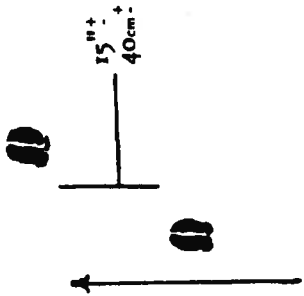
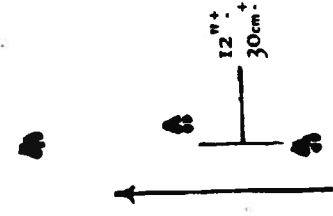


Spotter's Guide to Tracks

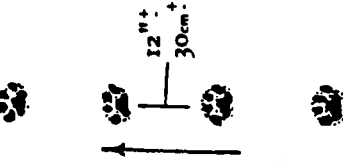
Cloven hoofs



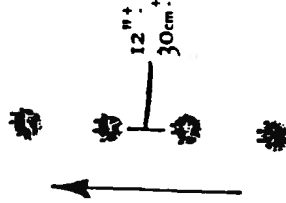
Cow (see page 20)



Deer (see page 22)

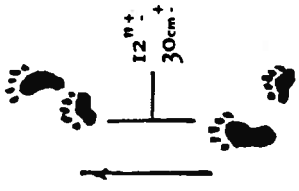


Bobcat (see page 34)

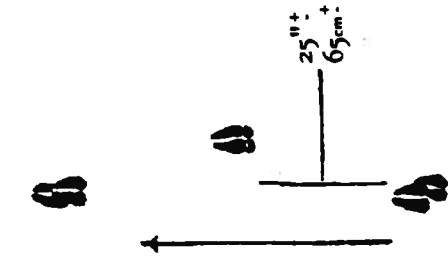


Coyote (see page 36)

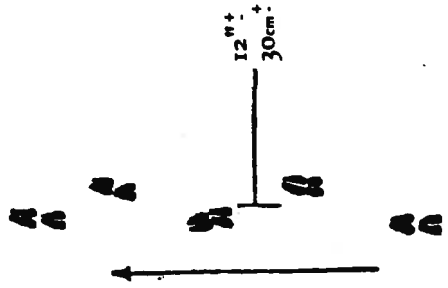
Black Bear (see page 30)



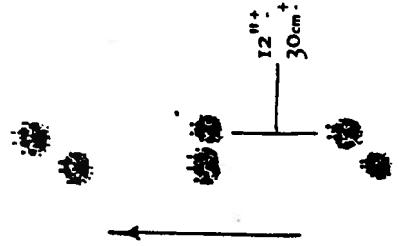
Padded Feet



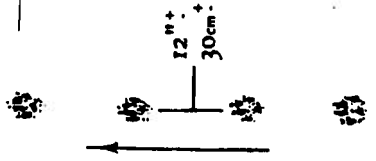
Moose (see page 24)



Sheep (see page 28)

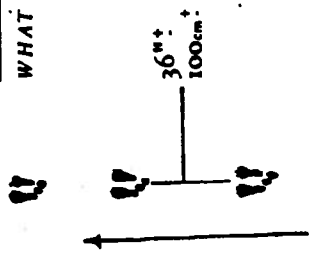


Dog (see page 38)

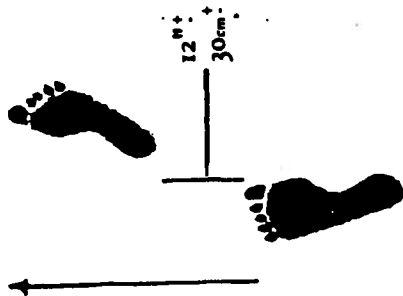


Fox (see page 40)

WHAT TO LOOK FOR

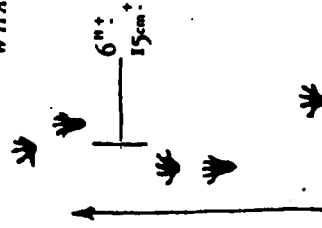


Hare (see page 42)

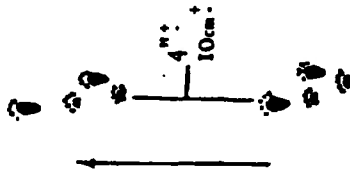


Human (see page 44)

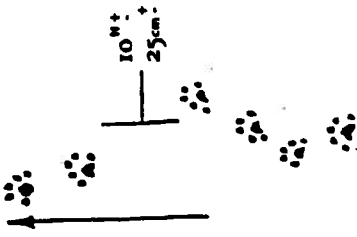
WHAT TO LOOK FOR



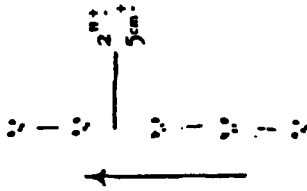
Raccoon (see page 54)



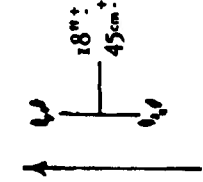
Skunk (see page 56)



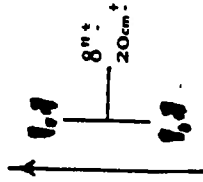
Mink (see page 46)



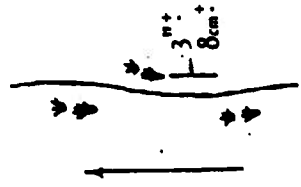
Mouse, White-footed (see page 48)



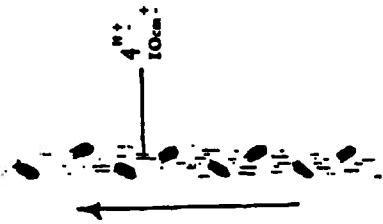
Squirrel (see page 58)



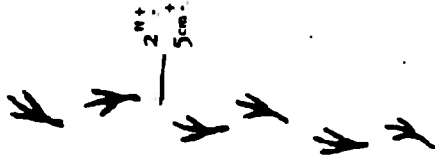
Weasel (see page 60)



Muskrat (see page 50)



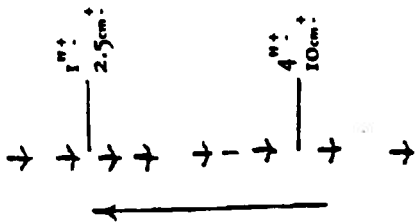
Porcupine (see page 52)



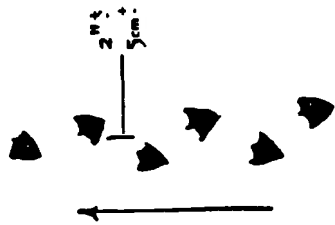
Bird Tracks

Crow (see page 64)

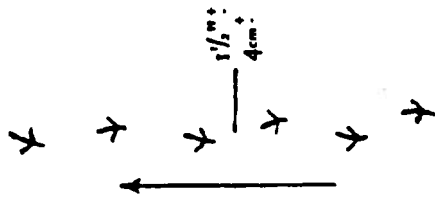
WHAT TO LOOK FOR



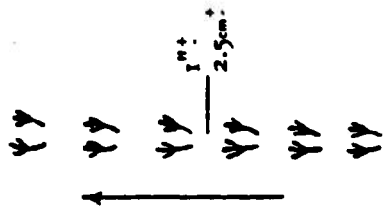
Grouse (see page 66)



