

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

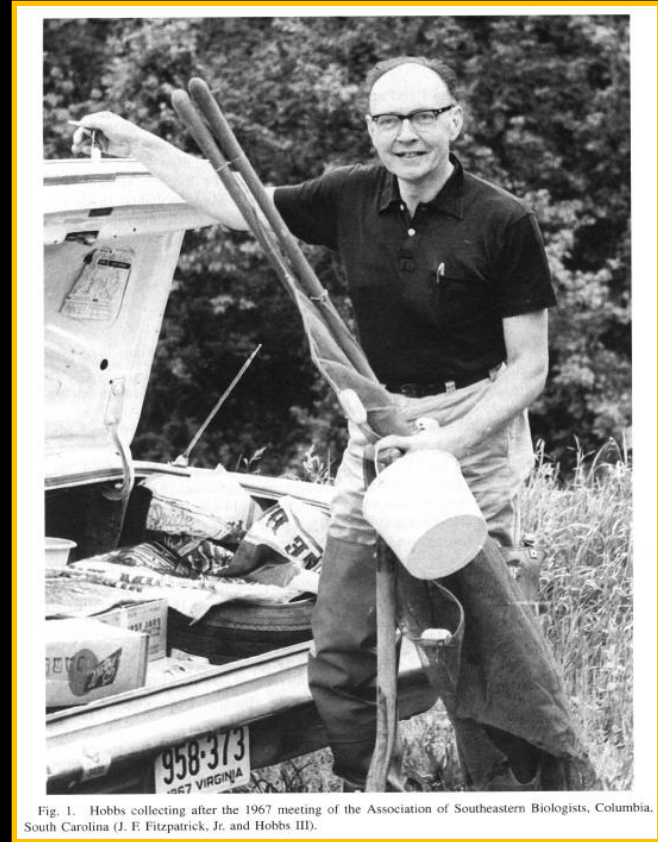


Fig. 1. Hobbs collecting after the 1967 meeting of the Association of Southeastern Biologists, Columbia, South Carolina (J. F. Fitzpatrick, Jr. and Hobbs III).

