

Field Guide to **MICHIGAN CRAYFISH**



Department of Fisheries and Wildlife
MICHIGAN STATE UNIVERSITY

TABLE OF CONTENTS

Background and introduction	3
Key terms	6
Anatomy diagram	7
Identification key	8
Big water crayfish (<i>Cambarus robustus</i>)	10
Digger crayfish (<i>Creaserinus fodiens</i>)	12
Calico crayfish (<i>Faxonius immunis</i>)	14
Northern clearwater crayfish (<i>Faxonius propinquus</i>)	16
Rusty crayfish (<i>Faxonius rusticus</i>) INVASIVE	18
Virile crayfish (<i>Faxonius virilis</i>)	20
Great Plains mudbug (<i>Lacunicambarus nebrascensis</i>)	22
Paintedhand mudbug (<i>Lacunicambarus polychromatus</i>)	24
White river crayfish (<i>Procambarus acutus</i>)	26
Red swamp crayfish (<i>Procambarus clarkii</i>) INVASIVE	28
Potential invasive species	30
Regulations and reporting	31

CREDITS

Kelley Smith, Michigan State University

Lucas Nathan, aquatic species and regulatory affairs unit manager,
Michigan Department of Natural Resources

Tracy Page, aquatic education coordinator,
Michigan Department of Natural Resources

Kathleen Quebedeaux, fisheries biologist
Michigan Department of Natural Resources

Will Budnick, Michigan State University

Illustrations: Rachel Spelich, Tracy Page

Editors: Casey Warner, Leah Higgins and Joanne Foreman

Cover: Paintedhand mudbug image courtesy Chris Lukhaup

BACKGROUND

Crayfish are members of the order *Decapoda*, or 10-footed crustaceans, which also includes shrimp, crabs and lobsters. There are approximately 700 species of crayfish worldwide. Of the 10 crayfish species known in Michigan, eight of them are native and two are invasive. All of Michigan's crayfish are part of the family *Cambaridae* that are broken up into three distinct groups based on their preferred habitat: primary burrowers, secondary burrowers and tertiary burrowers. Additionally, North American *Cambarid* crayfishes are unique in that all males seasonally alternate between reproductive (Form I) and non-reproductive (Form II) states. The reproductive Form I male has unique changes to body shape which can be used to make positive species identifications. Despite relatively low crayfish species richness in Michigan, each of the state's eight native species lives in, and contributes to, wetlands and aquatic ecosystems in important and unique ways.

Primary burrowers

Three of Michigan's crayfish, the paintedhand mudbug (*Lacunicambarus polychromatus*), Great Plains mudbug (*Lacunicambarus nebrascensis*) and digger crayfish (*Creaserinus fodiens*), are considered primary burrowers. These species spend most of their lives underground in fields, ditches, prairies and wet meadows. The best time to see these crayfish is in the spring during early morning rain showers as they make their trek to nearby water sources to explore or release their young. The rest of the year, they build and occupy a deep and complex subterranean tunnel system that goes at least as deep as the ground water table. Sometimes you can spot these crayfish on rainy or humid nights walking on land. Burrows sometimes include a small mound of soil piled at the opening, referred to as a "chimney," which can help spot their presence.

Primary burrowers provide food for many aquatic and terrestrial species and help aerate soil beds. Their burrows also serve as important habitat for many other species, including the federally endangered Hine's emerald dragonfly (*Somatochlora hineana*), the threatened eastern massasauga rattlesnake (*Sistrurus catenatus catenatus*), and the cicada killer wasp (*Sphecius speciosus*).^{1, 2 3}

1. Glon, M., R. Thoma. 2017. An Observation of the Use of Devil Crayfish (*Cambarus cf. diogenes*) Burrows as Brooding Habitat by Eastern Cicada Killer Wasps (*Sphecius speciosus*). *Freshwater Crayfish*. 23: 55-57.

2. Pintora, L.M., D. A. Soluk. 2006. Evaluating the non-consumptive, positive effects of a predator in the persistence of an endangered species. *Biological Conservation* 130: 584 – 591

3. R. A. Seigel 1986. Ecology and conservation of an endangered rattlesnake, *Sistrurus catenatus*, in Missouri, USA. *Biological Conservation* 35:333–346.

Image courtesy James Stauder



Paintedhand mudbug hunting from its burrow opening.

Secondary burrowers

Secondary burrowers can occupy diverse habitats. They are capable of burrowing to escape drought, cold temperatures and predation, but their burrows tend to be much smaller and less complex. Their burrows may or may not have chimneys like in primary burrowers. Most secondary burrowers have a direct connection to permanent bodies of water such as streams, wetlands or ponds. Secondary burrowers are likely to be found in the water during the spring, summer and fall.

Michigan is home to three secondary burrowing species of crayfish. White river crayfish (*Procambarus acutus*) and the calico, or paper-shell, crayfish (*Faxonius immunis*) are native secondary burrowers. In 2017, several confirmed populations of invasive red swamp crayfish (*P. clarkii*), also secondary burrowers, were found in Michigan watersheds.

Tertiary burrowers

Permanent bodies of water like streams, lakes and ponds are home to Michigan's last group of crayfish, the tertiary burrowers. These crayfish spend their entire life under surface water. The four species include the big water crayfish (*Cambarus robustus*), northern clearwater crayfish (*F. propinquus*), northern crayfish (*F. virilis*), and the non-native rusty crayfish (*F. rusticus*). These crayfish rarely, if ever, leave permanent water and only burrow during extreme circumstances or to excavate depressions under rocks and debris in the water for shelter. As both predators and prey, they are important keystone species to Michigan's aquatic ecosystems. They help to shape the vegetative and invertebrate communities in streams and lakes while simultaneously acting as a popular food item for many predatory fish.^{4,5}

Invasive crayfish species in Michigan

Michigan defines invasive species as those that are not native and whose introduction causes harm, or is likely to cause harm, to the environment, economy or human health. Some invasive species are legally designated by the state as “prohibited” or “restricted.” If a species is prohibited or restricted, it is unlawful to possess, introduce, import, sell or offer that species for sale as a live organism, except under certain circumstances.⁶

Rusty crayfish (*Faxonius rusticus*) are native to the Ohio River basin and have been introduced throughout the Great Lakes region. They have spread across many of Michigan’s inland and Great Lakes waters in the last 100 years, their spread most likely facilitated by habitat alterations and angler bait bucket transfers. Once established, they outcompete native crayfish, alter habitat, and consume fish eggs.

Red swamp crayfish (*Procambarus clarkii*) are native to the western Gulf Coast states and the southern Mississippi River drainage. Due to their popularity in the live food trade, biological supply industry, and pet trade, they have been introduced in many U.S. states and around the world.^{1,2} The first observations of established red swamp crayfish in Michigan occurred in 2017. Like rusty crayfish, red swamp crayfish can outcompete native species and negatively affect the ecosystem. Their burrowing tendencies can cause shoreline erosion and have negative effects on water quality.