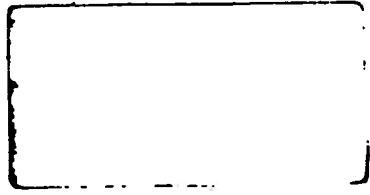
Gull (see page 68)



Pigeon (see page 69)



Sparrow (see page 70)



Spotter's Guide to Scat

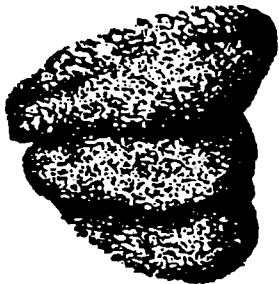


Deer (see also page 22)

Summer

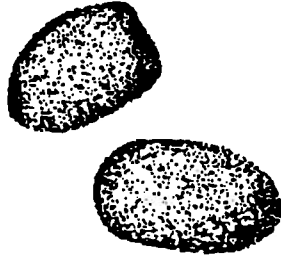


Winter



Moose (see also page 24)

Summer



Winter



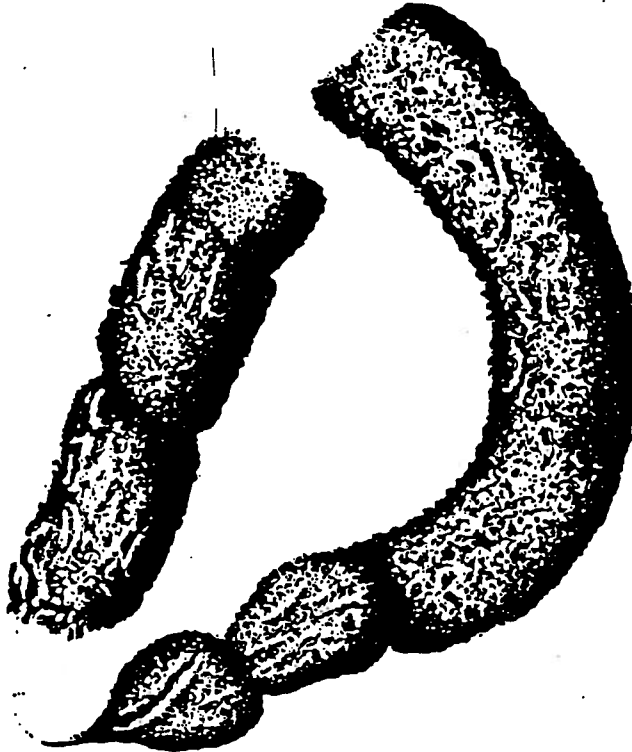
Fox (see also page 40)



Hare (see also page 42)



Bobcat (see also page 34)



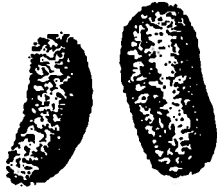
Coyote (see also page 36)



Mink (see also page 46)



Mouse (see also page 48)



Porcupine (see also page 52)

Muskrat (see also page 50)



Grouse (see also page 66)

Squirrel (see also page 58)

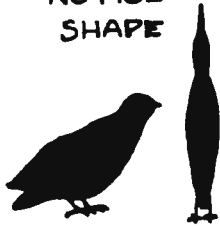


Sparrow (see also page 70)

Some Michigan Bird Songs

- American Goldfinch:** Per-chicory! (in flight), loose jumble of rapid twitters and tweets
- American Robin:** Cheer up, cheerily, cheer up, cheer up, cheerily....
- Black-capped Chickadee:** TEA-CHER!, chick-a-dee-dee-dee, cheese-burger...
- Brown Thrasher:** catbird like, but with paired phrases
- Chipping Sparrow:** Rapid, drawn out trill, on the same note
- Common Yellowthroat:** What's-a-wheel, what's-a-wheel, what's-a-wheel...
- Downy Woodpecker:** Rapid whinny, descending in pitch
- Eastern Bluebird:** 3 or 4 soft gurgling notes, Sher-bet (soft, raspy)
- Eastern Kingbird:** Pit-tew!
- Eastern Meadowlark:** Tea-YAH-tea-ye! (flute-like)
- Eastern Pewee:** Pee-a-wee! (high pitched)
- Eastern Phoebe:** Fee-BEE! (burry quality)
- Field Sparrow:** Notes given nearly all on the same pitch, but starting out slowly and increasing to a trill
- Gray Catbird:** Mew! (catlike), lengthy, disjointed notes and phrases, occasionally with a Mew! Interjected
- Great-crested Flycatcher:** Zreet! (rising in pitch)
- House Finch:** Loose jumble of rapid, raspy notes, usually ending in a wheel!
- House Wren:** Loud, rapid, gurgling, then bubbly notes rising then falling
- Indigo Bunting:** Fire-fire-where-where-quick-quick-put-it-out! (mostly paired notes)
- Northern Cardinal:** Cheer-cheer-cheer-wit-wit-wit-wit.....or Her-TEA-her TEA-her, TEA...
- Northern Flicker:** Wick-wick-wick-wick-wick....
- Red-Bellied Woodpecker:** Churr!...Churr!...
- Red-Winged Blackbird:** Kong-ka-KREE!
- Rose-breasted Grosbeak:** Robin-like, but more measured and melodious
- Rufous-sided Towhee:** Drink-your-tea-ee-ee-ee-ee!
- Scarlet Tanager:** Robin-like, but burrier quality
- Song Sparrow:** Maids-maids-maids-put-on-your-tea-kettle-ettle-ettle
- Tufted Titmouse:** Peter-peter-peter
- White-breasted Nuthatch:** Me-me-me-me-me....
- White-throated Sparrow:** Old-Sam-Peabody-Peabody-Peabody (high, thin notes)
- Yellow-billed Cuckoo:** Ka-ka-ka-ka-kowlp-kowlp-kowlp
- Yellow Warbler:** Sweet-sweet-sweet-sweeter-than-sweet!

NOTICE
SHAPE



of beak



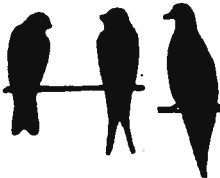
crest?



of wings



of tail



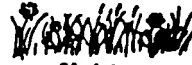
WHERE
WAS IT?



water



marsh



field



conifers



deciduous



suburbs



city

HOW DOES
IT FLY?



Checklist of Michigan Snakes

When you see and positively identify one of these snakes in a natural, unconfined situation, place a check or the date in the space to the left of the name of the snake. You may also want to make note of the location.

