



**WISCONSIN CRAYFISH**

# **CRAYFISH BASICS**

- CRAYFISH ARE OMNIVORES AND FEED ON A WIDE VARIETY OF ANIMAL AND PLANT MATERIALS**
- CRAYFISH COMMONLY HAVE LIFE SPANS OF 2 - 6 YEARS**
- SOME CRAYFISH SPEND MOST OF THEIR LIVES IN LAKES, PONDS, OR STREAMS**
- OTHER CRAYFISH SPEND MOST OF THEIR LIVES IN BURROWS**

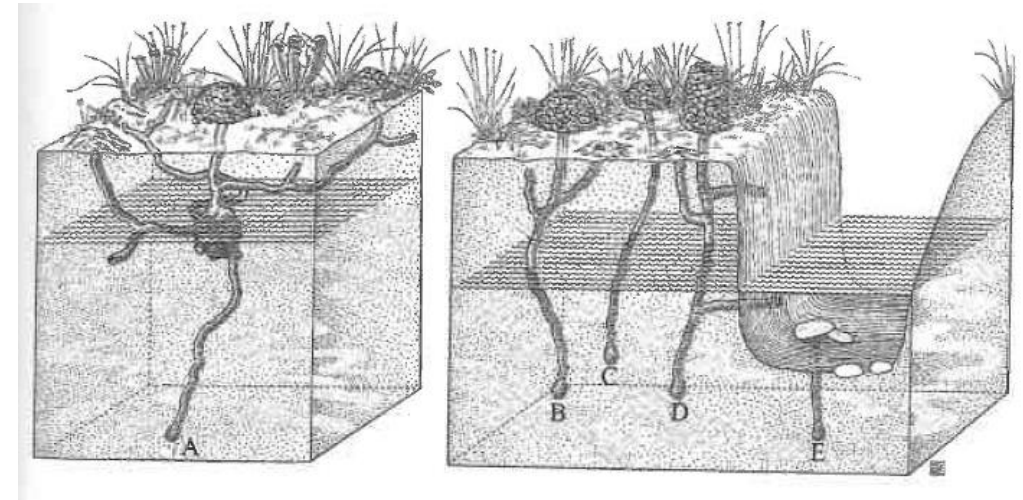




## CRAYFISH BURROW CHIMNEYS



Photos and figure from Taylor et al. 2015



## CRAYFISH BURROW DESIGNS

- **BURROWING CRAYFISH SPECIES TEND TO OCCUPY HABITATS WITH SEMI-PERMANENT STANDING WATER**
- **ALL CRAYFISH CAN BURROW TO SOME EXTENT WHEN FACED WITH LOSS OF STANDING WATER**

# RUSTY CRAYFISH

- AN AQUATIC INVASIVE SPECIES IN WISCONSIN; PRESENT IN 1/3 OF WI WATERS
- NATIVE TO THE OHIO RIVER VALLEY
- CAN DEVELOP VERY HIGH DENSITY POPULATIONS IN WISCONSIN WATERS
- CAN ELIMINATE NATIVE CRAYFISH
- CAN REDUCE AQUATIC PLANT, INVERTEBRATE, AND FISH POPULATIONS



# **WISCONSIN CRAYFISH IDENTIFICATION GUIDE**

- DEVELOPED TO HELP VOLUNTEERS MONITOR INVASIVE CRAYFISH SPECIES**
- 8 SPECIES OF CRAYFISH IN WISCONSIN**
- 2 INVASIVE CRAYFISH SPECIES**
  - RUSTY CRAYFISH**
  - RED SWAMP CRAYFISH (FOUND IN 3 MILWAUKEE COUNTY STORMWATER PONDS AND A PET STORE)**

## SIMPLIFIED WISCONSIN CRAYFISH KEY

For medium to large-sized, live or fresh specimens

1. Tufts of fibers usually present adjacent to claw hinge; mottled markings present on body and legs – *Orconectes immunis* p.5

(*Orconectes virilis*, 6., below, may also have a less extensive tufts of fibers)

No tufts of fibers present adjacent to claw hinge; no mottled markings – 2

2. Curved seams on back touch in middle – 3

Curved seams on back don't touch in middle – 4

3. Sides with numerous small bumps; claws often with red spots – *Procambarus clarkii* p.10

Sides without numerous small bumps; claws without spots – *Cambarus diogenes* p.4  
(also see 7. *Procambarus gracilis*, below)