Range maps

Maps in this guide show known ranges in green, based on the most current surveys and public reports. The most recent comprehensive state-wide stream and river survey was conducted by Smith et al. in 2018 and specimens identified in later field seasons. Species in Michigan have seen changes in their abundance and statewide range due to a variety of factors including natural and human-caused dispersal, habitat loss, pollution, and competition with invasive species.⁷

4. Twardochleb, L. A., J. D. Olden, and E. R. Larson. 2013. A global meta-analysis of the ecological impacts of nonnative crayfish. *Freshwater Science* 32(4):1367–1382.

5. Loureiro, T. G., P. M. S. G. Anastácio, C. Souty-Grosset, P. B. Araujo, and M. P. Almerão. 2015. Red swamp crayfish: biology, ecology and invasion - an overview. *Nauplius* 23(1):1–19.

6. Natural Resources and Environmental Protection Act (NREPA), Michigan Public Act 451. 1994. Part 413: Transgenic and Nonnative Organisms, section 324.41302.

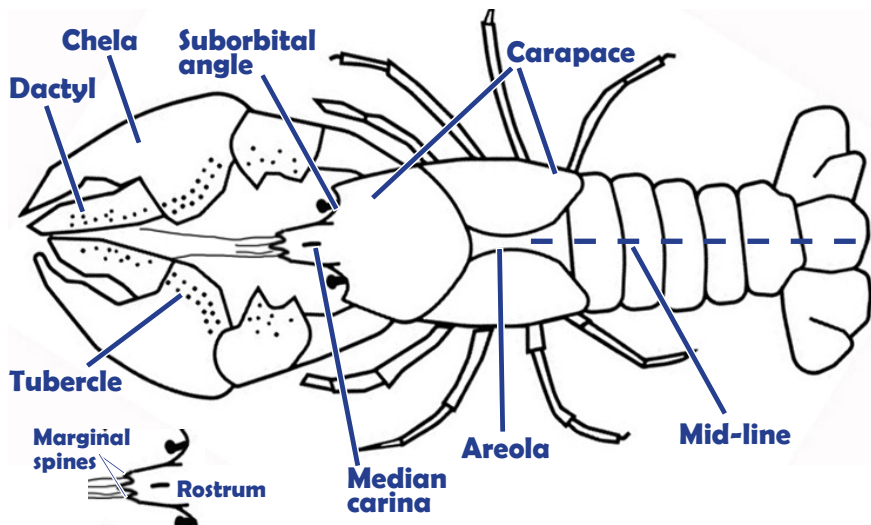
7. Smith, K. R., B. M. Roth, M. L. Jones, D. B. Hayes, S. J. Herbst, N. Popoff. 2018. Changes in the distribution of Michigan crayfishes and the influence of invasive rusty crayfish (*Faxonius rusticus*) on native crayfish substrate associations. *Biological Invasions* 21: 637–656.

Key terms

Areola:	Hourglass-shaped area on the dorsal surface of the carapace. Two arching portions of the carapace meet, or nearly meet.
Annulus ventralis:	Chamber on female crayfish used to store sperm from mating until eggs are laid. Located between the fourth and fifth pairs of walking legs
Carapace:	Hardened exterior of the crayfish's thoracic region, composed of two fused segments. It covers the head, gills, and internal organs of the crayfish.
Chelae:	First walking legs of crayfish, commonly referred to as claws.
Copulatory hook:	Small thorn-like extension near the base of the third and/or fourth walking legs. Found only in mature, Form I males. Used for holding female in place during sexual reproduction. Locations on which legs is distinguishing in many species.
Dactyl:	Movable finger of the chelae.
Dorsal:	Top side or "back" of the crayfish.
Gonopod:	First pleopod of male crayfish, they are significantly different in both shape and size from the remaining pleopods. Used for transferring sperm to the annulus ventralis. Form I, breeding phase, gonopods are used as an identifying feature and are more pointed, flexible, and have a yellowish, translucent appearance. Form II gonopods are the non-reproductive form and are often thicker and more blunt.
Gonopore (genital pore):	Opening at base of the third pair of walking leg that releases sperm or eggs.
Lateral view:	View from the side when crayfish is held horizontally level and perpendicular to the observer's line of sight.
Marginal spines:	Spines located at the margins of the rostrum.
Median carina:	Raised ridge located in the center of the rostrum that some species have. If the medina carina is not easily visible, it can be felt by using one's fingernail to scratch along the rostrum.
Mesial:	Towards the mid-line of the body.
Pleopod:	Appendages in ventral side of the abdomen, commonly called the tail, also called swimmerets. Female crayfish have longer pleopods for holding eggs.
Rostrum:	"Nose" of the crayfish. The extended triangular or shovel-shaped dorsal extension located above and between the eyes.
Suborbital angle:	Triangular point formed directly below the eye of the crayfish, as seen from the side view. The presence or absence of this point is an identifying feature in Michigan crayfish.
Tubercle:	Hard, rounded bumps located on carapace and/or chelae of crayfish. The presence or absence and arrangement of the tubercles can be helpful in identifying individuals.
Ventral:	Underside or "belly" of the crayfish.

Basic crayfish anatomy

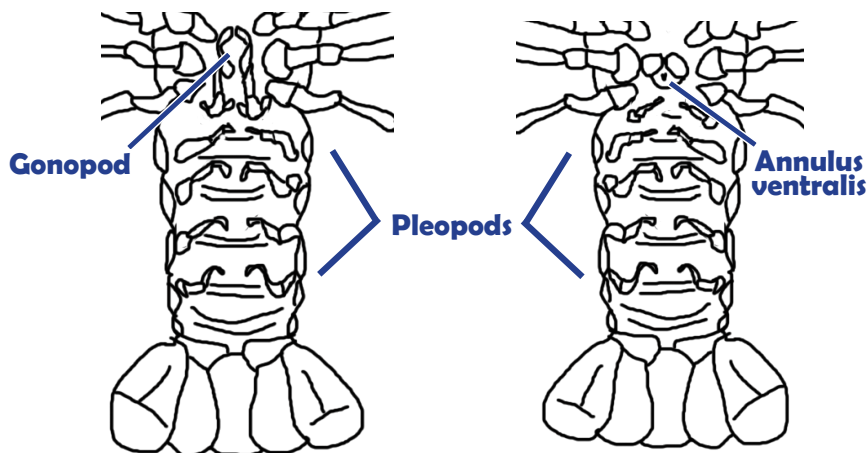
DORSAL VIEW



VENTRAL VIEW

Male

Female



Crayfish of Michigan identification key

1. Areola:

A. Closed ... go to 2.



B. Open ... go to 5.



2. Rostrum:

A. Without marginal spines; carapace without tubercles; gonopods with two terminal elements ... go to 3.

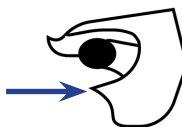


B. Small marginal spines; carapace covered in tubercles; gonopods with more than two terminal elements ... [red swamp crayfish](#) (*P. clarkii*).



3. Sub-orbital angle:

A. Present ... go to 4.



B. Absent ... [digger crayfish](#) (*C. fodiens*).



4. Chelae:

A. Tubercles are scattered on the dorsal surface of mesial edge of palm ... [paintedhand mudbug](#) (*L. polychromatus*).