Family Colubridae

Subfamily Natricinae

Kirtland's Snake - *Clonophis kirtlandi* Page 13

Northern Copperbelly Snake - *Nerodia erythrogaster neglecta* Page 15

Northern Water Snake - *Nerodia sipedon sipedon* Page 17

Queen Snake - *Regina septemvittata* Page 21

Brown Snake - *Storeria dekayi* (subspecies) Page 23

Northern Red-bellied Snake - *Storeria occipitomaculata occipitomaculata* Page 25

Eastern Garter Snake - *Thamnophis sirtalis sirtalis* Page 27

Butler's Garter Snake - *Thamnophis butleri* Page 31

Northern Ribbon Snake - *Thamnophis sauritus septentrionalis* Page 33

Subfamily Xenodontinae

Northern Ringneck Snake - *Diadophis punctatus edwardsi* Page 35

Eastern Hognose Snake - *Heterodon platyrhinos* Page 37

Subfamily Colubrinae

Blue Racer - *Coluber constrictor foxi* Page 41

Black Rat Snake - *Elaphe obsoleta obsoleta* Page 43

Eastern Fox Snake - *Elaphe vulpina gloydi* Page 45

Western Fox Snake - *Elaphe vulpina vulpina* Page 45

Eastern Milk Snake - *Lampropeltis triangulum triangulum* Page 49

Eastern Smooth Green Snake - *Ophedryx vernalis vernalis* Page 51

Family Viperidae

Subfamily Crotalinae

Eastern Massasauga Rattlesnake - *Sistrurus catenatus catenatus* Page 53

Identifying Characteristics of Michigan Snakes

Use these illustrations with the key on page 8 to help you identify any snake found in Michigan.

Figure 1

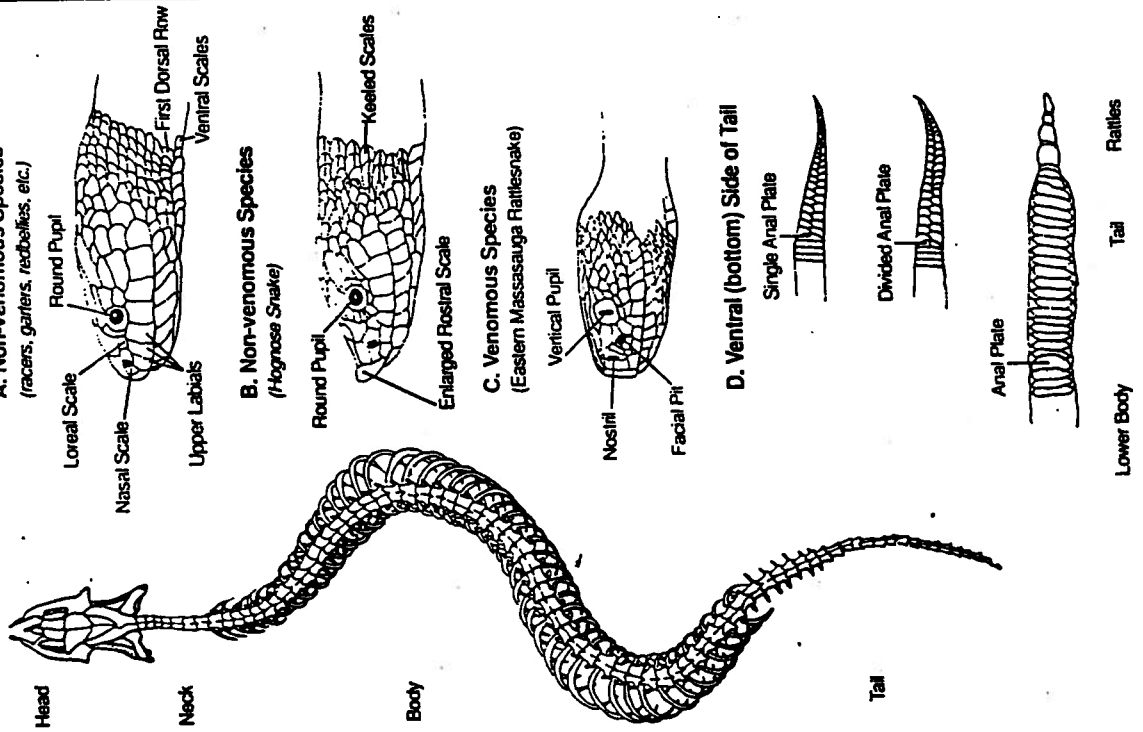
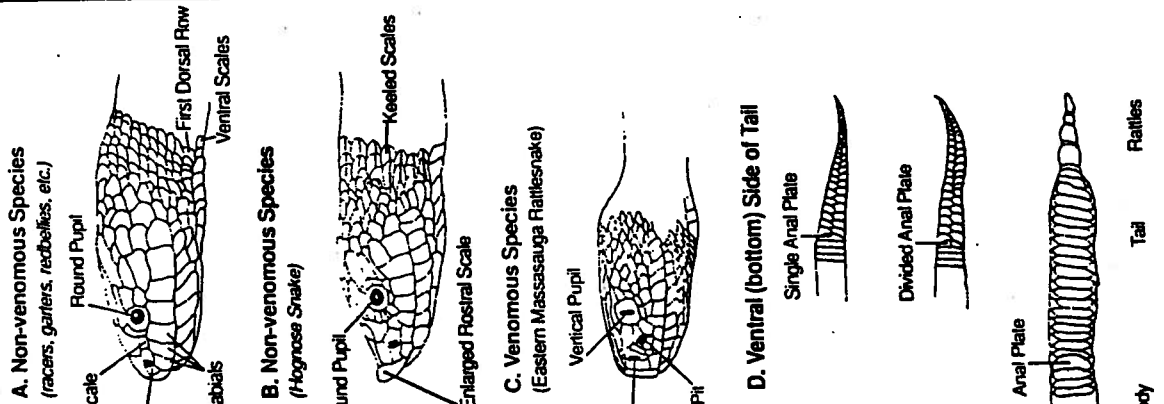


Figure 2



Selected Terms Used in Key and Text

Figure numbers refer to illustrations on page 6.

- anal plate**—scale above anal opening (Fig. 2d)
- band**—a patch of color running across the back of a snake
- blotch**—an irregular patch of color
- dorsal**—back or top side of a snake (Fig. 2a)
- keel**—small ridge along the center of some scales (Fig. 2b)
- labial scales**—scales on lip of snake (Fig. 2a)
- loreal scale**—scale between eye and nostril (Fig. 2a)
- pit**—heat-sensing organ on head of rattlesnake (Fig. 2c)
- rostral scale**—scale on tip of snake's head (Fig. 2b)
- stripe**—a narrow strip of color running along the length of the back of a snake
- ventral**—belly or underside of a snake (Fig. 2a & 2d)

A Simplified Key to Michigan Snakes

To use this key, start at the first set of paired descriptions and compare the two sets of characteristics given. Choose the one (a or b) that better fits the snake and proceed to the next number indicated and compare those two. By this process of elimination, you will eventually arrive at the name of the snake and the page number of its picture, range map and description. The illustrations on page 6 and the definitions on page 7 will help you use this key.