4. Dark band on top of tail – 5

Without dark band on top of tail – 6

5. Sides with numerous small bumps; often reddish body color – *Procambarus acutus* p.9

Sides without numerous small bumps; brown or grey body color; claw tips orange/red with black rings – *Orconectes propinquus* p.6

6. Claw tips orange/red without black bands; two to four rows of angular spots on tail – *Orconectes virilis* p.8

Claw tips orange/red with black bands; rust colored bands on tail segments; usually with rust colored spots on sides – *Orconectes rusticus* p.7  
(also see 7. *Procambarus gracilis*, below)

7. *Procambarus gracilis* p.11 – Has only been reported from far southeastern Wisconsin. Seams on back touch or nearly touch in middle; tail is shorter than remaining body length (carapace); claws wide with width of unhinged claw about half of length





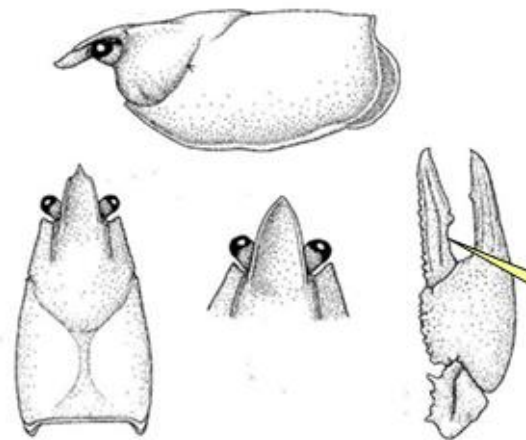
### **DEVIL CRAYFISH (*CAMBARUS DIOGENES*)**

This species is distributed statewide and is fairly common, but probably infrequently found. It spends most of its life in burrows and enters lakes and streams in spring for reproduction. It can be quite variable in appearance.

1. CURVED SEAMS ON BACK ARE JOINED IN CENTER.
2. TAIL (ABDOMEN) IS MORE FLATTENED THAN IN OTHER SPECIES.
3. HINGED CLAW HAS BROAD NOTCH NEAR ITS BASE. (THREE OTHER SPECIES HAVE A SIMILAR NOTCH.)



Line drawings from *The Crayfishes and Shrimp of Wisconsin*, Hobbs and Jass, Milwaukee Public Museum, 1988



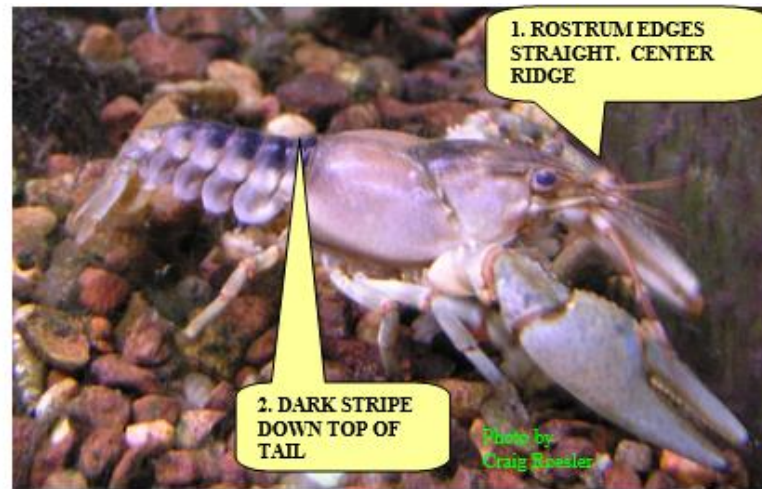
- 1. TUFTS OF FIBERS ADJACENT TO CLAW HINGE
- 2. NOTCH NEAR BASE OF HINGED CLAW

**CALICO CRAYFISH (*ORCONECTES IMMUNIS*)**

This species is distributed across much of the state but is uncommon. It is typically found in soft bottom areas, usually with aquatic plants present.

1. TUFTS OF FIBERS ADJACENT TO CLAW HINGE; MOST FIBERS ATTACHED TO UNDERSIDE OF UNHINGED CLAW (FIBERS MAY NOT ALWAYS BE PRESENT).
2. NOTCH NEAR BASE OF HINGED CLAW.
3. MOTTLED MARKINGS ON BODY AND LEGS; VARIABLE PATTERNS.
4. CLAWS WITH ORANGE/RED TIPS.

