Sampling Techniques for Crayfish in Lentic and Lotic Habitats

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Book Chapter (In Press)

Sampling Techniques for Crayfish

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Biology and Ecology of Crayfish
M. Longshaw and P. Stebbing, eds.
CRC Press

Has been waiting to go to print for over two years

27,000 words, **257 references**

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Crayfish Habitats

Lakes and Wetlands (Lentic)

Rivers and Streams (Lotic)

Terrestrial (Burrowers)

Caves (Stygobitic)

Lentic

- Baited traps

  Habitat structure, bundles

- Visual searches

  Divers, snorkelers

- Throw traps (wetlands)

- Bycatch (*e.g.* gill nets)

Lentic – Baited Traps

- Most common method?

- Biased

  Larger, males, more active

  or aggressive

- Passive sampling

  Dependent on activity (e.g. temp, predators, etc.)

Lentic – Baited Traps

- Trap dimensions
  - *4-6 cm diameter openings*
  - *Diameter can affect catch:*
    - *size, species, etc.*
- Modified Gee minnow traps (US, Canada)
- Many other designs exist
  - *“Swedish trappy”, commercial triangle Traps (Louisiana), etc.*

Lentic – Baited Traps

- Bait use variable

  Beef liver (WI), commercial baits, dog or cat food, fish or fish eggs

  Somers and Stechey (1986) found little effect of bait type on catch; some other studies disagree

- Trapping duration typically overnight

  15 – 26 hours; catch often peaks during night

Lentic – Baited Traps

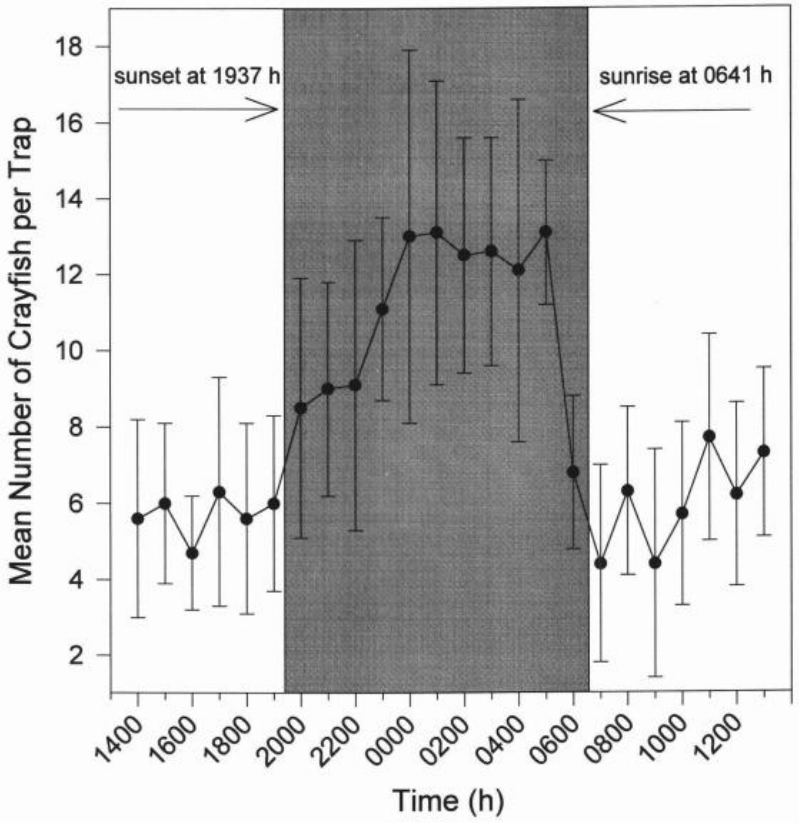


Figure 11. Diel activity of crayfish expressed as mean number of crayfish, with 95% confidence intervals, captured per 10 traps per hour for 24 continuous hours (n = 1,971). Shaded area indicates time period from sunset to sunrise.