1. (a) A pit between eye and nostril (Fig. 2c); tail ending in a rattle...
Sistrurus catenatus catenatus, Eastern Massasauga
See page 53
- (b) No pit between eye and nostril; tail pointed
number 2
2. (a) Keels on some or all of dorsal scales of body and tail (Fig. 2b) Go to number 3
- (b) Dorsal scales smooth (Fig. 2a) Go to number 16
3. (a) Anal plate divided (Fig. 2d) Go to number 4
- (b) Anal plate single (Fig. 2d) Go to number 14
4. (a) Rostral scale turned up and keeled above (Fig. 2b)
Heterodon platyrhinos, Eastern Hognose Snake See page 37
- (b) Rostral scale normal (Fig. 2a) Go to number 5
5. (a) No loreal, size small (12 inches or less) Go to number 6
- (b) Loreal present (Fig. 2a), adults usually larger than 12 inches Go to number 8
6. (a) Scale rows 17 in number (Fig. 2a); belly grayish
Go to number 7
- (b) Scale rows 15; red belly...
Storeria occipitomaculata occipitomaculata, Northern Red-bellied Snake See page 25

7. (a&b) Dorsal spots separate or fused to form crossbars; dark spot may or may not be present under eye...
Storeria dekayi (subspecies), Brown Snake—see text for explanation See page 23

8. (a) Dorsal scales weakly keeled (barely visible)
Go to number 9
- (b) Dorsal scales strongly keeled and easily seen (Fig. 2b) Go to number 11

9. (a) Adult black above or with obscure blotches; juveniles spotted; 25-27 scale rows...
Elaphe obsoleta obsoleta, Black Rat Snake See page 43
- (b) Adults and juveniles yellowish to brown above with dark brown blotches; 23-25 scale rows
Go to number 10

10. (a) 33 to 51 dorsal blotches (ave. 40); anterior dorsal blotches, usually 3 or 4 scales in length (Upper Peninsula)...

Elaphe vulpina vulpina, Western Fox Snake See page 45

- (b) 20 to 39 dorsal blotches (ave. 35); anterior dorsal blotches usually more than 4 scales in length (Lower Peninsula)...

Elaphe vulpina gloydii, Eastern Fox Snake See page 45

11. (a) Scale rows 17-19 in number Go to number 12
- (b) Scale rows 21 or more in number
Go to number 13

12. (a) A yellow stripe on side and 3 black lines on back; belly yellow with 4 dark stripes...

Regina septemvittata, Queen Snake See page 21

- (b) Back reddish-brown with 4 rows of round black spots; belly reddish, with a row of black spots on either side...

Clonophis kirtlandi, Kirtland's Snake See page 13

13. (a) Back uniformly black or brown, sometimes with faint dorsal blotches; belly uniformly red, orange or pink...

Nerodia erythrogaster neglecta, Northern Copperbelly
See page 15

(b) Back brown with dorsal blotches often uniting with lateral spots to form cross bands; belly mottled or with crescent-shaped spots...

Nerodia sipedon sipedon, Northern Water Snake See page 17

14. (a) Tail at least one-third of total length; lateral yellow stripe on scale rows 3 and 4 above the ventrals...

Thamnophis sauritus septentrionalis, Northern Ribbon Snake See page 33

(b) Tail length less than one-third of total length
Go to number 15

15. (a) Upper labials normally 7 (Fig. 2a); lateral yellow stripe on scale rows 2 and 3...

Thamnophis sirtalis sirtalis, Eastern Garter Snake See page 27

(b) Upper labials normally 6; lateral yellow stripe involves scale rows 2, 3 and 4; head about same width as neck...

Thamnophis butleri, Butler's Garter Snake See page 31

16. (a) Anal plate single; black-bordered brown blotches on back; top of head with a Y-shaped light spot; belly with a checkerboard pattern...

Lampropeltis triangulum triangulum, Eastern Milk Snake
See page 49

(b) Anal plate divided Go to number 17

17. (a) Nasal scale single with nostril in center (Fig. 2a); body color uniform green...

Ophiodys vernalis vernalis, Eastern Smooth Green Snake See page 51

(b) Two nasal scales with nostril between them (Fig. 2b); body not green Go to number 18











18. (a) A yellow ring around neck; uniformly blackish above; belly yellowish...

Diadophis punctatus edwardsi, Northern Ringneck Snake
See page 35

(b) No light collar; adults uniformly bluish to black above with a white chin; belly lighter blue; large size...

Coluber constrictor foxi, Blue Racer See page 41

Explanation of Symbols

Habitat	Temperament	Reproduction	Venom
 NEAR WATER	 NERVOUS	 EGG LAYING	 VENOMOUS
Found in and near wet areas—wet meadows, fens, marshes, swamps or bogs.	Quickly flees or threatens to strike when approached; may attempt to bite when handled.	Female snake gives birth to baby snakes.	Has glands and teeth capable of injecting a poisonous fluid (venom).
 WATER	 VARIABLE	 EGG LAYING	 VENOMOUS
Found in and along streams, rivers, lakes and ponds.	May be nervous, or calm, depending on the individual snake; usually adjusts to handling.	Female snake lays eggs from which baby snakes hatch.	Not capable of injecting a poisonous fluid (venom).
 NEAR WATER	 CALM		
Found in and near wet areas—wet meadows, fens, marshes, swamps or bogs.	Cautiously moves away when approached; not likely to bite when handled.		

MICHIGAN TURTLES AND LIZARDS

CHECKLIST OF MICHIGAN TURTLES AND LIZARDS

CLASS Reptilia (Reptiles)

ORDER Testudines (Turtles and Tortoises)

SUBORDER Cryptocheloni (Straight-Necked Turtles)

FAMILY Chelydridae (Snapping Turtles)

Snapping Turtle (*Chelydra serpentina*) Page 12

FAMILY Kinosternidae (Musk and Mud Turtles)

Common Musk Turtle (*Sternotherus odoratus*)
Page 16

FAMILY Emydidae (Pond and Box Turtles)

Spotted Turtle (*Clemmys guttata*) Page 20

Wood Turtle (*Clemmys insculpta*) Page 24

Eastern Box Turtle (*Terrapene carolina carolina*)
Page 28

Blanding's Turtle (*Emydoidea blandingii*) Page 32

A Field Guide and Pocket Reference

James H. Harding

and

J. Alan Holman

Michigan State University Museum

Photography and illustrations by James H. Harding,
except where otherwise credited.

FIRST EDITION 1990

[] Common Map Turtle (*Craptemys geographica*)
Page 36

[] Painted Turtle (*Chrysemys picta*) Page 40

[] Red-Eared Slider
(*Trachemys scripta elegans*) Page 44

FAMILY *Tritoniichelone* (Softshell Turtles)

[] Spiny Softshell (*Apalone* [= *Tritonyx spiniferus*])
Page 48

Lizards

ORDER *Squamata* (Lizards and Snakes)

SUBORDER *Sauria* (Lizards)

FAMILY *Scincidae* (Skinks)

[] Five-Lined Skink (*Eumeces fasciatus*) Page 52

FAMILY *Phrynosomatidae* (Spiny-tailed Lizards and Racerunners)

[] Six-Lined Racerunner (*Cnemidophorus sexlineatus*) Page 56

**Characteristics
of Michigan Turtles**

These silhouettes represent adult female specimens of the ten species of Michigan turtles drawn to scale to show comparative sizes. Adult male map and spiny softshell turtles are also included, as there is a great size difference between the sexes in these species. Just under 10% of natural size.