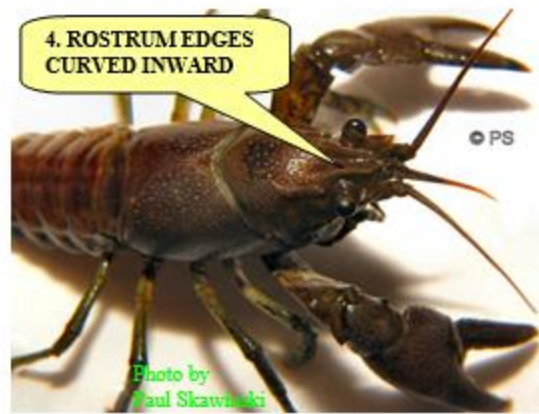
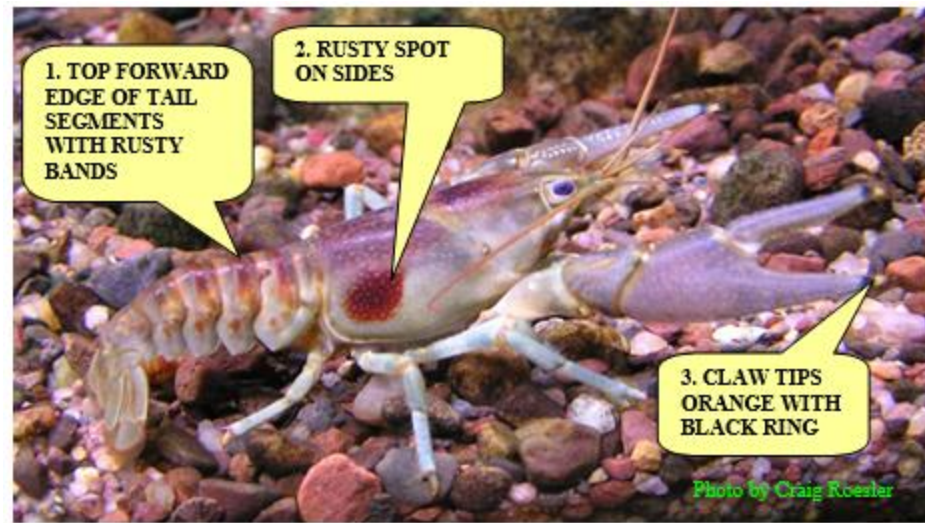




**NORTHERN CLEARWATER CRAYFISH  
(*ORCONECTES PROPINQUUS*)**

This species is distributed statewide and is very common. It is usually found on gravel or rocky bottoms. It can be grey (pictured) or brown. Grey specimens are more commonly found in very clear waters.

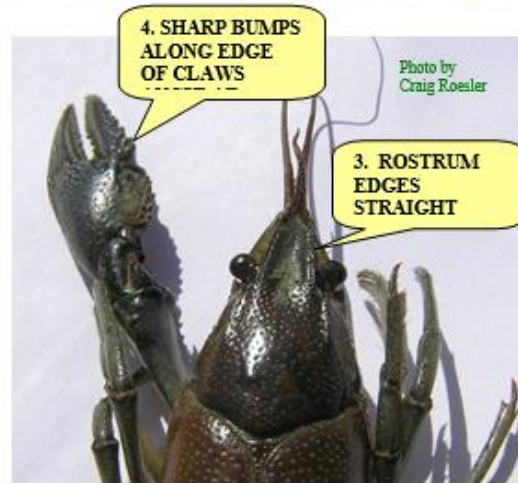
1. ROSTRUM EDGES STRAIGHT WITH RAISED RIDGE IN CENTER. RIDGE USUALLY DIFFICULT TO SEE, BUT CAN BE FELT WITH A FINE-POINTED OBJECT. RIDGE SHAPE / LOCATION VARIABLE.
2. DARK STRIPE DOWN TOP OF TAIL (ABDOMEN).
3. CLAW TIPS ORANGE WITH BLACK RING. RING SOMETIMES PARTIAL OR FAINT.



### **RUSTY CRAYFISH (*ORCONECTES RUSTICUS*)**

This species is distributed statewide and is very common. It is found on a wide variety of bottom types. It is not native to Wisconsin but has spread widely and causes serious ecological damage.

1. TOP FORWARD EDGE OF TAIL (ABDOMINAL) SEGMENTS WITH RUSTY BANDS.
2. RUSTY SPOTS ON SIDES. SOMETIMES VERY SMALL OR FAINT. OCCASIONALLY ABSENT.
3. CLAW TIPS ORANGE WITH BLACK RING. RING SOMETIMES ONLY PARTIAL OR FAINT.
4. ROSTRUM EDGES CURVED INWARD. SOMETIMES VERY SLIGHTLY. OCCASIONALLY STRAIGHT.

