

# **Invasive Crayfishes: Impacts, Pathways, Detection, and Prevalence**

**Susie Adams, PhD**

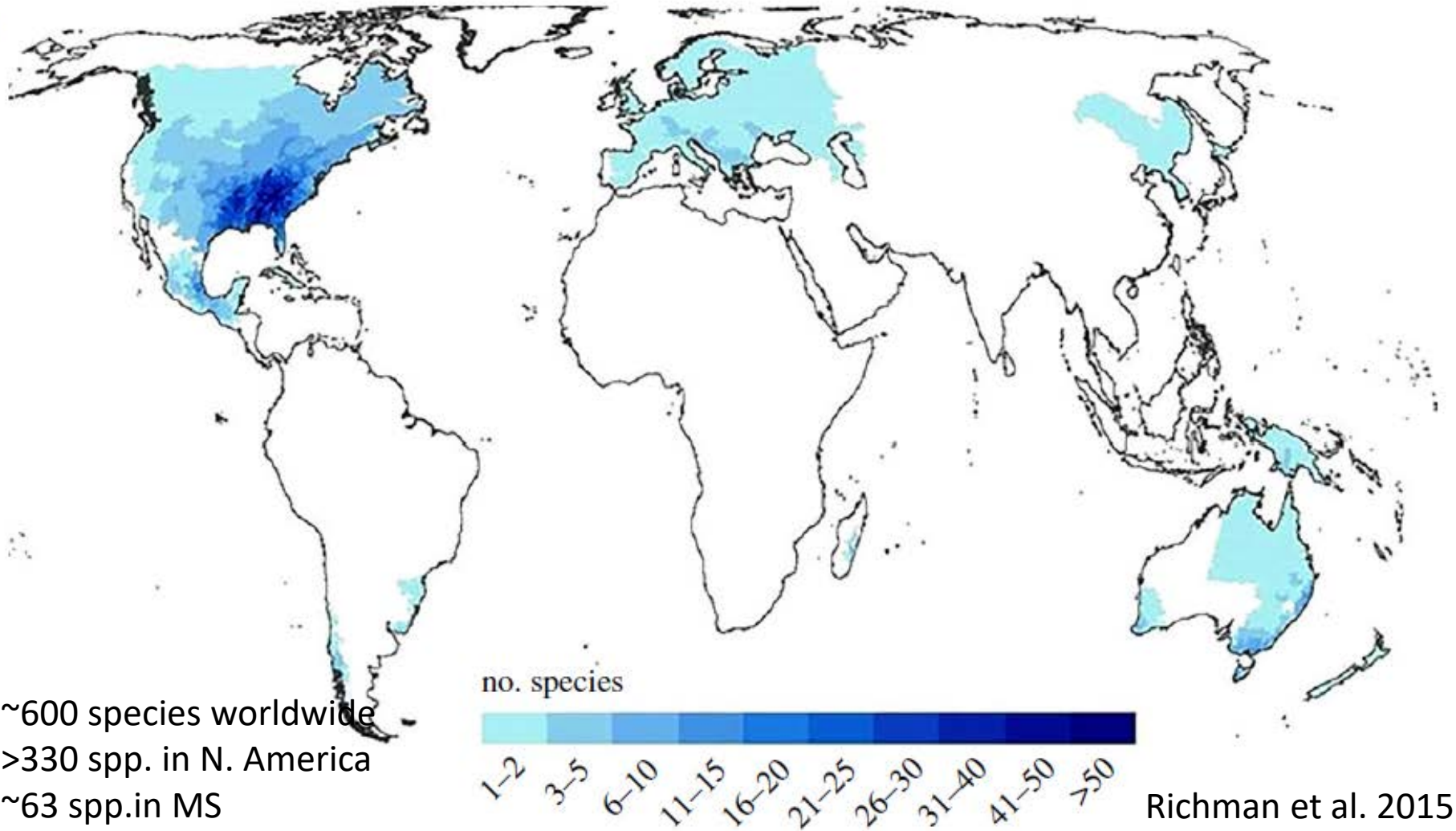
**USDA Forest Service, Southern Research Station,  
Center for Bottomland Hardwoods Research  
Oxford, Mississippi  
sadams01@fs.fed.us**

Gulf & South Atlantic Regional Panel on Aquatic Invasive Species  
USGS, Wetlands and Aquatic Research Center, Lafayette, LA, October 4-6, 2016



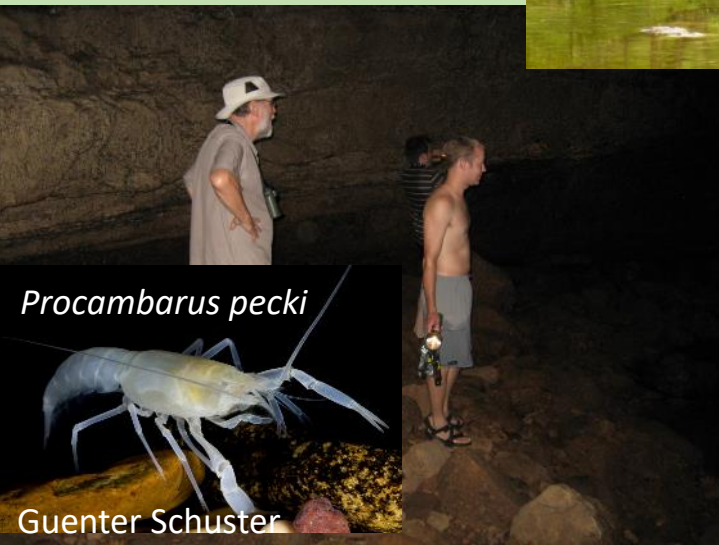


# Crayfish species diversity





# Crayfish habitat diversity





# I - IMPACTS





European perspective:

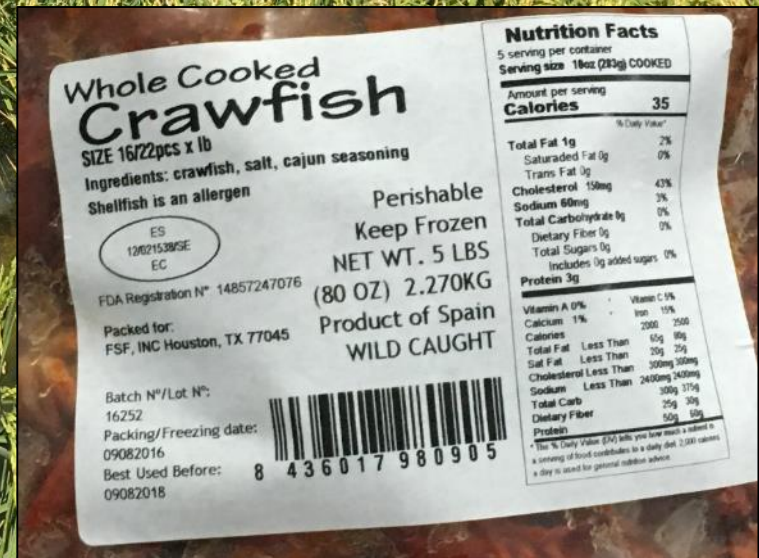
**“Crayfish are among the most notorious invasive aquatic species in freshwater ecosystems and have been reported not only to displace indigenous crayfish but also to impact a number of other aquatic organisms...”**

Ilhéu et al. 2007.





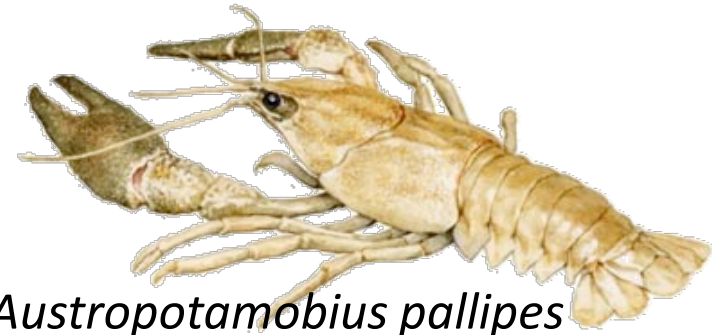
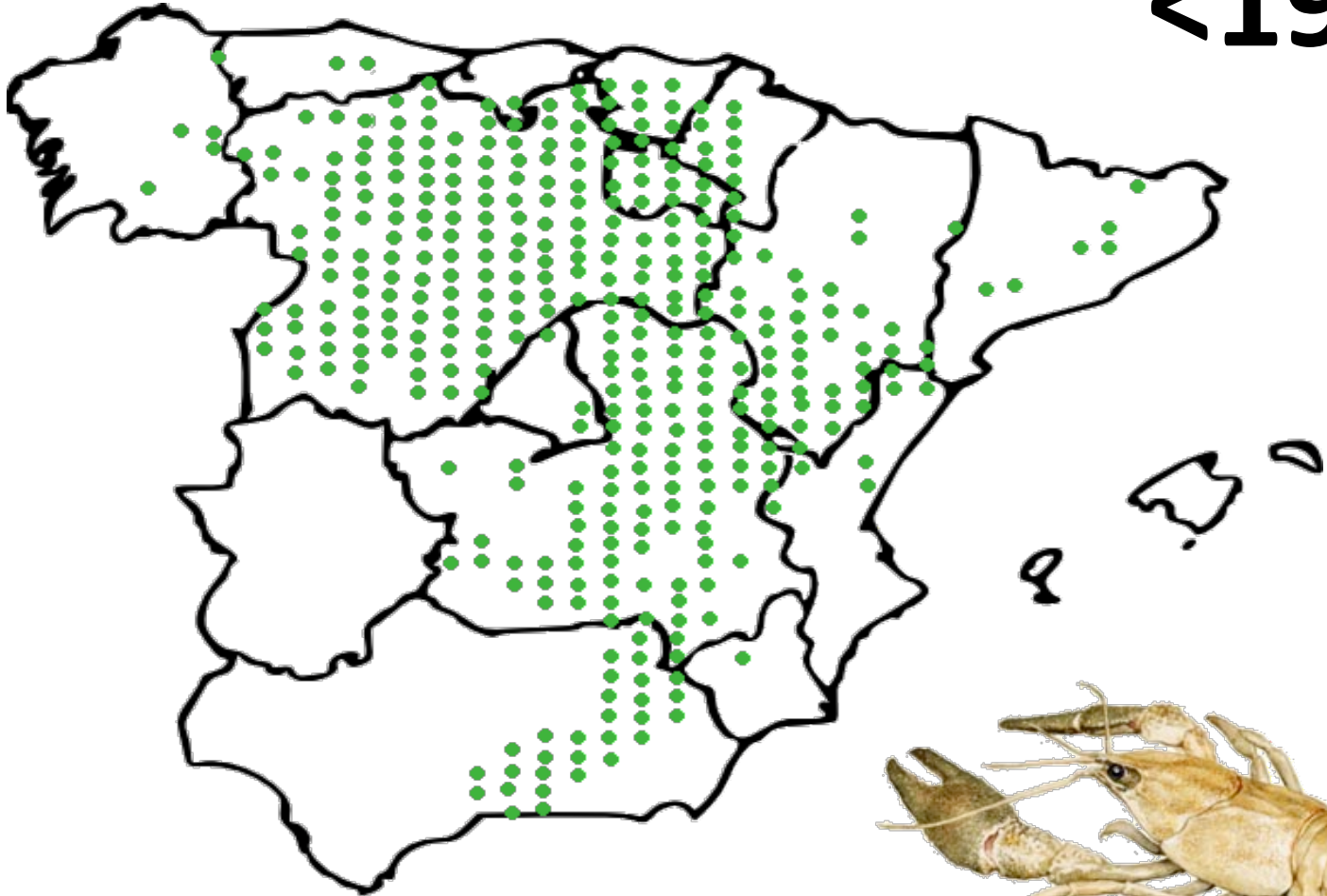
# Isla Mayor, Spain 2016