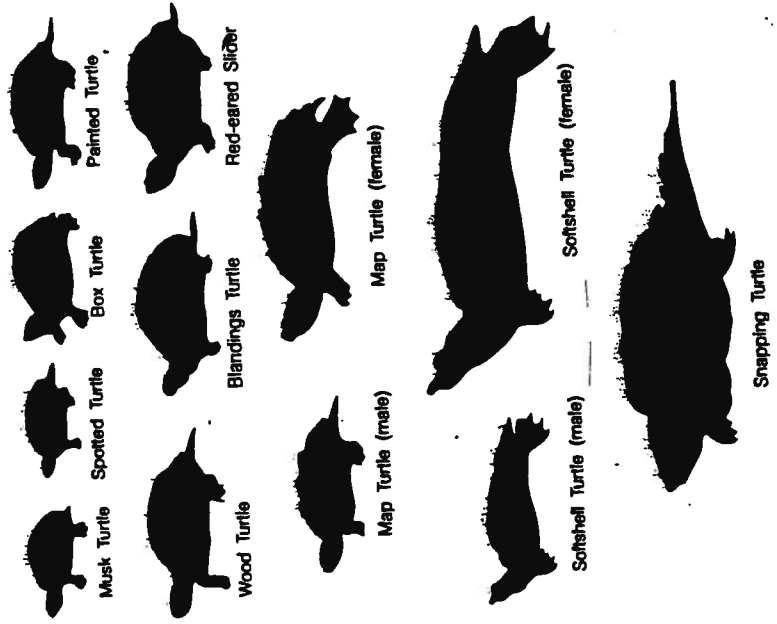
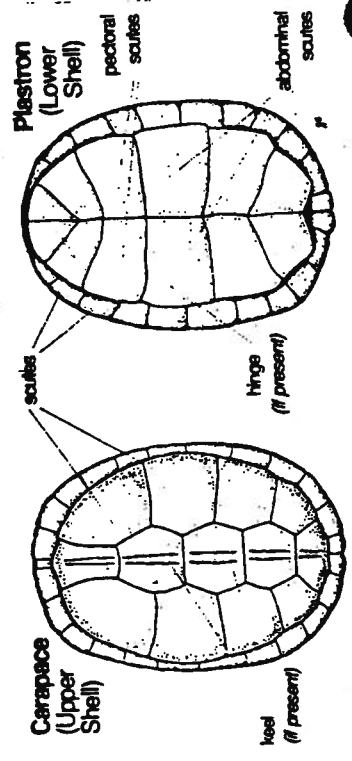


Illustration by W. James Turner



Simplified Key to the Turtles of Michigan

To use this key, start at the first set of paired descriptions and compare the two sets of characteristics given. Choose the one (a or b) that better fits the turtle and proceed to the next number indicated and compare those two. By this process of elimination, you will eventually arrive at the name of the animal and where to find the species account. The illustrations on page 7 and the definitions on page 11 will help you use this key.

1. a. Shell rigid and covered by scutes **GO TO 2.**
b. Shell flexible at edges and covered by leathery skin
Spiny Softshell (Apalone spinifera). See page 48.
2. a. Less than 12 scutes on the plastron **GO TO 3.**
b. 12 scutes on the plastron **GO TO 4.**
3. a. Tail very long, with large triangular scales along the top; plastron small and cross-shaped
Snapping Turtle (Chelydra serpentina). See page 12.
b. Tail short, without large triangular scales on top; plastron small, with skin between some scutes; usually two yellow stripes on side of head
Common Musk Turtle (Stemotherus odoratus). See page 16.
4. a. Plastron with a hinge between the pectoral and abdominal scutes **GO TO 5.**
b. Plastron without a hinge **GO TO 6.**
5. a. Upper jaw terminally hooked; carapace domed, with a central keel
Eastern Box Turtle (Terrapene c. carolina). See page 28.

b. Upper jaw terminally notched; carapace usually smooth and unkeeled; chin and throat yellow in color

Blanding's Turtle (Emydoidea blandingii). See page 32.

6. a. Head and neck with narrow stripes **GO TO 7.**
b. Head and neck without narrow stripes **GO TO 9.**
7. a. Edges of carapace usually marked with red; carapace smooth and unkeeled; rear edge of carapace not strongly serrated
Painted Turtle (Chrysemys picta). See page 40.
b. No red markings on edges of carapace; rear edge of carapace usually serrated **GO TO 8.**
8. a. Yellow spot behind eye; plastron unmarked or with dark lines along the scute edges; carapace often with fine light markings
Common Map Turtle (Graptemys geographica). See page 36.
b. Red or orange stripe behind each eye; plastron with a rounded dark blotch in most or all scutes, or (old males) infused with dark coloration
Red-Eared Slider (Trachemys scripta elegans). See page 44.
9. a. Head black above with rounded yellow or orange spots; carapace smooth and dark (usually black) with variable number of rounded yellow spots
Spotted Turtle (Clemmys guttata). See page 20.
b. Head black, usually without yellow spots; rough brownish carapace with distinct growth rings
Wood Turtle (Clemmys insculpta). See page 24.

KEY TO MICHIGAN LIZARDS

To use this key, start at the first set of paired descriptions and compare the two sets of characteristics given. Choose the one (a or b) that better fits the specimen and proceed to the next number indicated and compare those two. By this process of elimination, you will arrive at the name of the animal and the page number of its species account.

1. a. Skin smooth, without scales; no claws on toes
This is not a lizard! (It is a salamander, which is an amphibian and not covered in this book.)
- b. Skin covered with small scales; sharp claws on toes **GO TO 2.**
2. a. Smooth scales on body and tail; belly scales about the same size as back scales; five stripes on back (if stripes are present)

Five-Lined Skink (*Eumeces fasciatus*). See page 52.

- b. Dull scales on body, rough scales on tail; belly scales rectangular and wide and larger than back scales; six stripes on back

Six-lined Racerunner (*Cnemidophorus sexlineatus*). See page 56.



Like most salamanders, this eastern tiger salamander has smooth skin and no claws.

This six-lined racerunner, like nearly all lizards, has a dry scaly skin and sharp claws.

Selected Terms Used in Key and Text:

- aquatic**—living in water.
- barbel**—a fleshy, often pointed projection of skin on the chin or throat of some turtles.
- blotch**—an irregular spot or patch of color.
- carnivore**—an animal that feeds on other animals.
- carapace**—the top part of a turtle's shell.
- cloaca**—a chamber just before the anal opening.
- elliptical**—oval in shape.
- herbivore**—animal that feeds mostly on plants or plant products.
- hinge**—a flexible division between two parts of the bottom shell (plastron) of certain turtle species that allows one or both parts of the shell to move up and down.
- keel**—a raised ridge (or ridges) running lengthwise down the carapace of some turtles.
- omnivore**—an animal that feeds on both plants and animals.
- plastron**—the bottom part of a turtle's shell.
- population**—the members of a species (a recognized group of plants or animals) living in a specific geographical area.
- predator**—an animal that kills and eats other animals.
- scute**—one of the large scales on a turtle's shell.
- serrated**—having pointed projections along the edge.
- spherical**—rounded in shape, like a ball or globe.
- vertebrate**—animals with backbones and (usually) a bony skeleton.

