park
- 20 Fort Tilden
- 21 Kissena Park
- 22 Little Neck Bay
- 23 Queens Botanical Garden
- 24 Rockaway Beach

STATEN ISLAND

- 25 Blue Heron Park
- 26 Conference House
- 27 Staten Island Botanical Garden
- 28 The Greenbelt
High Rock Park
- 29 Wolfe's Pond Park

These are just a few of the places you can explore. In addition to federal, state, and city parks, visit local botanical gardens. Remember that New York City has a wealth of natural areas, and even pocket parks, abandoned lots, community gardens, and rooftop gardens provide habitat for invertebrates and are well worth exploring.

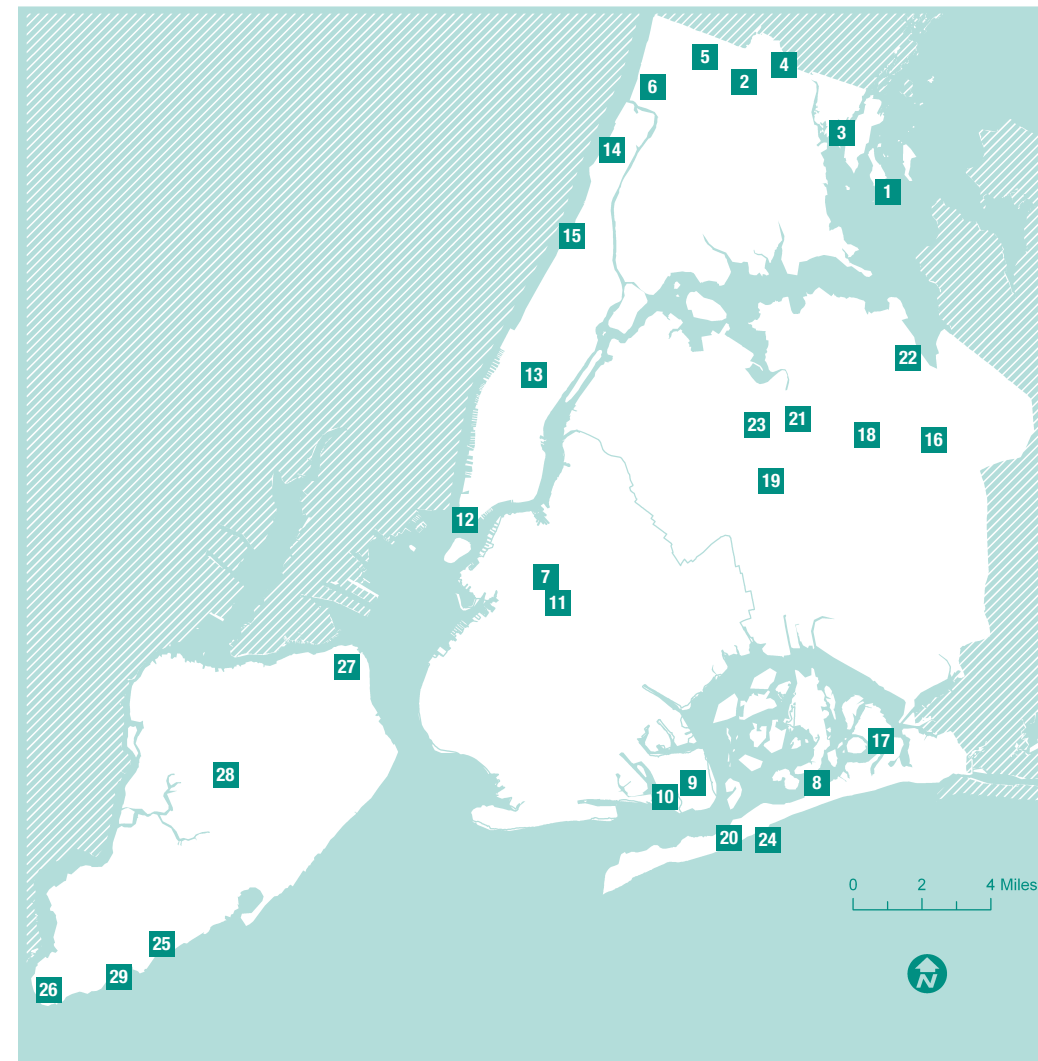
For detailed directions to city parks (call 311 or 212-New-York for information): gis.nyc.gov/parks/lc/NavigateTo.do?PAGE=NEW_SEARCH

For maps of area city, state, and other parks, gardens and open space, visit the OASIS map website:

www.oasisnyc.net/OASISMap.htm

Gateway National Recreation Area (718-338-3799): www.nps.gov/gate/

New York State Parks (212-866-3100): nysparks.state.ny.us/parks



Map by Kevin Koy

W E N E E D I N V E R T E B R A T E S !

Although we don't think about it every day, life on Earth would not be possible without the "free" services provided by invertebrates. Some of these vital services include:

- Plant pollination. Bees, wasps, moths, and even some beetles and flies travel from flower to flower to drink nectar, and bees collect pollen for their young. In the process, they all move pollen from one flower to another, fertilizing them so these plants can produce fruits and seeds. Imagine if farmers had to hand-pollinate all their crops!
- Creating fertile soil. Our parks, gardens, farms, and natural areas depend on the nutrient cycling and soil building of invertebrates, such as earthworms, millipedes, mites, springtails, and pillbugs.
- Controlling pests. Dragonflies, spiders, beetles, and other invertebrates feed on crop and garden pests such as some caterpillars (moth and butterfly larvae), plant bugs, plant lice, and leafhoppers.
- Providing food for other animals. Caterpillars, flies, beetles, moths, butterflies, and others provide "fuel" for the songbirds that migrate each spring and fall. These invertebrates are also fed upon by the birds that nest in New York City's green spaces, as well as by the frogs and salamanders that live in our wetlands, by the fish in our rivers and ponds, by the bats and shrews in our woodlands, and by the many creatures in our salt marshes, estuaries, and oceans.

Who are the Invertebrates?

Insects and spiders; millipedes and centipedes;
crabs, lobsters, and shrimps; clams and snails; jellyfishes and
corals; sponges; octopuses, squids, and cuttlefishes;
a variety of worms...and more!
