

Crayfish 101: An Introduction to Crayfish Biology and Identification

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NC Wildlife Resources Commission



What's a Crawdad?



Agenda

- Information
- Classification/Distribution
- Biology and Conservation
- Invasive species impacts
- Morphology
- Identification

Information

- H.H. Hobbs, Jr., 1972 Biota of Freshwater Ecosystems: Identification Manual No. 9. Crayfishes (Astacidae) of North and Middle America. For the Environmental Protection Agency, Project #18050 ELD.
- H.H. Hobbs, Jr., 1989. An illustrated checklist of the American crayfishes (Decapoda: Astacidae, Cambaridae, Parastacidae). Smithsonian Contributions to Zoology 480:1-236.
- H.H. Hobbs, III, 1991. In Thorp and Covich: Ecology and Classification of North American Freshwater Invertebrates, Academic Press.
- D.M. Holdich, 2002. Biology of Freshwater Crayfish, Blackwell Science.
- Taylor et al. 2007. A Reassessment of the Conservation Status of Crayfishes of the United States and Canada after 10+ Years of Increased Awareness. Fisheries 32(8):372-389.
- Online resources – NCWRC website & Dr. Jim Fetzner – Carnegie MNH
- Original descriptions

Horton H. Hobbs, Jr.

1914 - 1994

- 200+ publications
- Descriptions
 - 168 Crayfishes (~46%)
 - 29 genera and subgenera
 - 104 Ostracods
 - 8 Shrimps
 - 6 Crabs
 - And....1 Hush puppy recipe

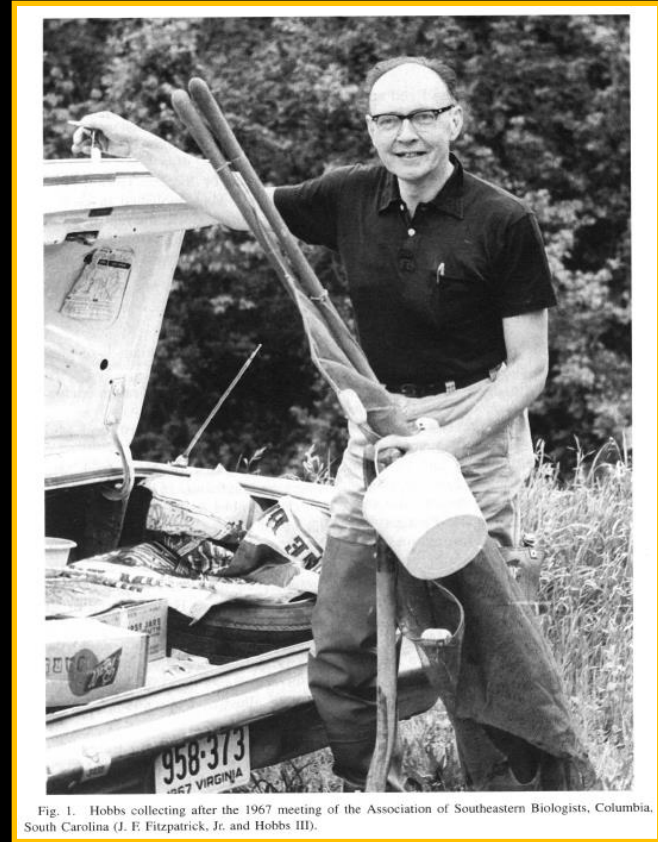


Fig. 1. Hobbs collecting after the 1967 meeting of the Association of Southeastern Biologists, Columbia, South Carolina (J. F. Fitzpatrick, Jr. and Hobbs III).

- “Oh Hobbs. He writes faster than I can read”