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

Classification

Phylum Arthropoda

Subphylum Crustacea

Class Malacostraca

Order Decapoda: shrimps, crabs, lobsters

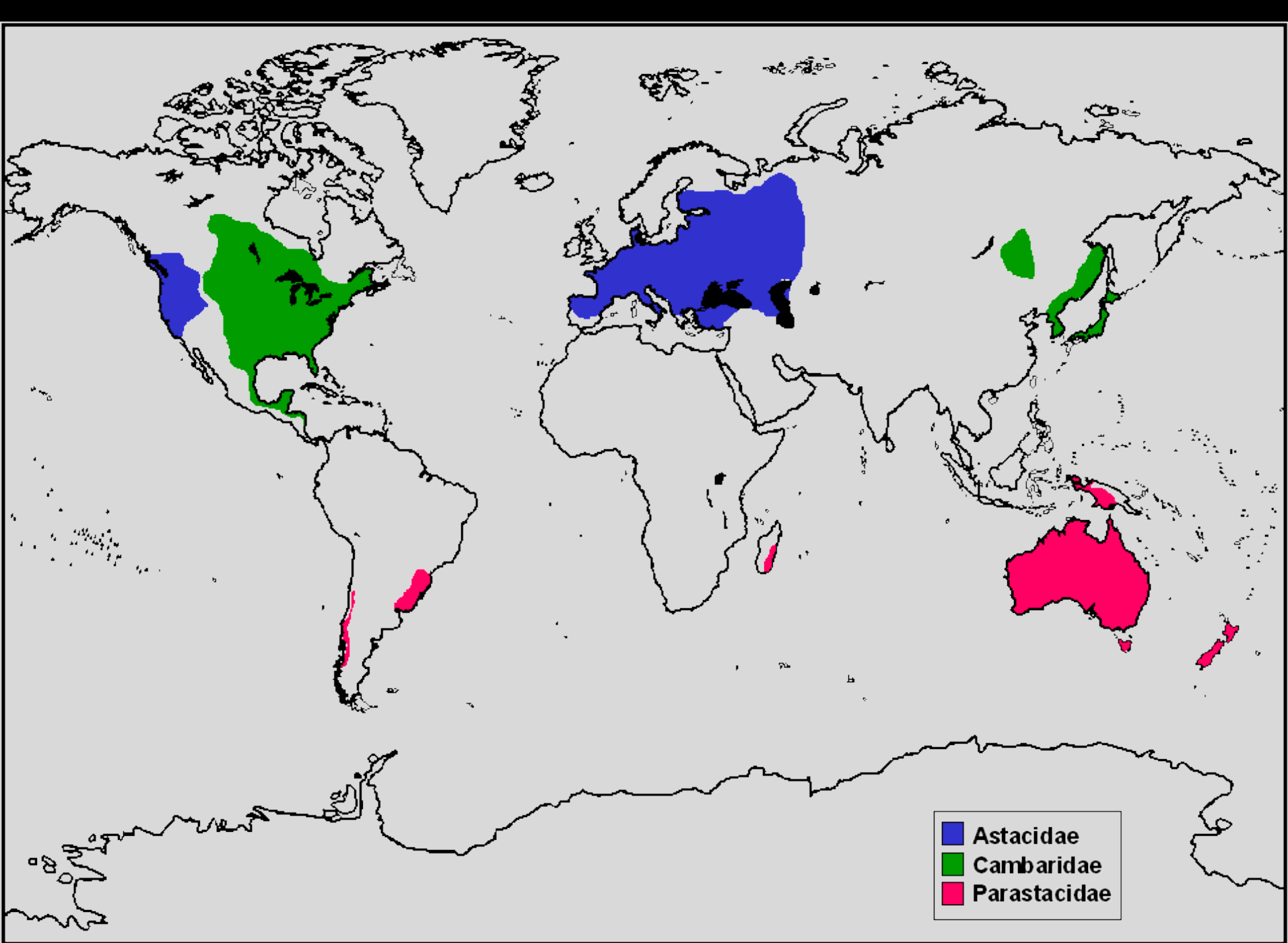
Superfamily Astacoidea – N. Hemisphere

Family Astacidae

Family Cambaridae

Superfamily Parastacoidea – S. Hemisphere

Family Parastacidae



Genera of North America

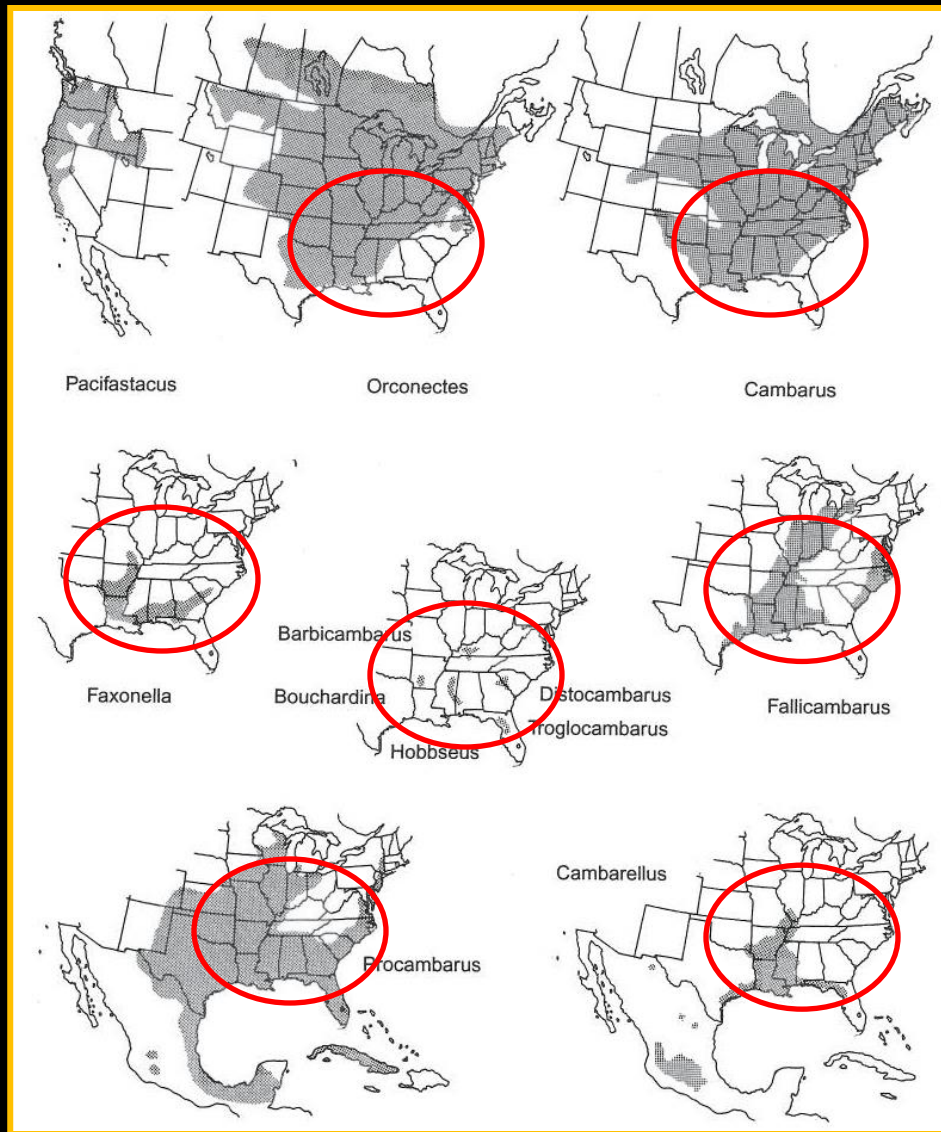
Astacidae

- *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)

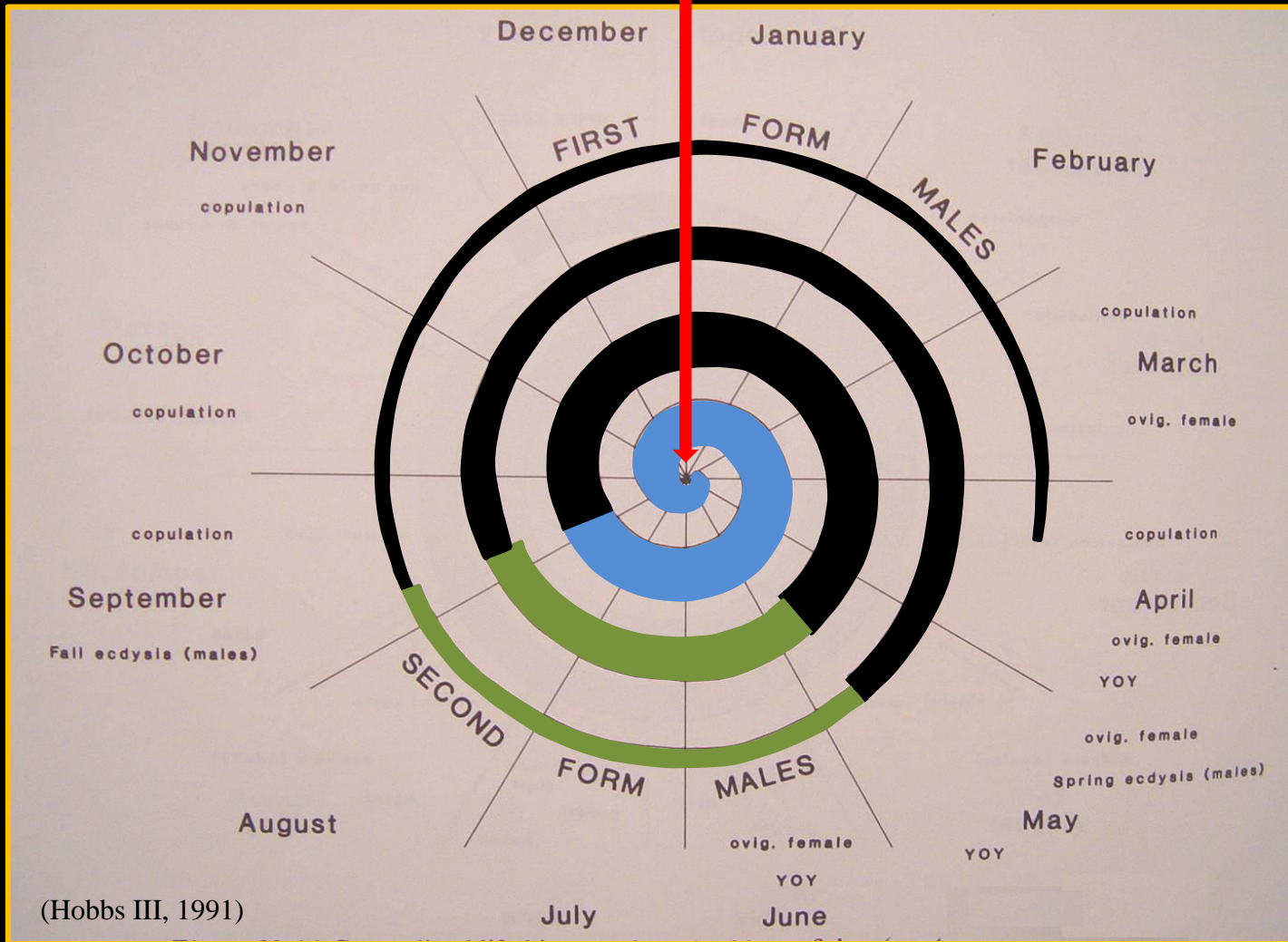
Biology

Life Cycle

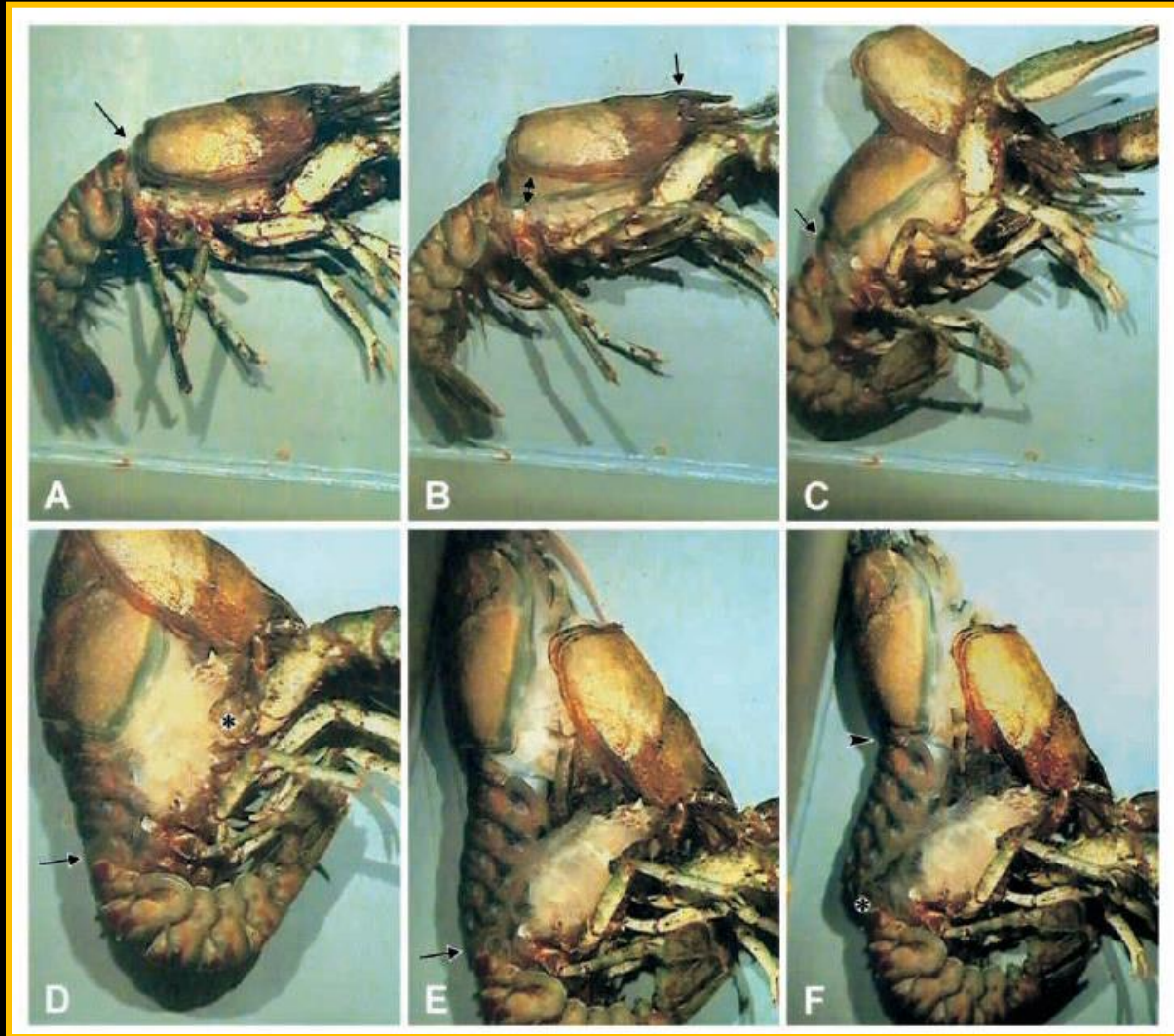
- Egg
- Immature (direct development)
- Adult Female
- Adult Male
 - Form I
 - Form II

General Life Cycle

START HERE!