Life History, Population Dynamics, and Management of Signal Crayfish in Lake Billy Chinook, Oregon.

by

Scott D. Lewis

A THESIS

submitted to

Oregon State University

Presented 24 November 1997
Commencement June 1998

Crayfish enter *and leave* traps over night

Does it matter? Standardize recovery time or duration as best as possible

Lentic – Baited Traps

- Season, temperature

  Higher catch in warmer water; summer, early autumn

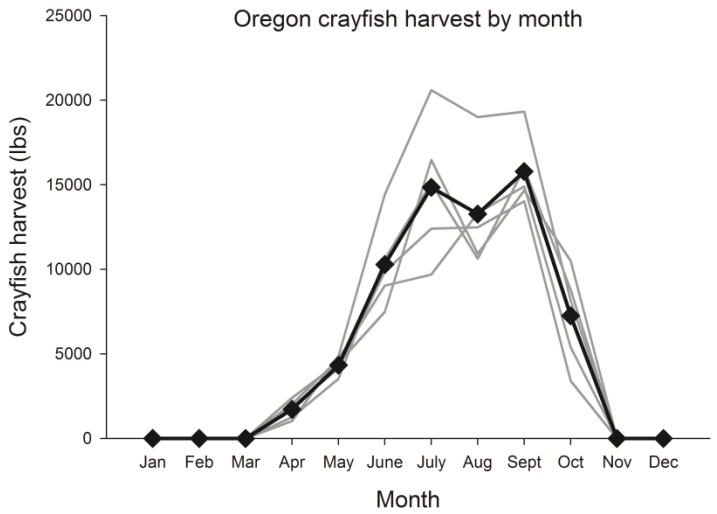
- Lunar phase?

  Some effect; not as important as temperature

- Best habitat?

  *Often **rock** (cobble)*

  But species dependent



***Depth:** 1-3 m typical*
Up to 100 m observed
Unknown in Great Lakes?

Lentic – Baited Traps

- Traps are biased

  *Measure Catch-per-Unit Effort (CPUE) as **adult males** only?*

- Trap CPUE vs. other population estimates?

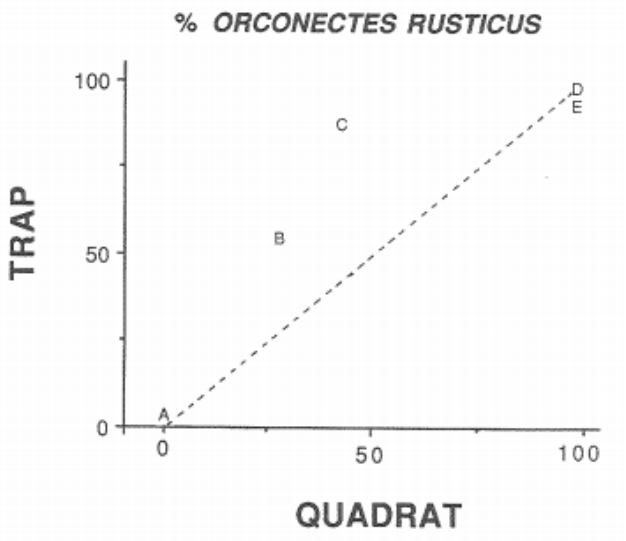


FIG. 1. Relationship between percent *O. rusticus* determined by visual sampling of quadrats and by trapping. Points represent the mean for quadrat (N = 9–10) and trap catches (N = 18–20) in each of nine lakes: White Sand (A), South Turtle (B), Boulder (C), Birch, Island, and Papoose (D), and Big, Clear, and Van Vliet (E). Broken line indicates perfect correlation between trap and quadrat catches.

r^2: *0.97 (Capelli and Magnuson 1983) – diver density estimates*

0.71-0.95 (Olssen et al. 1991) – diver density estimates

0.23-0.46 (Zimmerman and Palo 2011) – mark/recapture pop.

0.19 (Collins et al. 1983) – diver density estimates when <u>not</u> accounting for predatory fish abundance

Lentic – Baited Trap Alternatives

- Habitat structure or bundles
  - *Set for weeks, months*
  - *Allow colonization by crayfish*
  - *Better represents sex, size?*

United Kingdom

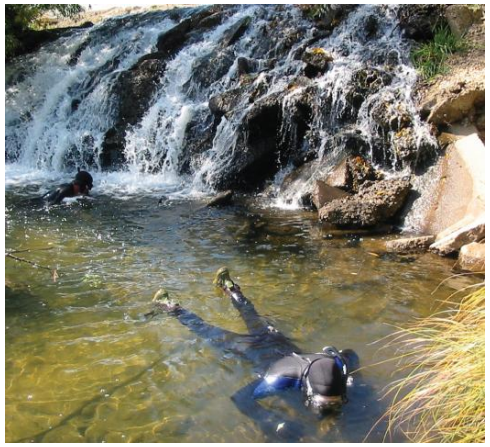
New Zealand; “tau koura”

FIGURE 1.—Cane (left), string (middle), and leaf (right) microhabitat units (bundles) deployed in three northern Mississippi streams (1-m rule at bottom).