# Once upon a time there was ...

## <1975



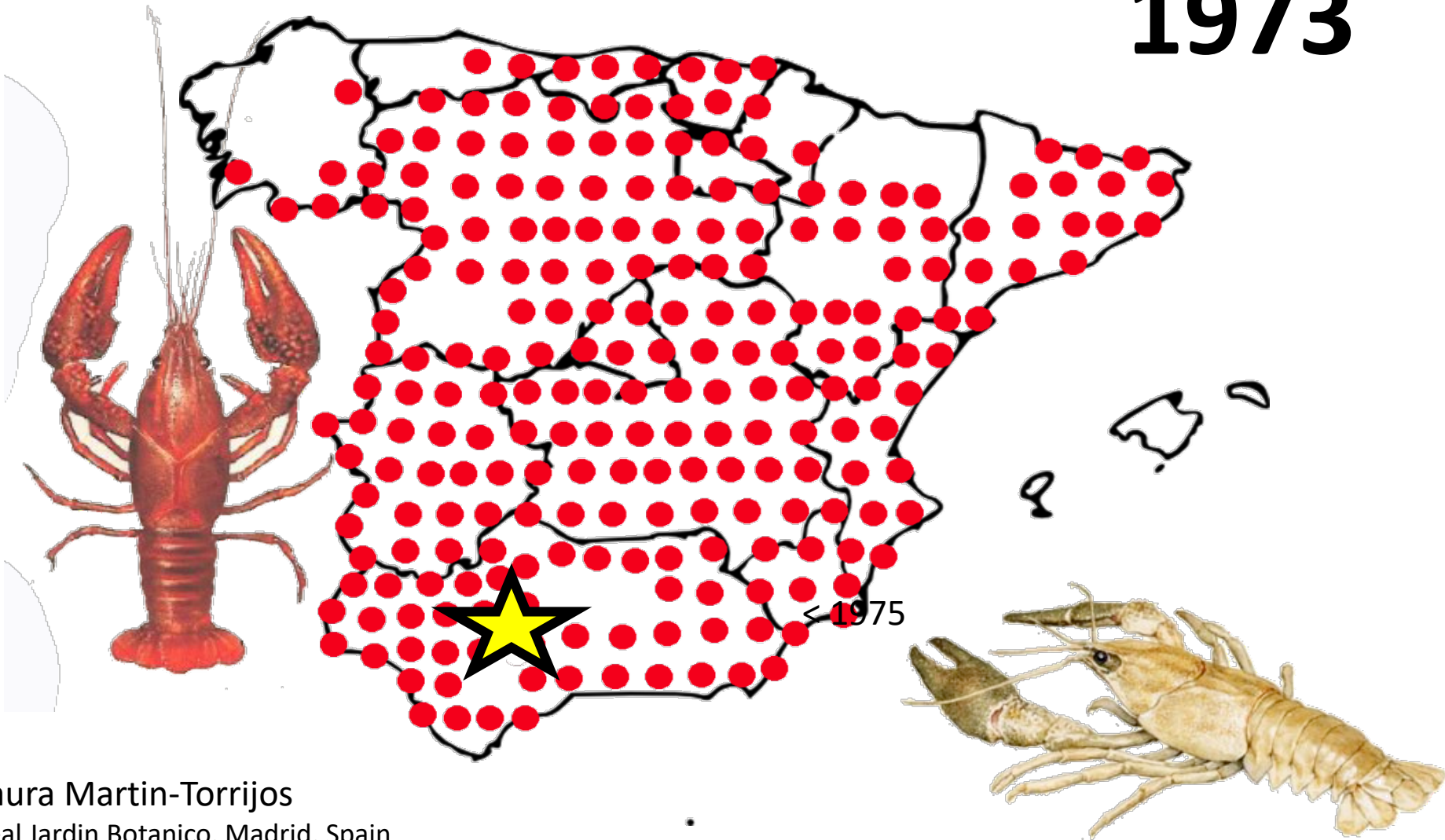
Laura Martin-Torrijos  
Real Jardin Botánico, Madrid, Spain

*Austropotamobius pallipes*



# ... first was the red swamp crayfish

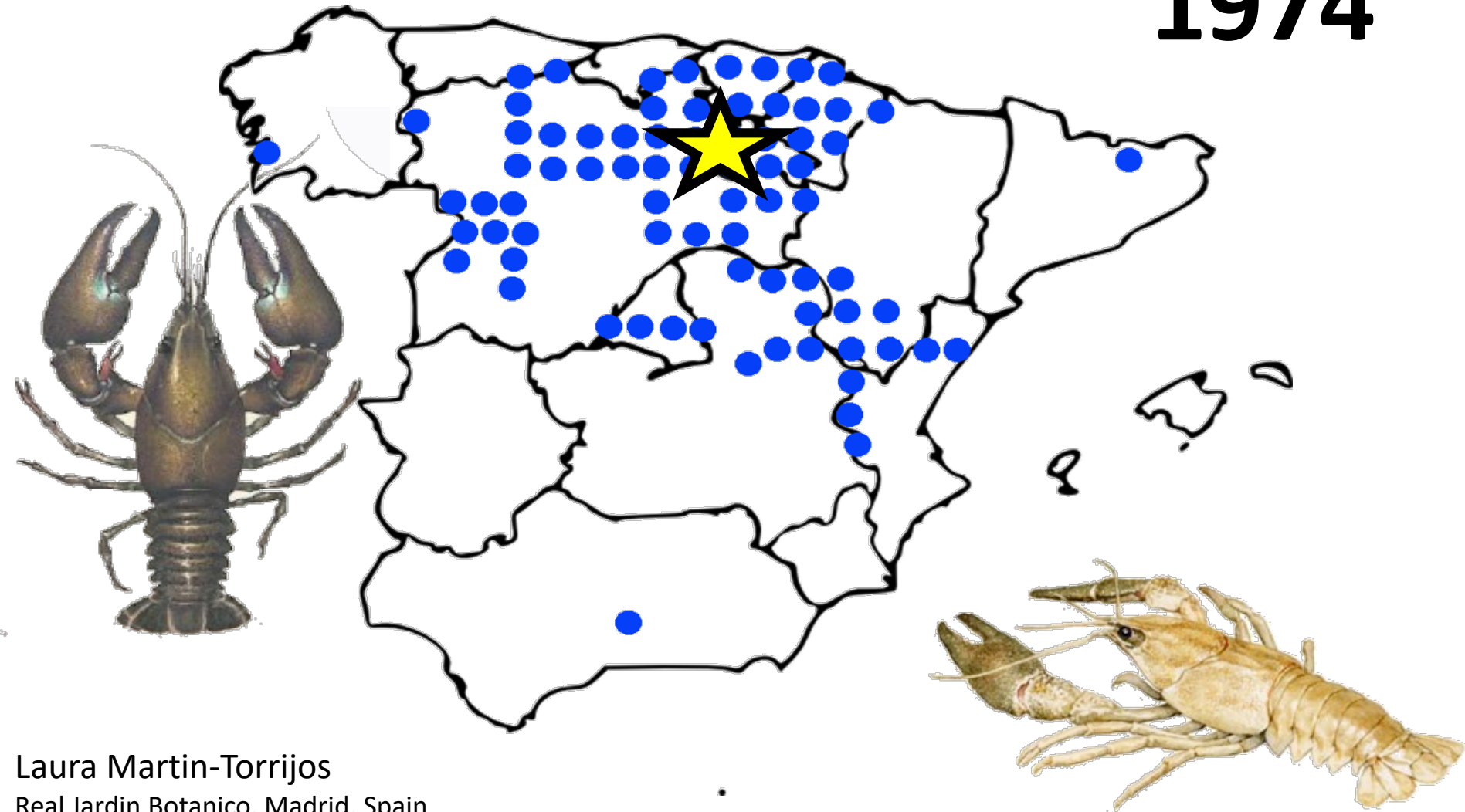
## 1973





... and a year later was the signal crayfish

1974

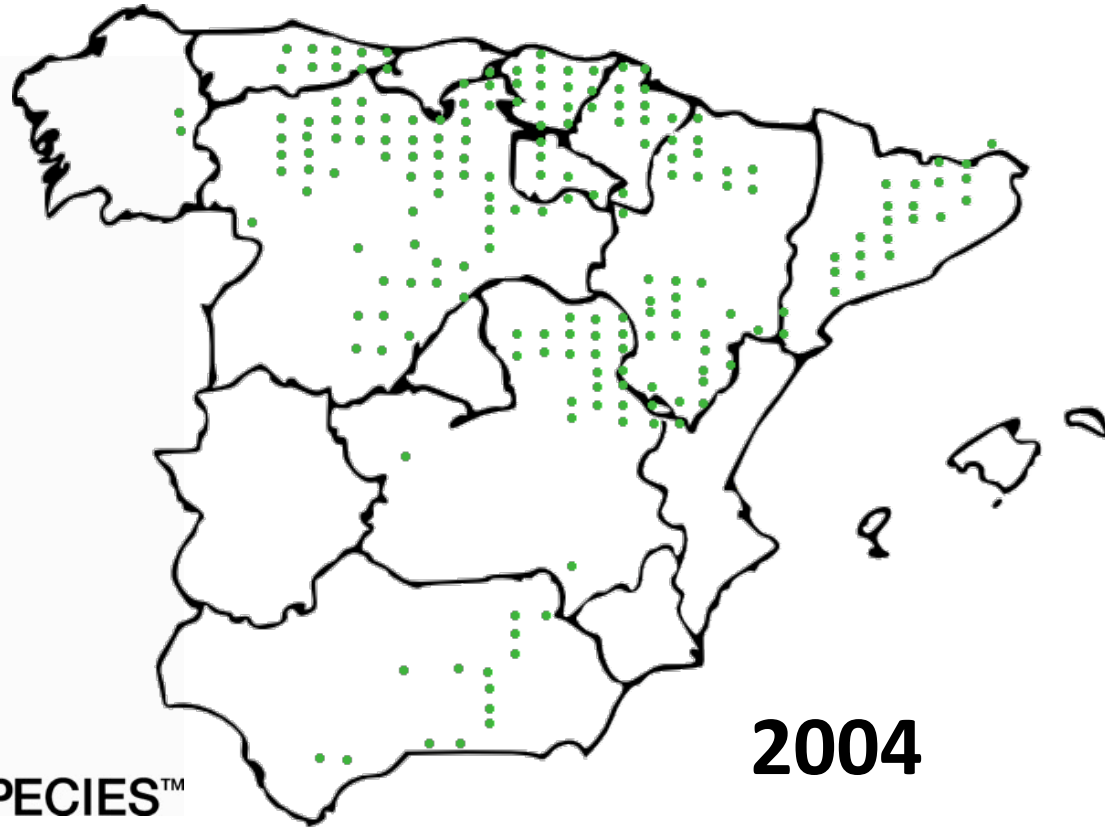




# Disappearance of populations



THE IUCN RED LIST  
OF THREATENED SPECIES™



2004

" class='species-lightbox'>



**Austropotamobius pallipes**

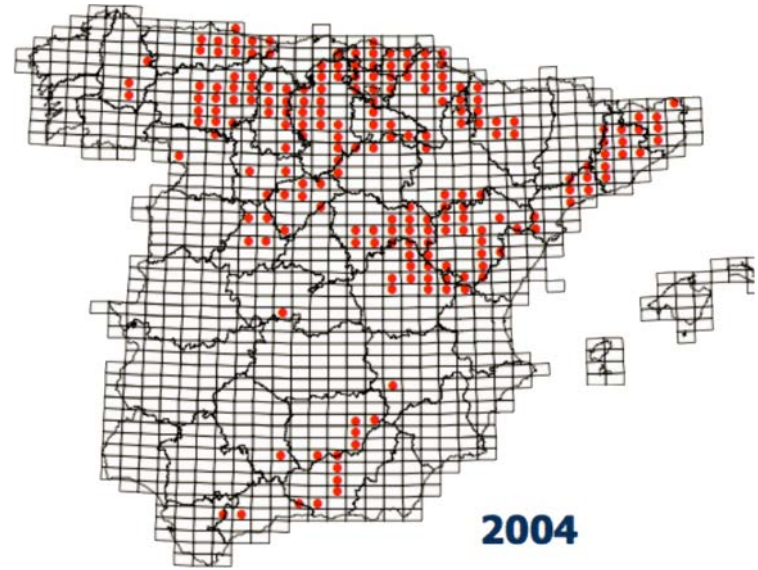
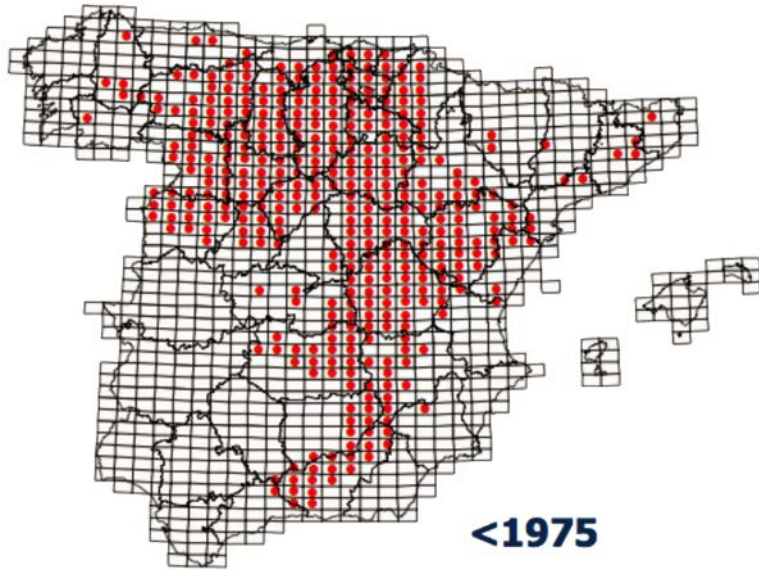
Scope: *Global*

NOT EVALUATED	DATA DEFICIENT	LEAST CONCERN	NEAR THREATENED	VULNERABLE	<ENDANGERED>	CRITICALLY ENDANGERED	EXTINCT IN THE WILD	EXTINCT
NE	DD	LC	NT	VU	EN	CR	EW	EX