Molting



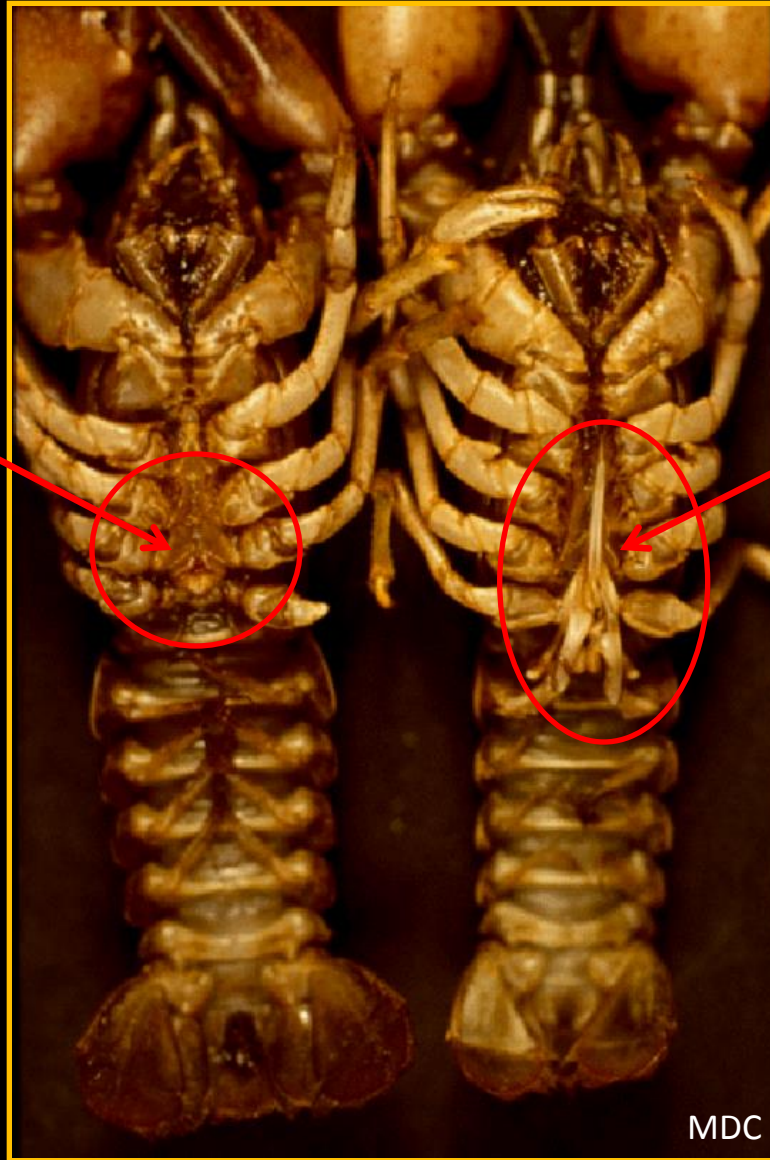
Regeneration and...ID issues



Female vs. Male

Annulus ventralis

Gonopods



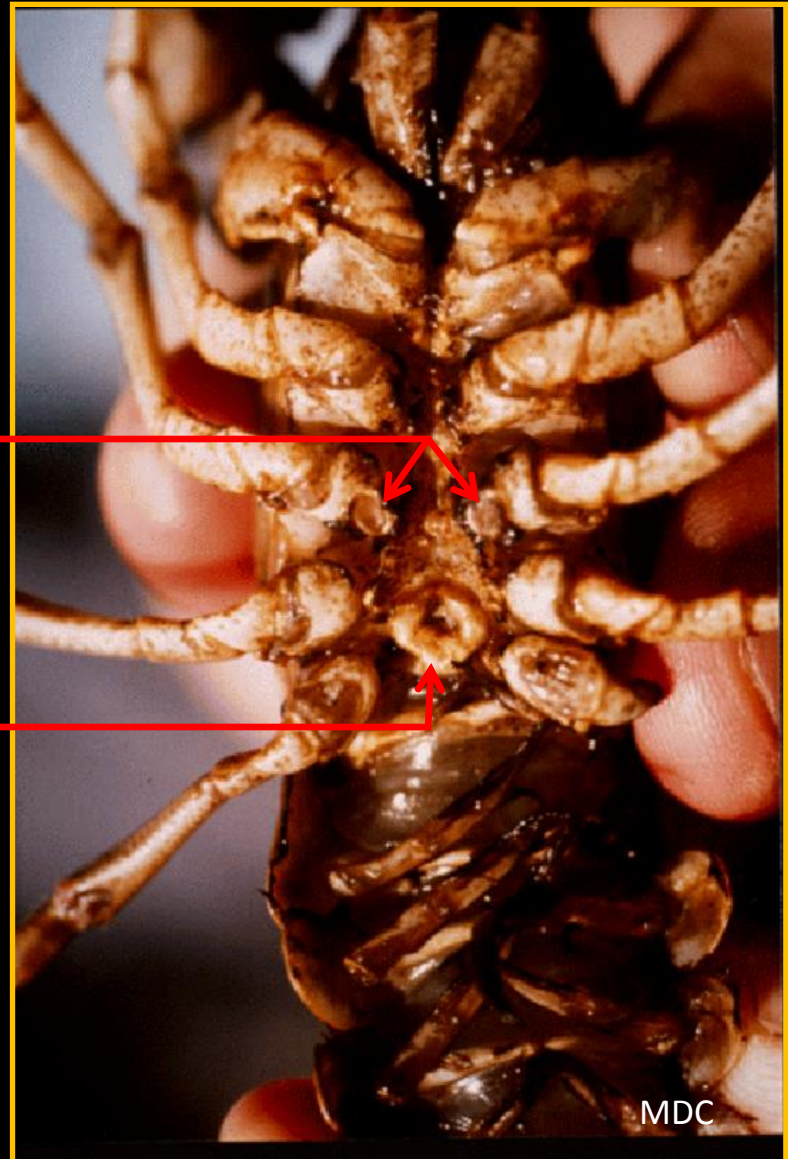
MDC

Orconectes ozarkae
(Ozark Crayfish)

Female

Gonopores

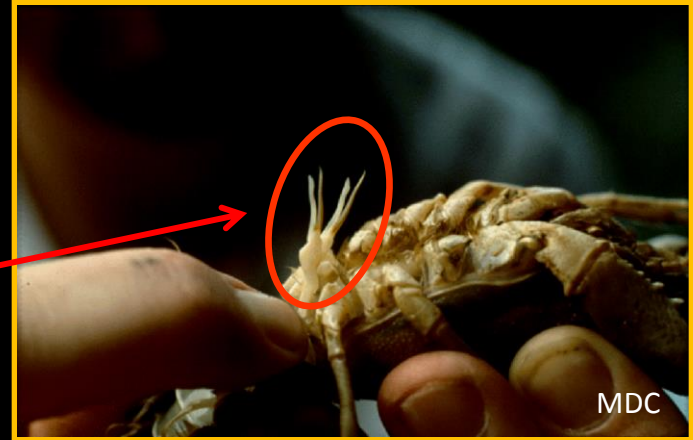
Annulus ventralis



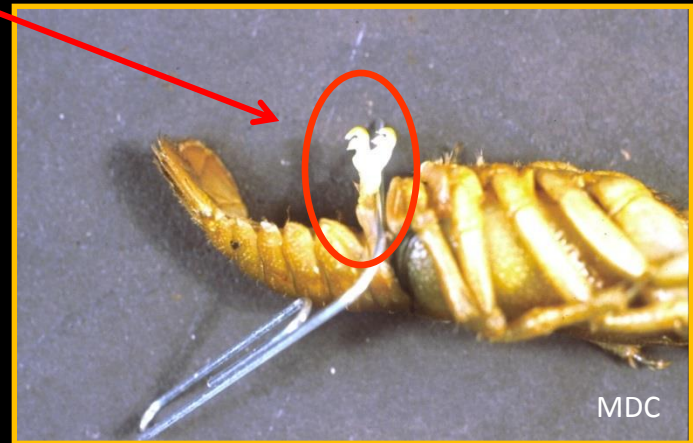
MDC

Male

Gonopods



Male *Orconectes* sp.