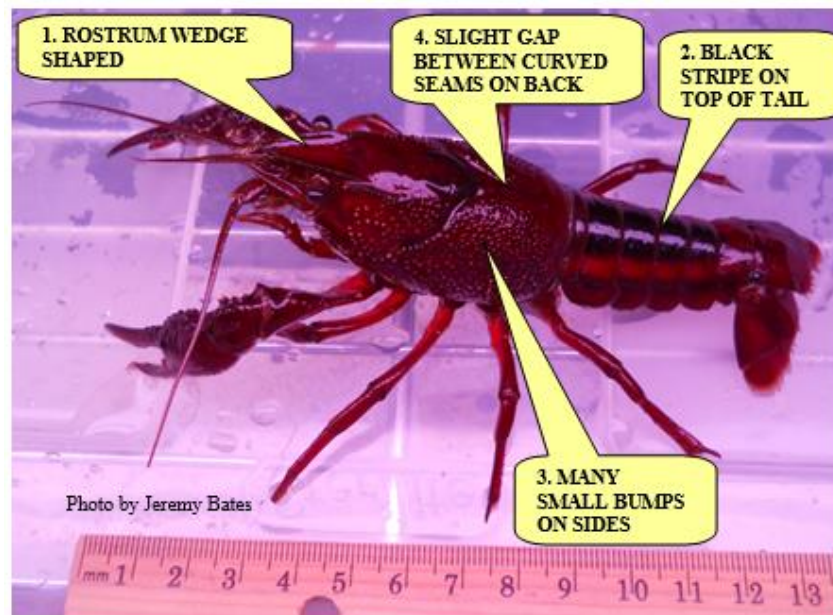


#### **VIRILE CRAYFISH (*ORCONECTES VIRILIS*)**

This species is distributed statewide and is very common. It is found on a wide variety of bottom types.

1. TAIL (ABDOMEN) WITH FOUR ROWS OF ANGULAR SPOTS, AN UPPER AND LOWER ROW ON EACH SIDE. UPPER OR LOWER ROW SOMETIMES FAINT.
2. CLAW TIPS ORANGE WITH NO DISTINCTIVE BLACK RING. ORANGE TIPS SOMETIMES VERY SMALL.
3. ROSTRUM EDGES USUALLY STRAIGHT. NO CENTRAL ROSTRUM RIDGE.
4. LARGE SHARP BUMPS ALONG INSIDE EDGE OF CLAWS

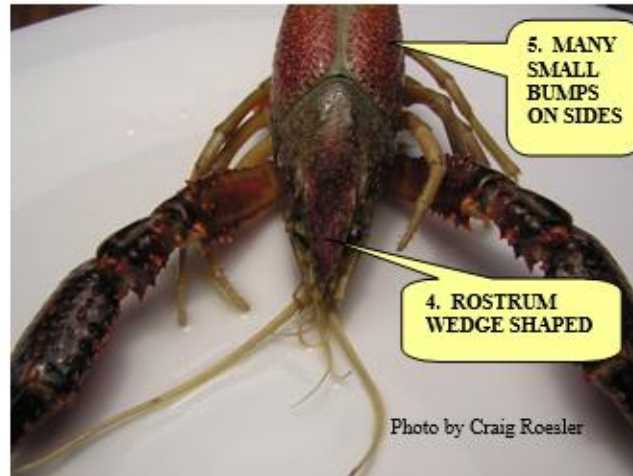
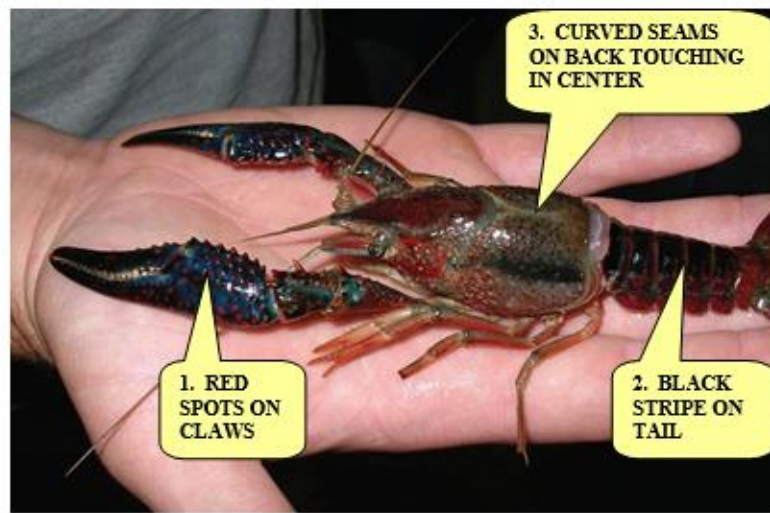




### **WHITE RIVER CRAYFISH (*PROCAMBARUS ACUTUS*)**

This species is distributed statewide but is uncommon. It is found on a wide variety of bottom types.