Classification

Phylum Arthropoda

Subphylum Crustacea

Class Malacostraca

Order Decapoda: shrimps, crabs, lobsters

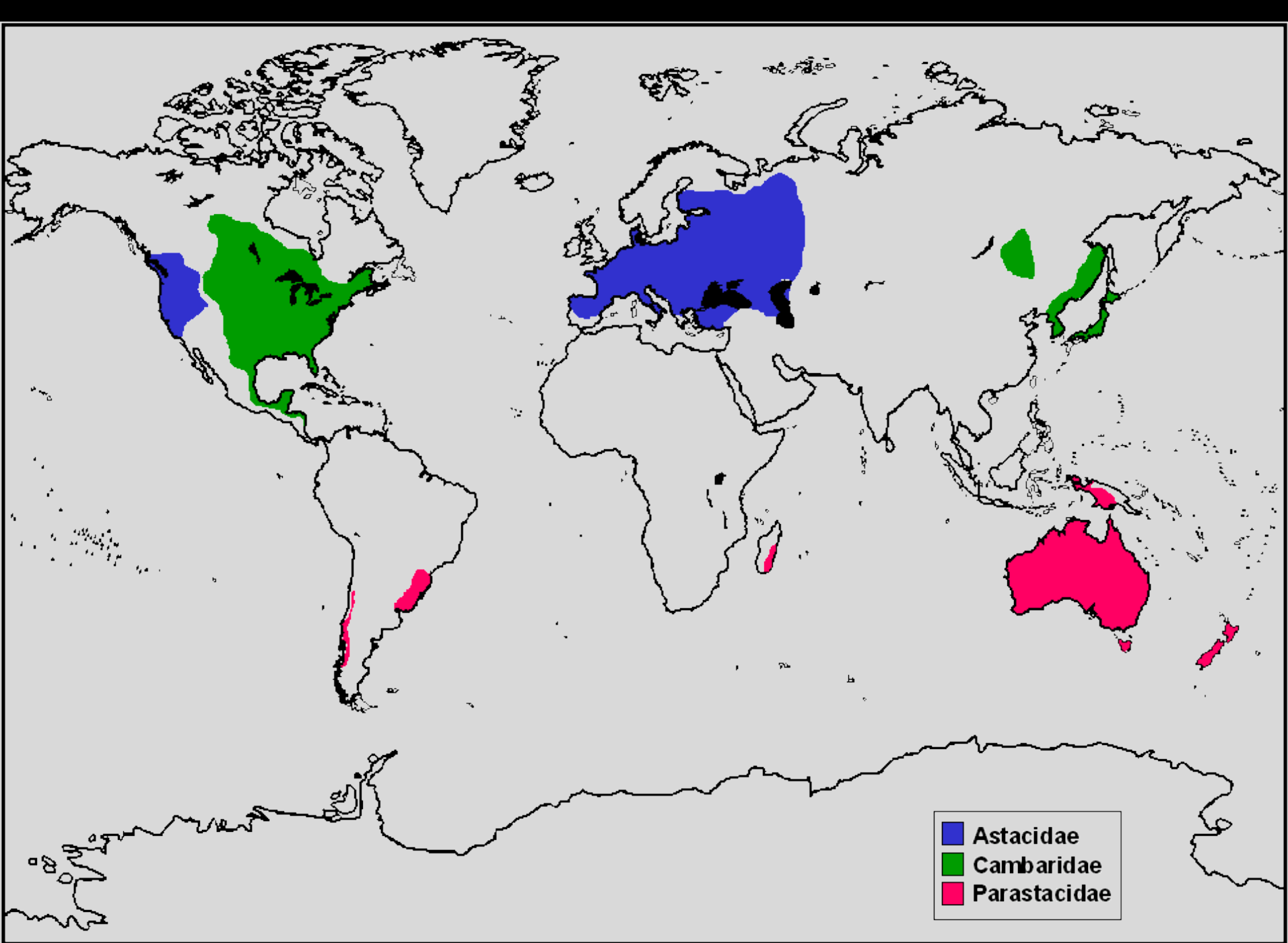
Superfamily Astacoidea – N. Hemisphere

Family Astacidae

Family Cambaridae

Superfamily Parastacoidea – S. Hemisphere

Family Parastacidae



Genera of North America

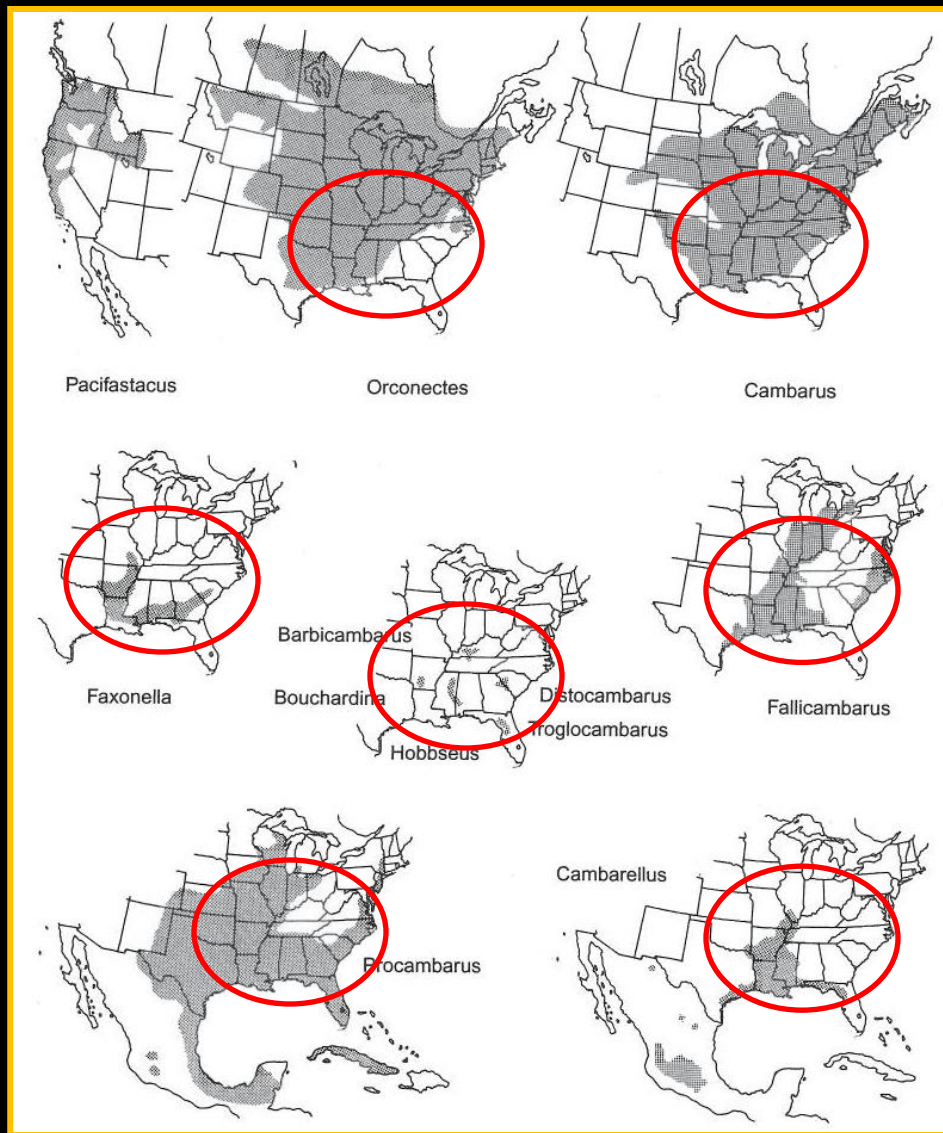
Astacidae

- *Pacifasticus* (7)

Cambaridae

- *Barbicambarus* (2)
- *Bouchardina* (1)
- *Cambarellus* (8)
- *Cambarus* (98)
- *Distocambarus* (5)
- *Fallicambarus* (16)
- *Faxonella* (4)
- *Hobbseus* (7)
- *Orconectes* (90)
- *Procambarus* (125)
- *Troglocambarus* (1)

Genera of North America



(From Hobbs III, 1991)

NC Taxa

49+ taxa, 4 genera

- 44 Native (17 type localities)
- 5 Introduced

- *Cambarus* (31)
- *Fallicambarus* (1)
- *Orconectes* (8)
- *Procambarus* (9)

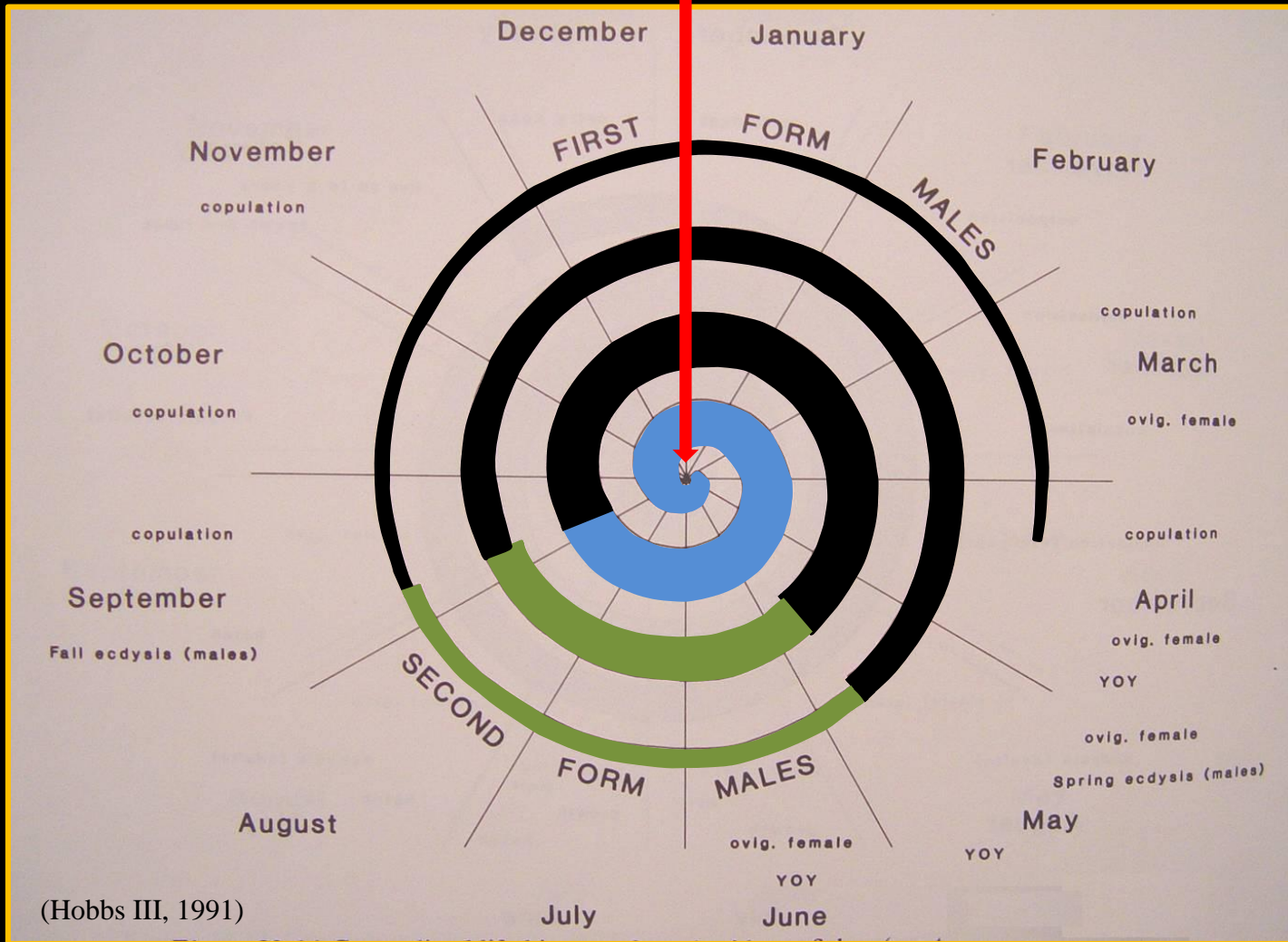
Biology

Life Cycle

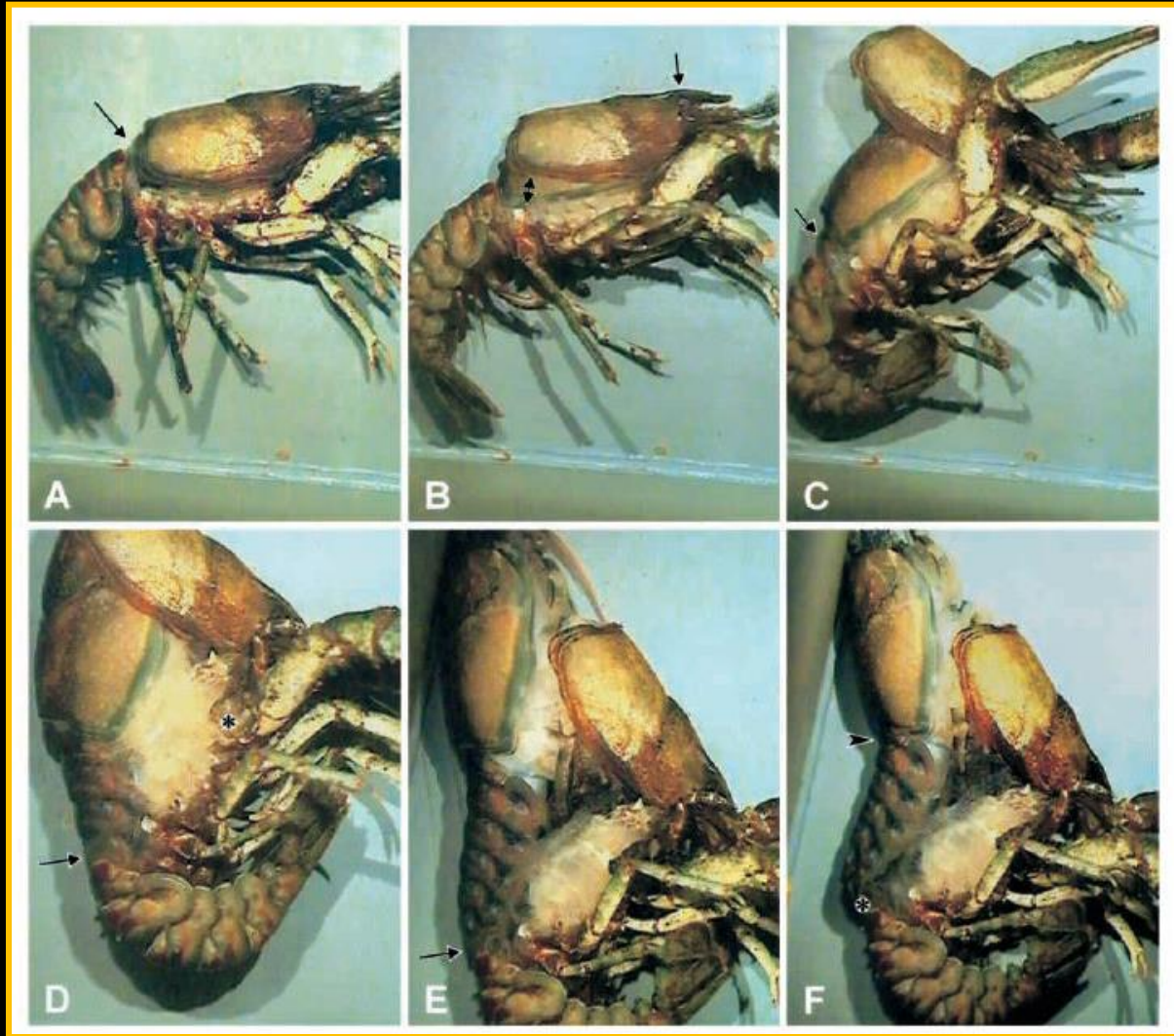
- Egg
- Immature (direct development)
- Adult Female
- Adult Male
 - Form I
 - Form II