Laura Martin-Torrijos  
Real Jardin Botanico, Madrid, Spain



# Disappearance of populations



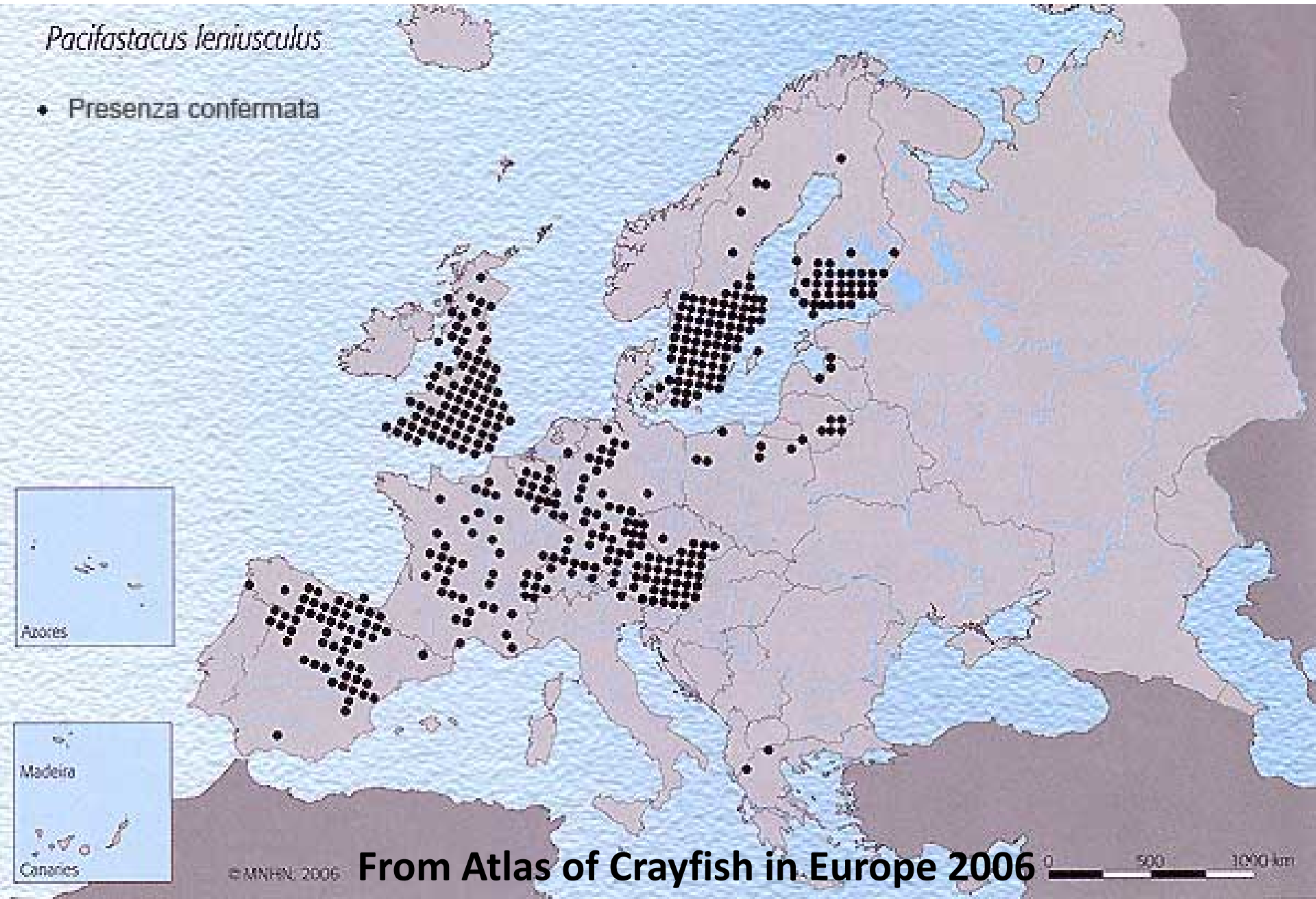
Laura Martin-Torrijos  
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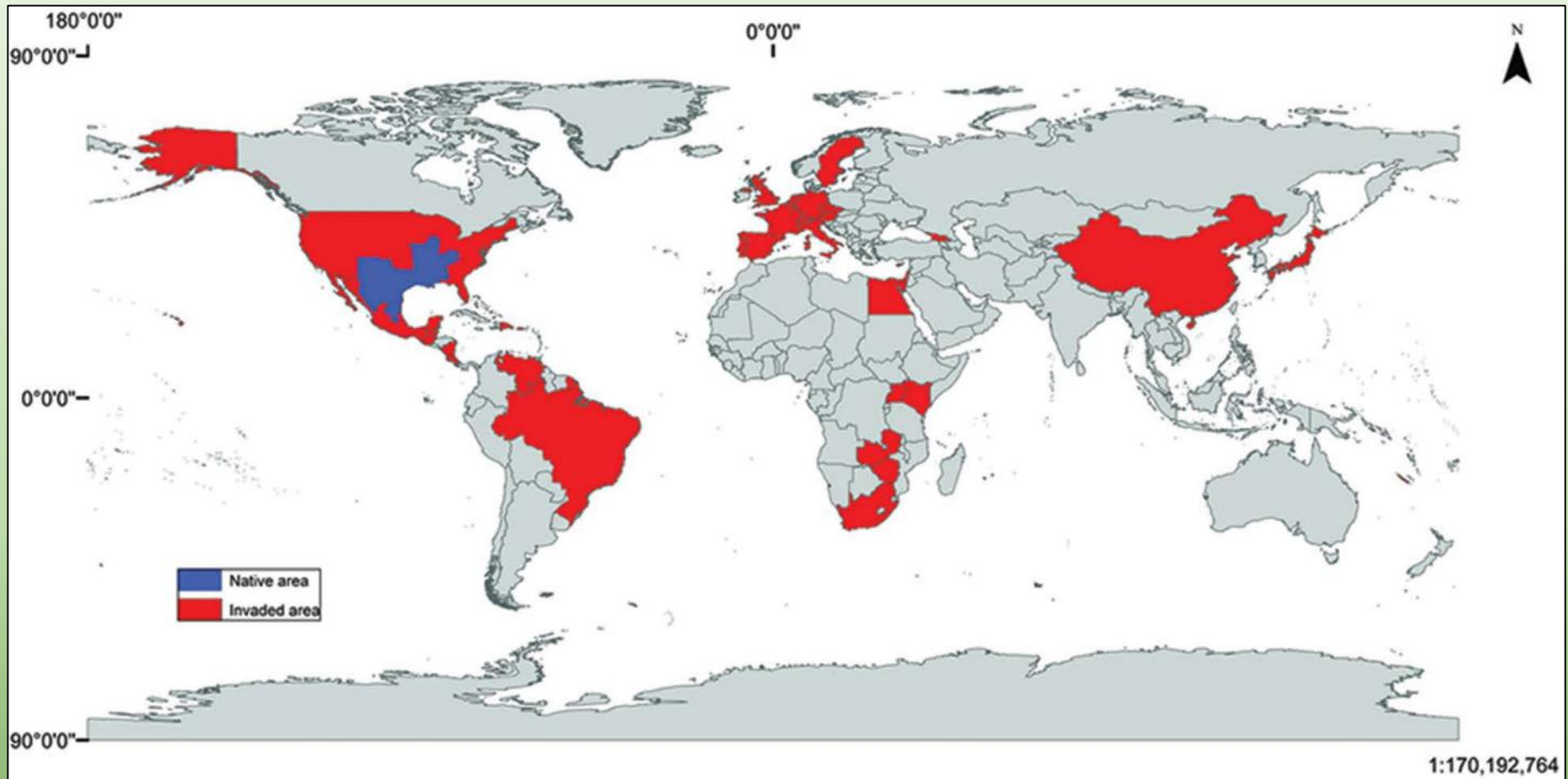
# Signal crayfish distribution in Europe

*Pacifastacus leniusculus*

• Presenza confermata



# Native and introduced ranges of *Procambarus clarkii*

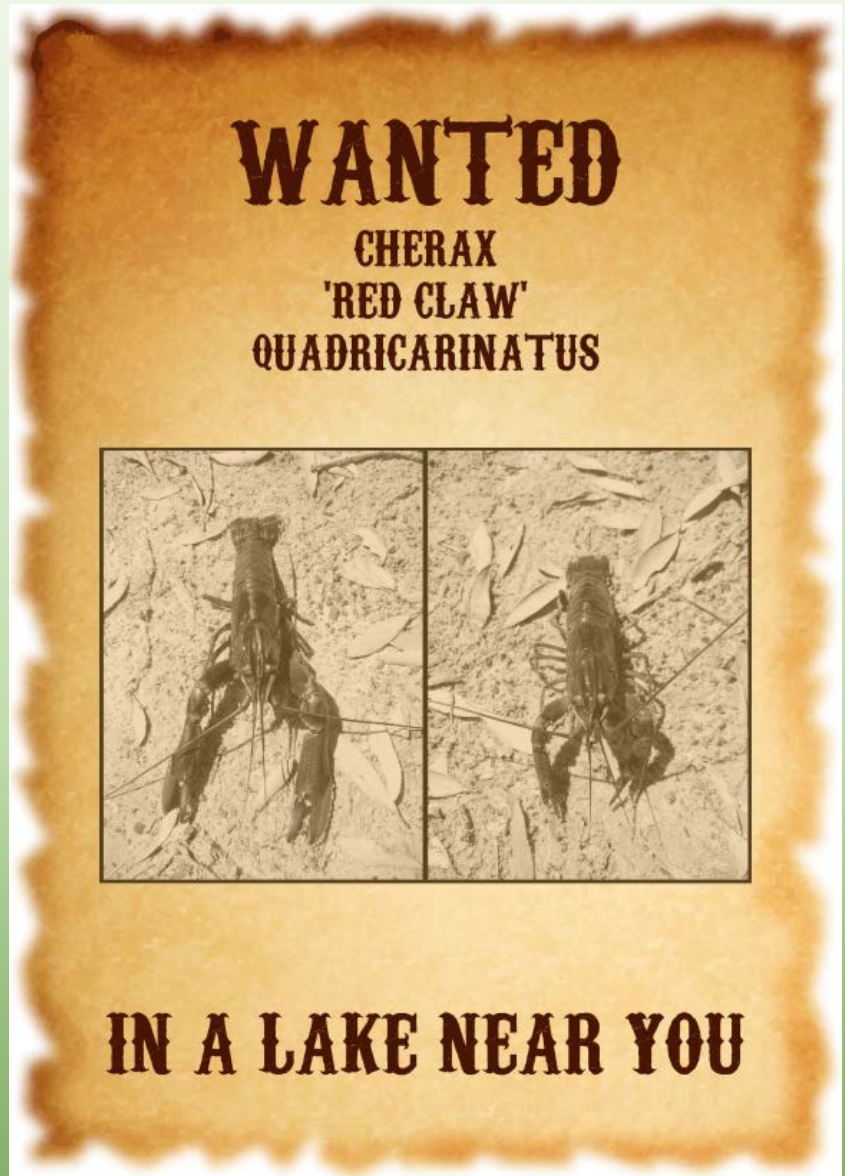




# The Invasion from Within ... Australia

## Australian redclaw

*Cherax quadricarinatus*



# ***C. quadricarinatus* – In Australia**

- Tolerant of environmental extremes
- Large – >600 g (1.3 lbs)
- Fast growing
- Matures quickly
- Highly fecund
- High tail meat ratio

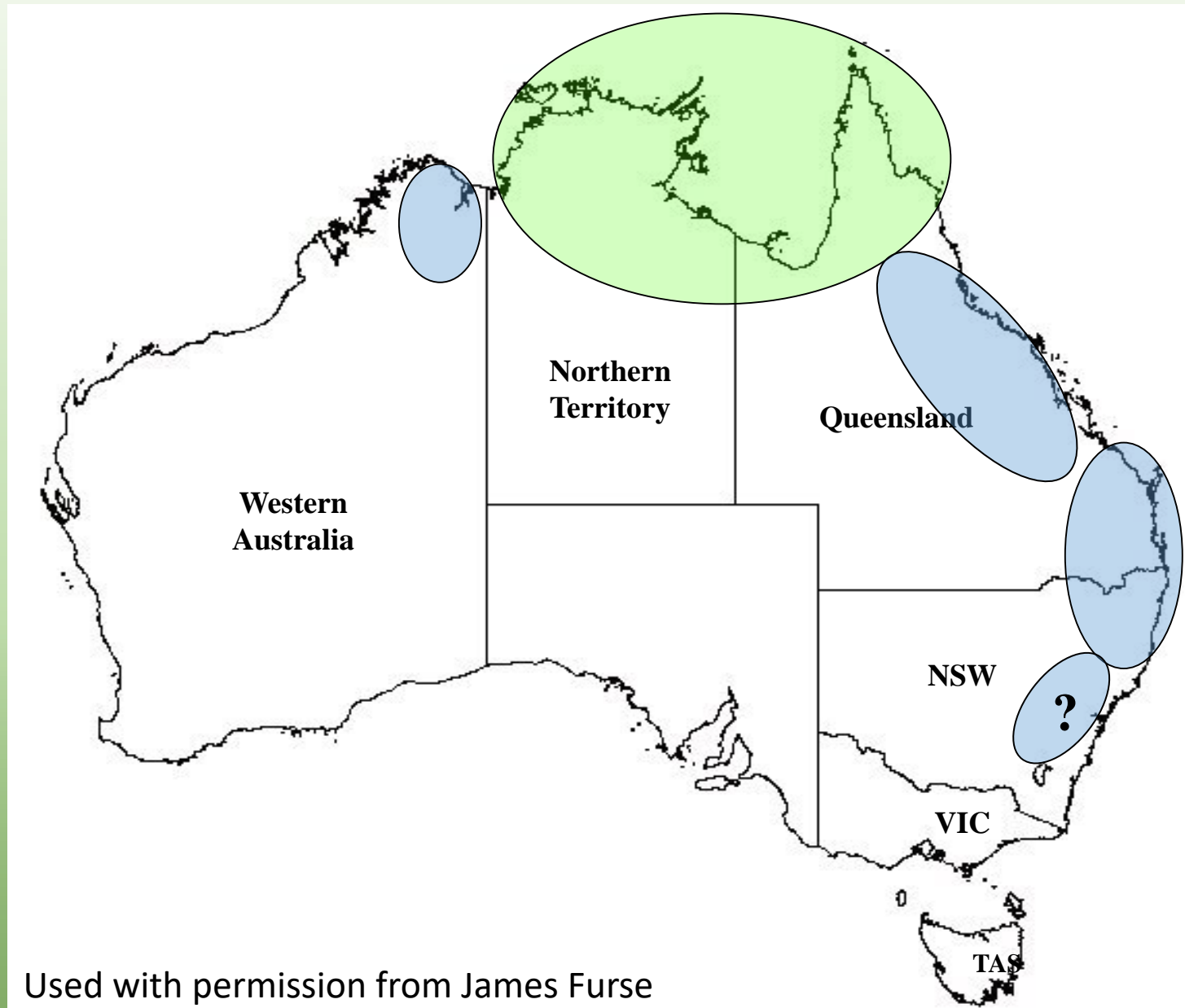


(e.g. Jones 1989, Wingfield 2002, Thompson *et al.* 2004, and many others)