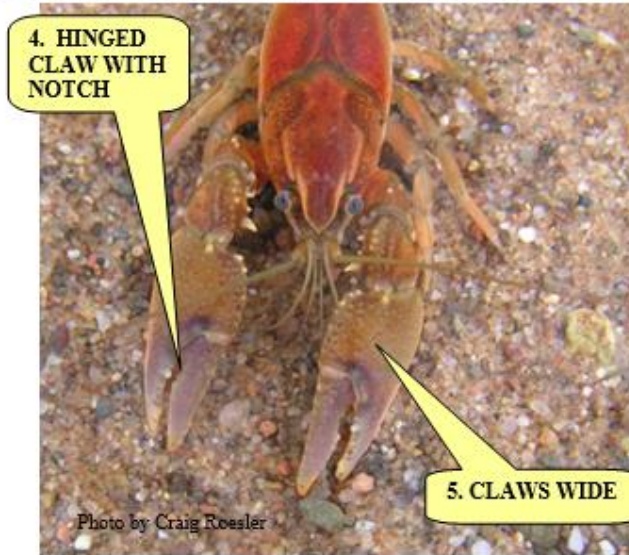
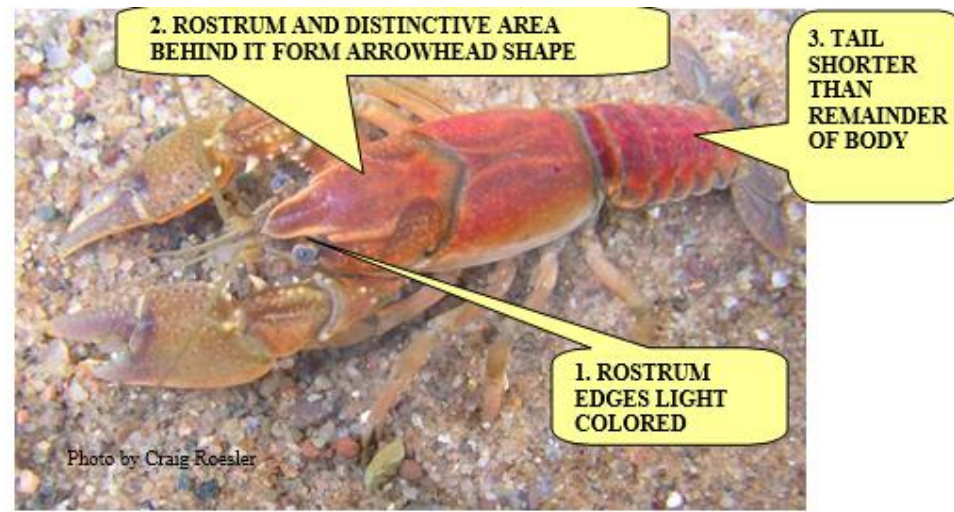
1. ROSTRUM WEDGE-SHAPED, WITH ONLY VERY SMALL INDENTATIONS NEAR TIP. INDENTATIONS ARE LESS THAN 1/6<sup>TH</sup> ROSTRUM WIDTH.
2. BLACK STRIPE ON TOP OF TAIL (ABDOMEN).
3. SIDES HAVE NUMEROUS SMALL BUMPS.
4. SLIGHT GAP BETWEEN CURVED SEAMS ON BACK.
5. HINGED CLAY WEAKLY NOTCHED NEAR BASE; SOMETIMES NOT NOTICEABLE.



**RED SWAMP CRAYFISH  
(*PROCAMBARUS CLARKII*)**

This crayfish has only been found in 2 stormwater ponds in southeast Wisconsin.