General Life Cycle

START HERE!



Molting



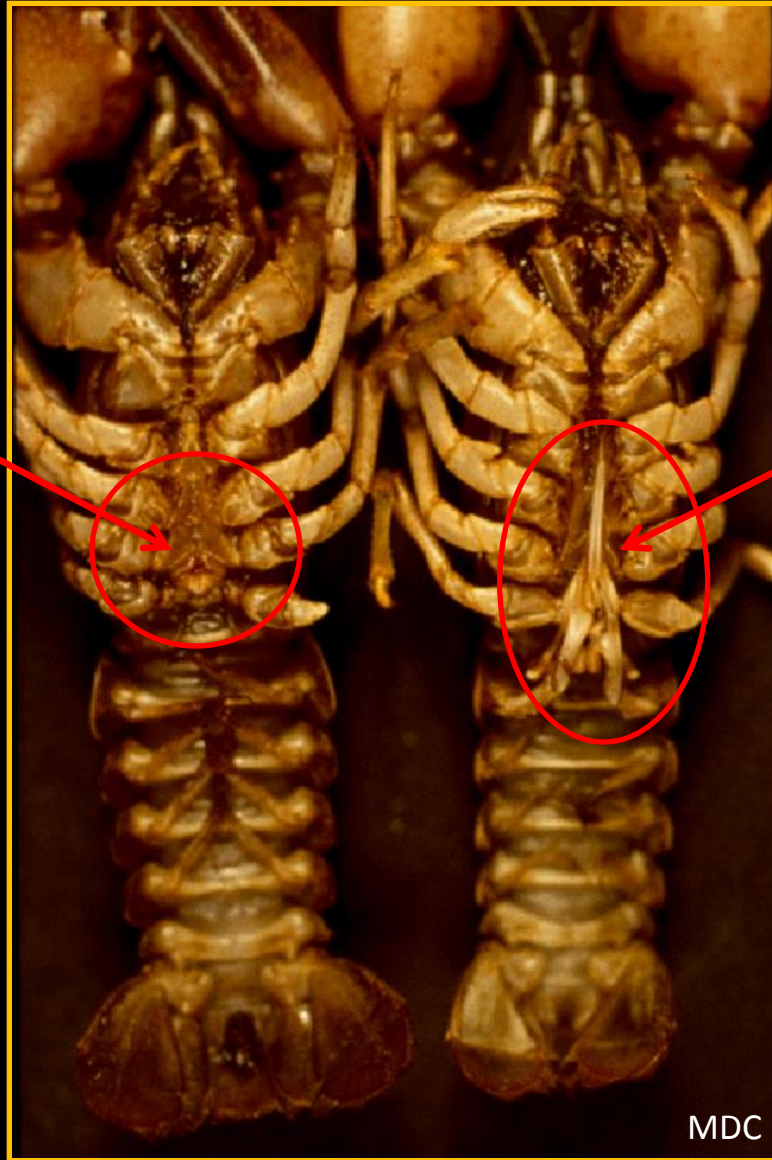
Regeneration and...ID issues



Female vs. Male

Annulus ventralis

Gonopods



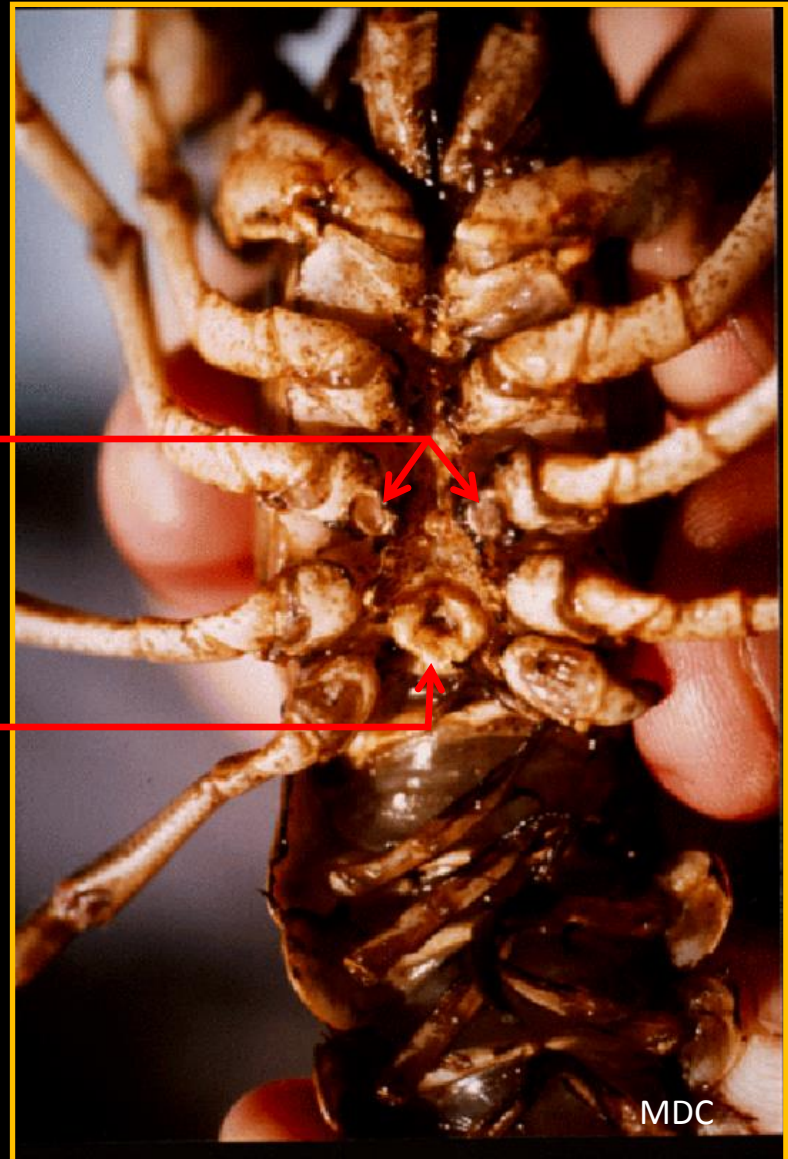
MDC

Orconectes ozarkae
(Ozark Crayfish)

Female

Gonopores

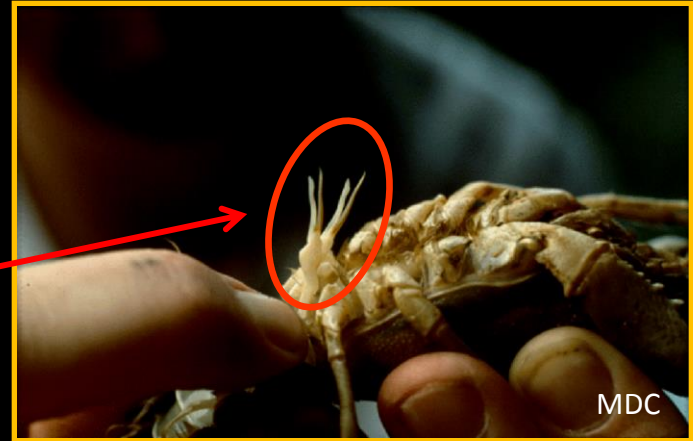
Annulus ventralis



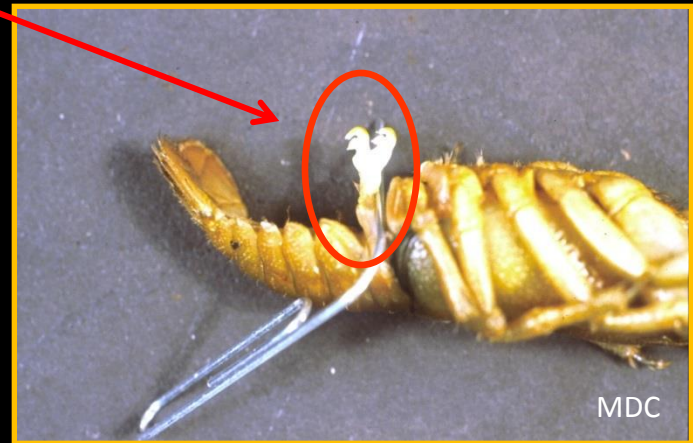
MDC

Male

Gonopods



Male *Orconectes* sp.