Male *Cambarus* sp.

Male I vs. Male II



Form I

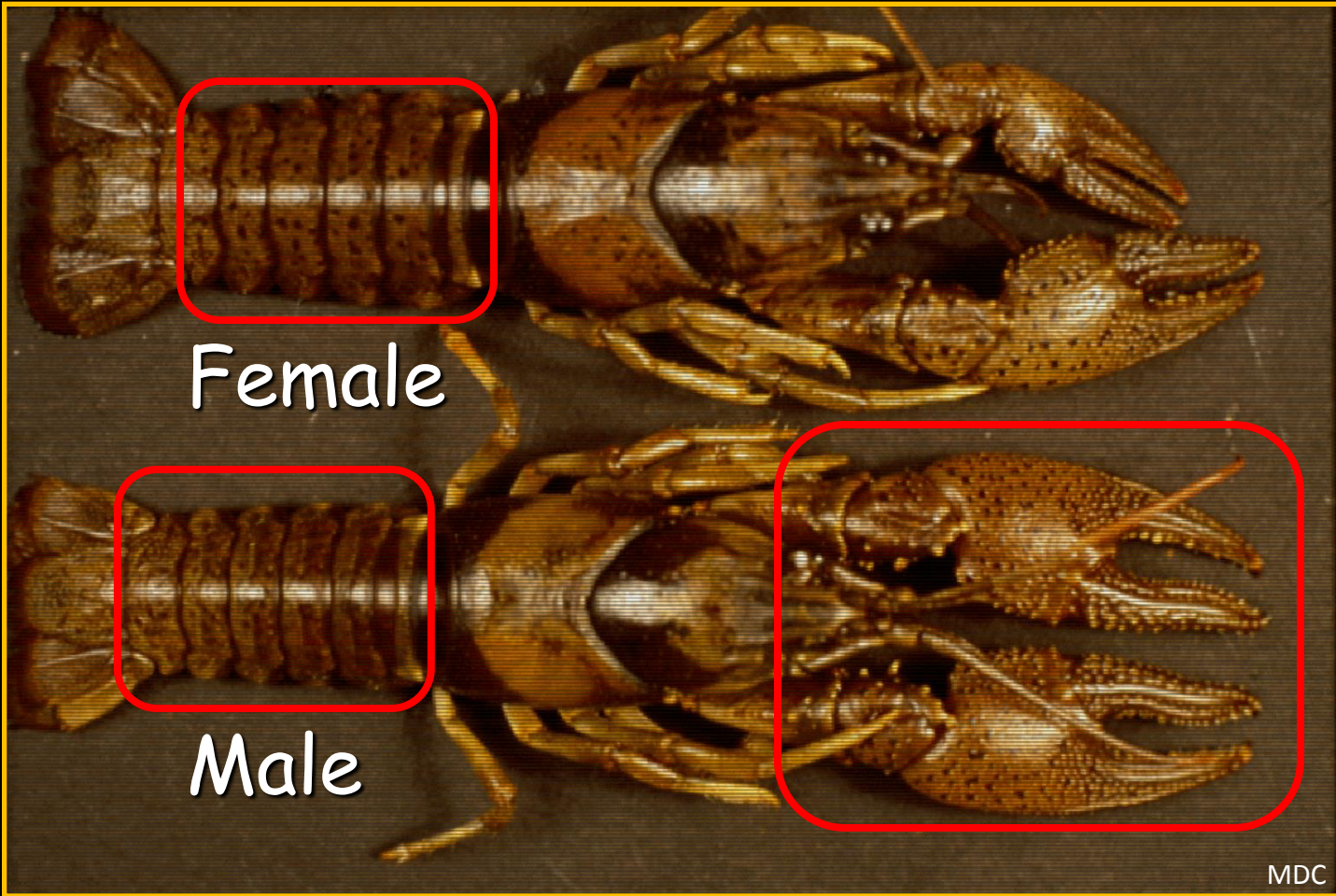
- Reproductively active
- Corneous
- Longer and more definition
- Featherlike



Form II

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

Female vs. Male

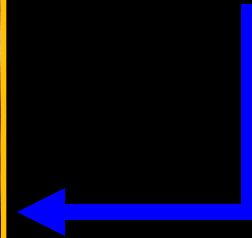


Orconectes ozarkae (Ozark Crayfish)