1. RED SPOTS ON CLAWS OFTEN PRESENT.
2. BLACK STRIPE ON TAIL (ABDOMEN), BUT SOMEWHAT INDISTINCT.
3. CURVED SEAMS ON BACK TOUCHING IN CENTER.
4. ROSTRUM WEDGE-SHAPED, WITH VERY SMALL INDENTATIONS NEAR TIP. INDENTATIONS ARE LESS THAN 1/6<sup>TH</sup> ROSTRUM WIDTH.
5. SIDES HAVE NUMEROUS SMALL BUMPS.



**PRAIRIE CRAYFISH (*PROCAMBARUS GRACILIS*)**

This species has only been found in a few Counties in far southeastern Wisconsin. This is a burrowing species that enters lakes and ponds for reproduction.

1. ROSTRUM EDGES LIGHT COLORED
2. ROSTRUM AND DISTINCTIVE AREA BEHIND IT FORM ARROWHEAD SHAPE
3. TAIL (ABDOMEN) SHORTER THAN REMAINDER OF BODY
4. CLAWS WIDE; WIDTH OF UNHINGED CLAW ABOUT HALF OF LENGTH
5. HINGED CLAW WITH NOTCH NEAR BASE



# RUSTY CRAYFISH AND THE MICROPHALLUS PARASITE



## **DECLINES IN RUSTY CRAYFISH POPULATIONS NOTED**

- **AFTER 20+ YEARS OF ABUNDANCE (ROUND, CONNORS, ISLAND CHAIN, PIKE CHAIN LAKES)**
- **NO REBOUND AFTER >SEVERAL YEARS**
- **RUSTIES IN OTHER LAKES PRESENT FOR MANY YEARS WITHOUT BECOMING ABUNDANT**



## **MIDDLE EAU CLAIRE LAKE (BAYFIELD CO.)**

- **HIGH DENSITY RUSTY POPULATION >25 YR**
  - **EXTENSIVE COMMERCIAL TRAPPING DONE**
  - **TRAPPING DISCONTINUED IN 2007 DUE TO DECLINING CATCHES**
  - **2010 TRAPPING HAD A CATCH RATE OF 0.1 CRAYFISH PER TRAP PER DAY**
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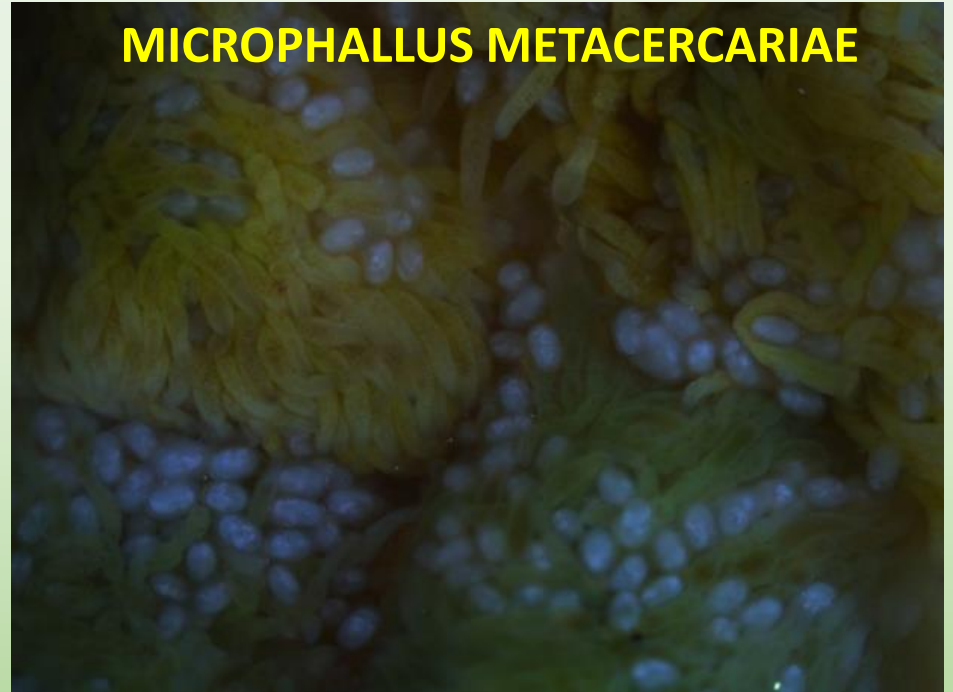


- **RUSTY CRAYFISH FROM MIDDLE EAU CLAIRE LAKE SENT TO A CRAYFISH DISEASE SPECIALIST IN LOUISIANA. HE FOUND LARGE NUMBERS OF METACERCARIAE ON HEPATOPANCREAS'S.**
- **ROBIN OVERSTREET AT UNIVERSITY OF SOUTHERN MISSISSIPPI IDENTIFIED THE METACERCARIAE AS MICROPHALLUS SP.**