Male *Cambarus* sp.

Male I vs. Male II



Form I

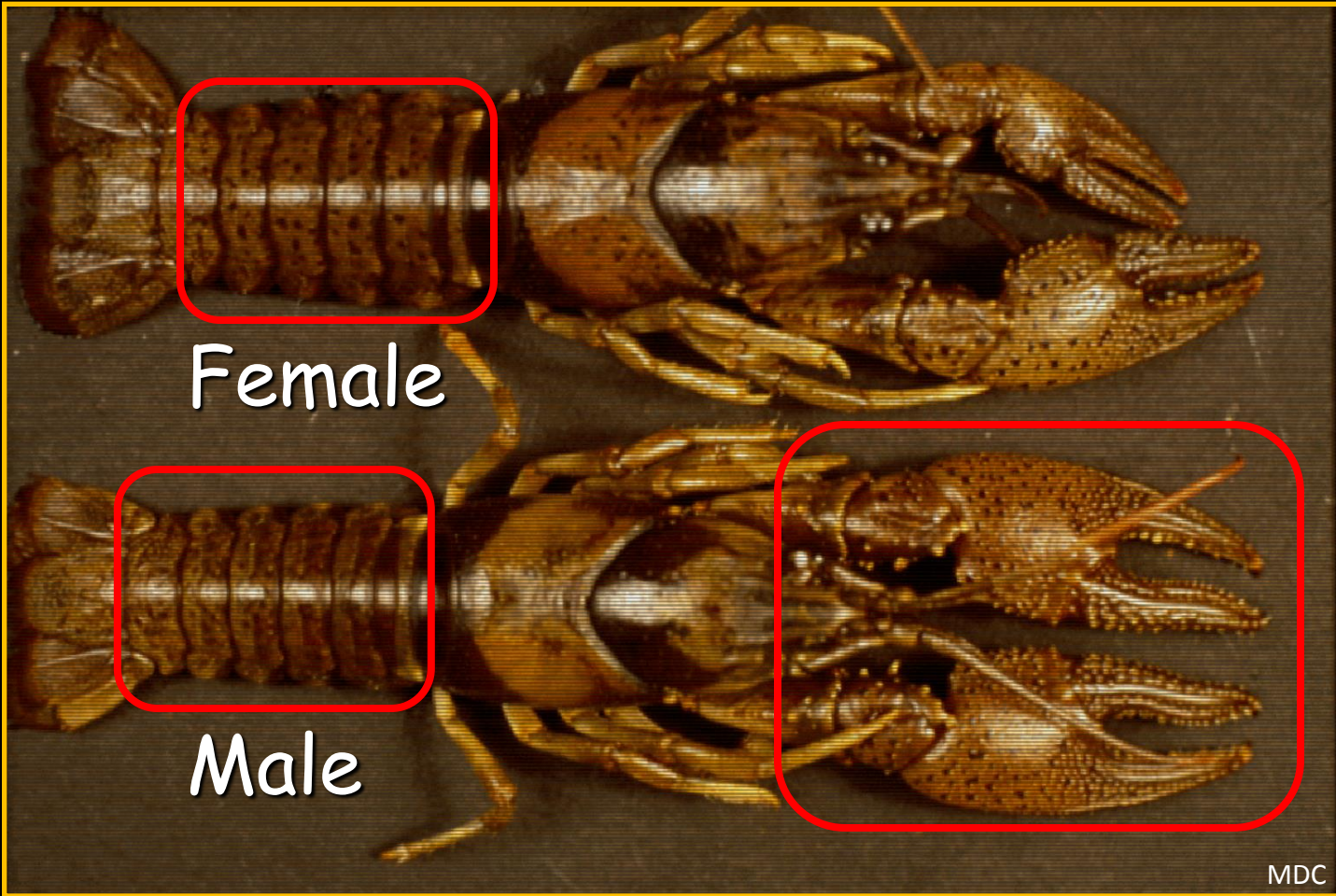
- Reproductively active
- Corneous
- Longer and more definition
- Featherlike



Form II

- Reproductively inactive
- Reddish or orange tip
- Blunt
- Hard

Female vs. Male

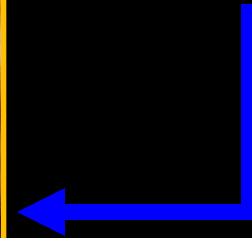


Orconectes ozarkae (Ozark Crayfish)

Reproduction



Cambarus batchi
(Bluegrass Crayfish)



Sperm plug



MDC

Orconectes quadrucus (St. Francis River Crayfish)

Glair Glands



MDC

Female *Orconectes* sp.

Ovigerous “In Berry”



Development



Orconectes luteus (Golden Crayfish) hatchlings

Hatchlings



Biology

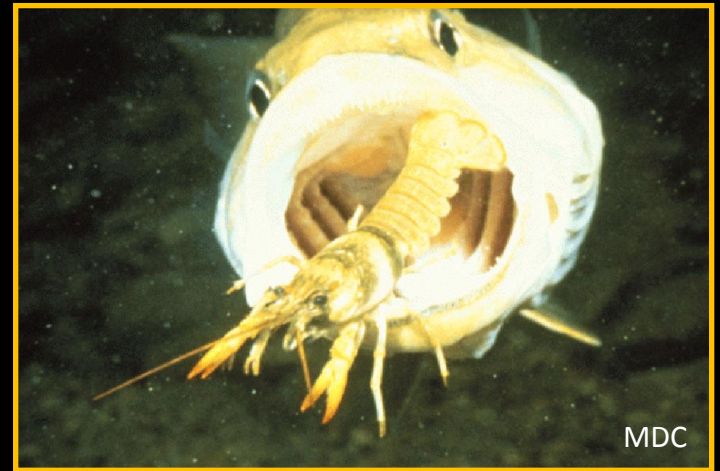
Diet

- Typically considered omnivores and scavengers
- Carnivores
- Considerable variation likely

