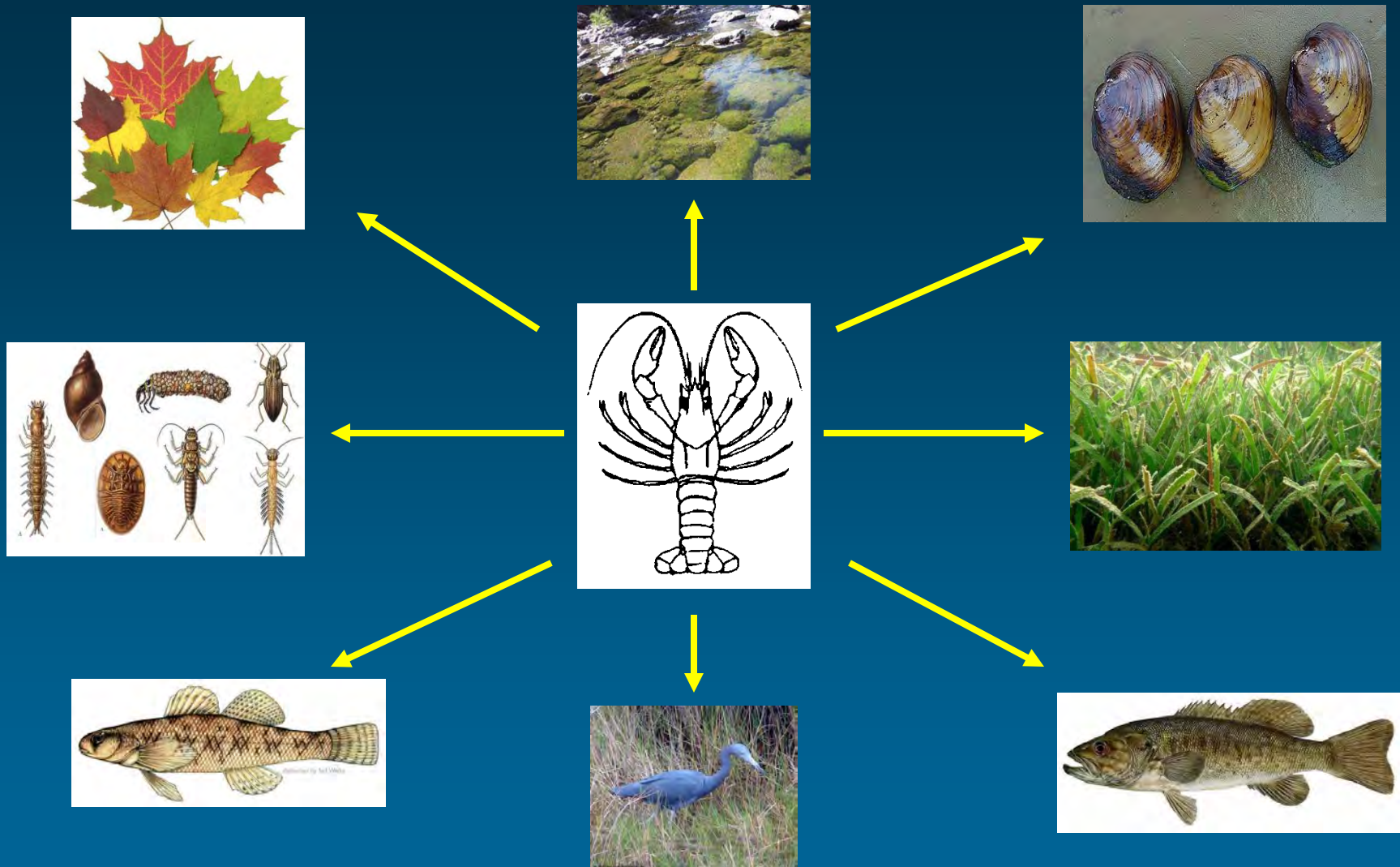


# Protecting Maryland Waters from the Spread of Invasive Crayfishes



SFAC Meeting, April 9, 2014

# Crayfish are keystone species in freshwater streams and lakes



As keystone species, changes in crayfish populations (species and abundance) can have profound effects on aquatic ecosystems.