MICHIGAN FROGS, TOADS, AND SALAMANDERS

A Field Guide and Pocket Reference

James H. Harding
and
J. Alan Holman

Michigan State University Museum

*Photography by James H. Harding, except where otherwise credited.
Illustrations by W. James Hunter*

FIRST EDITION 1992



© 1992 Cooperative Extension Service, Michigan State University
MSU is an Affirmative-Action Equal-Opportunity Institution. Cooperative Extension Service programs and materials are open to all without regard to race, color, national origin, sex, handicap, age or religion.
Issued in furtherance of Cooperative Extension work in agriculture and home economics, acts of May 8, and June 30, 1914, in cooperation with the U.S. Department of Agriculture.
Gail Imig, director, Cooperative Extension Service, Michigan State University, E. Lansing, MI 48824.

CHECKLIST OF MICHIGAN AMPHIBIANS

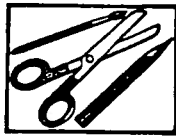
CLASS	Amphibia	[Amphibians]	
ORDER	Caudata (= Urodela)	[Salamanders]	Page No.
FAMILY	Proteidae	(Mudpuppies and Waterdogs)	
	Mudpuppy <i>Necturus maculosus maculosus</i>		14
FAMILY	Sirenidae	(Sirens)	
	Western Lesser Siren <i>Siren intermedia nettingi</i>		18
FAMILY	Ambystomatidae	(Mole Salamanders)	
	Blue-Spotted Salamander <i>Ambystoma laterale</i>		22
	Spotted Salamander <i>Ambystoma maculatum</i>		26
	Marbled Salamander <i>Ambystoma opacum</i>		30
	Small-Mouthed Salamander <i>Ambystoma texanum</i>		34
	Eastern Tiger Salamander <i>Ambystoma tigrinum tigrinum</i>		38
FAMILY	Salamandridae	(Newts)	
	Red-Spotted Newt <i>Notophthalmus viridescens viridescens</i>		42
	Central Newt <i>Notophthalmus viridescens louisianensis</i>		42
FAMILY	Plethodontidae	(Lungless Salamanders)	
	Red-Backed Salamander <i>Plethodon cinereus</i>		46
	Four-Toed Salamander <i>Hemidactylium scutatum</i>		50

ORDER	Anura (= Salientia)	[Frogs and Toads]	Page No.
FAMILY	Bufonidae	(True Toads)	
	Eastern American Toad <i>Bufo americanus americanus</i>		54
	Fowler's Toad <i>Bufo woodhousii fowleri</i>		58
FAMILY	Hylidae	(True Tree Frogs)	
	Blanchard's Cricket Frog <i>Acris crepitans blanchardi</i>		62
	Western Chorus Frog <i>Pseudacris triseriata triseriata</i>		66
	Boreal Chorus Frog <i>Pseudacris triseriata maculata</i>		66
	Northern Spring Peeper <i>Pseudacris crucifer crucifer</i>		70
	Eastern Gray Treefrog <i>Hyla versicolor</i>		74
	Cope's Gray Treefrog <i>Hyla chrysoscelis</i>		74
FAMILY	Ranidae	(True Frogs)	
	Green Frog <i>Rana clamitans melanota</i>		78
	Bullfrog <i>Rana catesbeiana</i>		82
	Northern Leopard Frog <i>Rana pipiens</i>		86
	Pickereel Frog <i>Rana palustris</i>		90
	Sp. Mink Frog <i>Rana septentrionalis</i>		94
	Wood Frog <i>Rana sylvatica</i>		98



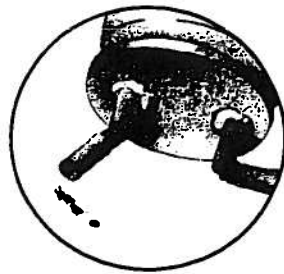
Looking for Minibeasts

Minibeasts are all around us, but they can be hard to find, as they are small and often hidden. Look in corners, cupboards, sheds, and garages. Some live outside in long grass, bushes, or trees, or in the air or water. Many minibeasts only come out at night, so you may have to set traps for them.

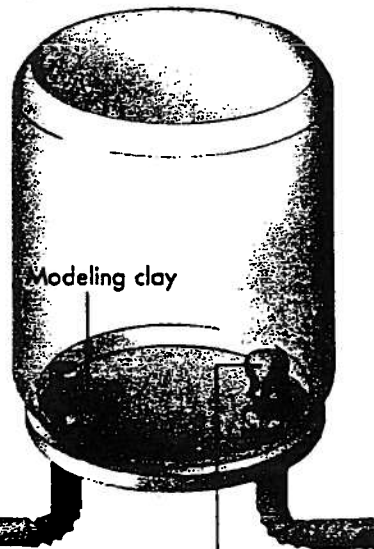


Make a Vacuum Trap

A vacuum trap is for catching minibeasts that are too small to pick up with your fingers. Find a small plastic container about 2 inches high and 1½ inches across. Ask an adult to help you pierce two holes in the lid big enough to put a straw through. You need two wide, flexible straws. Put one straw into each hole and seal the end with modeling clay. Tape a small piece of muslin over one of the straws to stop creatures from being sucked into your mouth!



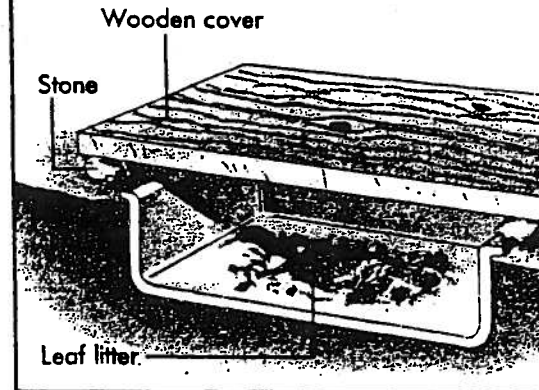
Use your vacuum trap only for tiny creatures. Big ones might get stuck.

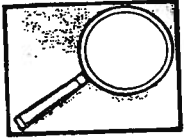


Make a Pitfall Trap

Equipment: margarine box, stones about half an inch wide, piece of wood or cardboard, trowel.

Dig a small hole in the ground just deeper than your box. Lay the box in the ground and make sure the edges don't stick up. Find some stones about half an inch high and put one stone at each corner. Place the wood on top to keep rain from getting in. Put some leaves or earth in the box for the creatures to shelter in. Put in some small scraps of apple, lettuce, cheese, or tomato to attract your minibeasts.





Be a Minibeast Detective

Using your vacuum and pitfall traps, try to find different minibeasts. Keep the creatures you find in a large plastic container. Remember to make the container as similar to their natural habitat as possible. When you have found some creatures, be a minibeast detective: use the following questions and a magnifying glass to help you find out about your minibeast. Record your findings in a notebook. **Only keep your minibeasts for one day, as they will need food and proper shelter.**

Wings

How many wings does the creature have? Describe the way it flies. (Darting, flapping, in a straight line, up and down.)

Where Does It Live?

Does your minibeast live in long grass, in short grass, under rocks, in trees, on plants or flowers, in water, in dead wood?