Biology

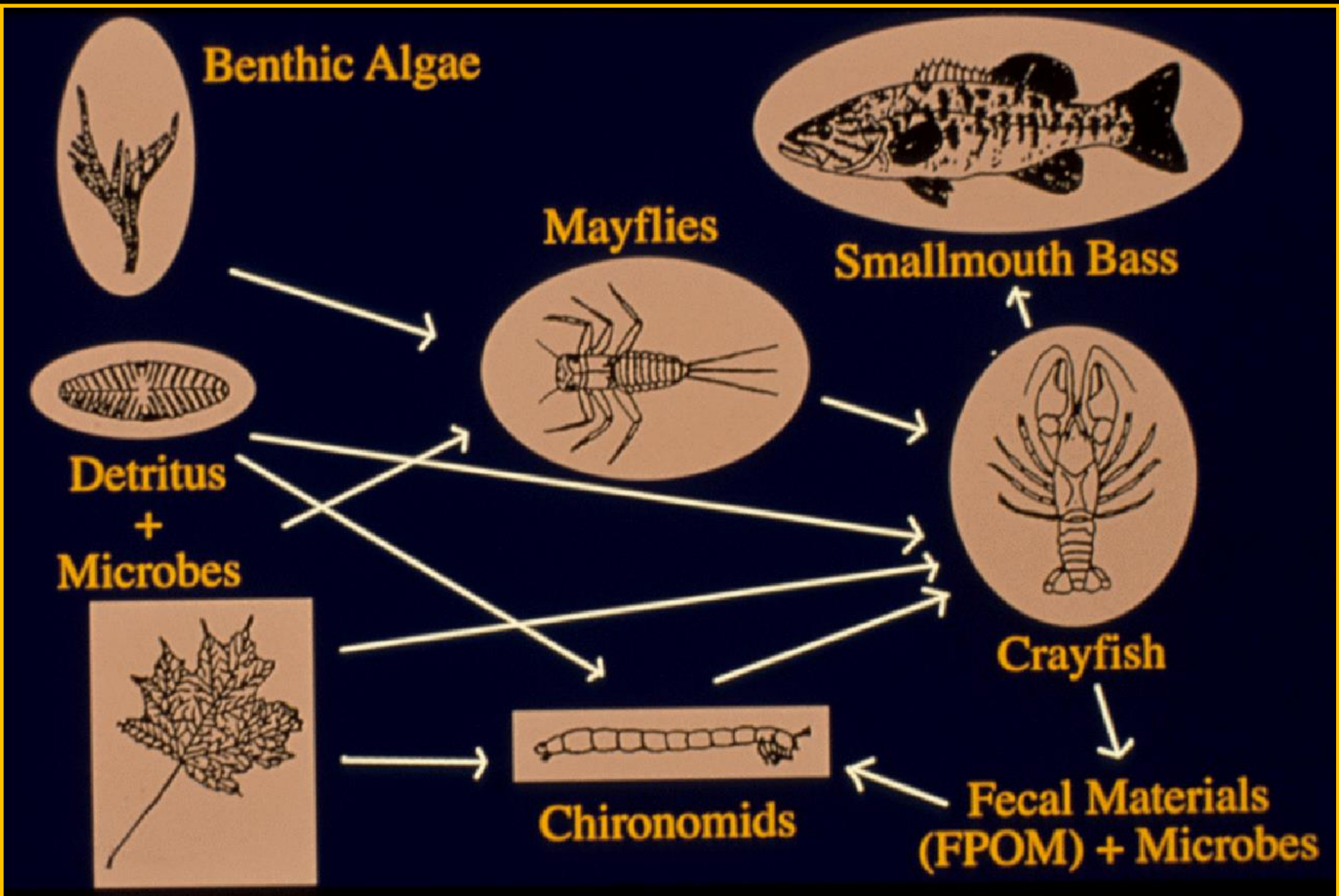
Predators

- Fish – 81 species
- Birds – 77 species
- Reptiles – 40 species
- Amphibians – 18 species
- Mammals – 18 species



MDC

Smallmouth Bass &
Orconectes ozarkae



Benthic Algae

Mayflies

Smallmouth Bass

**Detritus
+
Microbes**

Crayfish

Chironomids

**Fecal Materials
(FPOM) + Microbes**

Biology

Longevity

- Sexual maturity ≥ 1 year
- Life span ≈ 5 years
 - Exceptions! Cave dwelling species > 20 years?

Biology

Habitat

➤ Water = Crayfish habitat

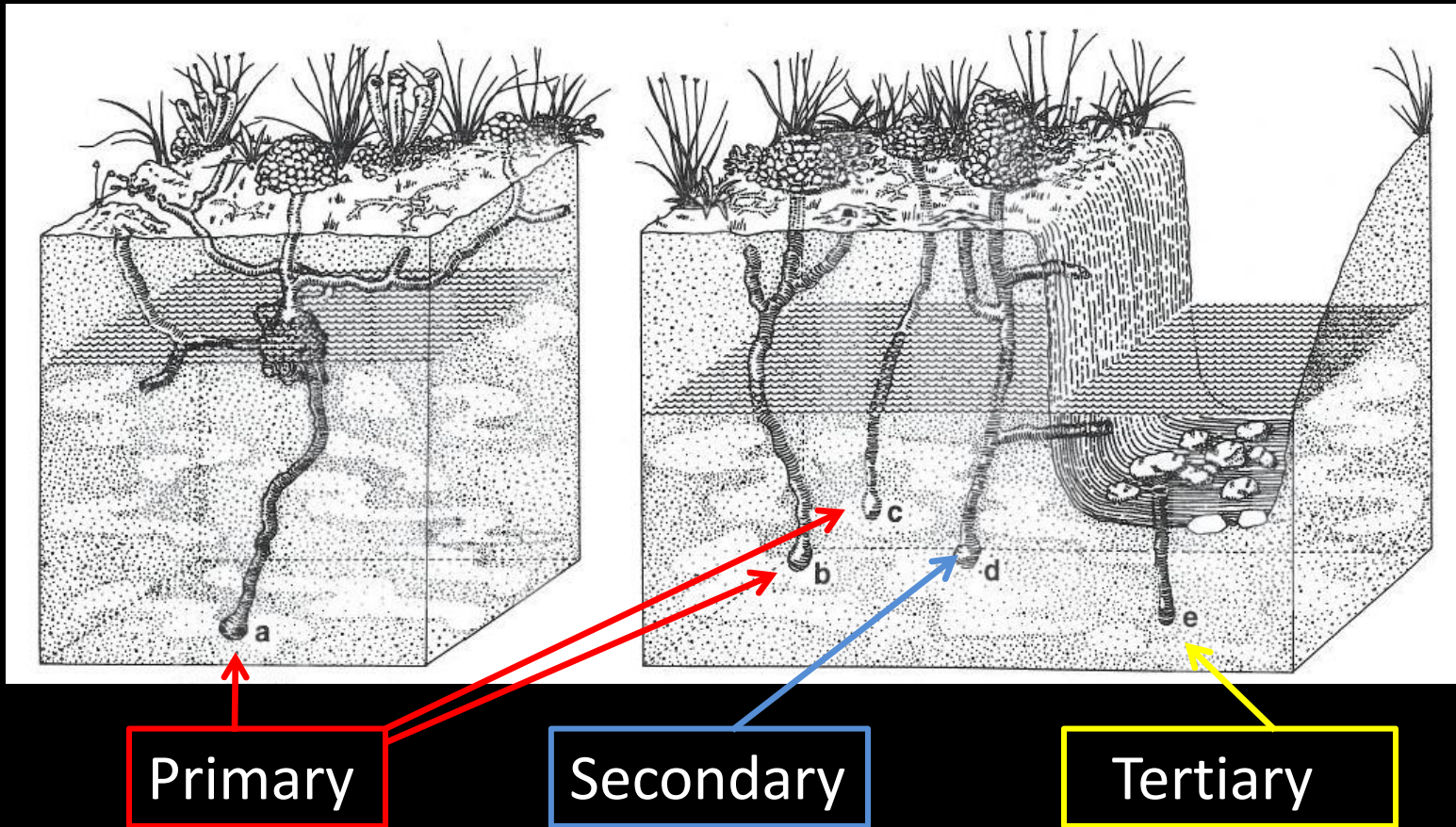
- Streams and rivers
- Lakes and ponds
- Wetlands/marshes
- Ditches
- Underground burrows
- Caves

➤ Habitat Partitioning

- Species
- Age

Biology

Habitat - Burrows



Conservation

Taylor et al. 2007

- 363 taxa
 - 2 (<1%) – Possibly extinct
 - 66 (18%) – Endangered
 - 52 (14%) – Threatened
 - 54 (15%) – Vulnerable
 - 189 (52%) – Stable

- Federally listed species - 4

Conservation

Threats

- Restricted range
- Habitat loss and fragmentation
- Introduced species
- Disease

Collection

- Surface waters
 - Seines
 - Traps
 - Dip nets
 - Electrofishing



Collection

- Burrowers
 - Excavation
 - Traps
 - Hook and Line
 - Night Surveys



Preservation of specimens

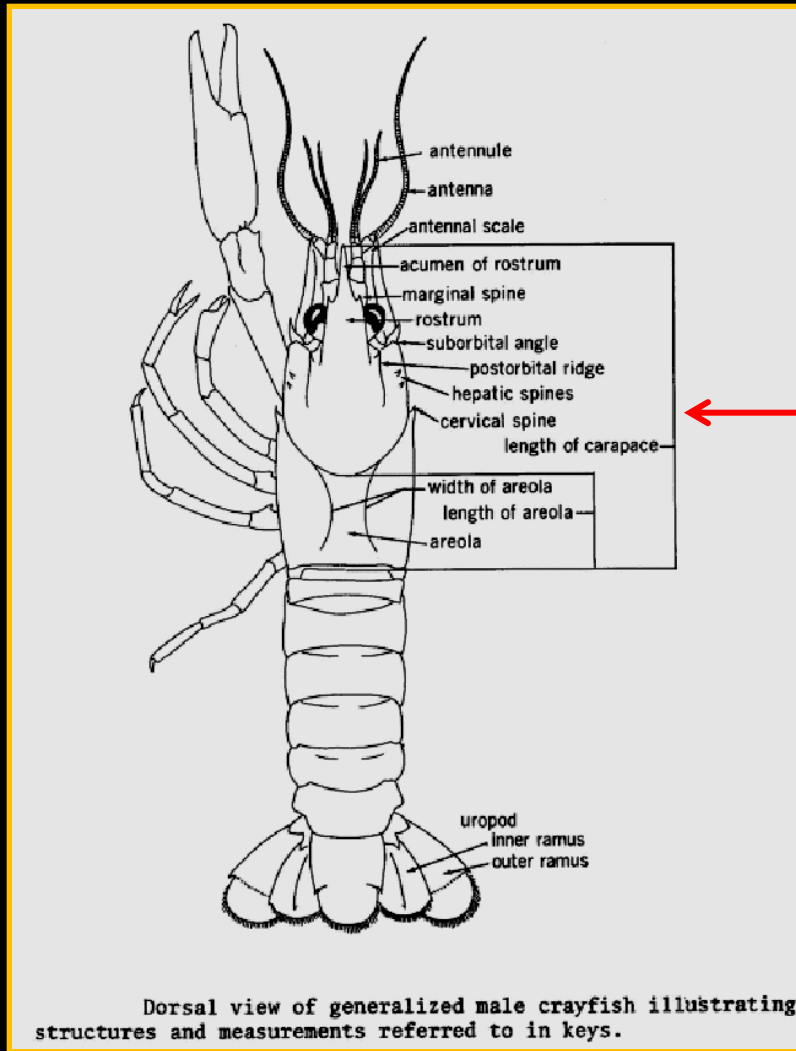
- 70% Ethanol
 - Best for long-term storage
 - Specimens remain flexible
- 95% Ethanol
 - Higher likelihood of future DNA extraction
 - Specimens become stiff and fragile
- 40% Isopropanol
 - Ok, but tends to make specimens stiff and fragile
- Formalin?