# Maryland's Native Species



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Common Name	Scientific Name
White River Crawfish	<i>Procambarus acutus</i>
Spinycheek Crayfish	<i>Orconectes limosus</i>
Allegheny Crayfish	<i>Orconectes obscurus</i>
Acuminate Crayfish	<i>Cambarus acuminatus</i>
Common Crayfish	<i>Cambarus bartonii</i>
Rock Crawfish	<i>Cambarus carinirostris</i>
Devil Crawfish	<i>Cambarus diogenes</i>
Upland Burrowing Crayfish	<i>Cambarus dubius</i>
Digger Crayfish	<i>Fallicambarus fodiens</i>

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# Maryland's Non-Native Species

Common Name	Scientific Name
Southern White River Crawfish	<i>Procambarus zonangulus</i>
Red Swamp Crawfish *	<i>Procambarus clarkii</i>
Virile Crayfish *	<i>Orconectes virilis</i>
Rusty Crayfish *	<i>Orconectes rusticus</i>
Little Brown Mudbug	<i>Cambarus thomaii</i>

\* Invasive

35% of Maryland species are non-native!

# Vectors of non-native crayfish



- Aquaculture
- Live Bait Industry
- Aquarium Pet Trade
- Biological Supply



*From: Lodge et al.. (2000)*

# Vectors of non-native crayfish in Maryland

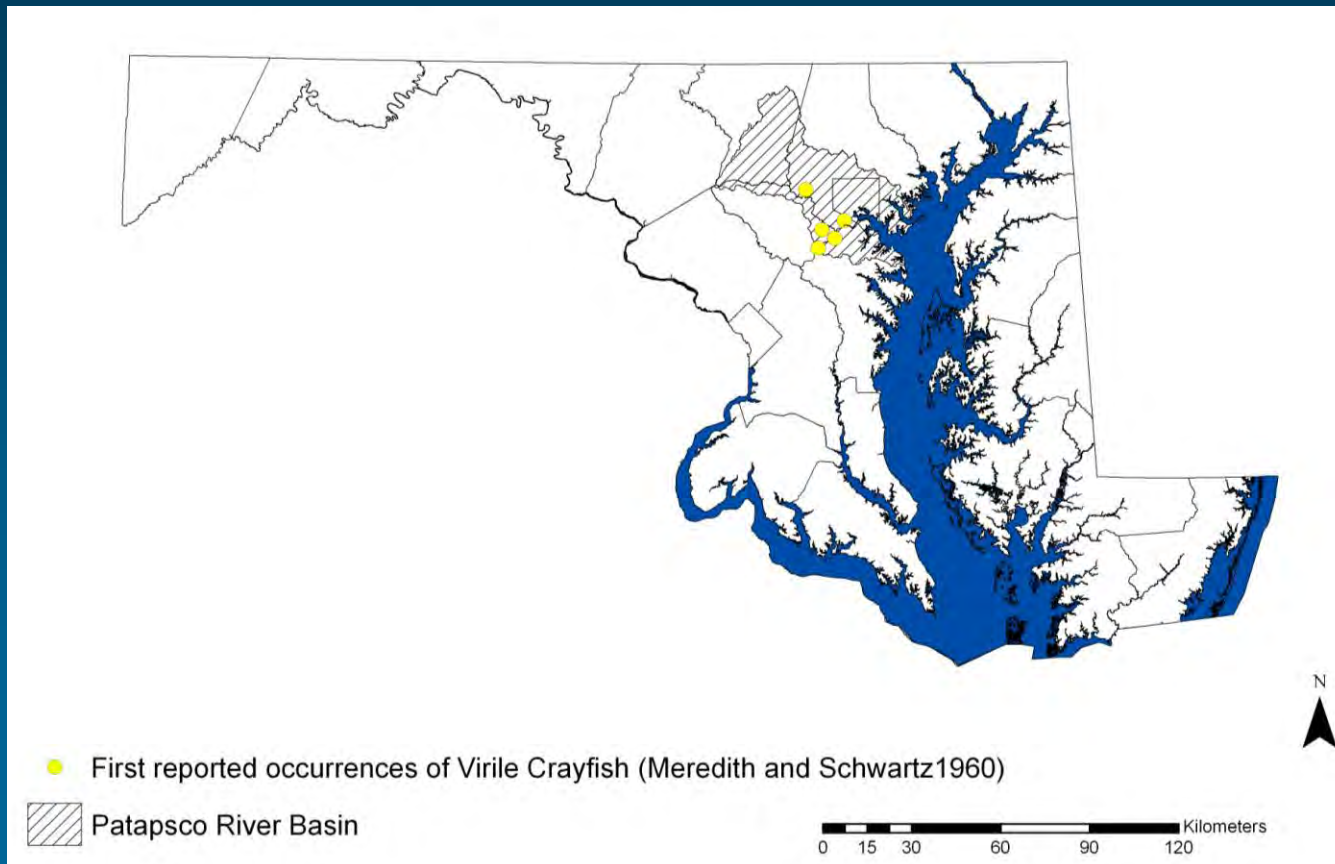


Non-native Species	Suspected Vector of Introduction			
	Live Bait	Aquaculture	Aquarium/Pet Trade	Biological Supply
Little Brown Mudbug	X			
Virile Crayfish	X			
Rusty Crayfish	X			
Red Swamp Crawfish	X	X	X	X
Southern White River Crawfish		X		