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

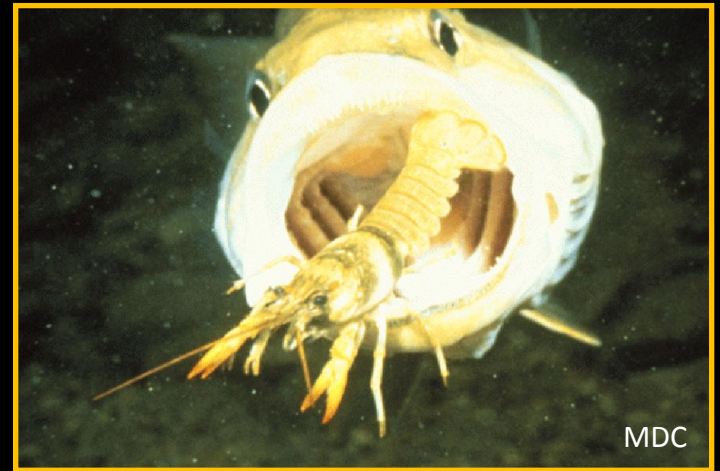
Diet

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

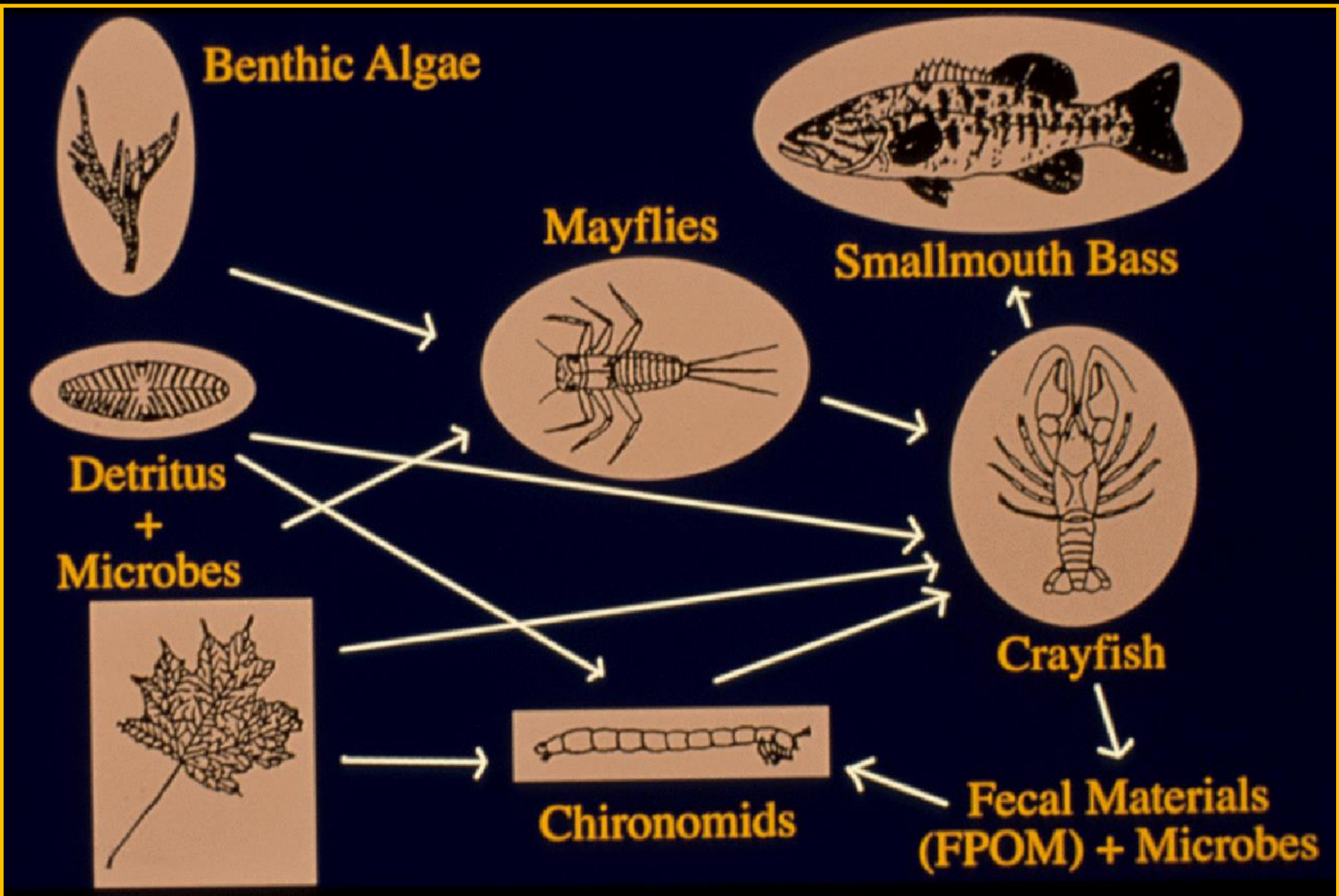
Biology

Predators

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



Smallmouth Bass &
Orconectes ozarkae



Biology

Longevity

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

Biology

Habitat

➤ Water = Crayfish habitat

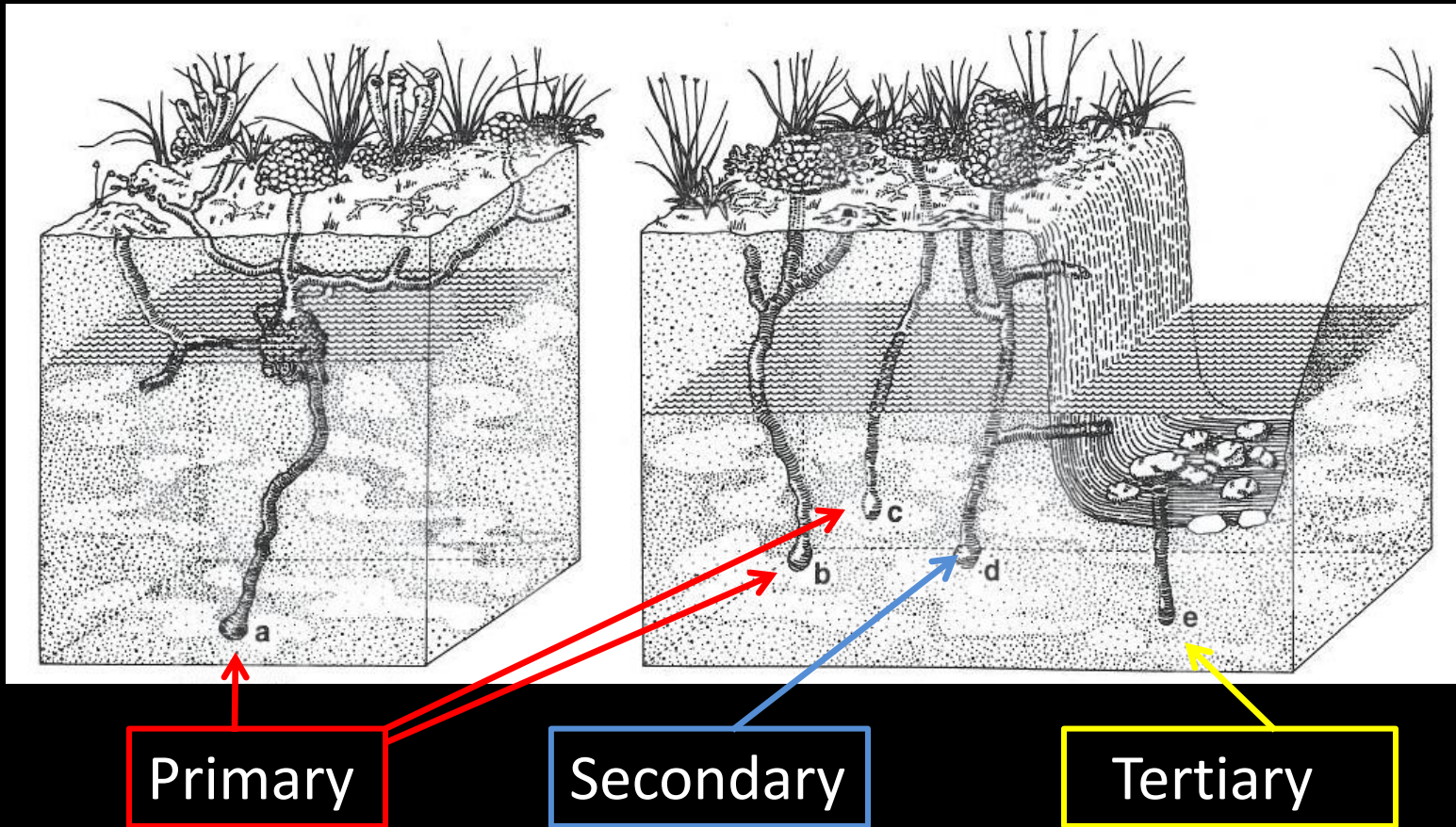
- Streams and rivers
- Lakes and ponds
- Wetlands/marshes
- Ditches
- Underground burrows
- Caves

➤ 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

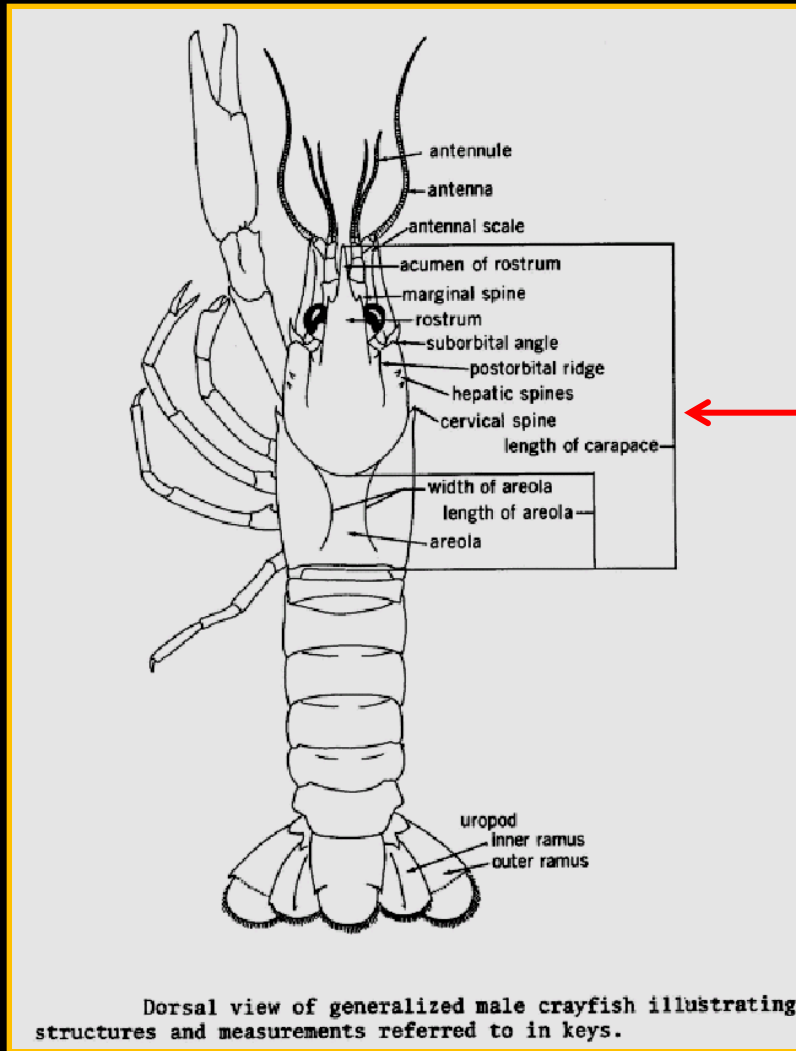
- 70% Ethanol
 - Best for long-term storage
 - Specimens remain flexible
- 95% Ethanol
 - Higher likelihood of future DNA extraction
 - Specimens become stiff and fragile
- 40% Isopropanol
 - Ok, but tends to make specimens stiff and fragile
- Formalin?