Morphology

The Basics

- Compound eyes on stalks
- 10 pr. of appendages (non-feeding)
- 2 pr. of antennae
- Two body regions
 - Cephalothorax
 - Abdomen

Morphology



(From Hobbs, 1976)

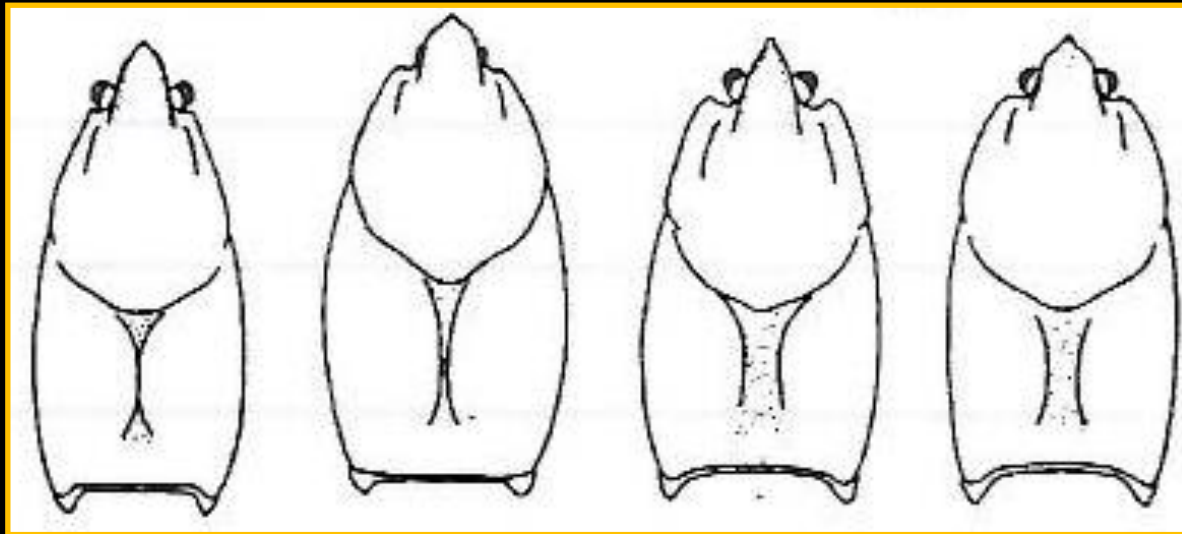
Morphology

Areola width

Obliterated
(Linear)

Narrow

Wide



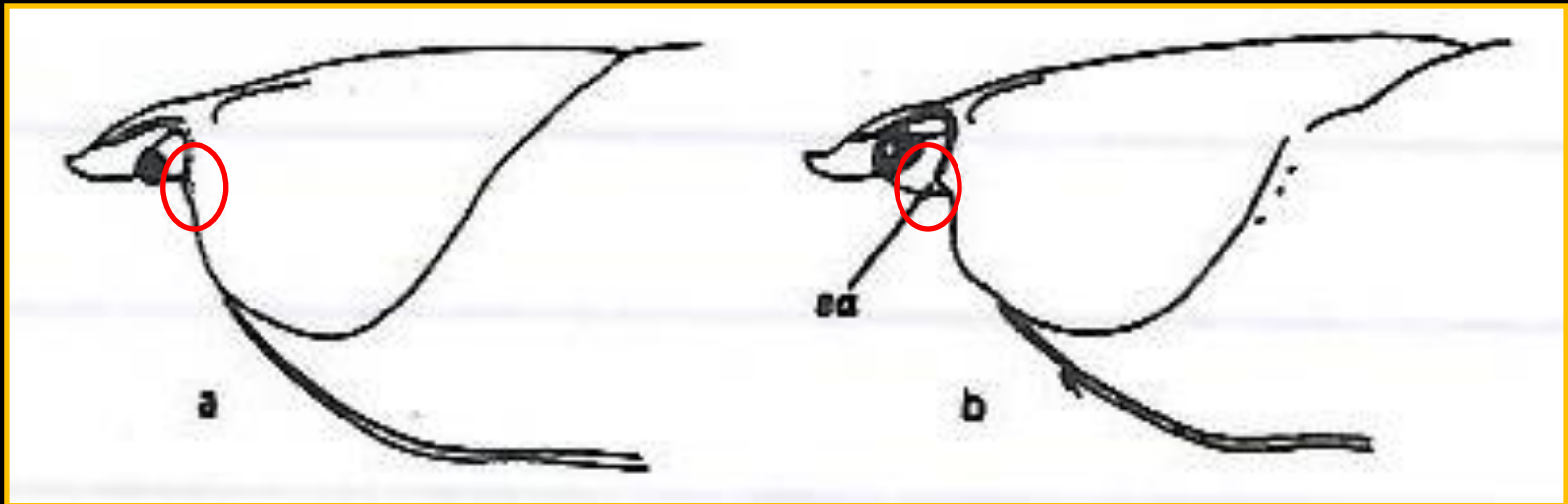
From Hobbs, 1972

Morphology

Suborbital angle

Obsolete

Acute

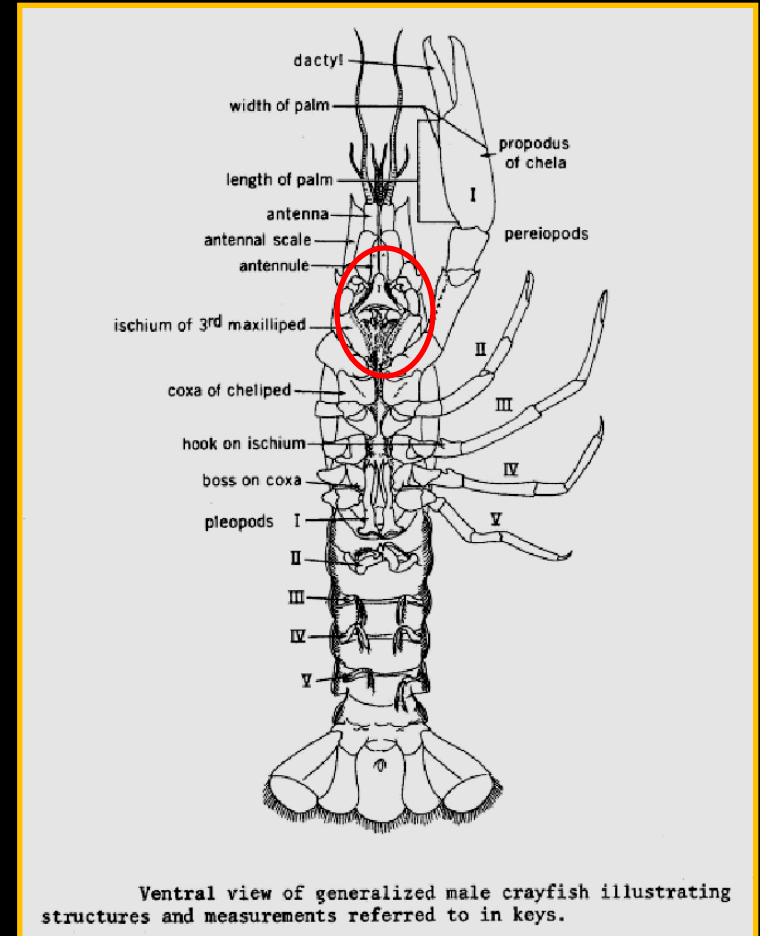


From Hobbs, 1972

Morphology

Appendages of the Head

- 1 pair of mandibles
 - Chewing
- 2 pair of maxillae
 - Grasp food
 - Baling water
- 3 pair of maxillipeds
 - Feeding
 - Cleaning
 - Baling water



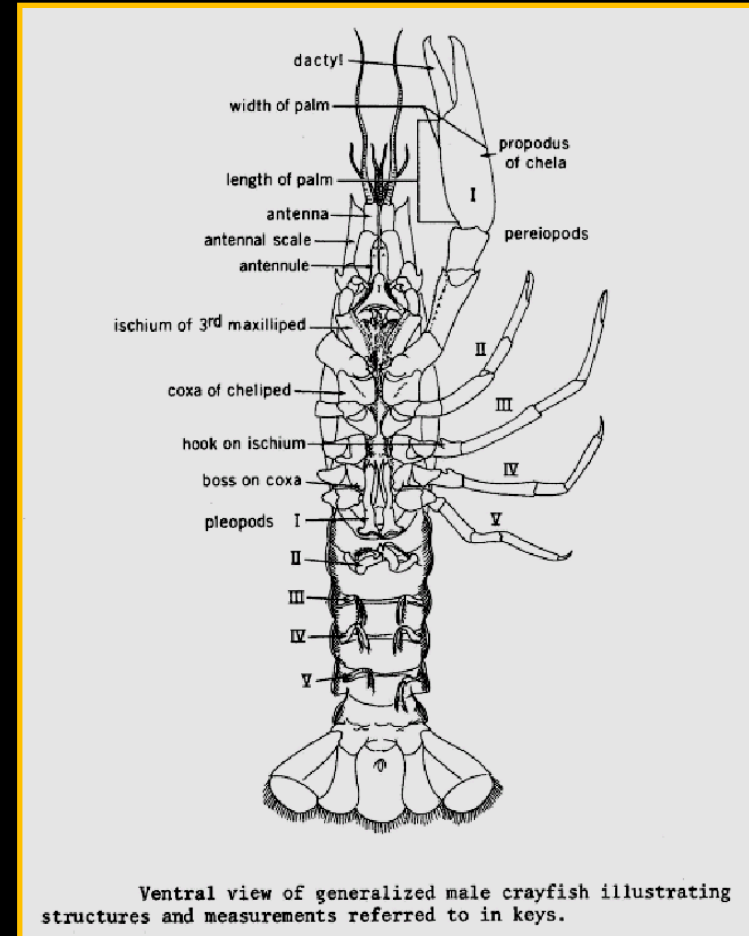
Ventral view of generalized male crayfish illustrating structures and measurements referred to in keys.