Live bait is the most important vector in Maryland

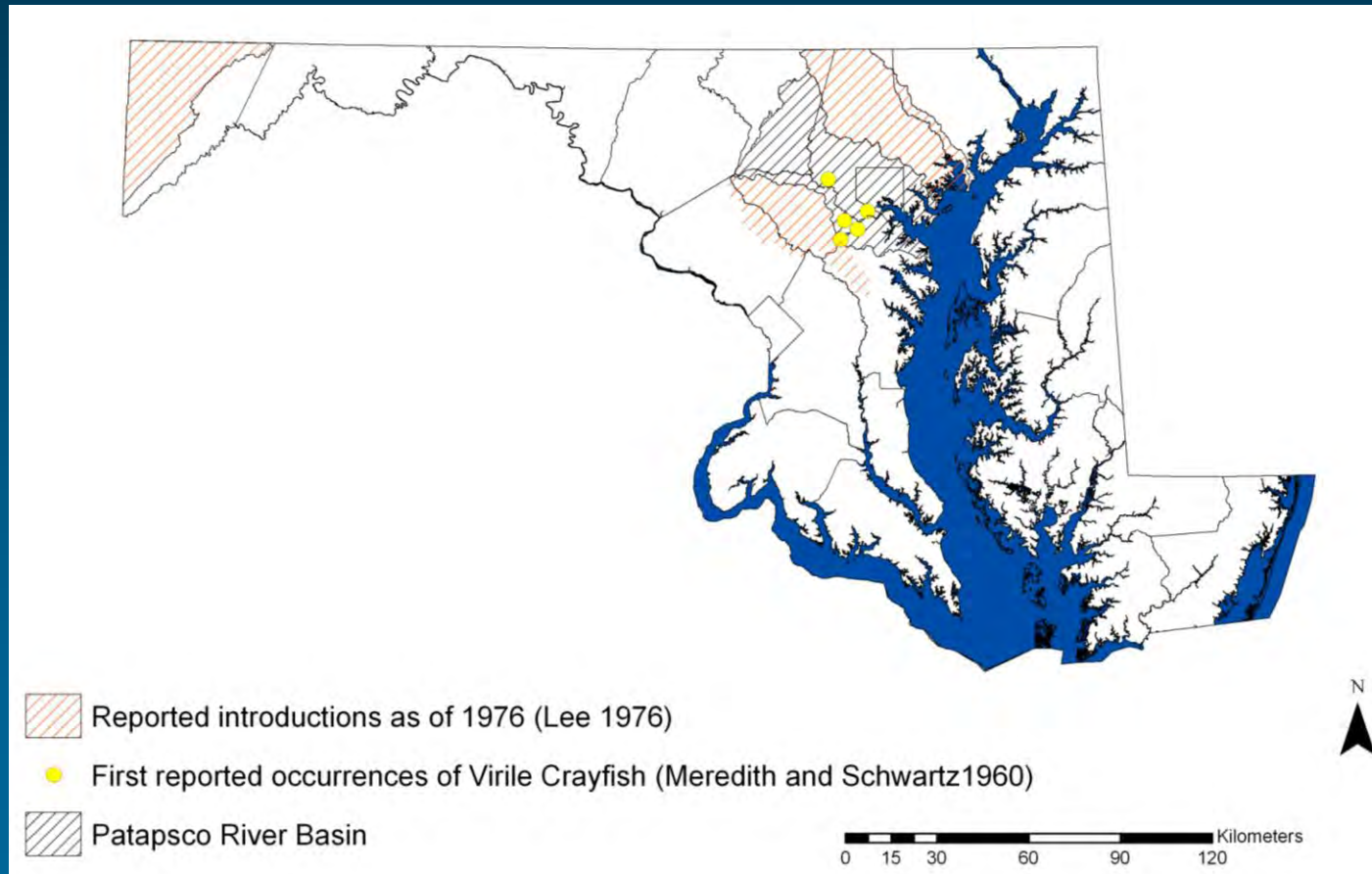
# Virile Crayfish (*Orconectes virilis*)

- First introduced in the Patapsco River basin (circa late 1950s)
- Was widespread in the Patapsco River basin by 1963