Mississippi

Lentic – Divers or Snorkelers

- Direct observation, hand collection
  - *Quadrats, transects, timed searches*
  - *Day or night (dive lamp)*
  - *Less size, sex bias than trapping*



- Limitations
  - *Expertise (dive certification)*
  - *Equipment (dive costs)*
  - *Depth*
  - *Visibility*

Lentic – Other Methods

- Throw traps

  Dense vegetation, wetlands

  Dorn et al. (2005)

- Fisheries by-catch

  Crayfish regularly foul gill nets, etc.; can be used to monitor relative abundance, spread of invasive species

Lentic – Fisheries by-catch

Relative abundance and habitat association of three crayfish (*Orconectes virilis*, *O. rusticus*, and *O. immunis*) near an invasion front of *O. rusticus*, and long-term changes in their distribution in Lake of the Woods, Canada

Wolfgang Jansen[1*], Nola Geard[1], Tom Mosindy[2], Gavin Olson[2] and Michael Turner[3]

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Gill net catch tracks spread of *O. rusticus* in Lake of the Woods

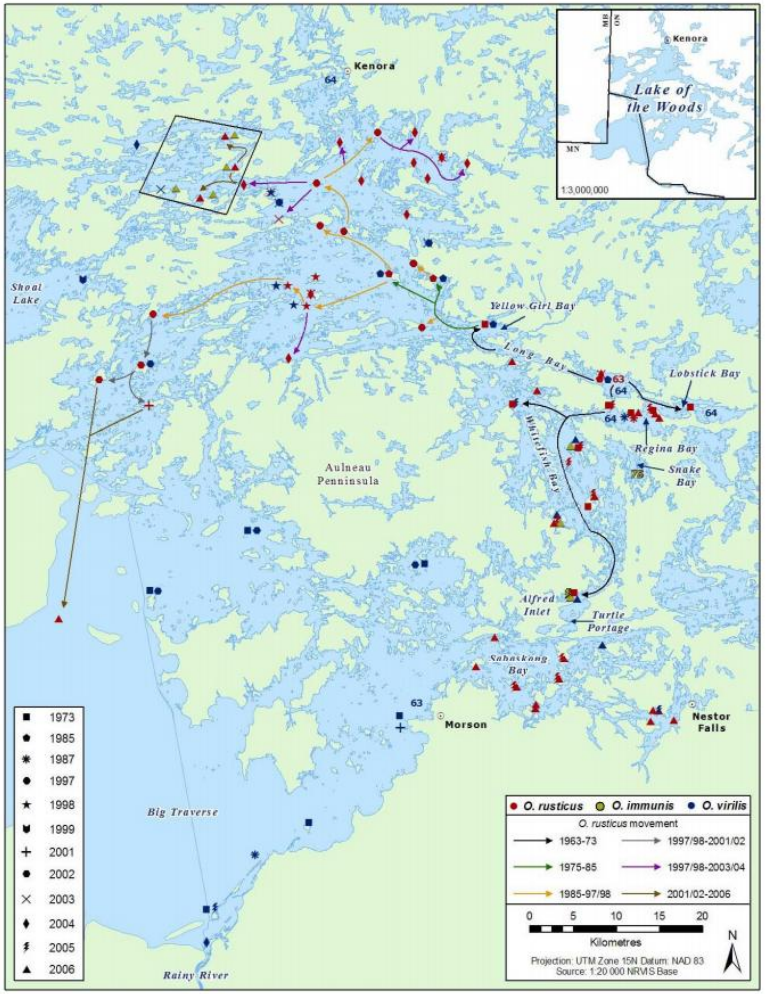


Figure 10. Crayfish capture locations in LOW from 1963-2006 (see Annex 1). Only the oldest and the most recent records are shown for multiple year captures of *O. virilis* at a location. Literature data are given with the year of capture (e.g., 64). The 2006 study area is shown by a square and a sample of capture sites. The approximate route and timeline of expansion of *O. rusticus* is indicated