(From Hobbs, 1972)

Morphology

Cephalothorax

- Five pair of walking legs
 - 1st three pair are chelate
 - 1st pair = cheliped
- Each leg with seven segments
 - Coxa, basis, ischium, merus, carpus, propodus, and dactyl

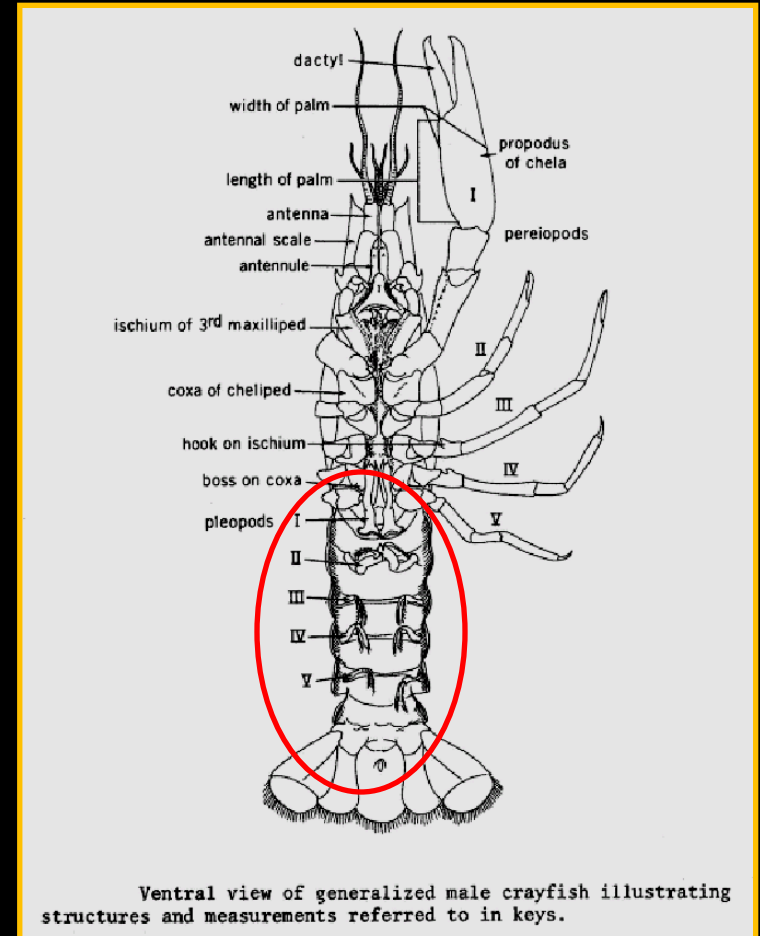


(From Hobbs, 1972)

Morphology

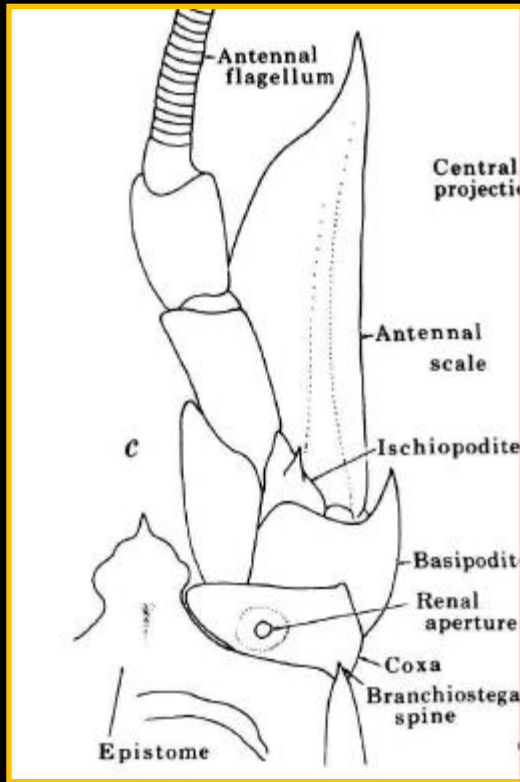
Abdomen

- Pleopods (swimmerets)
 - 1st 5 segments
 - Males – 1st two are modified
 - Females – no modification
 - 6th segment with:
 - Telson (median)
 - Uropods (lateral)

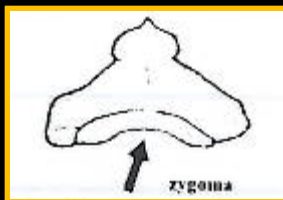
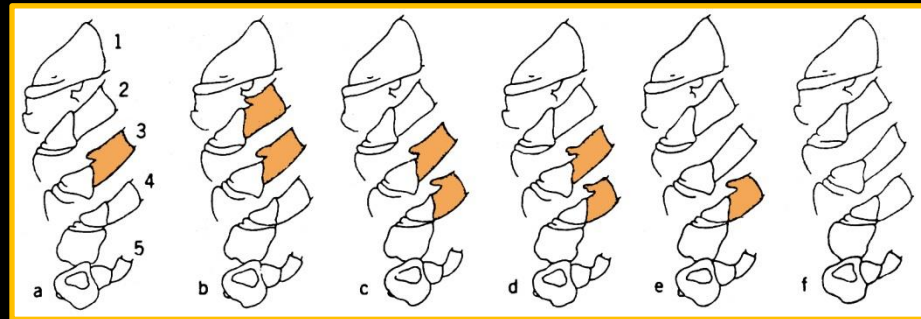


(From Hobbs, 1972)

Morphology



Ischial hooks



(From Hobbs, 1972)

Morphology

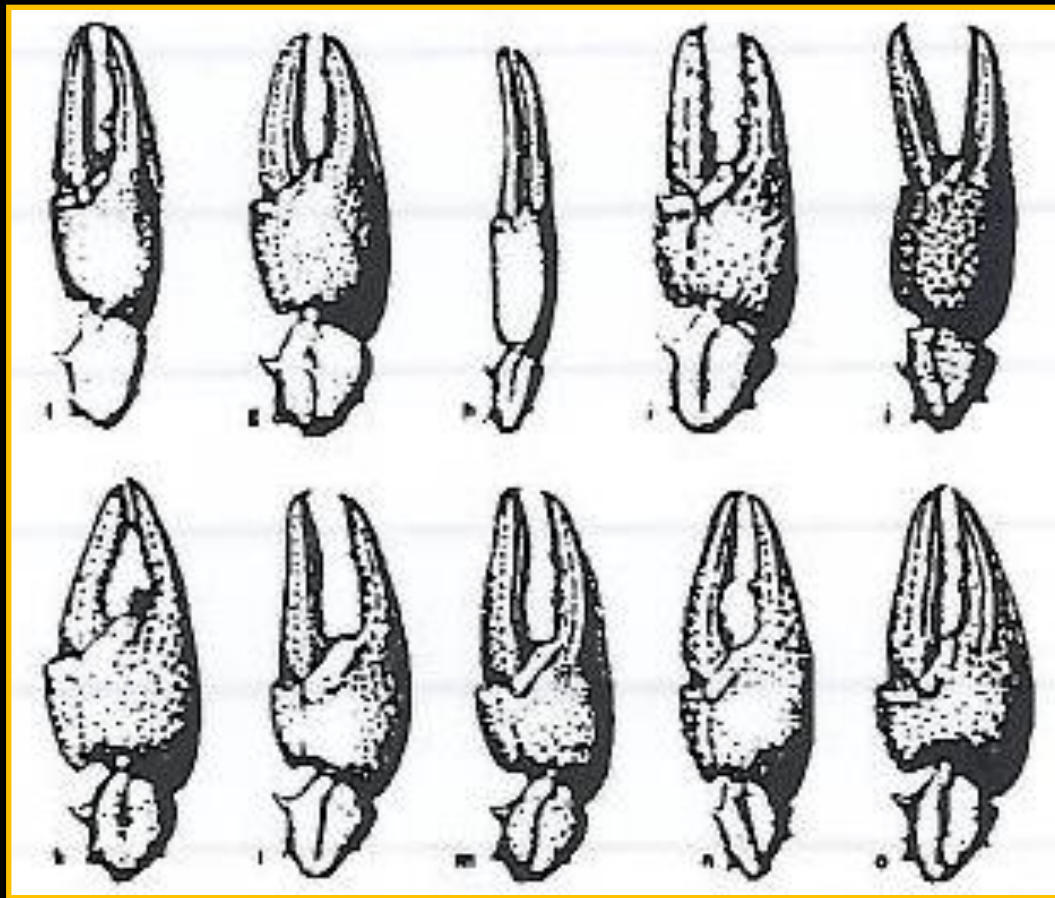
Chelae

- Robustness (e.g. slender vs heavy)
- Dactyl notch
- Tubercles on palm
 - Rows, shape, number
- Overall shape of chelae
 - Subtriangular, quadrate, etc.
- Setae
- Ridges