# Virile Crayfish (*Orconectes virilis*)

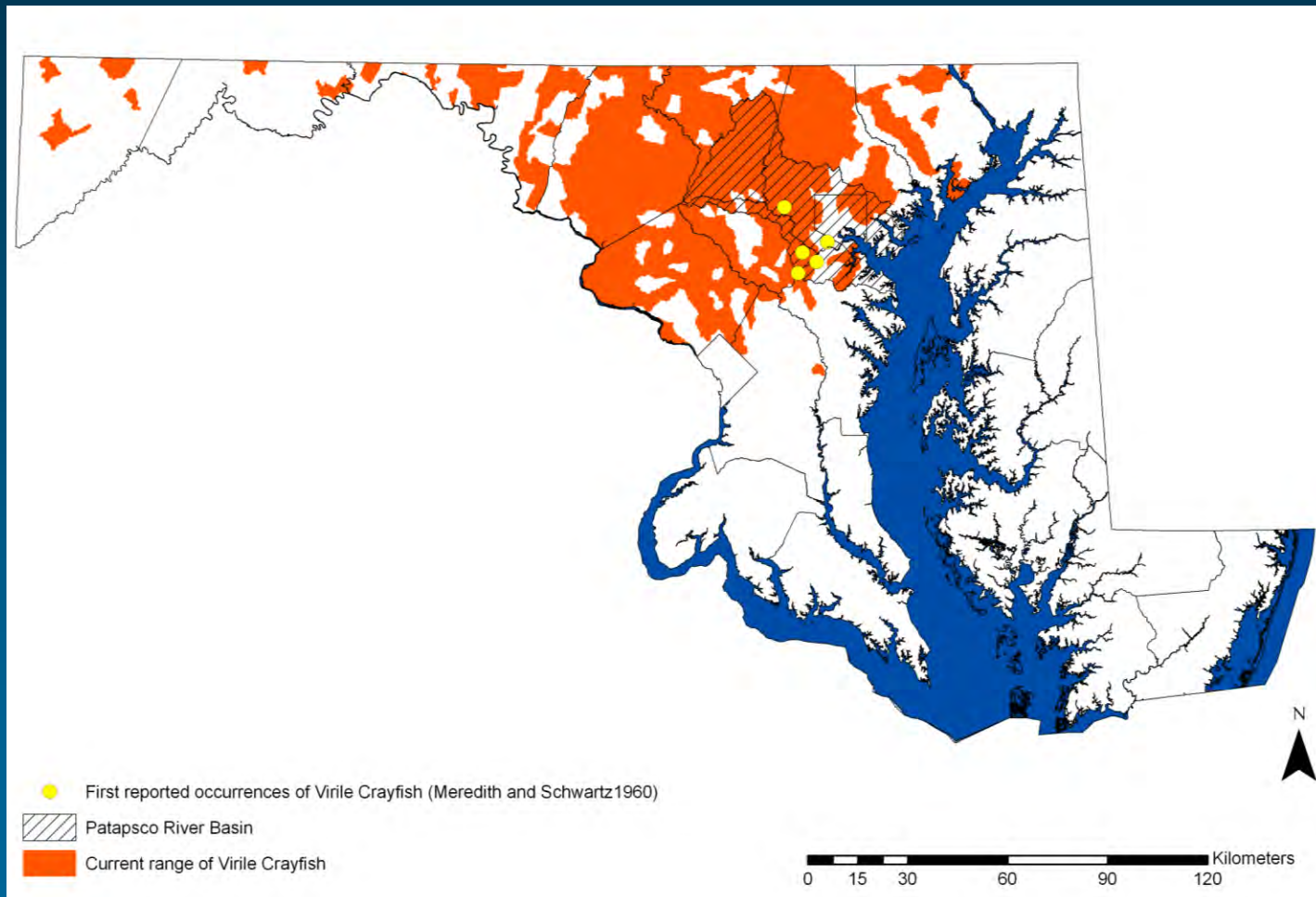
- Reported from portions of the Patuxent, Gunpowder, and Youghiogheny River basins by 1976





# Virile Crayfish (*Orconectes virilis*)

- Current distribution of this invasive species as of 2014



# How did this species spread?

Once introduced, crayfish do disperse upstream and downstream, but...