Morphology

The Basics

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

Morphology



Carapace

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

(From Hobbs, 1976)

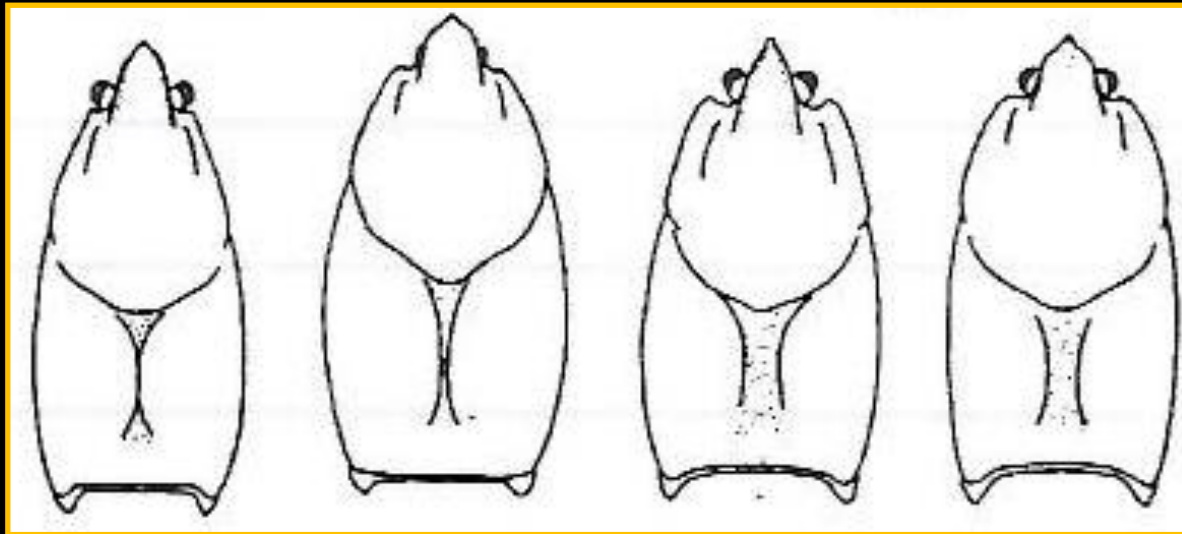
Morphology

Areola width

Obliterated
(Linear)

Narrow

Wide



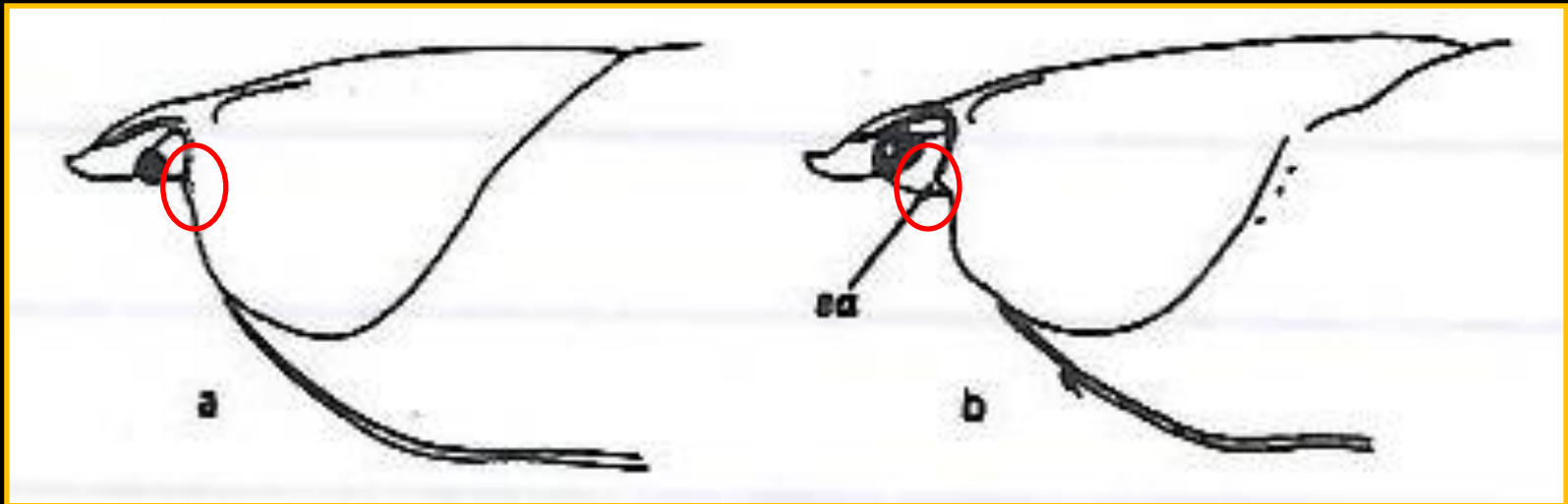
From Hobbs, 1972

Morphology

Suborbital angle

Obsolete

Acute

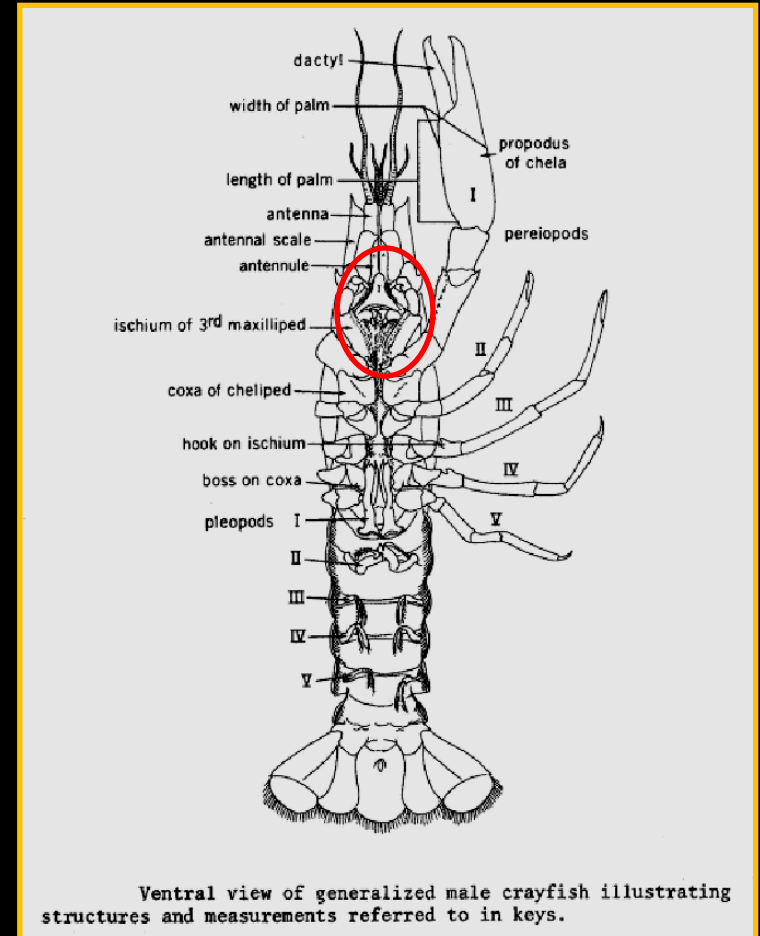


From Hobbs, 1972

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



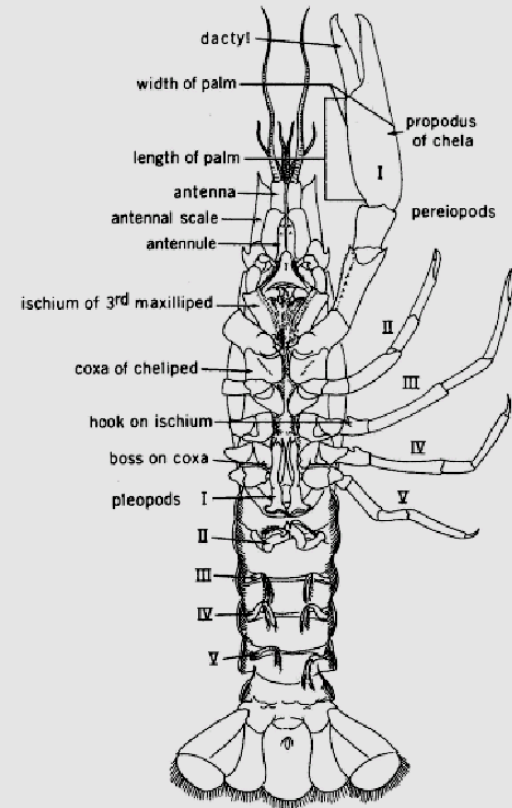
Ventral view of generalized male crayfish illustrating structures and measurements referred to in keys.