B. Tubercles in 2-3 rows on dorsal surface of mesial edge of palm ... [Great Plains mudbug](#) (*L. nebrascensis*).



5. Rostrum:

A. Rostrum terminates without marginal spines ... [big water crayfish](#) (*C. robustus*).



B. Rostrum terminates with marginal spines ... go to 6.



6. Median carina:

A. Median carina on dorsal surface of rostrum ... [northern clearwater crayfish](#) (*F. propinquus*).

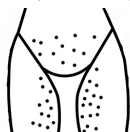


B. No median carina on rostrum ... go to 7.

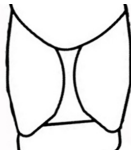


7. Carapace:

A. Carapace covered in tubercles; gonopods having more than two terminal elements ... [white river crayfish](#) (*P. acutus*).



B. Carapace lacking numerous tubercles; gonopods with two terminal elements ... go to 8.



8. Chelae:

A. Deep incision at base of dactyl ... [calico crayfish](#) (*F. immunis*).



B. No deep incision at base of dactyl ... go to 9.



9. Rostrum:

A. Rostrum margins concave; black band around tips of fingers.. [rusty crayfish](#) (*F. rusticus*).



B. Rostrum margins straight or slightly convex; no black bands near tips of fingers ... [virile crayfish](#) (*F. virilis*).

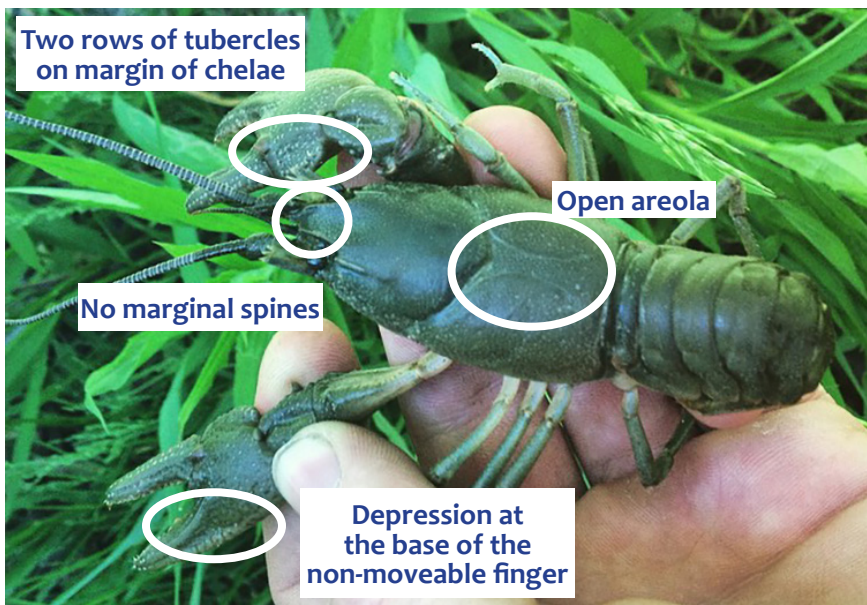


Big water crayfish

Cambarus robustus



Image courtesy Chris Lukhaup



Big water crayfish

Cambarus robustus

A robust tertiary burrower that prefers fast, oxygen-rich, stone-laden streams and is often found occupying depressions beneath large stones. Abundant populations inhabit the eastern Lower Peninsula streams, and found occasionally in the western Lower Peninsula. The big water crayfish has a smooth body with two rows of tubercles on the inside edge of its large claws. It rarely exhibits flashy colors; instead these crayfish are monotones of drab green, brown, tan, or gray. Big water crayfish appear to share streams with rusty crayfish, which are known to displace other crayfish species.

IDENTIFYING CHARACTERISTICS

Areola: Open, moderately wide.

Rostrum: Excavated rostrum or “spoon shaped”. Terminates without marginal spines in a strong point.

Chela: Large and robust and often with depression at the base of the non-moveable finger.

Tubercles: Mesial margin of palm has two rows of rounded tubercles.

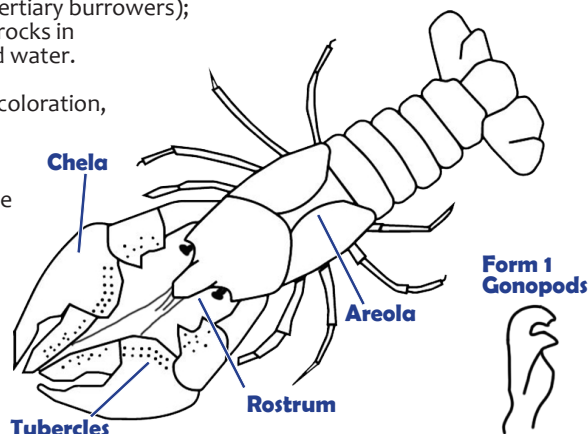
Gonopods: Two short, sharply angled and sickle-shaped terminal elements on form 1 gonopods.

Habitat: Open water (tertiary burrowers); often found under large rocks in flowing, well-oxygenated water.

Color notes: Uniform coloration, often gray, tan, or olive drab. Juveniles are often mottled in appearance with two dark, lengthwise stripes on the tail.