Adapted with permission from Leyton Tierney



# The Redclaw Invasion



Used with permission from James Furse

**Australian Redclaw -  
Coming soon to a location  
near you??**





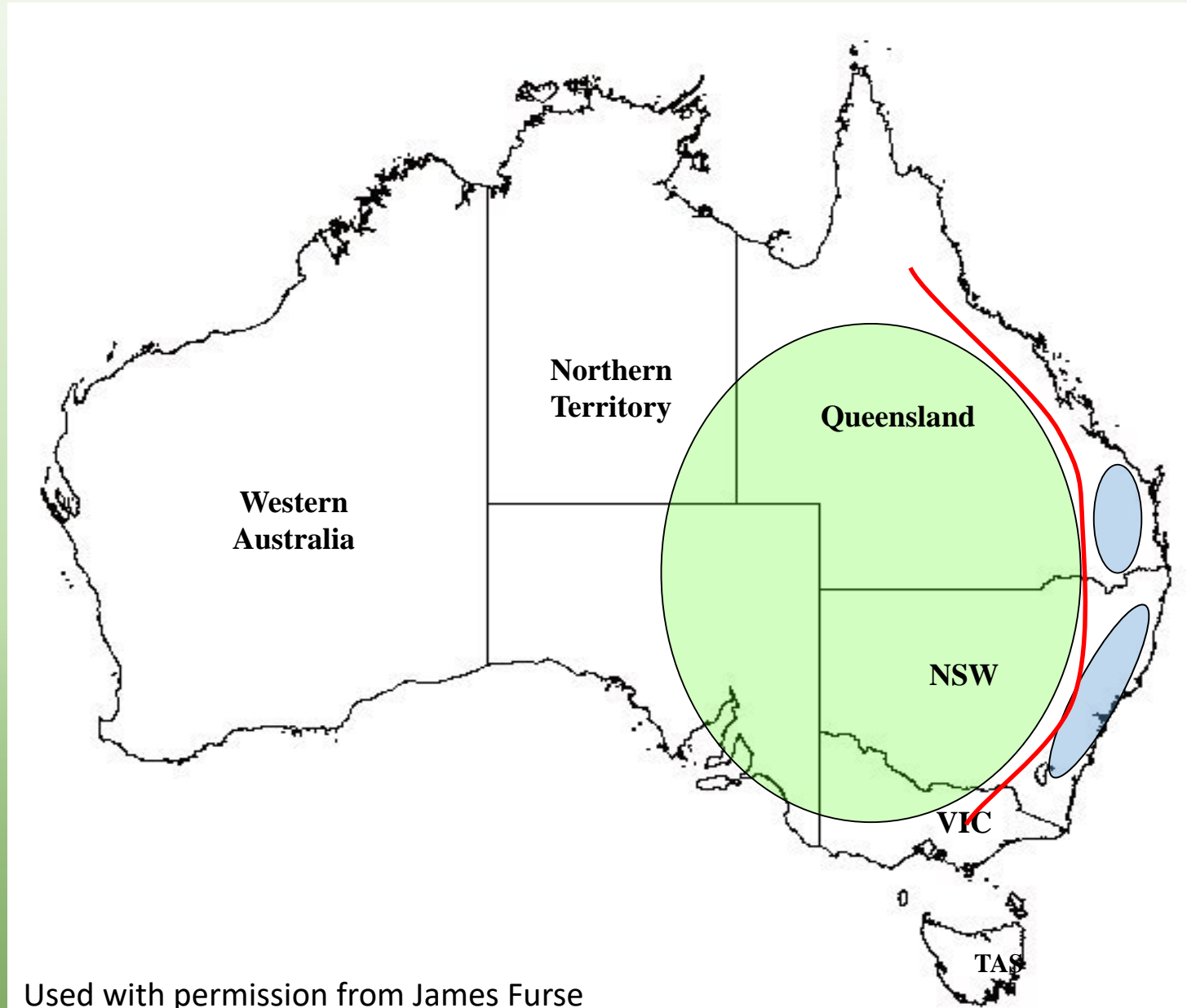
# *Cherax destructor*



Photo: Anon

Used with permission from James Furse

# *C. destructor* Australian invasion





# American Scene



# Impacts of Invasive Crayfishes in US – Vertebrates

## Fish

**Reduce fish growth** (CA - Light 2005; AZ - Carpenter 2005)

**Compete for shelter** (CA - Light 2005; AZ - Carpenter 2005)

**Negative population effects** (AZ - Rogowski & Stockwell 2006)

## Other

**Deter breeding in CA newts** (Gamradt et al. 1997)

**Alter terrestrial food webs – common black-hawks** (AZ - Etzell et al 2014)



# Effects of Invasive Crayfishes in US - Invertebrates

## Displace or reduce abundance of native crayfishes

WI lakes (Olsen et al. 1991)

MO streams (Distefano and Westhoff 2011)

AL wetlands (Coble et al. 2015)

↓ **Zoobenthos densities/abundance/biomass** (Charlebois and Lamberti 1996; McCarthy et al. 2006)

↓ Gastropods (Olsen et al. 1991; McCarthy et al. 2006)

↓ macroinvertebrate densities 47-58% (Charlebois and Lamberti 1996)

↓ herbivore densities 55-72% (Charlebois and Lamberti 1996)

↓ Dipterans, Ephemeropterans, Odonates, Trichopterans  
(McCarthy et al. 2006)

# Effects of Invasive Crayfishes in US – Aquatic Plants

- ↓ Macrophyte biomass in WI lakes (Olsen et al. 1991)
- ↑ Chlorophyll a 48-70% (MI streams - Charlebois and Lamberti 1996)
- ↑ Periphyton primary productivity 4-7x (MI streams - Charlebois and Lamberti 1996)

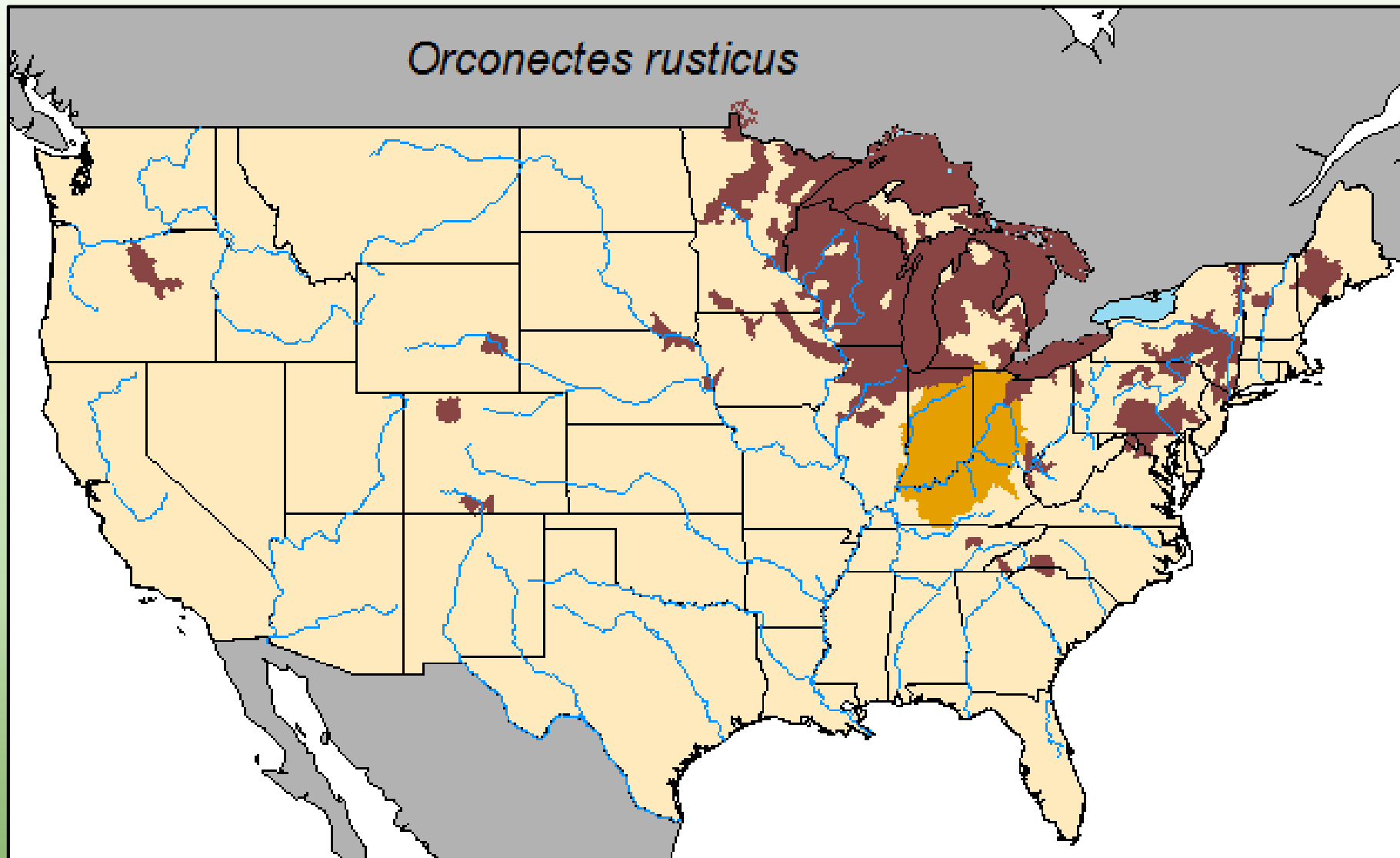
Invasive crayfish can have *complex*,  
multi-trophic-level effects on food webs  
(*Charlebois and Lamberti 1996*)



# #1 - Rusty Crayfish *Orconectes rusticus*



*Orconectes rusticus*







By Ray Gildow

Sports

# Rusty crayfish – a serious threat to Midwestern waterways

Published July 9, 2016 at 8:15 am



It is just one more threat to our lakes, streams and rivers to worry about – rusty

crayfish. They're nonthreatening, but these critters are a very



76°

Clear



The Frederick News-Post



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## INVASION OF THE RUSTY CRAYFISH

News ► GFP Discovers Invasive Rusty Crayfish in South Dakota Waters

# GFP Discovers Invasive Rusty Crayfish in South Dakota Waters

Saturday, June 27, 2015 8:02 a.m. CDT by Stan Allen

«Jazz: A Revived Label Does Right by...

THURSDAY, APRIL 28, 2011

ENVIRONMENT / NEWS / ECO

## Invasion of the Rusty Crayfish

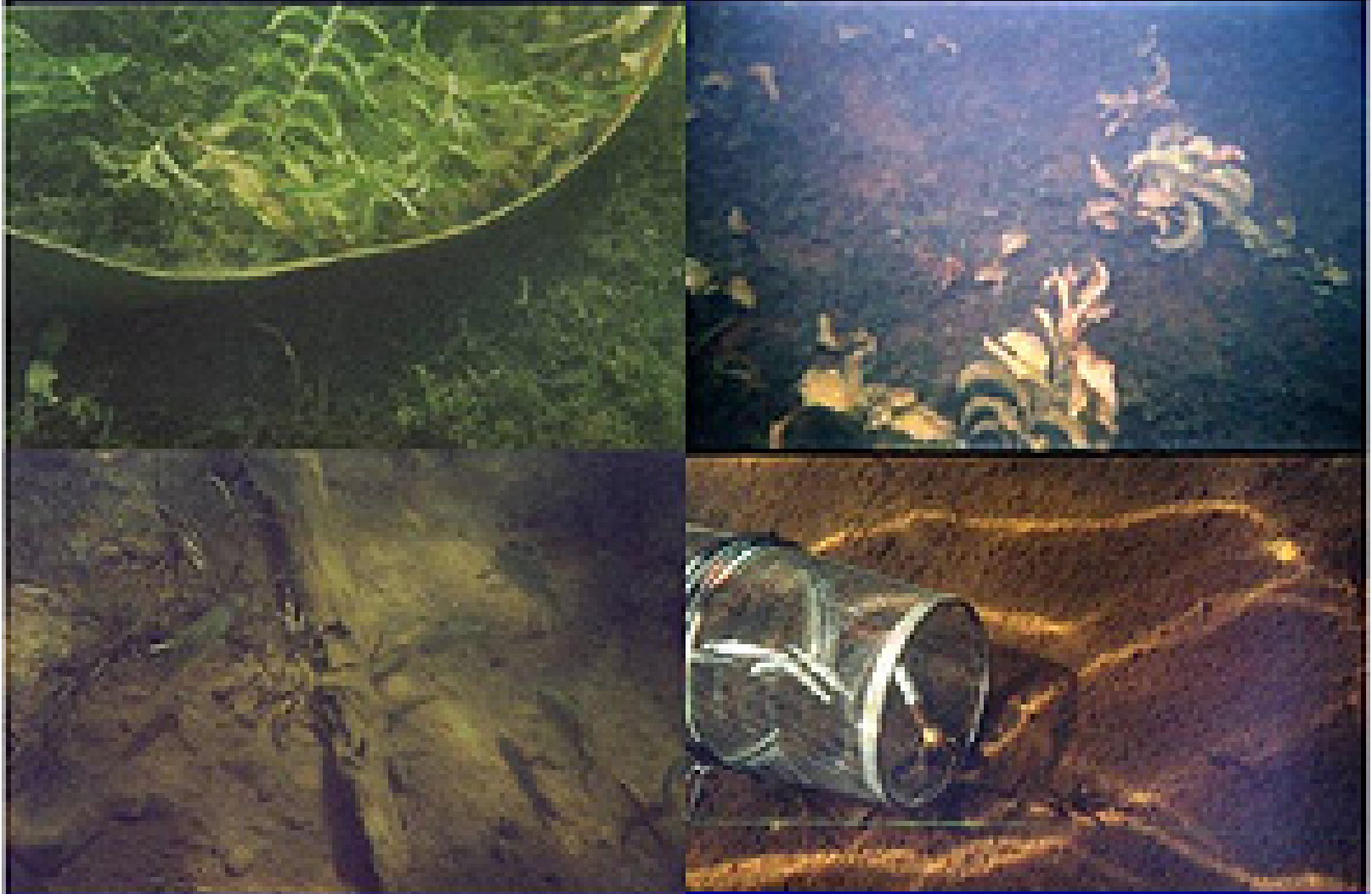
Posted By Mick Dumke on 04.28.11 at 04:03 PM

I've never seen so many claws.