- they do not crawl overland across ridge tops into other watersheds
- they are not carried by birds

**The spread of this species is the result of its use as bait!**

– anglers purchasing or catching crayfish, transporting them, and releasing them



# 2008-2009 survey of MD anglers and bait shops



- Approximately 20% of MD anglers (30,675) use crayfish as bait
- 72% (22,016) of anglers that use crayfish collect their own
- MD bait shops sell live crayfish as bait, but not many
  - at least two non-native, invasive species (Virile Crayfish and Red Swamp Crawfish) have been sold
- **69%** (21,139) of anglers that use crayfish release them live in the water



# Crayfish as invasive species...



- ✓ Tolerant of environmental extremes
- ✓ Early maturation
- ✓ Rapid growth rates
- ✓ Produce large number of offspring
- ✓ Large body size
- ✓ Aggressive



<http://techalive.mtu.edu>



<http://www.lanaplan.de>

# Invasive crayfish introductions...the potential consequences



## 1) Loss of native biodiversity

- Native crayfish species abundance decline
- Native crayfish eliminated from entire watersheds



# Invasive crayfish introductions...the potential consequences



## 1) Loss of native biodiversity

- Native crayfish species abundance decline
- Native crayfish eliminated from entire watersheds
  - This has been widely documented

Abrahamsson (1973)

Bovbjerg (1953)

Butler (1973)

Capelli (1982)

Capelli and Munjal (1983)

Munjal (1980)

Klocker and Strayer (2004)

Hobbs et al. (1989)

Bubb et al (2004)

Gherardi and Daniels (2004)

Vorburger and Ribi (1999)

Hill and Lodge (1999)

Hill et al. (1993)

Daniels (1998)

Bergman and Moore (2003)

Garvey and Stein (1993)

Hazlett et al. (2003)

And many, many more...

“The single greatest threat to crayfish biodiversity worldwide comes from the introduction of non-indigenous crayfishes.” (Lodge et al. 2000).

# Native crayfish declines in Maryland



Spinycheek Crayfish  
(*O. limosus*)

- The spread of Virile Crayfish in Central Maryland has been followed by declines in the native Spinycheek Crayfish
- It is presumed extirpated from 15 watersheds
- This has also happened in Pennsylvania and West Virginia

# Invasive crayfish introductions...the potential consequences



1) Loss of native biodiversity



# What's the big deal?



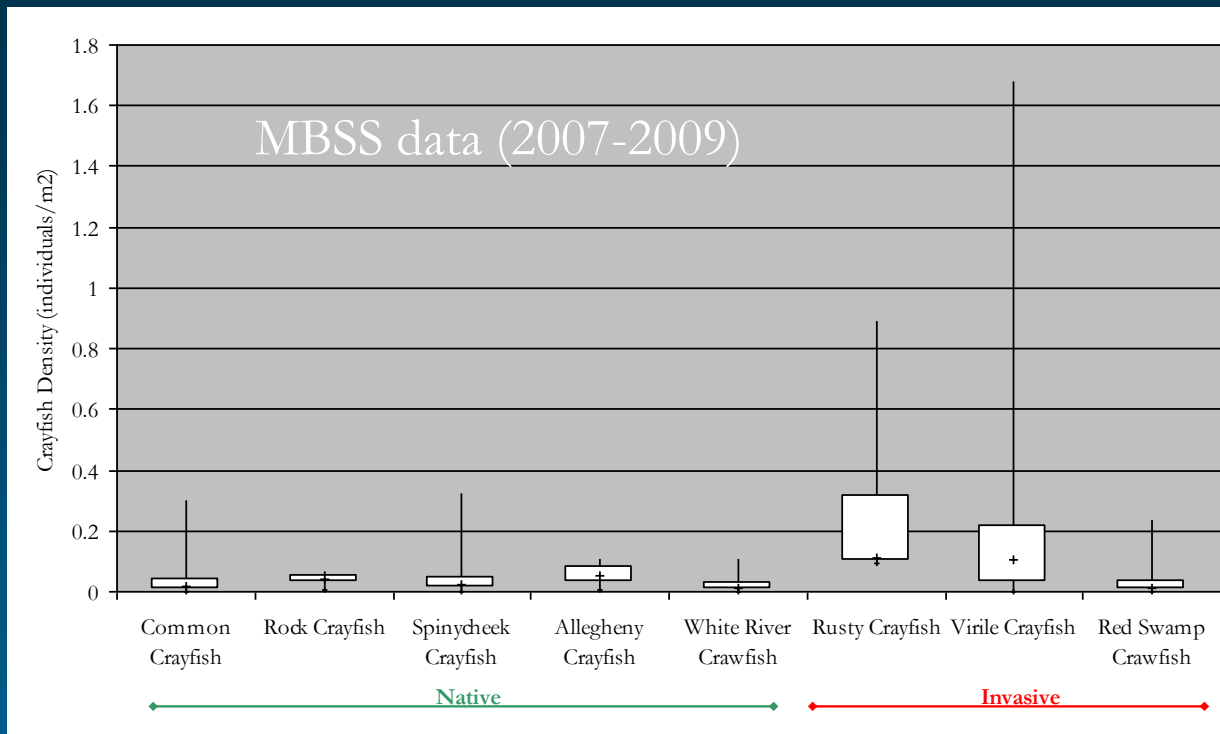
# Does replacing one crayfish species with another one really make a difference?