Known range of *C. robustus*, 2020



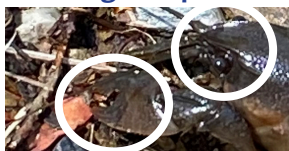
Digger crayfish

Creaserinus fodiens



Image courtesy Chris Lukhaup

No suborbital angle;
downward deflected
rostrum with no
marginal spines



Notch in dactyl;
large tubercles at
base of dactyl;
sometimes hairs
in chelae

Closed areola

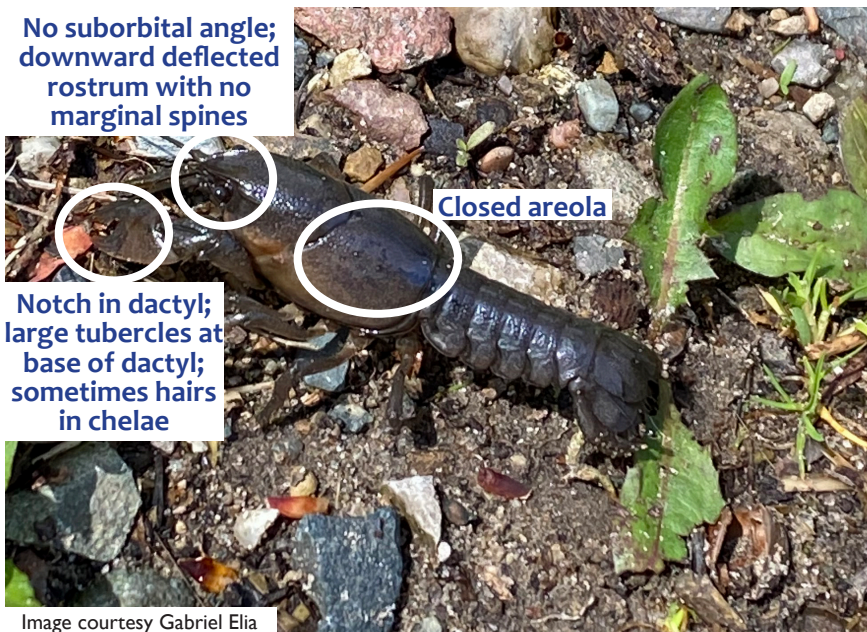


Image courtesy Gabriel Elia

Digger crayfish

Creaserinus fodiens

A round-bodied primary burrower that prefers floodplains and forested wetlands across the Lower Peninsula, and occasionally can be found in sluggish streams, vernal pools and ditch lines with abundant detritus and leaf packs. Digger crayfish live up to their name, digging burrows that often have several openings and occasionally intersect with the burrows of other digger crayfish. These burrows have been shown to be critical habitat for the federally endangered Hine's emerald dragonfly (*Somatochlora hineana*) and threatened eastern massasauga rattle-snake (*Sistrurus catenatus catenatus*). The digger crayfish is most likely to be encountered outside of its burrow in the early spring after snow melt fills the water table and vernal pools. This small crayfish is compact and oval-shaped and its color is often mottled in earth tones and grays, with the occasional warm highlight.

IDENTIFYING CHARACTERISTICS

Areola: Closed. Often completely obliterated or linear in appearance.

Rostrum: Wide, moderately excavated with downward angle. Lacks marginal spines and sub-orbital angle.

Chela: Large and wide with flattened fingers. Often dactyl has prominent notch and hairs.

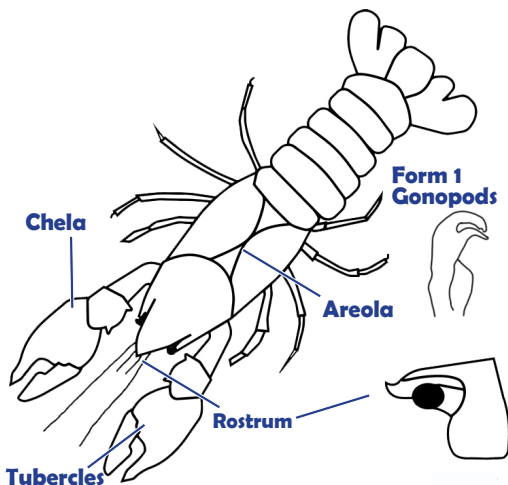
Gonopods: Two short, sharply angled and sickle-shaped terminal elements on form 1 gonopods.

Habitat: Primary burrowers. Can be found in complex burrows in wet meadows, near vernal pools. Often multiple individuals of this gregarious species inhabit a complex.

Color notes: Often brown to light brown with mottling. Two faint longitudinal stripes may be present on dorsal side of tail.



Known range of
C. fodiens, 2020



Calico crayfish

Faxonius immunis



Image courtesy Chris Lukhaup



Image courtesy Brennen Wright

Calico crayfish

Faxonius immunis

A small to medium, thin-shelled crayfish, often called the “paper-shell crayfish.” This secondary burrower has a scattered range across the Lower Peninsula and is occasionally observed in the western Upper Peninsula. It can be quite abundant where observed, occupying sluggish, soft-bottomed streams, ditch lines, vernal pools and flooded meadows. It is often found in vegetated portions of water bodies, or in simple burrows near permanent and temporary bodies of water. It is highly dynamic in its use of simple burrows or open water, often returning to burrows when conditions are not favorable or during water draw-down. Calico crayfish have a wide range of color patterns, from black and brown to mottled displays of green, gray and brown and sometimes blue, green, or purple chelae. Chelae in larger individuals usually display a prominent notch in the dactyl. Because of its availability and its soft body, the calico crayfish is popular among anglers as a form of live bait.

IDENTIFYING CHARACTERISTICS

Areola: Narrowly open.

Rostrum: Moderately excavated; margins converges in small spines.

Chela: Large; deep incision at base of the movable dactyl. Tips of fingers are orange.

Tubercles: Large, forward-angling tubercles along mesial margin of palm region and dactyl.

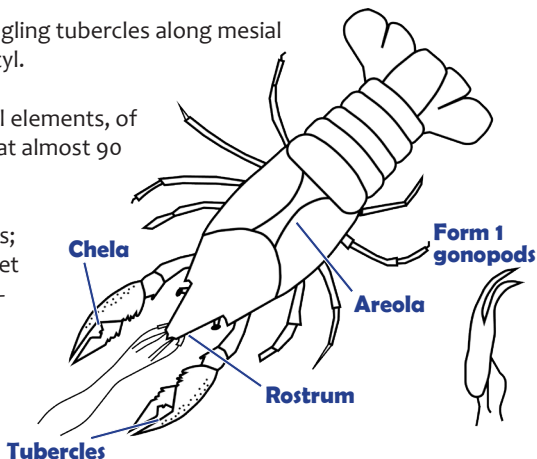
Gonopods: Two thin terminal elements, of similar length, strongly curved at almost 90 degrees on form 1 gonopods.

Habitat: Secondary burrowers; found in banks of ditch lines, wet fields, and in vegetation of soft-bottomed creeks and streams.

Color notes: Often mottled with light hues of gray and brown. Gray or cream colored stripe runs down midline.



Known range of *F. immunis*, 2020

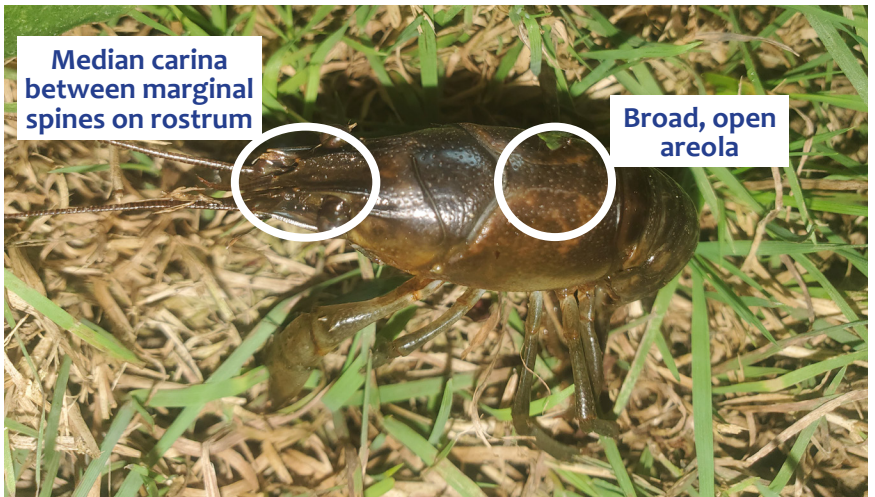


Northern clearwater crayfish

Faxonius propinquus



Image courtesy Chris Lukhaup



Northern clearwater crayfish

Faxonius propinquus

One of the more common native tertiary burrowers in Michigan, they are found in both the Upper and Lower peninsulas, in both fast-moving and stagnant waters. These crayfish are not tolerant of water drawdown and are poor excavators of even temporary burrows to escape drying out. Northern clearwater crayfish are most abundant in bodies of water that offer large areas of cobble and boulders, but can utilize vegetation, detritus and wood as alternate habitat when rusty crayfish are present. Northern clearwater crayfish have been observed hybridizing rusty crayfish, which leads to concern over local extirpation through hybridization with invasive species. The northern clearwater crayfish is very similar in appearance to the rusty crayfish, with the most notable differences being the lack of the rust-colored saddle, and the presence of a median carina, a prominent notch in the middle of the rostrum.