**EXTRACTED CRAYFISH HEPATOPANCREAS**



**MICROPHALLUS METACERCARIAE**



## **MICROPHALLUS 3-STAGE LIFE CYCLE**

- **INFECTED SNAIL RELEASES CERCARIAE**
  - **CRAYFISH INFECTED, METACERCARIAE FORMED**
  - **MAMMAL OR BIRD (?) EATS CRAYFISH; ADULT TREMATODES ATTACH TO INTESTINAL WALL**
  - **EGGS RELEASED WITH FECES; LARVAE HATCH AND INFECT SNAILS**
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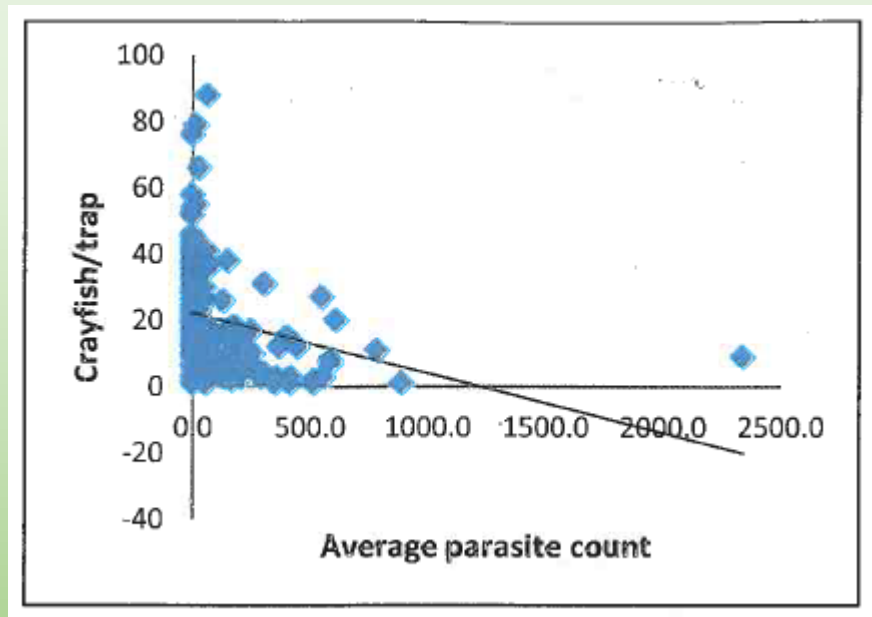
# INVESTIGATIVE ACTIONS

- **CRAYFISH COLLECTED FROM 41 LAKES AND 6 STREAMS EXAMINED FOR MICROPHALLUS; CAN MICROPHALLUS CAUSE POPULATION DECLINES?**
- **CRAYFISH AND SNAIL SAMPLES SENT FOR DNA TESTING OF METACERCARIAE IN CRAYFISH AND CERCARIAE RELEASED BY SNAILS TO DETERMINE MICROPHALLUS SPECIES AND SNAIL HOSTS**
- **MICROPHALLUS EXPOSURE TEST OF CAGED CRAYFISH IN MIDDLE EAU CLAIRE LAKE; DOES MICROPHALLUS INFECT BOTH RUSTIES AND NATIVES?**
- **COMPARED RUSTY CRAYFISH EGG PRODUCTION IN MIDDLE EAU CLAIRE LAKE TO LAKES WITHOUT MICROPHALLUS**



# CRAYFISH EXAM RESULTS (41 LAKES)

- **71% OF LAKES WITH LOW DENSITIES OF RUSTIES HAD MICROPHALLUS PRESENT**
- **80% OF LAKES WITH HIGH DENSITIES OF RUSTIES HAD MICROPHALLUS ABSENT (< 0.5 PER HEPATOPANCREAS)**



Sargent et al. 2012

# DNA TEST RESULTS

- 5 SPECIES OF MICROPHALLUS WERE FOUND
- ONLY SPECIES 1 WAS FOUND IN RUSTY CRAYFISH; IT WAS THE MOST ABUNDANT AND WAS SHOWN TO INFECT 4 SPECIES OF CRAYFISH.
- SPECIES 2-5 INFECTED ONLY NATIVE CRAYFISH AND WERE PRESENT IN LOW NUMBERS
- 1 SNAIL SPECIES WAS FOUND TO BE A PRIMARY MICROPHALLUS HOST