Morphology

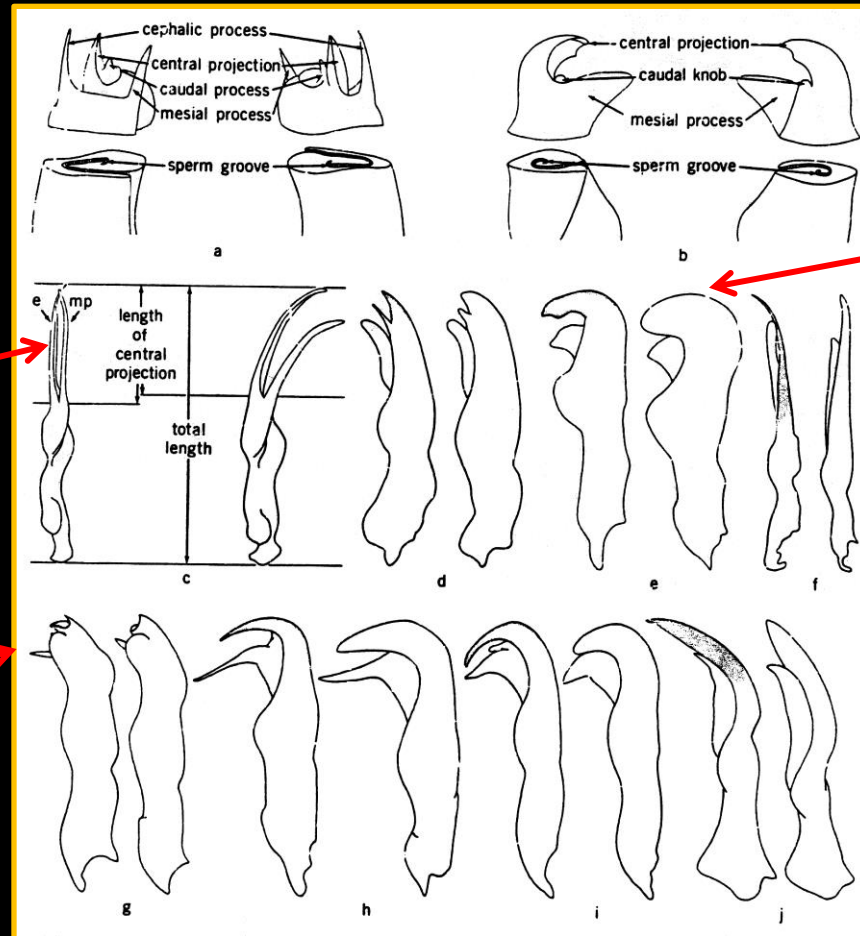
Chelae



(From Hobbs, 1972)

Morphology

Gonopods



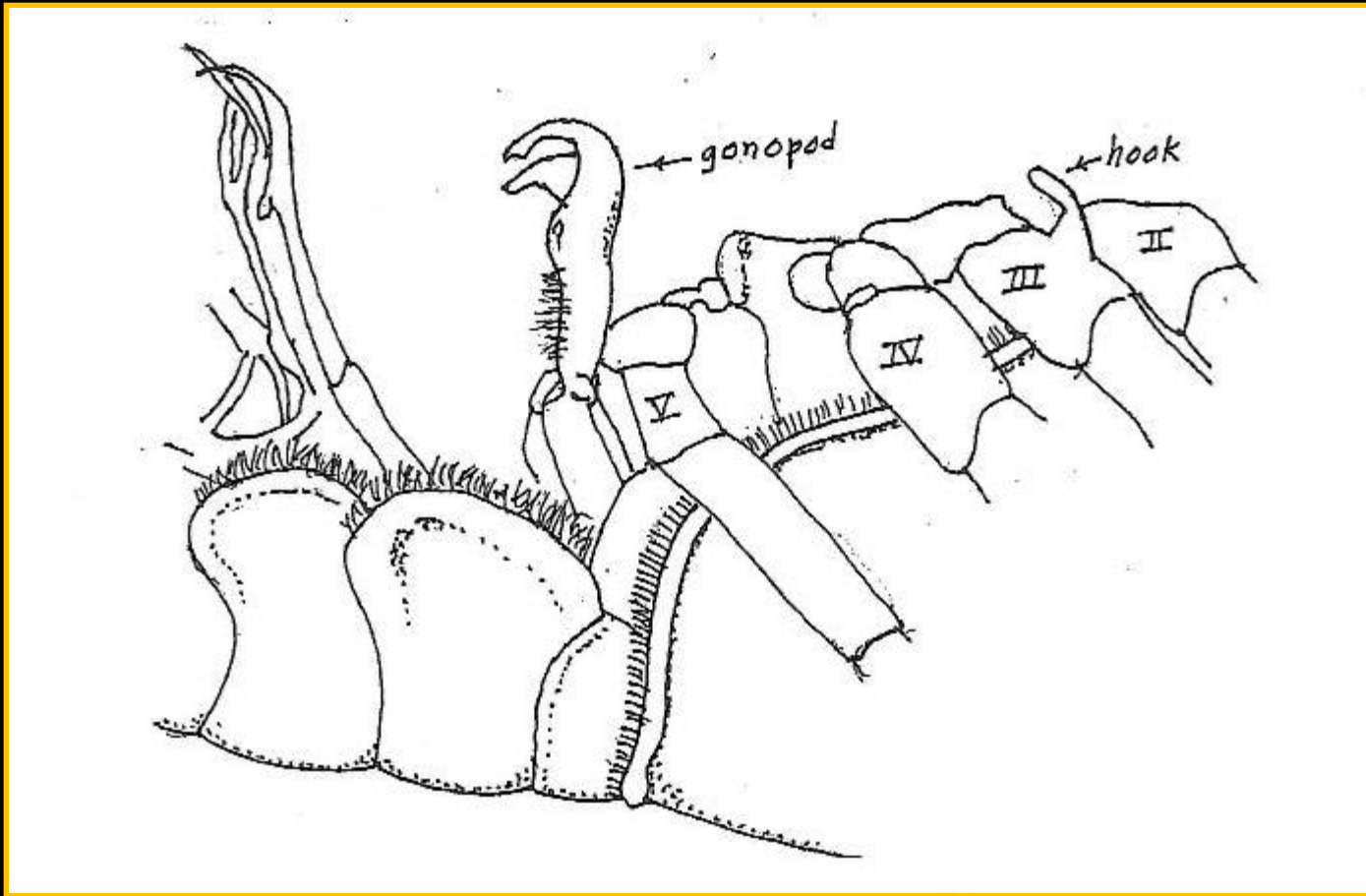
Orconectes

Cambarus

Procambarus

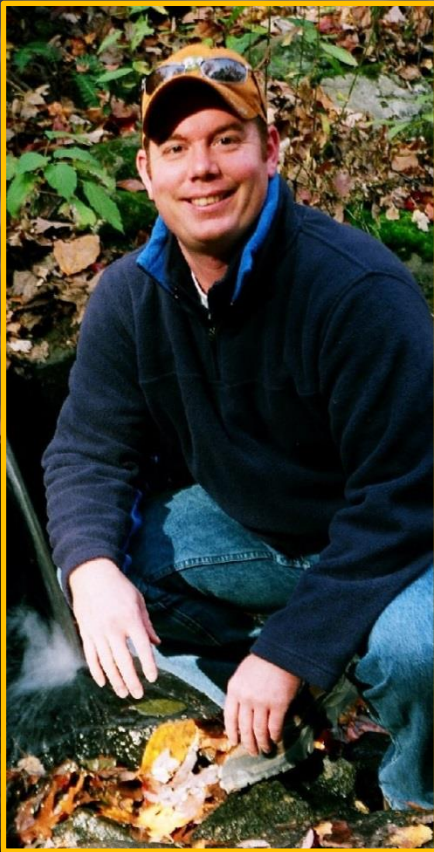
(From Hobbs, 1972)

How do I view this dang Mudbug?



(From Cooper, 2004)

The End



Chris Riggert (MDC)



Dr. Cooper (NCSM)