They're all over Chicago beaches, scattered all over the city.

# Rusty Crayfish

Before crayfish removal:





# Rusty Crayfish

After crayfish removal:



# *Orconectes virilis* in AZ/CO R Basin

## Effects on native AZ fishes - Carpenter 2005

- PREDATORY INTERACTIONS and COMPETITION FOR SHELTER between crayfish and Gila chub, desert sucker, and speckled dace.
- Crayfish PREYED ON all species - most heavily on desert suckers.
- FOOD COMPETITION between crayfish and two native fishes
- Crayfish NEGATIVELY IMPACTED GROWTH of Flannelmouth suckers.

## *O. virilis* & threatened White Sands Pupfish - Experiments -

Rogowski & Stoeckert

- At high densities

Pupfish.

## Middle Yuma

- *O. virilis* & pupfish
- Biomass
- “AS LARGE COMMUNITIES



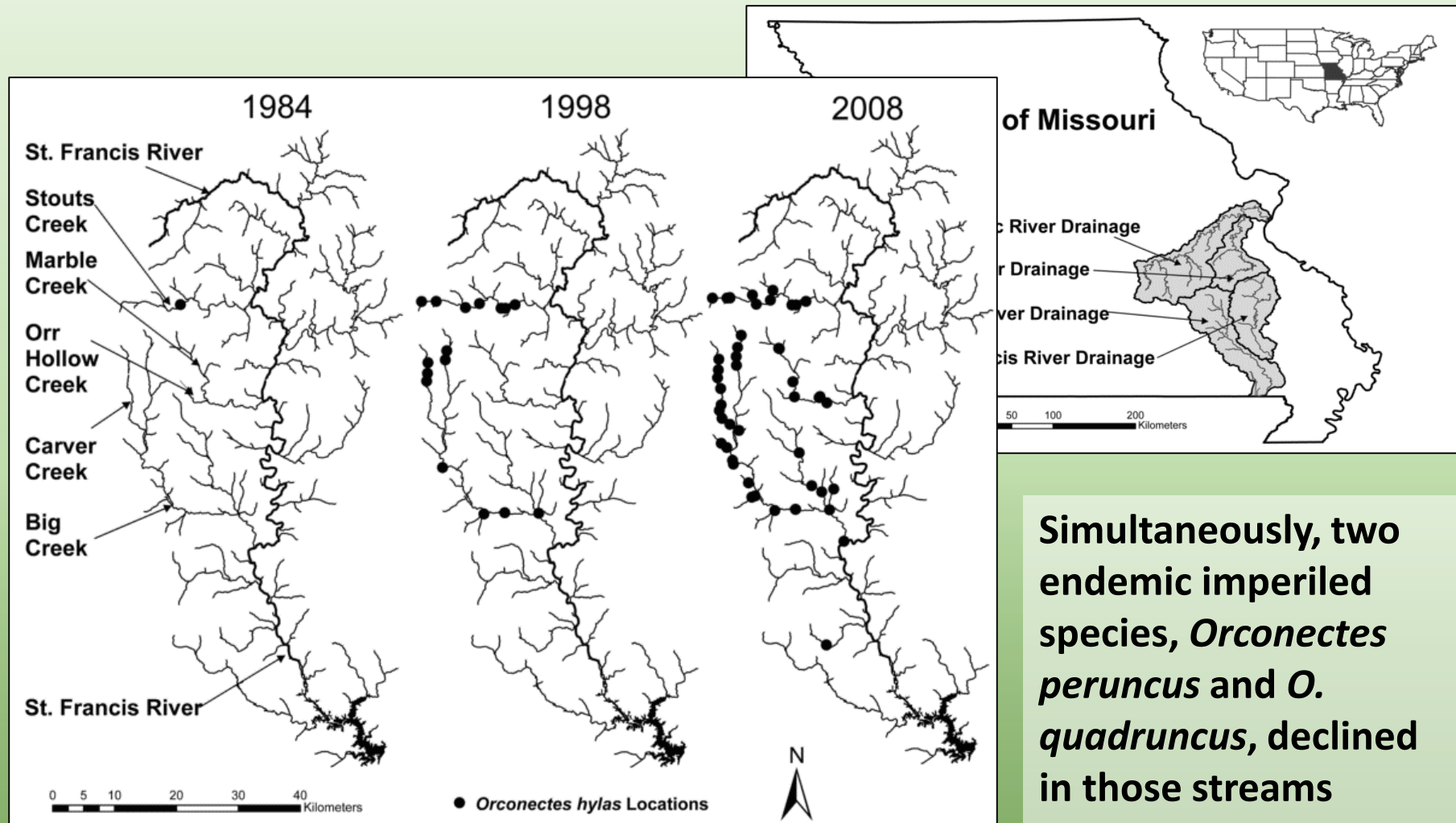
rates & fishes  
STRUCTURE  
ns at multiple

trophic levels as primary and secondary consumers, and as predators.”



# Range Expansion by an Invasive Crayfish and Subsequent Range Contraction of Imperiled Endemic Crayfish in Missouri (USA)

Ozark Streams RJ DISTEFANO AND JT WESTHOFF



# Invasive Crayfish Effects - Summary

## Negative Effects

- Collapse of fisheries
- Extirpation of native species
- Complex community changes
- Crop and native plant damage
- Structural damage/habitat

## Mechanisms of problems

- Diseases/Parasites
- Predation
- Competition
- Habitat alteration





# II - INTRODUCTION PATHWAYS

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## Lobster Costume Adult Mardi Gras Craw Daddy

★★★★★ Be the first to [write a review](#)

Item condition: **New with tags**  
Sale ends in: 01d 10h 32m  
Quantity:  **Last one** / 33 sold

Was: ~~US \$54.95~~ [?](#)  
You save: \$2.75 (5% off)  
Price: **US \$52.20**

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18 watching [Add to watch list](#)  
[Add to collection](#)

**33 sold** More than 96% sold

Shipping: **\$10.95** Standard Shipping | [See details](#)  
Item location: Byron Center, Michigan, United States  
Ships to: Worldwide [See exclusions](#)  
Delivery: Estimated between **Wed. Sep. 28** and **Wed. Oct.**



# Live bait



WI and PA outlawed use of live crayfishes as bait AFTER devastating invasions by *Orconectes rusticus*.



# Pet Trade

ebay



\*\*\*3\*\*\*~RARE ~BLUE~~Procamburus Marmorkrebs self cloning  
CRAYFISH,FREST WATER

**\$10.00**

1 bid

1d 5h left (Tuesday, 9PM)



One (1) Cherax Destructor Crayfish (FW Lobster) - Truly RARE in the US

**\$49.95**

Buy It Now

Free shipping



28 Live Dwarf crayfish plant shrimp pond farm fish koi mancave tadpole  
betta kit

**\$58.00**

Buy It Now

Free shipping

5 watching



Two (2) Live Australian Redclaw (cherax quadricarinatus) Crayfish (FW  
Lobster)

**\$39.95**

Buy It Now

Free shipping



(1) Vanilla Crayfish (Lobster) 1.5 inch Live fish FULLY GUARANTEED

**\$9.99**

or Best Offer

37 watching

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**Your Current Selection**

**User Search:**  
crayfish

**Search within Results**

**Price Range**

\$0-\$5 (1)  
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\$25-\$50 (2)



Starting at:  
**\$199**

Crayfish



Starting at:  
**\$1099**

Mexican Dwarf Crayfish



Starting at:  
**\$2499**

Zebra Crayfish



Starting at:  
**\$1999**

Electric Blue Lobster



**OVERVIEW**

**SHIPPING & GUARANTEE**

**Scientific Name:** *Cherax peknyi*

**Ease of Care:** Easy

**Approximate Arrival Size:** 2 to 3 inches

**Approximate Full Size:** 5 inches

**Native Region:** New Guinea

**Temperament:** Mostly Peaceful, can be Semi Aggressive

**Diet:** Omnivore

The Zebra Crayfish is primarily a peaceful aquarium inhabitant, leaving most fish alone. It is recommended to not keep loaches or other full time bottom dwellers with the crayfish, since one or the other may be harmed at some point either intentionally or accidentally. This attractive crayfish is an omnivore, and will eat most foods it is offered.

**Note: no restrictions mentioned here**

***Procambarus* sp.**

**Known**

**Restrictions: We are unable to ship crayfish into California, Wisconsin or Pennsylvania**



**Region:**  
le



Officials with the Missouri Department of Conservation are concerned about ecological problems that could result if Australian red-claw crayfish were brought into the Show-Me State. The Wildlife Code of Missouri prohibits the importation or possession of Australian crayfish. Only species on the Approved Aquatic Species List may be brought into the state legally. (Photo courtesy of Clive Jones, Queensland Department of Primary Industries and Fisheries)



# Food



0 items













Check Out

## LIVE CRAWFISH FOR SALE

[HOME](#)[ABOUT US](#)[FAQS](#)[CONTACT US](#)

### LIVE CRAWFISH

Crawfish is IN SEASON. Live crawfish season runs from January to June/July. From July/August to December, we sell boiled crawfish. Buy live crawfish today!

 from \$117.99 10 Pounds Live Crawfish	 from \$142.99 15 Pounds Live Crawfish	 from \$172.99 20 Pounds Live Crawfish	 from \$192.99 25 Pounds Live Crawfish
 from \$230.99 30 Pounds Live Crawfish	 from \$257.99 35 Pounds Live Crawfish	 from \$316.99 40 Pounds Live Crawfish	 from \$396.99 50 Pounds Live Crawfish
 from \$458.99 60 Pounds Live Crawfish	 from \$563.99 75 Pounds Live Crawfish	 from \$672.99 90 Pounds Live Crawfish	 from \$699.99 100 Pounds Live Crawfish

#### MAIN MENU

- Home
- Secure Website
- Order Boiled Crawfish
- Order Live Crawfish
- Live Crayfish for Sale
- Crayfish As Pets
- Crawfish Traps for Sale
- Crawfish Cookie Cutter
- About Us
- Testimonials
- FAQ
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- Catalog
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# Aquaculture



# Schools



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SUPPORT

You Make the Difference  
**contribute now**

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## Invasive Crayfish May Be Class Pets First

by **Vince Patton** [Follow](#) OPB | Feb. 16, 2011 10 p.m. | Updated: July 17, 2012 1:05 a.m. | Corvallis, OR



00:00

04:31



THANKS TO OUR SPONSORS



Oregon has two new invasive species to deal with. For the first time in the western United States, scientists say two kinds of crayfish have appeared in



# **Introduction pathways**

**Typically cited:**

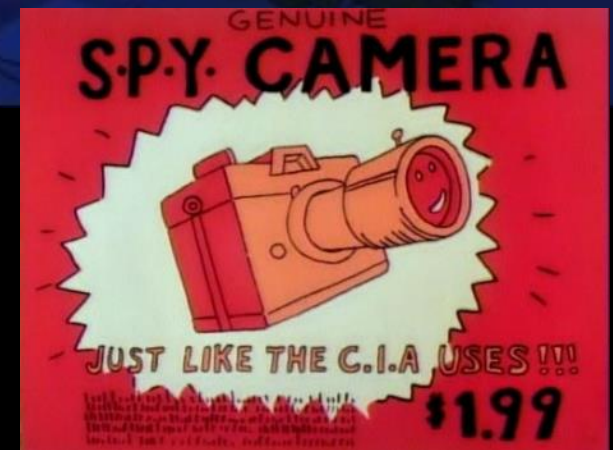
- Live bait, commercial or individual**
- Pet/ornamental trade**
- Food**
- Aquaculture**
- Schools**