Absolutely **YES!** And here's why:

- 1) native and non-native crayfish species are not ecological equivalents
- 2) invasive crayfishes attain higher densities than their native counterparts.



In Maryland, invasive crayfishes can occur at densities **7** times greater than natives



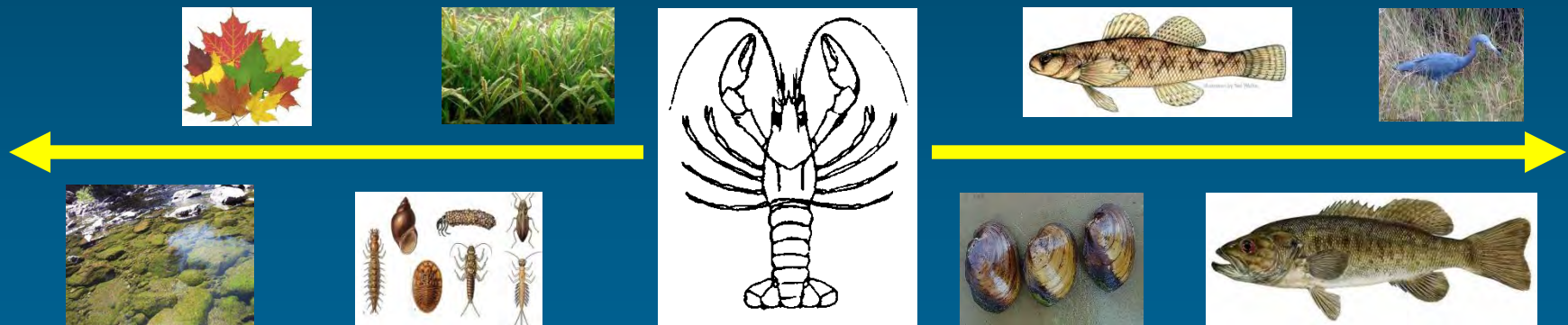
In other states, invasives have been reported at **>10** times native density

At these high densities, invasive crayfish can have a big effect on the ecosystem!

# Invasive crayfish introductions...the potential consequences



- 1) Loss of native biodiversity
- 2) Adverse changes to ecosystem function and integrity, energy flow, community structure, stream insects, mussels, snails, amphibians, reptiles, fishes, and sport fisheries.



Disrupt the flow of energy up and down the food chain

# Invasive crayfish introductions...the potential consequences



## Decrease

Leaf Matter/  
Detritus

Water Clarity

Submerged Plants

Stream Insects/Inverts

Freshwater Mussels

Snails

Amphibians

Recreational Fisheries



# What has MDNR done to reduce the spread of invasive crayfishes?



A combination of angler education and regulation

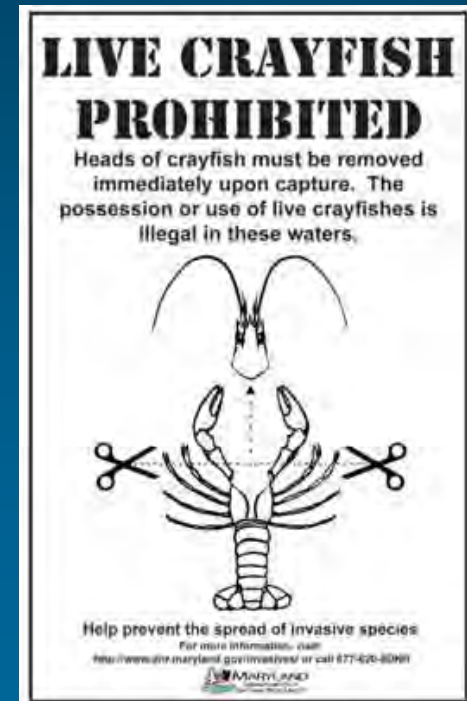
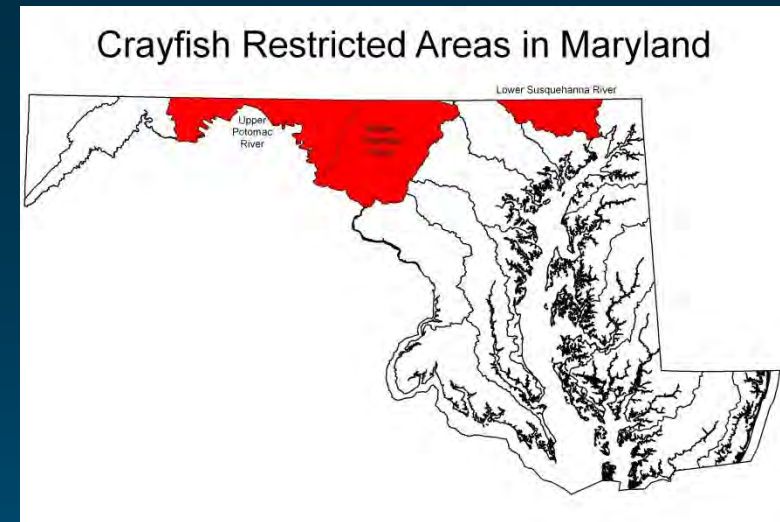
## Regulations:

- Prohibit the import, sale, and possession of Rusty Crayfish and several other potentially invasive species
- Prohibit the transport of Virile Crayfish and several other invasive species from one watershed to another
- Prohibit the catch, possession, and use of crayfish (all species) unless the head is removed in the Upper Potomac, Middle Potomac, and Lower Susquehanna River basins

# The “Headless Crayfish” Regulation

## Strengths:

- Raised public awareness
- Allowed for continued use of crayfishes (dead)
- Allowed for harvest for consumption
- Aimed to contain Rusty Crayfish and other invasives in the three basins
- Enforceable – possession of any live crayfish while fishing is illegal

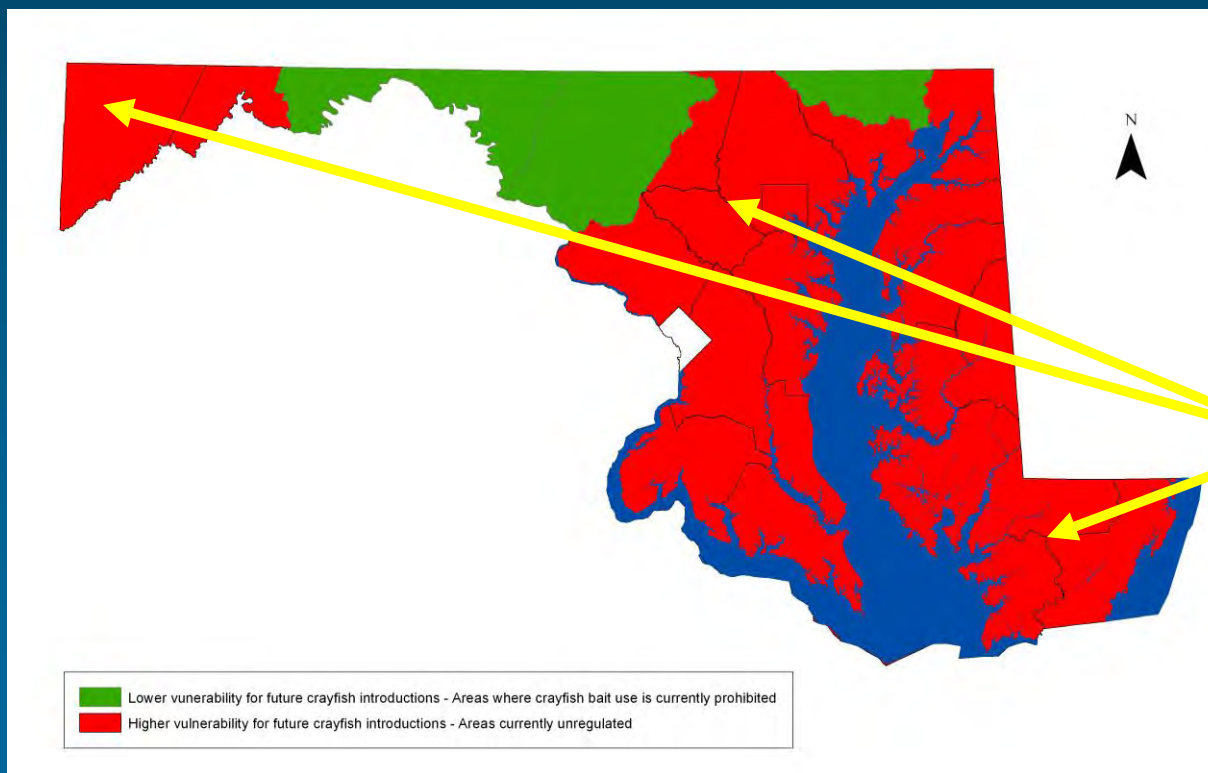


# The “Headless Crayfish” Regulation



## Weaknesses:

- Difficult for anglers and enforcement officers to interpret – no one knows river basin boundaries
- Limited in scope – leaves a large portion of Maryland unregulated and unprotected!