Lotic

- Baited trap, snorkeling or diving

  Flow many influence trapping

- **Quadrat, kick seine**

- **Electrofishing**

- **D-frame, dip net, etc.**

Lotic – Quadrat Sampler

- 1 m^2 ; disturb substrate to 15 cm depth ; ~ 3 -5 min

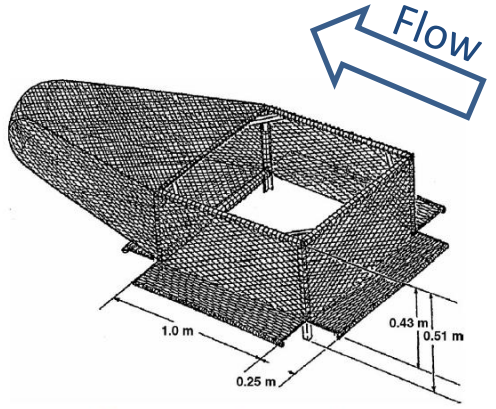


FIGURE 1.—Illustration of the 1-m^2 quadrat sampler used to collect lotic crayfish in Rock Creek, Missouri, during June 2005.

- Density, habitat associations
- Methods studies

  DiStefano et al. (2003)

  Larson et al. (2008)

- Heavy, labor intensive

Lotic – Kick Seining

- Similar to quadrat sampler
- Disturb substrate within set area, for set time
- Light, fast, 1-2 people
- Potentially less accurate, lower catch than quadrat

Williams et al.2014

Lotic – Electrofishing

- Generally effective for crayfish, infrequently used

- Alonso (2001) reported 60% of crayfish at first pass, 90% at 3rd or 4th

- Rogowski et al. (2014) criticized – ineffective where crayfish in substrate, burrows

Lotic – Methods Comparisons?

- **Rabeni et al. (1997)** – "*Evaluating techniques for sampling stream crayfish*" (New Zealand)

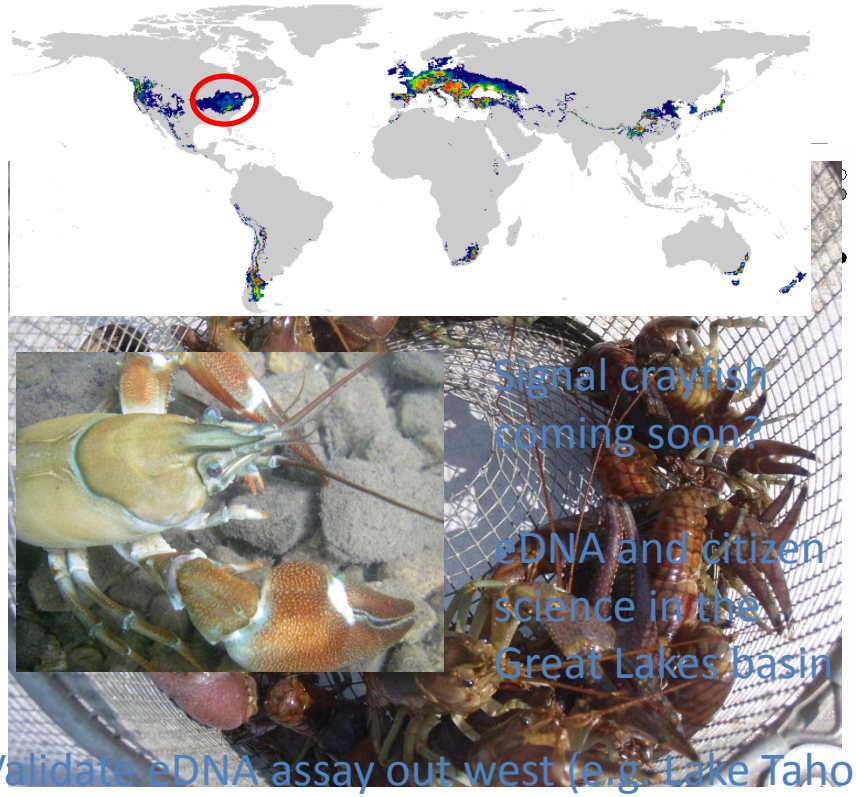
- Quadrat sampler, hand collection, electrofishing, mark-recapture

- Small (quadrat) vs. large (hand collection) size biases

- Electrofishing least biased for size, produced highest abundance estimates

- Mark-recapture population estimates more precise than serial depletion

Environmental DNA (eDNA) for Crayfish?



Signal crayfish coming soon?

eDNA and citizen science in the Great Lakes basin

Validate eDNA assay out west (e.g. Lake Tahoe)

Use zoo, aquarium summer camp kids to take water samples summer 2015 for eDNA

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Questions?