IDENTIFYING CHARACTERISTICS

Areola: Open, wide.

Rostrum: Margins straight with marginal spines; strong median carina.

Chela: Large; tips of fingers red or orange with black bands.

Tubercles: Two rows of rounded tubercles along mesial margin of the palm region.

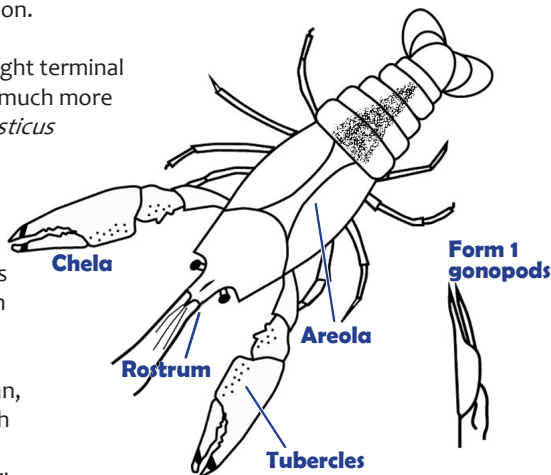
Gonopods: Two, short, straight terminal elements on form 1 gonopod, much more stout in comparison with *F. rusticus* and *F. virilis*.

Habitat: Open water (tertiary burrowers), preferring coarse substrates as shelter. Will occupy vegetation if rusty crayfish are present.

Color notes: Usually light tan, greenish-brown, or brown with a dark colored wedge present on the dorsal surface of the tail.



Known range of *F. propinquus*, 2020



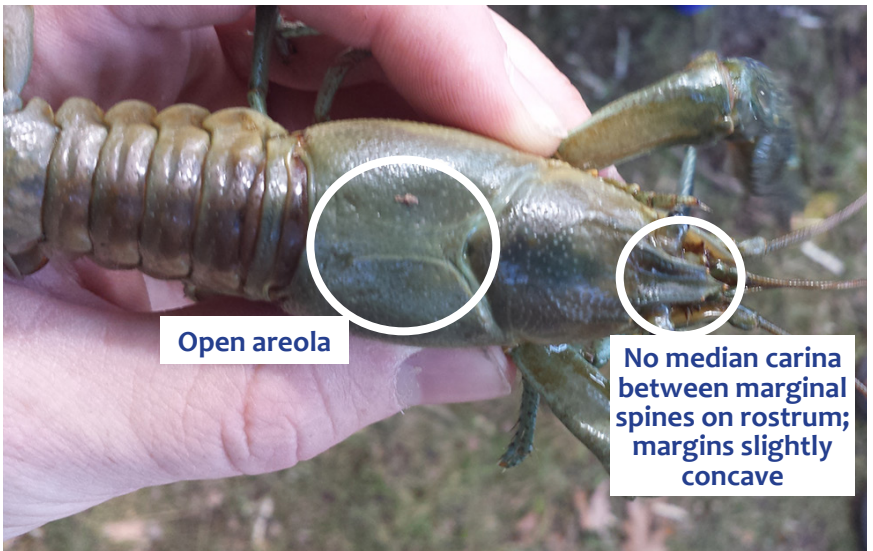
Rusty crayfish

Faxonius rusticus

INVASIVE



Image courtesy Chris Lukhaup



Open areola

**No median carina
between marginal
spines on rostrum;
margins slightly
concave**

Rusty crayfish

Faxonius rusticus

INVASIVE

Rusty crayfish are one of the most widespread invasive crayfish in the United States and are one of the most abundant crayfish in the Great Lakes and Midwest. Rusty crayfish are generalist tertiary burrowers, occupying fast-flowing streams, large lakes, small ponds and offshore reefs in the Great Lakes. They prefer hard, rocky substrates and will readily push native northern clearwater and virile crayfish out of these habitats, forcing them to use less ideal vegetative habitat, if it's available. Rusty crayfish have been shown to alter macrophyte, fish, and invertebrate communities, where they abound. In Michigan, rusty crayfish can reach large sizes, with chelae significantly larger than similarly sized native crayfish.

IDENTIFYING CHARACTERISTICS

Areola: Open; moderately wide.

Rostrum: Margins concave with marginal spines; median carina absent. Appears pinched at the base of the rostrum.

Chela: Large; tips of fingers orange with wide black bands.

Tubercles: Small tubercles on palm region and fingers.

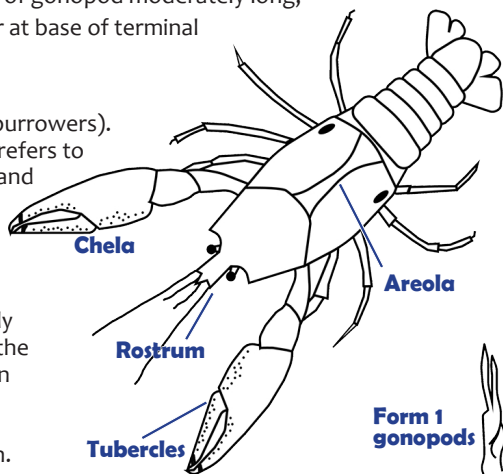
Gonopods: Terminal elements of gonopod moderately long, straight, and thin. Small shoulder at base of terminal elements.

Habitat: Open water (tertiary burrowers). Common in lakes and streams; prefers to occupy structures such as rocks and boulders. Very territorial.

Color notes: Browns, olive greens and tans common, with the addition of a rust or burgundy spot, or saddle, near the rear of the carapace. However, identification should not rely solely on the presence of a rust spot, as this spot might be hard to distinguish.