**But what about...**

# Fish stocking?



# III - DETECTION





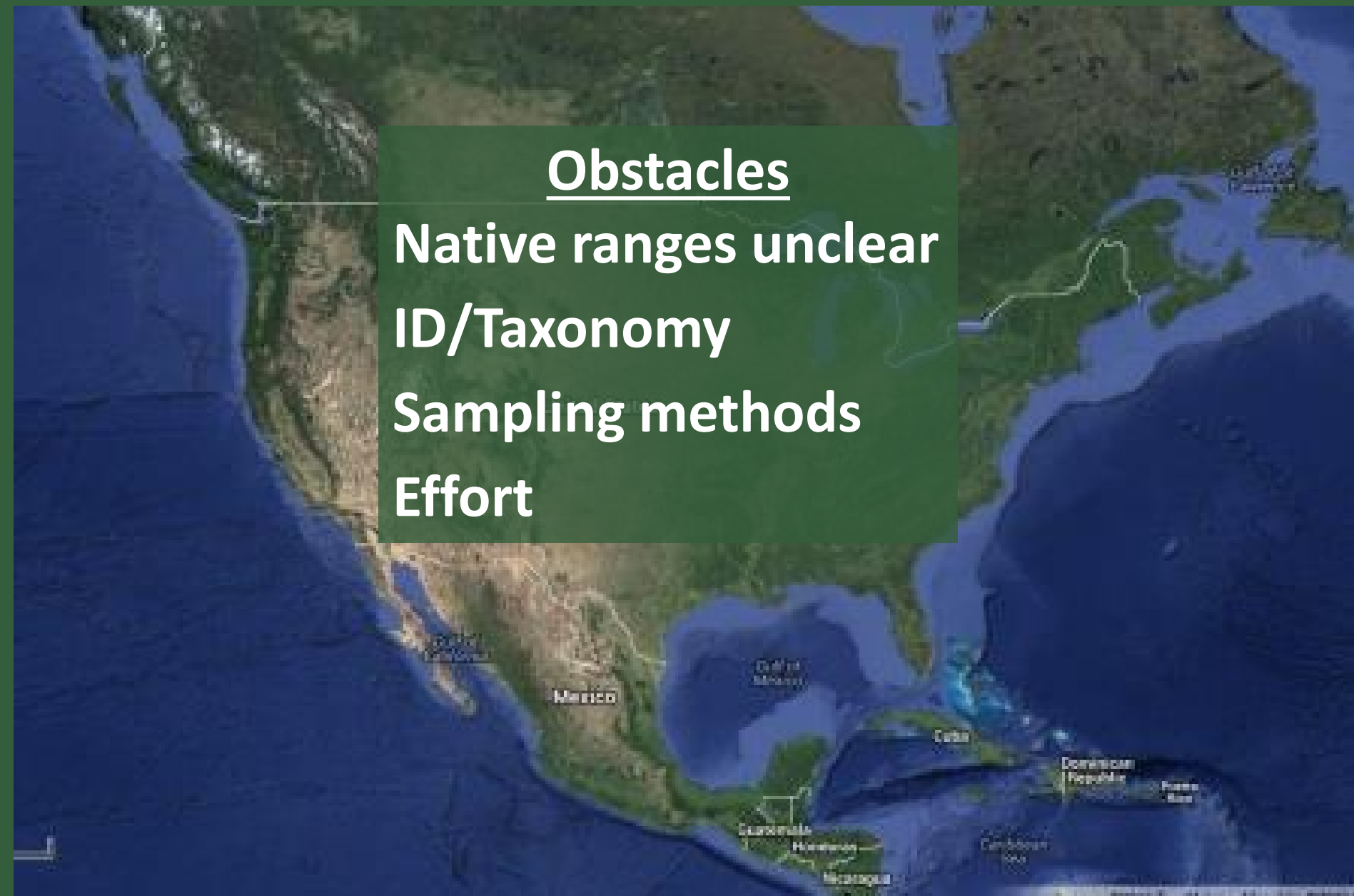
## Obstacles

Native ranges unclear

ID/Taxonomy

Sampling methods

Effort



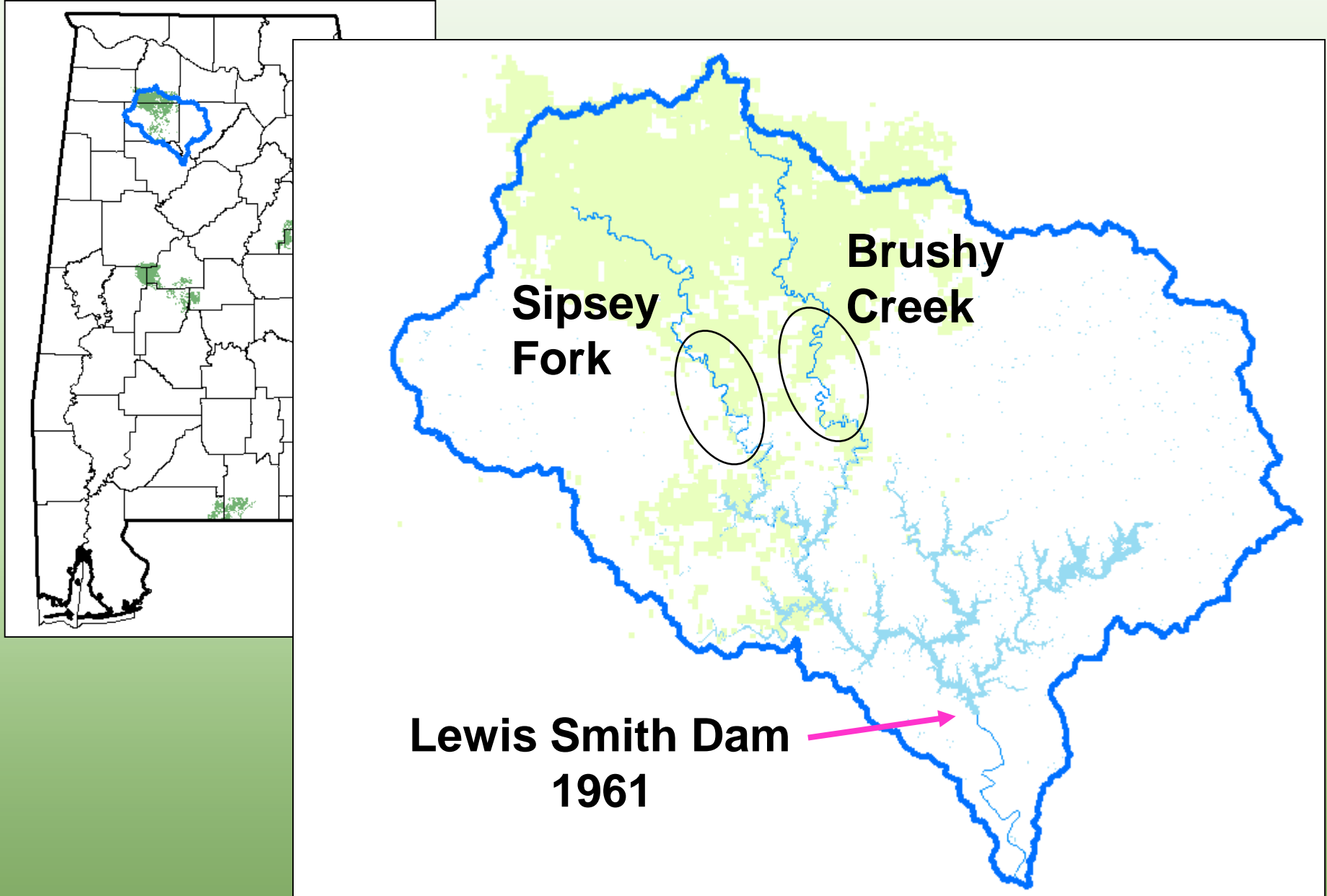


# Sipsey Fork River drainage, Alabama:





# Sipsey Fork Drainage, Alabama







**Sipsey Fork above transition**

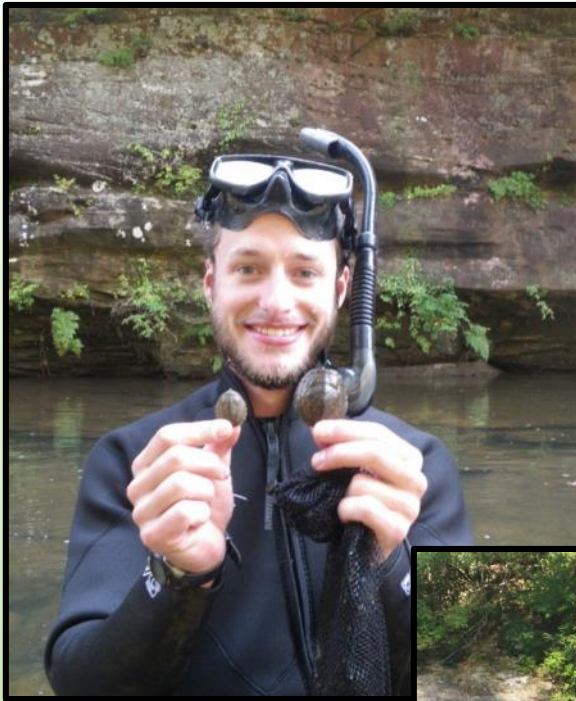




**Sipsy Fork – impounded**



# Sampling methods





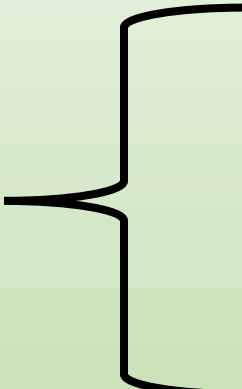
# Results

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**2010's**

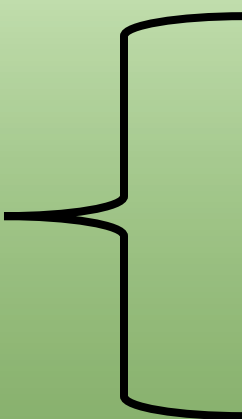
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**Definite or probable  
natives**



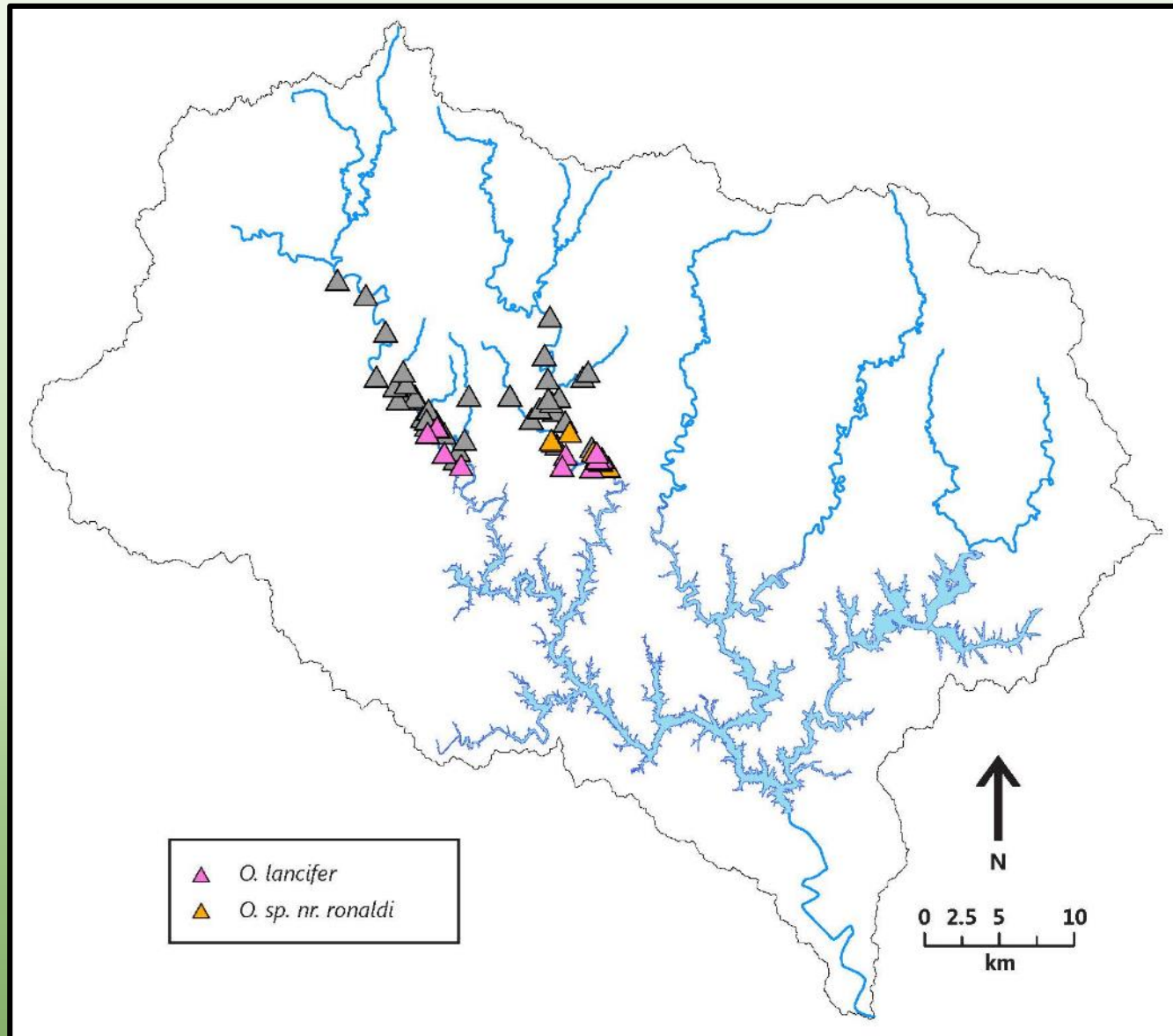
***Cambarus  
striatus***  
***C. obstipus***  
***O. validus***