(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



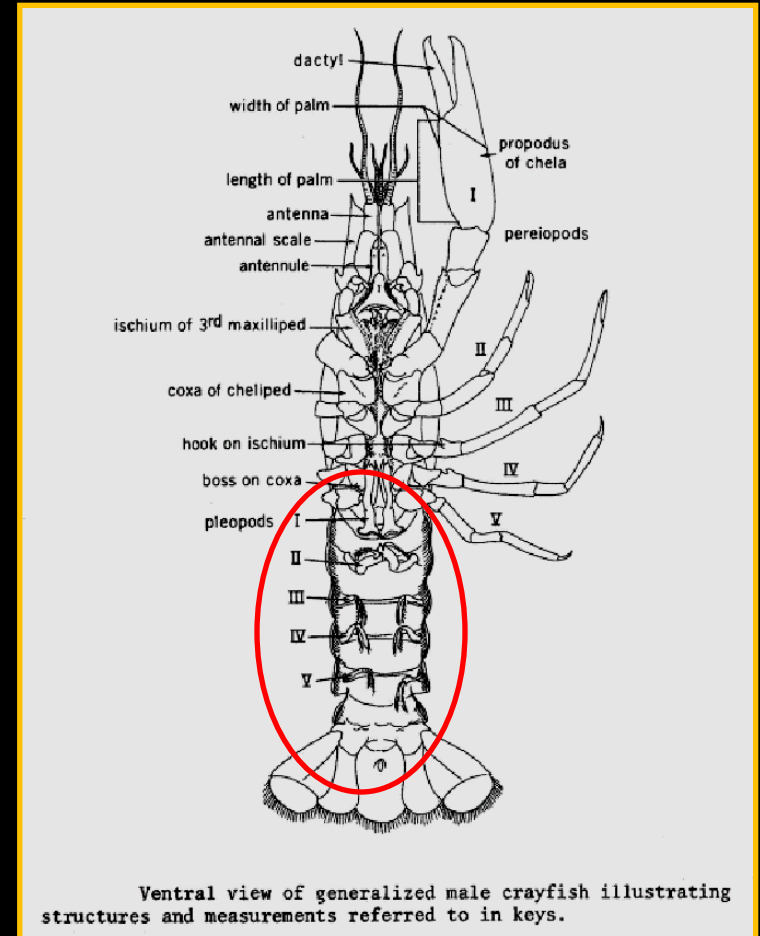
Ventral view of generalized male crayfish illustrating structures and measurements referred to in keys.

(From Hobbs, 1972)

Morphology

Abdomen

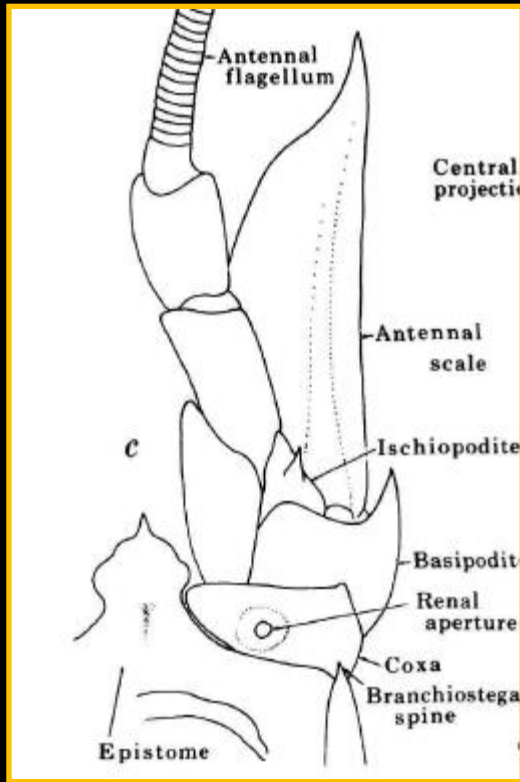
- Pleopods (swimmerets)
 - 1st 5 segments
 - Males – 1st two are modified
 - Females – no modification
 - 6th segment with:
 - Telson (median)
 - Uropods (lateral)



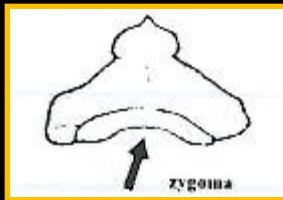
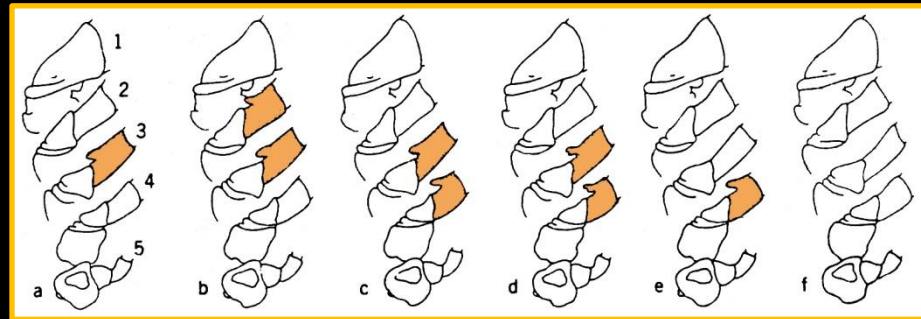
Ventral view of generalized male crayfish illustrating structures and measurements referred to in keys.

(From Hobbs, 1972)

Morphology



Ischial hooks



(From Hobbs, 1972)