Known range of
F. rusticus, 2020



Virile crayfish (northern crayfish)

Faxonius virilis

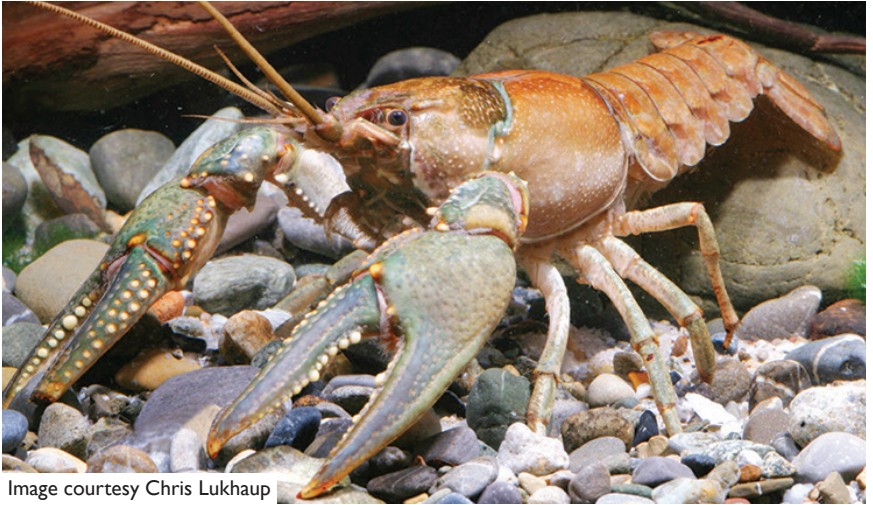
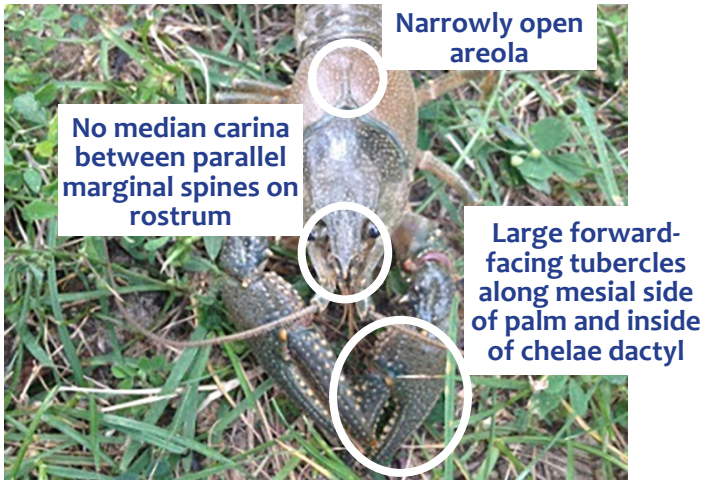


Image courtesy Chris Lukhaup



Virile Crayfish (northern crayfish)

Faxonius virilis

Common large tertiary burrower widely distributed across the Upper and Lower peninsulas. They are highly adaptable and often found in small streams, large rivers, inland lakes and the Great Lakes. Preferring hard, rocky substrates, this species can also shift its habitat to vegetative areas and detritus if necessary to avoid aggressive interactions with northern clearwater crayfish and red swamp crayfish. Virile crayfish have been observed occupying crude, shallow burrows in muddy river bottoms or river banks during dry periods. Virile crayfish can grow quite large, with significantly meatier tails than both northern clearwater and rusty crayfish. However, its chelae are often reduced in comparison to its body size relative to those species.

IDENTIFYING CHARACTERISTICS

Areola: Open, narrowly.

Rostrum: Slightly convex or straight margins that terminate in strong marginal spines; median carina absent.

Chela: Large; often a hue of blue or green that contrasts with the body. Smaller individuals often have dark speckling on the chelae. Tips of fingers are orange.

Tubercles: Large, sharp tubercles along mesial margin of chela; tubercles usually angled forward.

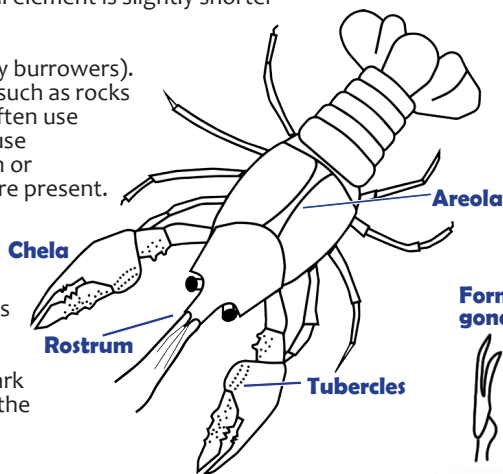
Gonopods: Two long, slightly curved terminal elements on form 1 gonopods. One terminal element is slightly shorter than the other.

Habitat: Open water (tertiary burrowers). Often found under structures such as rocks and logs. Smaller individuals often use vegetation; larger individuals use vegetation when rusty crayfish or northern clearwater crayfish are present.

Color notes: Virile crayfish most commonly have a brown or olive carapace and blue, or green-hued chelae. It is common for the head to be darker in coloration than the more chestnut body. Paired dark patches run lengthwise along the tail. Younger individuals might appear more mottled.



Known range of
F. virilis, 2020



Form 1
gonopods



Great Plains mudbug

Lacunicambarus nebrascensis



Image courtesy Bailey O'Brian



Image courtesy Greg Kelly

Great Plains mudbug

Lacunicambarus nebrascensis

The Great Plains mudbug was recently discovered to be a new species of crayfish, and was formerly thought to be the Devil crayfish. The Great Plains mudbug has a wide range and is found throughout much of the upper midwest. The Great Plains mudbug is a large-bodied, primary burrower. They are readily found in ditches, farm fields, wet meadows, prairies, and floodplains in both the Upper and Lower peninsulas. They are occasionally found in stream banks, especially in sandy areas. They are much less colorful than the paintedhand mudbug, often with faint orange or red highlights on the rostrum and chelae. They are usually colored tan, brown or olive with chelae showcasing two rows of well-defined, robust mesial tubercles and an additional row on the dorsal side. Younger individuals may have some mottling and a light stripe on the mid-line.

IDENTIFYING CHARACTERISTICS

Areola: Closed. Often obliterated or linear in appearance.

Rostrum: Terminates without marginal spines in a straight, slightly downward angle. Has sub-orbital angle.

Chela: Large and robust.

Tubercles: Mesial margin of palm with two rows of rounded tubercles and a third row on dorsal surface of palm.

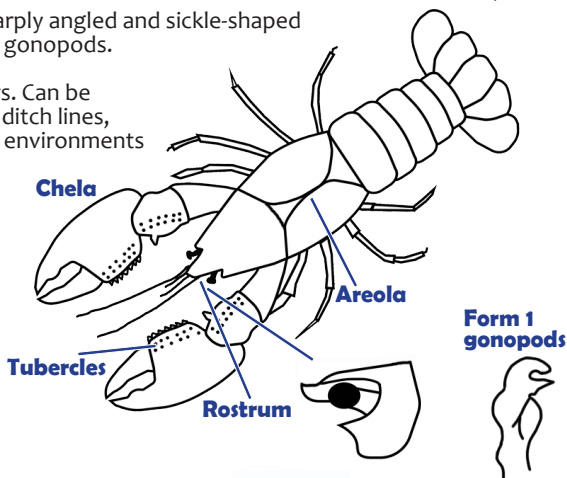
Gonopods: Two short, sharply angled and sickle-shaped terminal elements on form 1 gonopods.

Habitat: Primary burrowers. Can be found in deep burrows near ditch lines, wet fields, and other upland environments with slow water nearby.

Color notes: Coloration is drab and made up of olive greens, browns, and grays, with some faint orange or red highlights. Younger individuals may have some mottling and a light stripe on the mid-line.