Head

Is the head large or small? Which way does it move? Does it have eyes? Where are they? Does your minibeast have antennae or feelers? It uses these to detect smell, the way we use our noses. Many minibeasts breathe through tiny holes in the sides of their body case called spiracles.

Legs

How many legs does it have? Are they jointed like yours? (Your leg has a joint at the hip, the knee, and the ankle.)

Body

What color and shape is the body? How many body parts are there? Is it segmented (in more than one piece)? Does the body change shape when it moves? Is it symmetrical?

Gently put the big creatures into the container using your fingers.

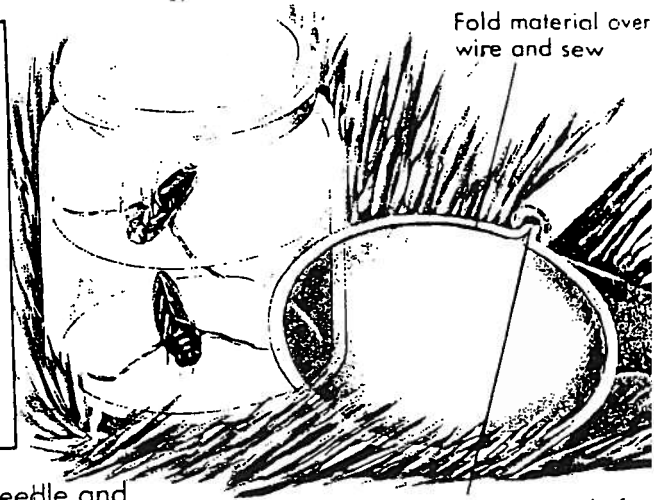
Minibeasts

Be very careful with your minibeasts. They are fragile. Remember you are a giant to them!

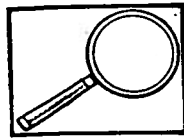


Water Minibeasts

On the next four pages you can find out about some of the creatures that live in water. Some spend only part of their life underwater; others live all their lives there. Some can breathe underwater, using gills. Others need to come to the surface to breathe air.



Fold material over wire and sew



Equipment: old stocking, needle and thread, tape, wire, bamboo cane.

Going Pond Dipping

To make a net, bend a piece of wire 2 feet long into a circle and push the ends into the cane, then tape it up. Fold the open end of one foot of the stocking over the wire and sew it together.

When you go dipping, take a large plastic tub to put your creatures in. Remember they need water! Don't pick them up with your hands, as it is easy to squash them. Instead you can turn your net inside out into the tub and let the creatures swim off. Try dipping in different places: ponds, streams, ditches, rain tubs, and even puddles are good places to investigate.

Poke wire into end of sti

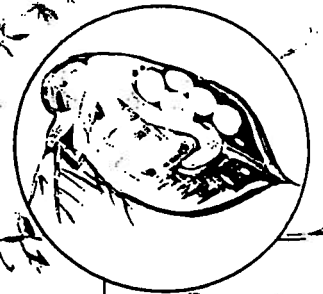


Great diving beetle

Harlequin bug larva

Water boatmen swim freely all around the pond. They are called boatmen because they use their legs like oars of a boat. Some eat plants, and some are carnivorous. Look for those that swim on their back and others that swim on their front. They are insects and can fly.

Daphnia are very small. They swim by waving their feelers in the water and feed by filtering even tinier things from the water.

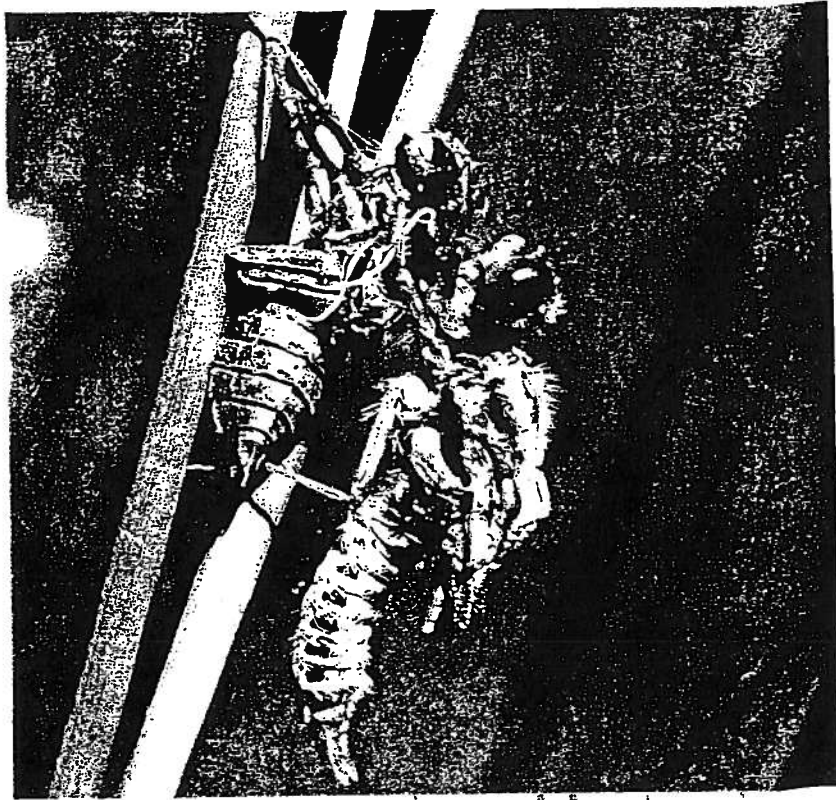


Daphnia or water flea magnified

Snails Snails eat dead plants and animals and slime or algae growing in the water. They crawl along the bottom of ponds but can also move while hanging down from the surface of the water.