Morphology

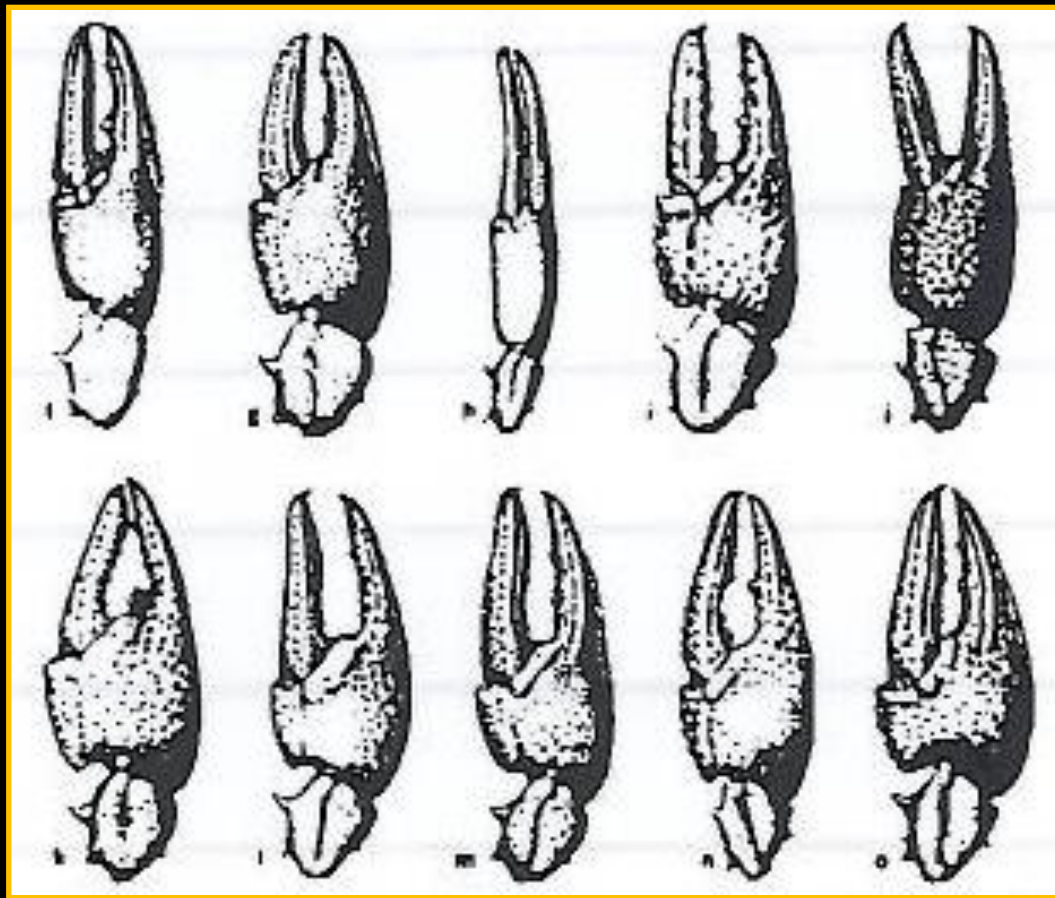
Chelae

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



Morphology

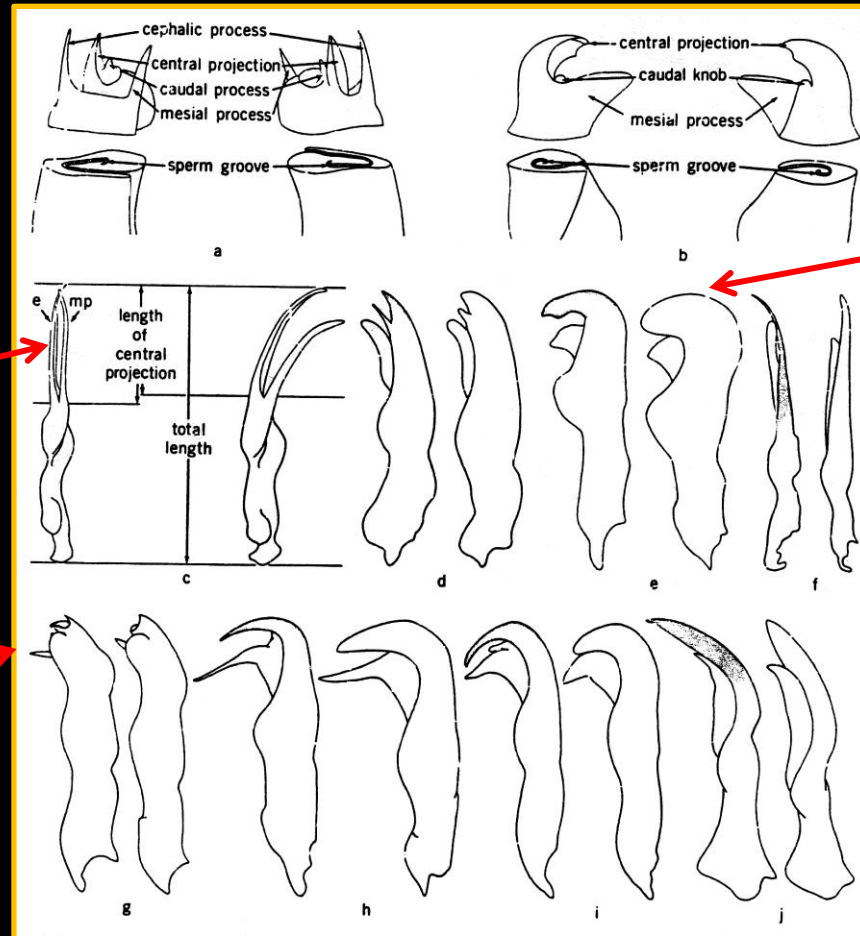
Chelae



(From Hobbs, 1972)

Morphology

Gonopods



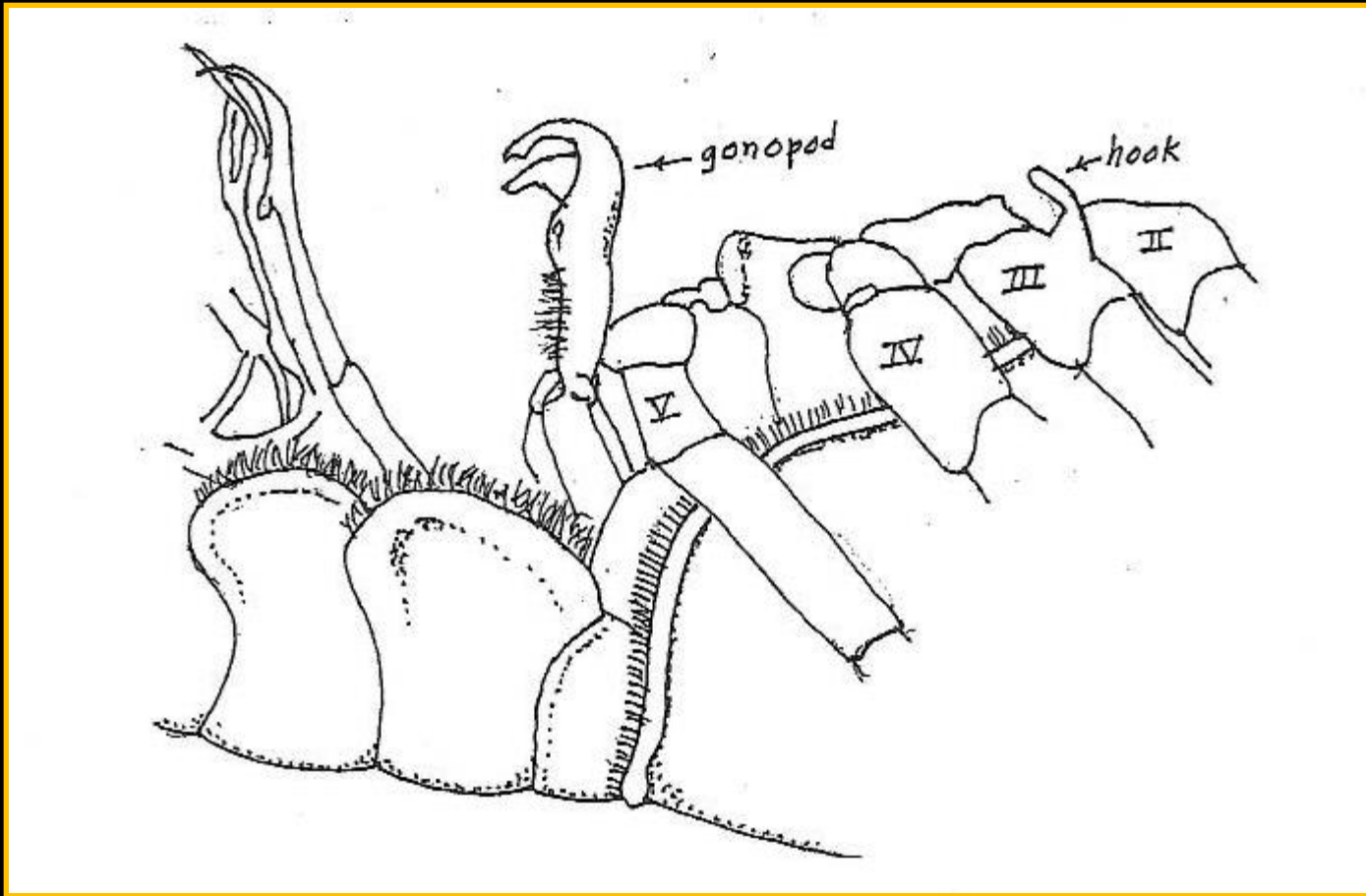
Cambarus

Orconectes

Procambarus

(From Hobbs, 1972)

How do I view this dang Mudbug?



(From Cooper, 2004)

The End



Chris Riggert (MDC)



Dr. Cooper (NCSM)