Known range of
L. nebrascensis, 2020



Paintedhand mudbug

Lacunicambarus polychromatus



Image courtesy Chris Lukhaup

Small
scattered
tubercles
on palm of
chela

Closed areola

Downward
deflected
rostrum with no
marginal spines

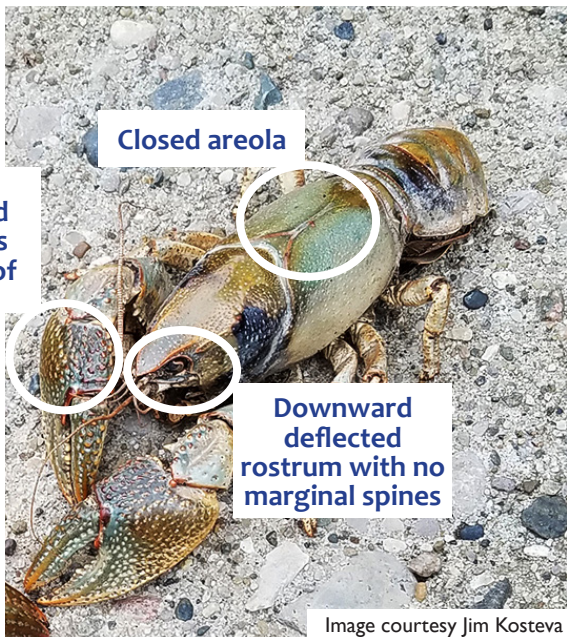


Image courtesy Jim Kosteva

Paintedhand mudbug

Lacunicambarus polychromatus

Large, primary burrower found throughout much of the southern Lower Peninsula. This species is rarely observed in permanent water and spends most of its life in deep, complex subterranean burrows. It is occasionally viewed at night with its chelae outside its burrow, waiting on passing prey. It can be found in a variety of habitats, from farm fields to ditches, and floodplains to wet meadows, and its chimneys are a common sight in some suburban areas. The paintedhand mudbug is easily identified by its strong, large claws with tubercles scattered (not in lines) on the mesial side, a downwardly deflected rostrum, and closed areola. This is the most colorful crayfish species in Michigan. Its carapace is most often olive, tan, and brown with an occasional accent of purple, green, or blue. Paintedhand mudbugs have bright red and orange margins on the rostrum, claws, and tail segments, with claws that are often tones of green, blue, and olive.

IDENTIFYING CHARACTERISTICS

Areola: Closed. Often completely obliterated or linear in appearance.

Rostrum: Terminates without marginal spines in a steep downward angle. Has suborbital angle.

Chela: Large and robust.

Tubercles: Dorsal surface of palm covered with scattered small, round tubercles.

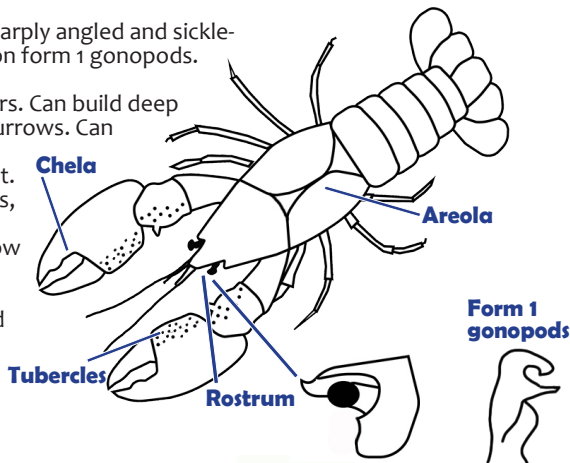
Gonopods: Two short, sharply angled and sickle-shaped terminal elements on form 1 gonopods.

Habitat: Primary burrowers. Can build deep and some times complex burrows. Can be seen hunting from the mouth of its burrow at night. Typically occupies ditch lines, wet fields, and upland environments bordering slow or stagnant waters.

Color notes: Often found with bright orange lines on the rostrum and colorful green/blue marks on the claws and tail.



Known range of
L. polychromatus,
2020



White river crayfish

Procambarus acutus



Image courtesy Chris Lukhaup



White river crayfish

Procambarus acutus

The white river crayfish, a secondary burrower, prefers stagnant wetlands, sluggish streams and ditch-line habitats. Where found, they can be abundant and found in an array of browns, tans, reds and ochres, with chelae and carapace covered in small tubercles. This species often can be mistaken for invasive red swamp crayfish, which are closely related. It can be distinguished from the invasive red swamp crayfish by its having an open areola, lack of a shoulder on the form 1 gonopod, and black or white tubercles on its chelae instead of red. Anecdotal evidence indicates the white river crayfish appears to be expanding its range within the state, as few watersheds had reports of this species in the 20th century, but they are now commonly found as far north as Flint.

IDENTIFYING CHARACTERISTICS

Areola: Open, narrowly.

Rostrum: Terminates in a strong point with weak marginal spines.

Chela: Long and thin; dorsal surface covered in black tubercles.

Tubercles: Carapace covered in small black tubercles.

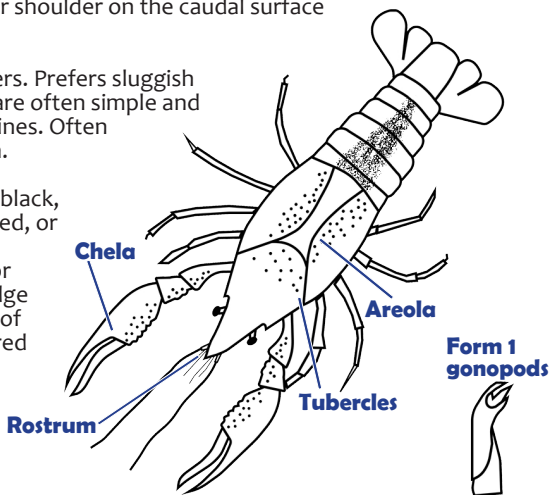
Gonopods: Multiple short, curved terminal elements on form 1 gonopods. No strong angular shoulder on the caudal surface of the gonopod.

Habitat: Secondary burrowers. Prefers sluggish to stagnant waters. Burrows are often simple and shallow in the banks of ditch lines. Often associated with calico crayfish.

Color notes: Ranging from black, olive drab and tan to brown, red, or yellow. Tubercles are black or white regardless of other color tones. Has a dark colored wedge present on the dorsal surface of the tail. Often confused with red swamp crayfish.