*CINNCINNATIA SP.* – ABOUT 1/8 INCH LONG

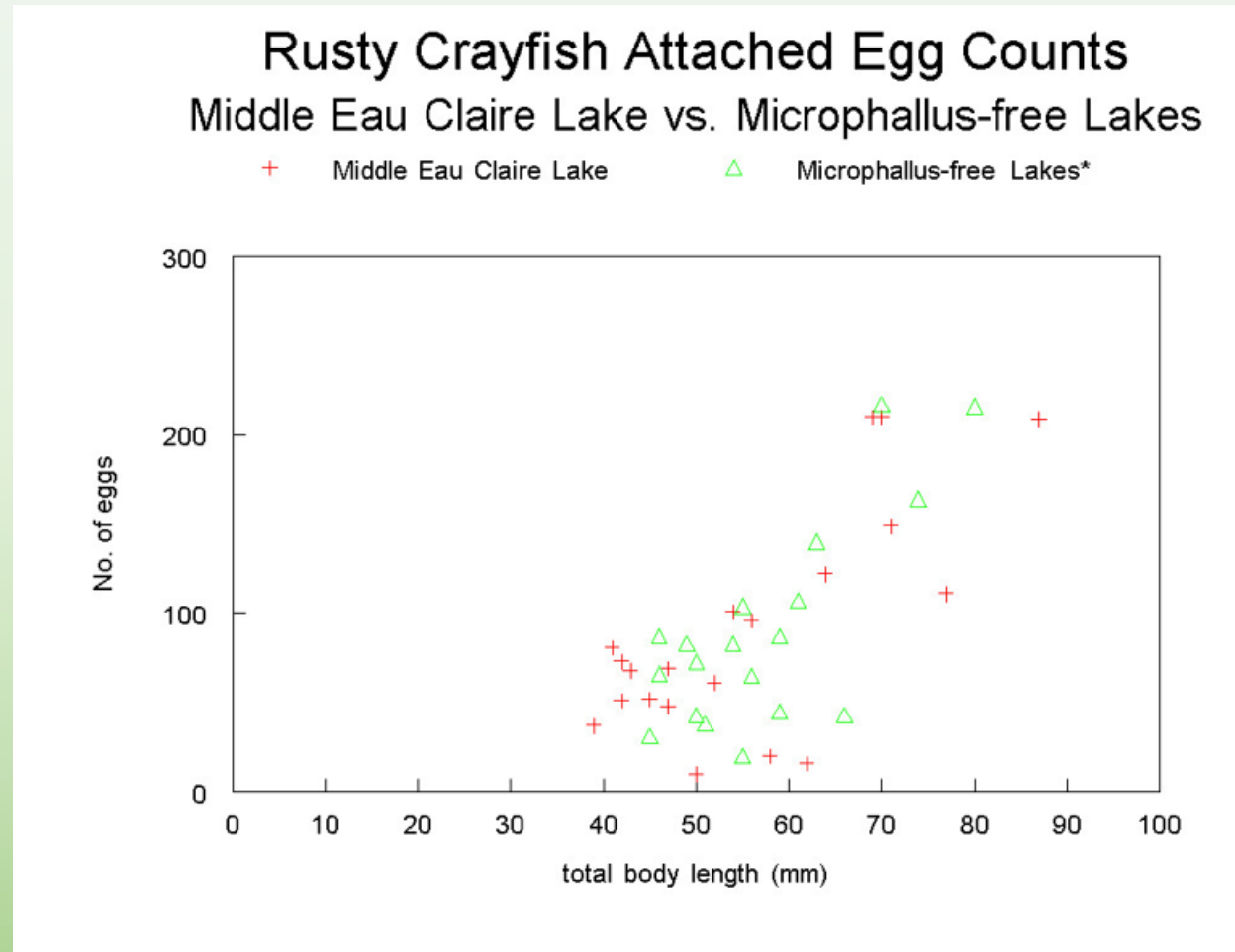
# CAGED CRAYFISH TEST RESULTS

- HEPATOPANCREAS'S AVERAGED 233 METACERCARIAE AFTER 1 SUMMER OF EXPOSURE
- RUSTIES AND 2 NATIVE SPECIES HAD COMPARABLE INFECTION RATES





# EGG PRODUCTION IN MICROPHALLUS-INFECTED MIDDLE EAU CLAIRE LAKE WAS SIMILAR TO THAT IN MICROPHALLUS-FREE LAKES



**THANKS FOR LISTENING!**