**Possible non-natives**

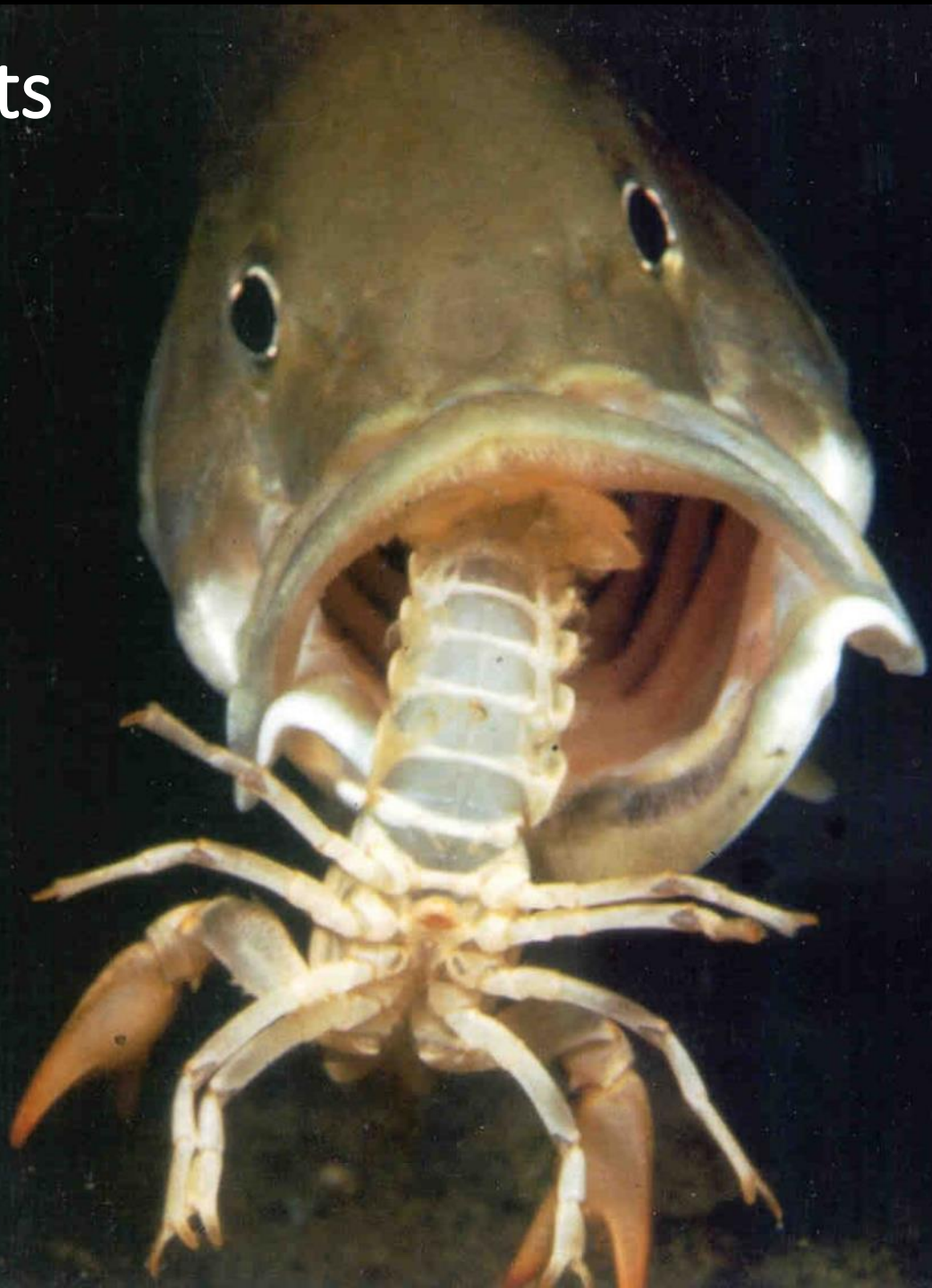


***O. lancifer*\*\***  
***O. sp. nr  
ronaldi*\*\***

# *Orconectes lancifer* and *O. sp. nr ronaldi*



# Fish Gut Contents





# Results

---

**2010's**

---

**Definite or probable  
natives**

***Cambarus  
striatus***

***C. obstipus***

***O. validus***

***O. perfectus***

***O. lancifer*\*\***

***O. virilis***

**Definite or possible  
non-natives**

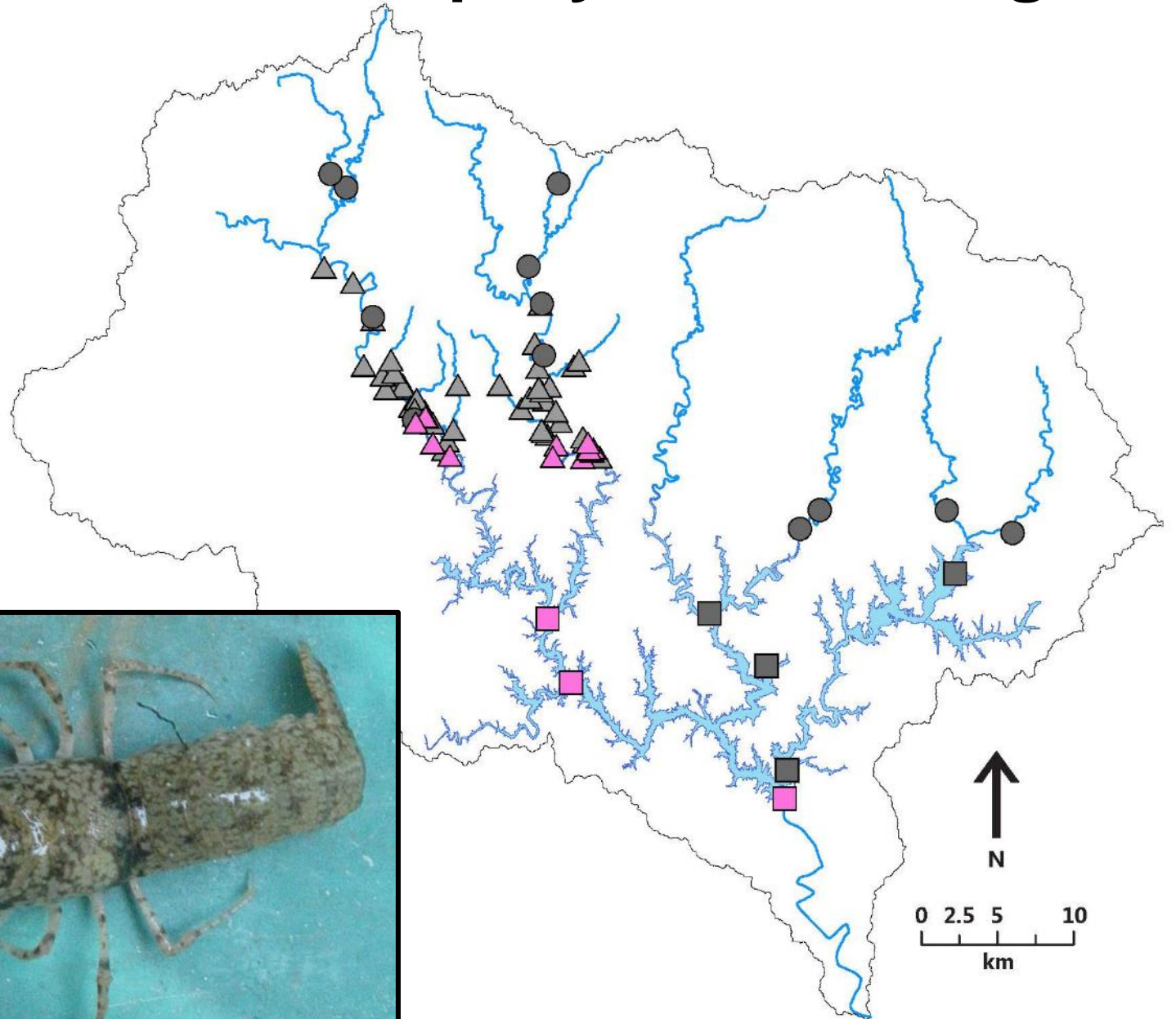
***O. sp. nr***

***ronaldi*\*\***

# Results with “historic” fish

	1988-95	2010's
Definite or probable natives	<i>C. striatus</i> <i>C. obstipus</i> <i>O. validus</i> ?	<i>C. striatus</i> <i>C. obstipus</i> <i>O. validus</i> <i>O. perfectus</i> <i>O. lancifer</i> <i>O. virilis</i>
Definite or possible non-natives	X X X	<i>O. sp. nr ronaldi</i>

# *Orconectes lancifer* - Sipsy Fork drainage, AL



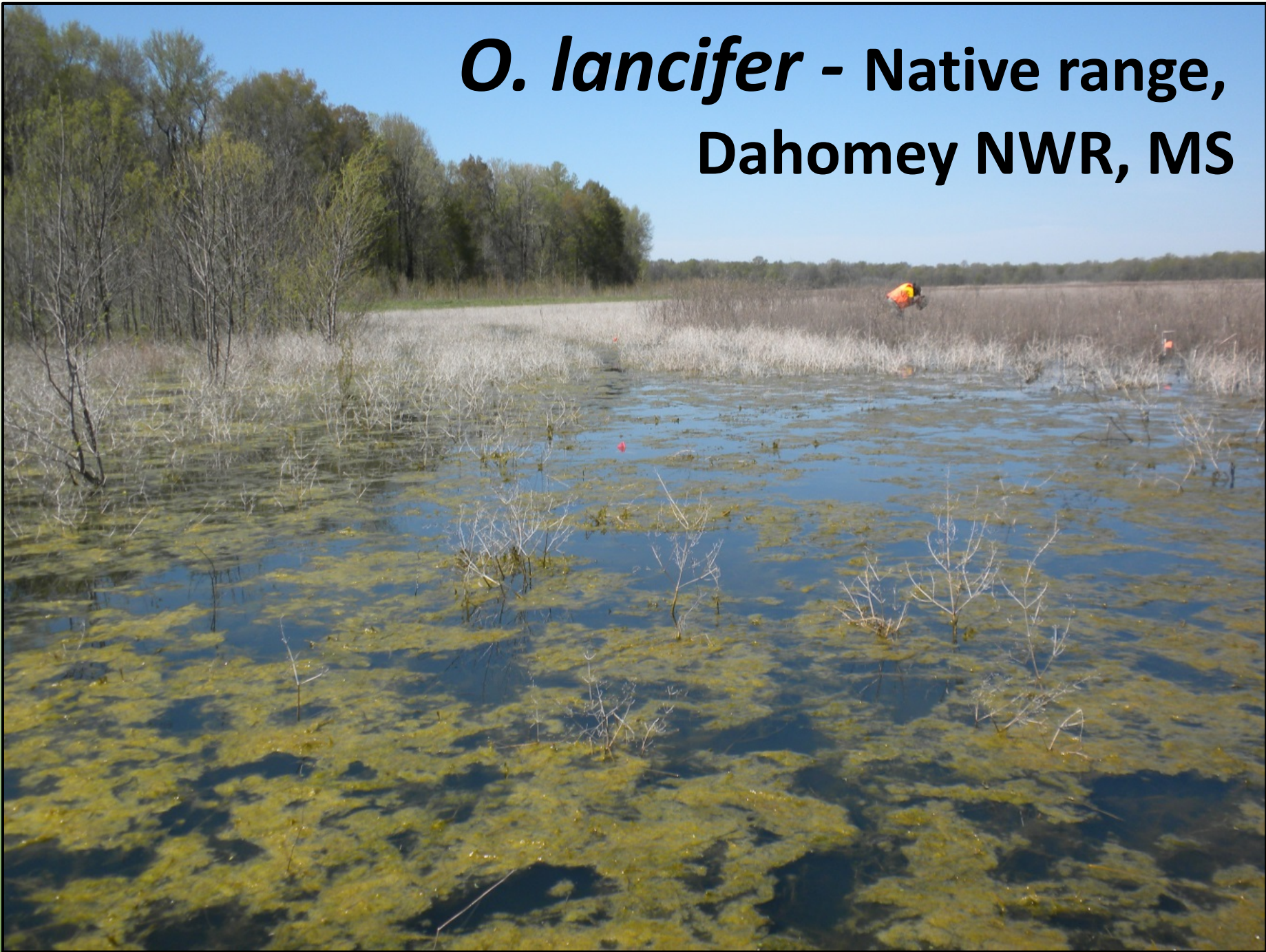


Approximate range *O. lancifer*  
(Taylor and Schuster 2004; MS crayfish  
database)