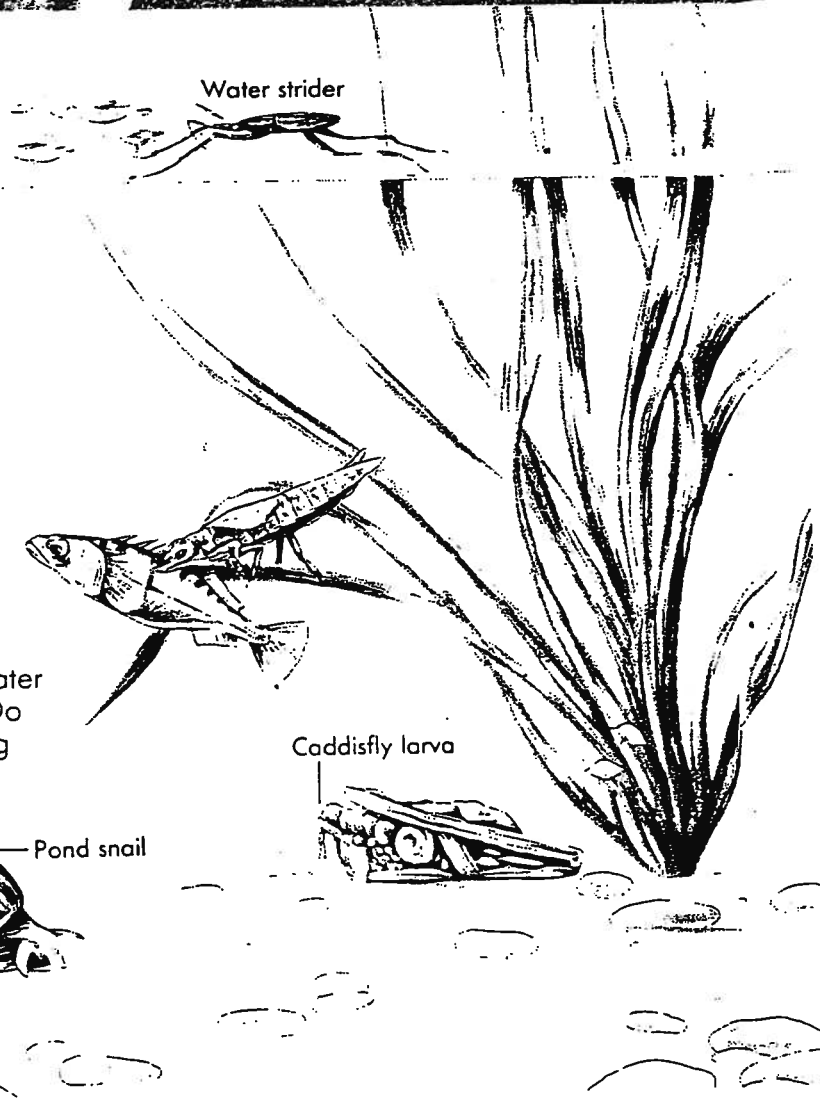
A Different Life Cycle

A dragonfly spends the first two years of its life underwater. Unlike a butterfly, the dragonfly has only three stages in its metamorphosis (see page 58), egg, nymph (see photo), and adult. It drops its eggs in the water or lays them on water plants. The eggs hatch into tiny nymphs, which are carnivorous and feed off other creatures. They have a tough outside skin that does not stretch. Eventually it splits, uncovering a new and larger skin. Dragonfly nymphs shed their skins, or molt, seven times before they are ready to emerge as adults.



Mosquito and midge larvae swim by flicking and twisting suddenly in the water. They come in different colors — some are red (bloodworms), some are transparent. Soon they turn into pupae, which hang from the surface of the water by tiny breathing tubes.

Warning: Deep water is very dangerous. Do not go dipping in big rivers.

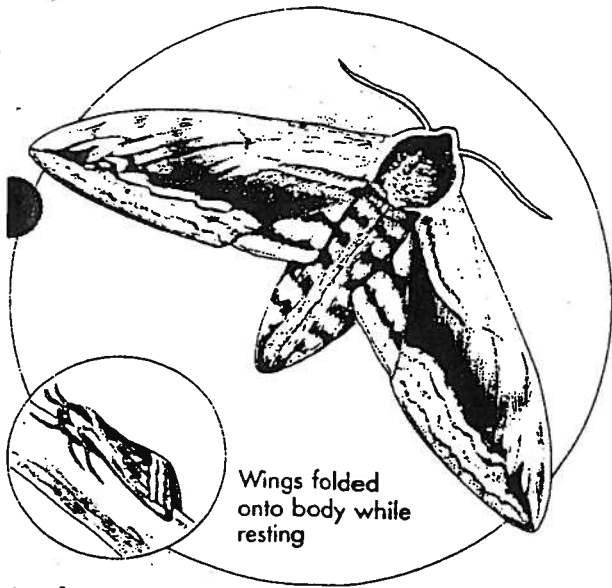


Water strider

Caddisfly larva

Pond snail

d maggot



Wings folded onto body while resting

Moths

Moths get all the energy they need to fly from the food they eat. They fly, and eat, at night and so do not need bright colors to attract each other. Instead the female gives off a strong smell which can attract males from a great distance. Moths usually come in dull colors, which provide camouflage against their normal surroundings, making it hard for predators to find them.



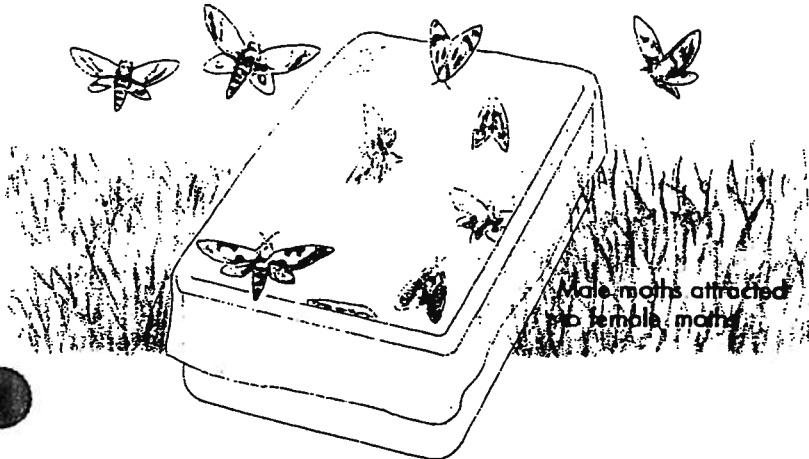
Catching Moths

Moths have fragile wings, so if you catch one, handle it very carefully. Put a box with a saucer of sugar solution inside (one teaspoon sugar mixed with one tablespoon water) next to a lamp. The moths will fly toward the light and may go to the sugar to feed.

Moths navigate using the light of the moon, and they always keep light to the same side of them when they fly. This is why moths fly in circles around your lamp.



Saucer of sugar solution in box



Male moths attracted to female moths

After Dark

Wrap a piece of muslin over your box of moths. Young female moths give off pheromones, a substance that a male moth can smell several miles away. If you attract moths to your box, then you must have some females.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS / vi	
PREFACE / viii	
AUTHOR'S NOTE / xiii	
INTRODUCTION / xiv	
ANTS / 1	
ANTLIONS / 6	
BITING MIDGES (NO-SEE-UMS) / 9	
BLACK FLIES / 11	
BUTTERFLIES AND MOTHS / 14	
CADDISFLIES / 25	
CICADAS / 27	
COCKROACHES / 31	
CRANE FLIES / 38	
CUCUMBER BEETLES / 40	
DRAGONFLIES / 43	
FIREFLIES / 49	
GRASSHOPPERS / 53	
COLOR PLATES FOLLOW PAGE 54	
HONEY BEES / 56	
HORSE AND DEER FLIES / 61	
HOVER FLIES / 63	
JUMPING PLANT LICE / 68	
LACEWINGS / 71	
LOVEBUGS / 73	
MIDGES / 77	
MOLE CRICKETS / 79	
MOSQUITOES / 83	
MUSCID FLIES / 94	
SOLDIER FLIES / 97	
COLLECTING AND MOUNTING INSECTS / 99	
GAMES YOU CAN PLAY IN THE CAR / 101	
BIRDS, INSECTS, AND AUTOMOBILES / 103	
REFERENCES / 104	
GLOSSARY / 109	
INDEX / 113	

THAT GUNK ON YOUR CAR

A UNIQUE GUIDE TO

INSECTS OF NORTH AMERICA

By Mark E. Hostetler, Ph.D.



Ten Speed Press
Berkeley, California