Unprotected  
Areas



# How can we improve protection in Maryland?

MDNR proposes to extend the current Headless Crayfish regulation to include all MD river basins

## Strengths:

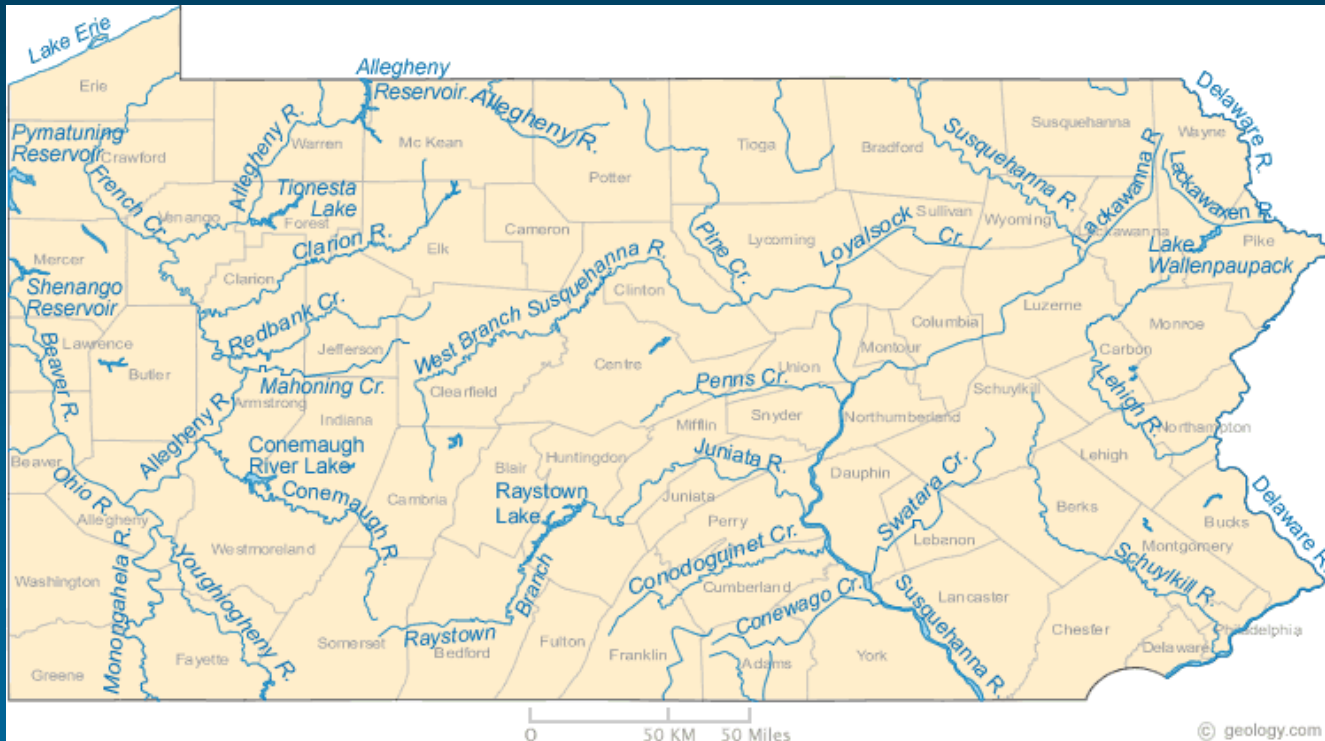
- further raise public awareness
- allow for continued use of crayfish (dead) as bait
- prevent further spread by anglers of species already established in the state
- proactively prevent the introduction of other species not yet in Maryland
- easy for anglers to interpret
- enforceable



# Protection of our boundary waters...



Pennsylvania Fish and Boat Commission has proposed a similar statewide ban on the use of live crayfishes as bait.



**LIVE CRAYFISH PROHIBITED**

Heds of crayfish must be removed immediately upon capture. The possession or use of live crayfishes is illegal in these waters.

A line drawing of a crayfish with two pairs of scissors positioned to cut off its head. The head is shown as a separate piece, indicating the required removal.

Help prevent the spread of invasive species  
For more information, visit  
<http://www.dnr.maryland.gov/invasive/> or call 877-620-8089

The logo for the Maryland Department of Natural Resources, featuring a stylized tree and water.



# Timeline for the Proposed Crayfish Regulation

- Presentation to SFAC on April 29, 2014
- Receive feedback from SFAC by May 31, 2014
- Scope regulatory idea at the SFAC/TFAC meeting July 2014
- Scope regulation in August 2014
- Propose regulation in September 2014
- Regulation effective as of January 2015

Please send all feedback to Jay Kilian ([jkilian@dnr.state.md.us](mailto:jkilian@dnr.state.md.us))