study area

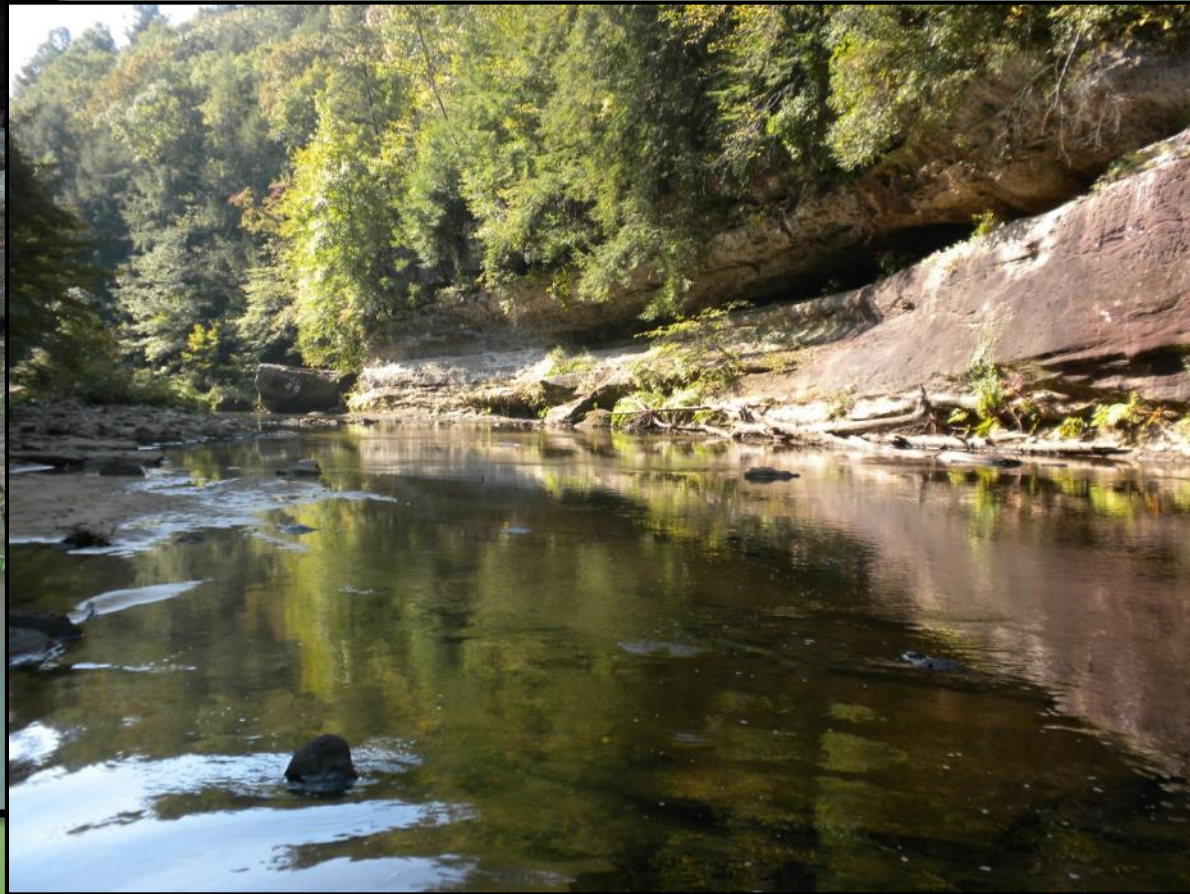


***O. lancifer* - Native range,  
Dahomey NWR, MS**





# Sipsey Fork, AL



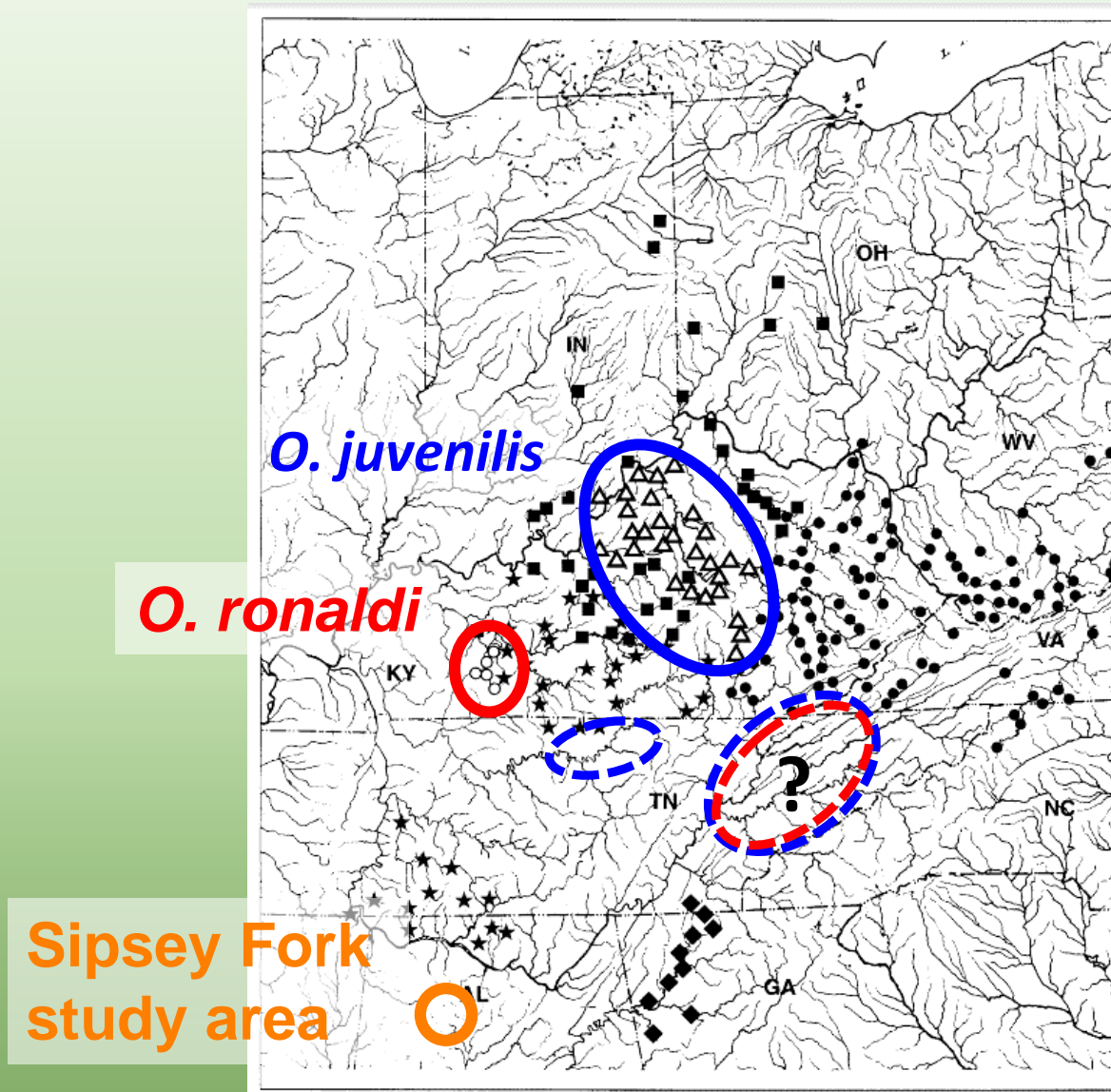


# *Orconectes (Procericambarus) sp.*



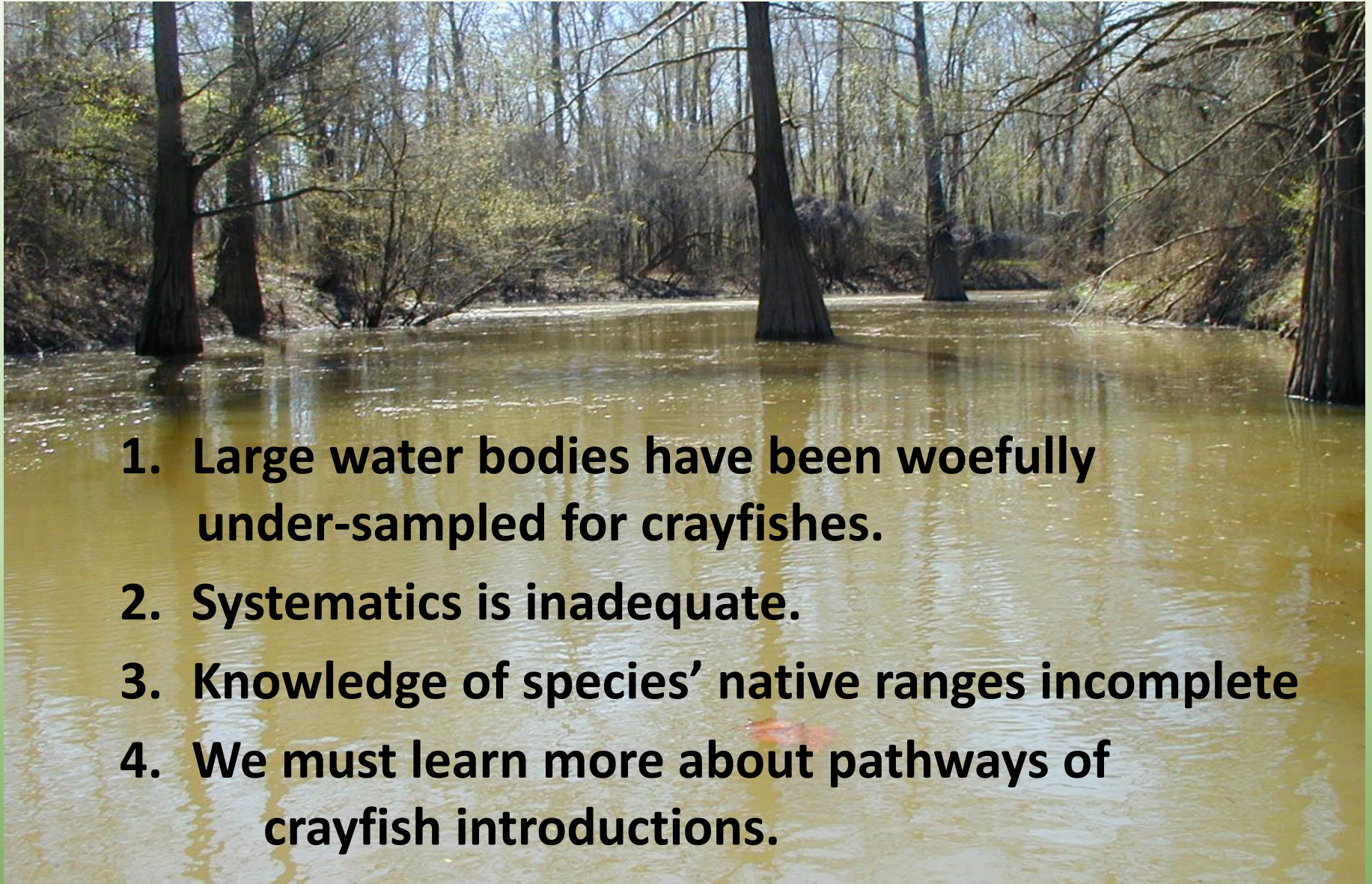


# Ranges of *O. ronaldi* & *O. juvenilis*



From Taylor 2000;  
Kessler 2014

# **Results highlight 4 issues re. invasive crays**



- 1. Large water bodies have been woefully under-sampled for crayfishes.**
- 2. Systematics is inadequate.**
- 3. Knowledge of species' native ranges incomplete**
- 4. We must learn more about pathways of crayfish introductions.**

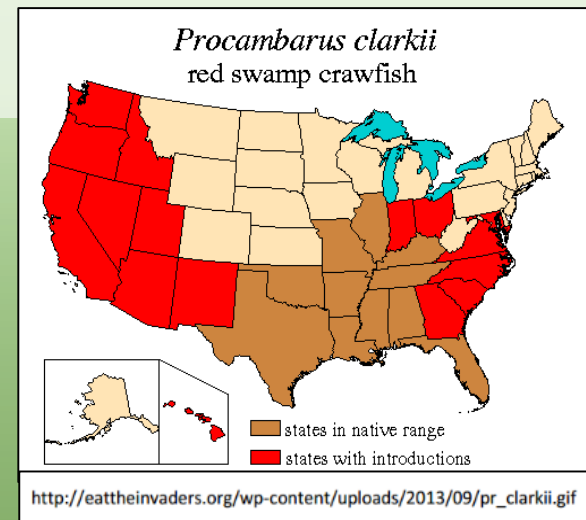
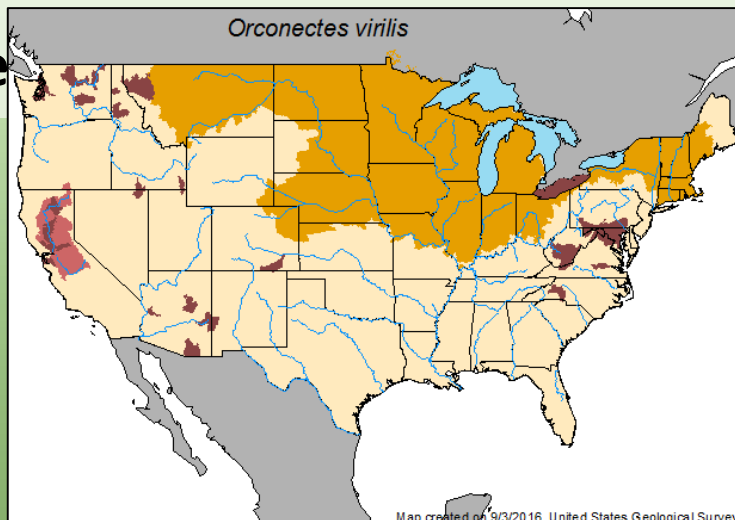


# IV - Prevalence



# Prevalence of invasive crays in U.S.?

- No easy answer right now
- Eastern crays introduced throughout West
- *Pacifastacus* spp. widely introduced beyond native ranges in West
- *O. rusticus*, *O. virilis*, and *P. clarkii* widely invasive
- Ane





# Summary

## Impacts



- Many, complex
- Direct and indirect
- Multiple trophic levels
- Structural & functional

## Pathways



- 5 commonly cited
- Fish stocking needs to be examined

## Detection



- better baseline info
- >effort
- additional methods

## Prevalence



- > than often realized
- Need summary pub.



**Eat chicken!**