Known range of
P. acutus, 2020



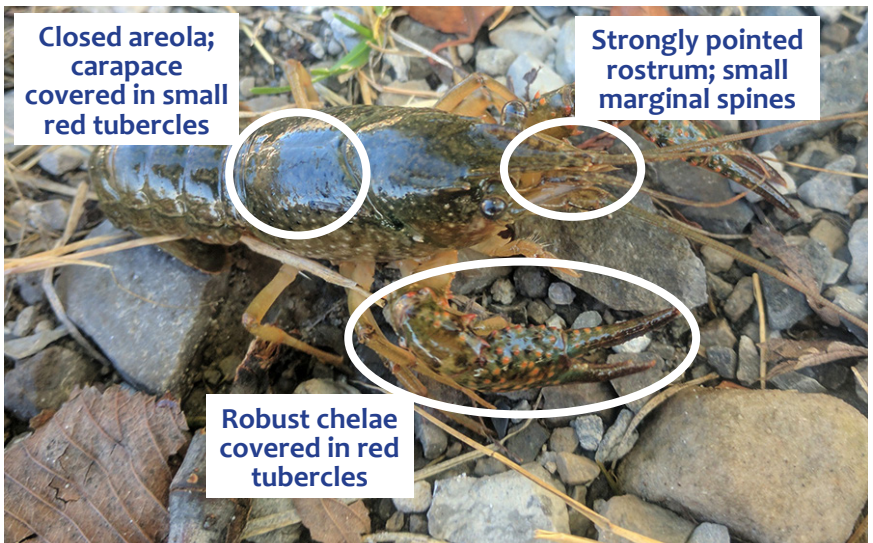
Red swamp crayfish

Procambarus clarkii

INVASIVE



Image courtesy Chris Lukhaup



Red swamp crayfish

Procambarus clarkii

INVASIVE

Recently discovered in Michigan waters, the red swamp crayfish is one of the most widespread invasive crayfish on the planet. Native to the southern U.S., it has invaded several other U.S. states as well as, Africa, Asia, Europe and South America. In other parts of the world, red swamp crayfish have extirpated native crayfish and invertebrates, affected amphibian populations, damaged and eroded levees, altered vegetation communities and directly affected water quality through intensive burrowing and foraging. As secondary burrowers, they exhibit a dynamic ability to persist in a wide variety of ecological systems and disturbed areas. When surface conditions become less hospitable, they quickly construct crude burrows that, due to high population densities, can erode banks and upset wetland systems. Red swamp crayfish look very similar to white river crayfish. They can be distinguished by noting their closed areola, strong angular shoulder on the caudal surface of the gonopod, and typically red tubercles covering the carapace and chela.

IDENTIFYING CHARACTERISTICS

Areola: Closed.

Rostrum: Terminates in a strong point with weak marginal spines.

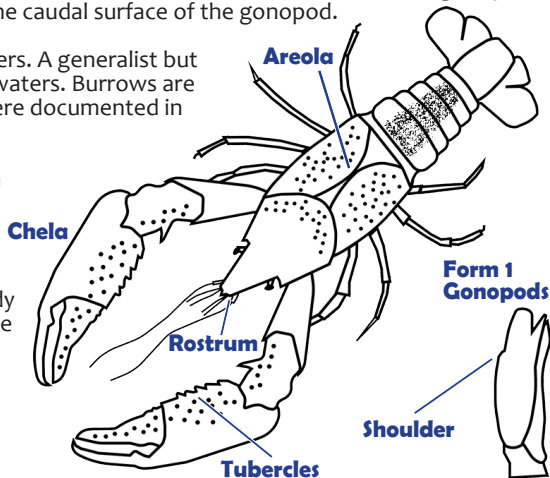
Chela: Long and thin; dorsal surface covered in red tubercles.

Tubercles: Carapace covered in small, red tubercles.

Gonopods: Multiple short, robust, curved terminal elements on form 1 gonopod. Strong angular shoulder on the caudal surface of the gonopod.

Habitat: Secondary burrowers. A generalist but prefers sluggish to stagnant waters. Burrows are often simple and shallow where documented in Michigan.

Color notes: Body colors in wild individuals range from crimson, to olive, brown and black. Individuals in the pet trade have been reported being bright blue, white, candy cane-colored and other unique patterns. Has a dark colored wedge present on the dorsal surface of the tail. Larger individuals are often red, and smaller individuals are often brown with black spots.



Other prohibited species

Marbled crayfish

Marbled crayfish, also known as marmokrebs (*Procambarus virginalis*), is an invasive species threat that has the potential to harm Michigan's natural resources and economy. For this reason, it has been listed as a prohibited species in Michigan, making it unlawful to possess, introduce, import, sell or offer the sale in the state.⁸ Marbled crayfish are often tan, brown, or blue. Identified by the marbled coloration on their sides and their thin claws with fingers approximately the same length as the palm. Feed heavily on plants, snails, and amphibians, competing with native species for food and habitat. In addition, they dig burrows, which causes instability of riparian soils, increasing the potential for shoreline erosion. They are parthenogenetic, meaning they are all females clones that do not need males to reproduce, allowing for rapid colonization. Introduction of a single individual can result in the establishment and spread of a population and can quickly dominate lakes, ponds, rivers and wetlands. Introduced populations of marbled crayfish in Madagascar and several European countries have spread rapidly, and they have now been introduced into Canada. Marbled crayfish are readily available in the aquarium trade, so there is



Chucholl C. / CC BY-SA

a high risk of introduction and spread through the release of live unwanted pets. Although they have not been documented in Michigan, their popularity in the aquarium trade makes them a high risk for future introductions. Marbled crayfish were added to Michigan's prohibited species list and invasive species watch list in May 2020.

Common yabby

The common yabby (*Cherax destructor*) is native to eastern Australia and has been introduced into Western Australia and several countries in Europe, Asia and Africa. Their spread is likely due to their availability in the live food and aquarium trades. When introduced, yabby have the potential to displace native crayfish species, alter habitat, consume large amounts of native aquatic species and spread disease. Yabby can tolerate a wide range of environmental conditions, which allows them to establish and spread in new places. No wild populations have been documented in the United States; however, their popularity in the aquarium trade raises concern over potential introductions. To prevent future introductions, yabby are prohibited in Michigan and most other states and provinces in the Great Lakes region.



Image courtesy Chris Lukhaup

Invasive species regulations & reporting

Red swamp crayfish, common yabby crayfish and marbled crayfish are listed as prohibited species in Michigan, meaning they cannot be possessed, sold, imported, introduced or transported live. Rusty crayfish, which are restricted in the state, may be harvested for personal consumption (see below); however, they are illegal to commercially take, possess or sell. Invasive crayfish may not be used for bait, whether alive or dead, on any private or public waters.

If you currently have live crayfish as part of a hobby or classroom aquarium, it is important that they are properly euthanized by placing in the freezer, where they will pass in their rest state. No individuals should be released into the wild or flushed down drains as they can potentially survive and later reproduce in the wild, spurring further infestations.

Any observations of red swamp, yabby or marbled crayfish should be reported to the Michigan DNR Fisheries Division at DNR-Fisheries@Michigan.gov.

More information about watch list species and reporting can be found at the Michigan invasive species website, Michigan.gov/Invasives.

Harvest regulations

- Native crayfish can be harvested in all waters open to fishing with the possession of a recreational fishing license.
- Rusty crayfish may only be harvested and possessed live for personal consumption.
- Fishing methods can include traps, nets, spears, hook and line, or hand harvesting.
- All traps must display the owner's name and address.
- There are no size or possession limits on crayfish.
- Native crayfish may be taken and used for bait except on the Michigan-Wisconsin boundary waters.
- A license is required in order to take, possess, or transport crayfish for commercial purposes. MCL 324.48732
- See the current Michigan Fishing Guide, available online at Michigan.gov/Fishing for the most updated crayfish regulations.



Department of Fisheries and Wildlife
MICHIGAN STATE UNIVERSITY

