

A Major Vector in the Introduction and Dispersal of Non-native Invasive Species in Maryland Waters

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U.S. Live Bait Industry

- Worth over \$1 billion (Litvak and Mandrak 1993)
- Large variety of bait animals available to anglers
- Animals are cultured/caught and transported great distances
- Source of biological invasions nationwide
 - Fishes
 - Earthworms
 - Crayfishes
 - Other invertebrates
 - Plants
 - Pathogens
- Bait species introductions have resulted in passage of regulations in several states



In Maryland, the sale/ use of live bait has been unmonitored and unregulated.

Bait Bucket Introductions in Maryland



Non-native Crayfishes in Maryland

Procambarus clarkii (Red Swamp Crawfish)★

Procambarus zonangulus (Southern White River Crawfish)

Orconectes virilis (Virile Crayfish)★

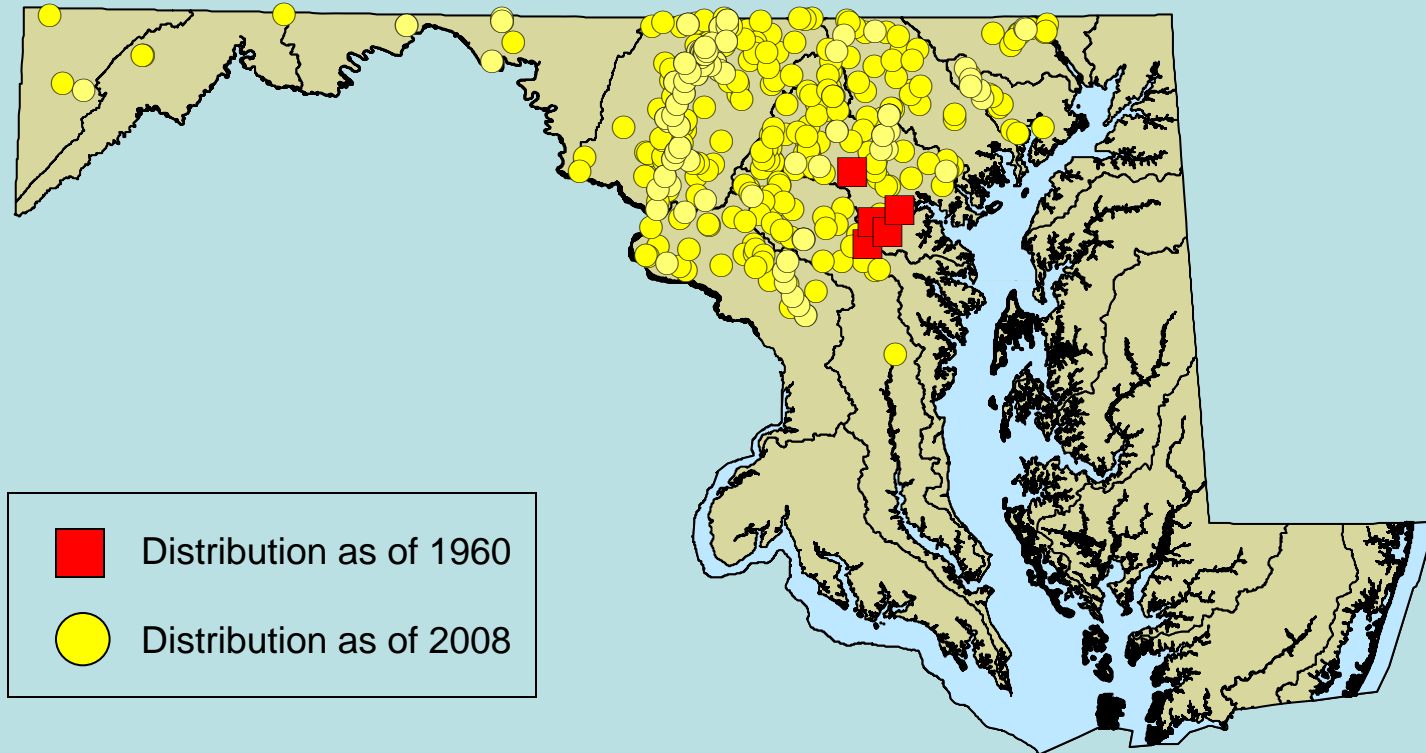
Orconectes rusticus (Rusty Crayfish)★

Cambarus thomai (Little Brown Mudbug)

★ Invasive, problematic species



Bait Bucket Introductions of Virile Crayfish



- It is now one of the most common species in streams, rivers, and reservoirs
- Its expansion was followed by concurrent range contractions of native crayfishes

What do anglers do with unused bait?

Where do anglers get their bait?

What types are sold?



Where do bait shops get their bait?

Where do they use live bait?

How many anglers use live bait?

What species are used?

We conducted two surveys to answer these management questions:

Telephone survey of Maryland bait shops (October 2008)

To determine:

- 1) what types of live bait are sold
- 2) the source of live bait

Mail survey of Maryland freshwater anglers (December 2008)

To determine:

- 1) how many anglers use live crayfish as bait
- 2) where anglers get their live crayfish
- 3) how anglers dispose of unused live crayfish

Mail Survey of Maryland Freshwater Anglers

Methods:

- Randomly selected 10,000 (approx. 6%) freshwater anglers
- Selection included resident and non-resident anglers
- Stratified selection by county
- Survey questions included:
 - What types of live bait do you use?
 - Where do you get your live bait? (e.g. self-caught, bait shop, internet, etc)
 - Where do you fish with live bait? (e.g. creek, river, small pond, reservoir)
 - What do you do with your unused live bait?

Methods:

- Answers were categorized by bait type. Example:

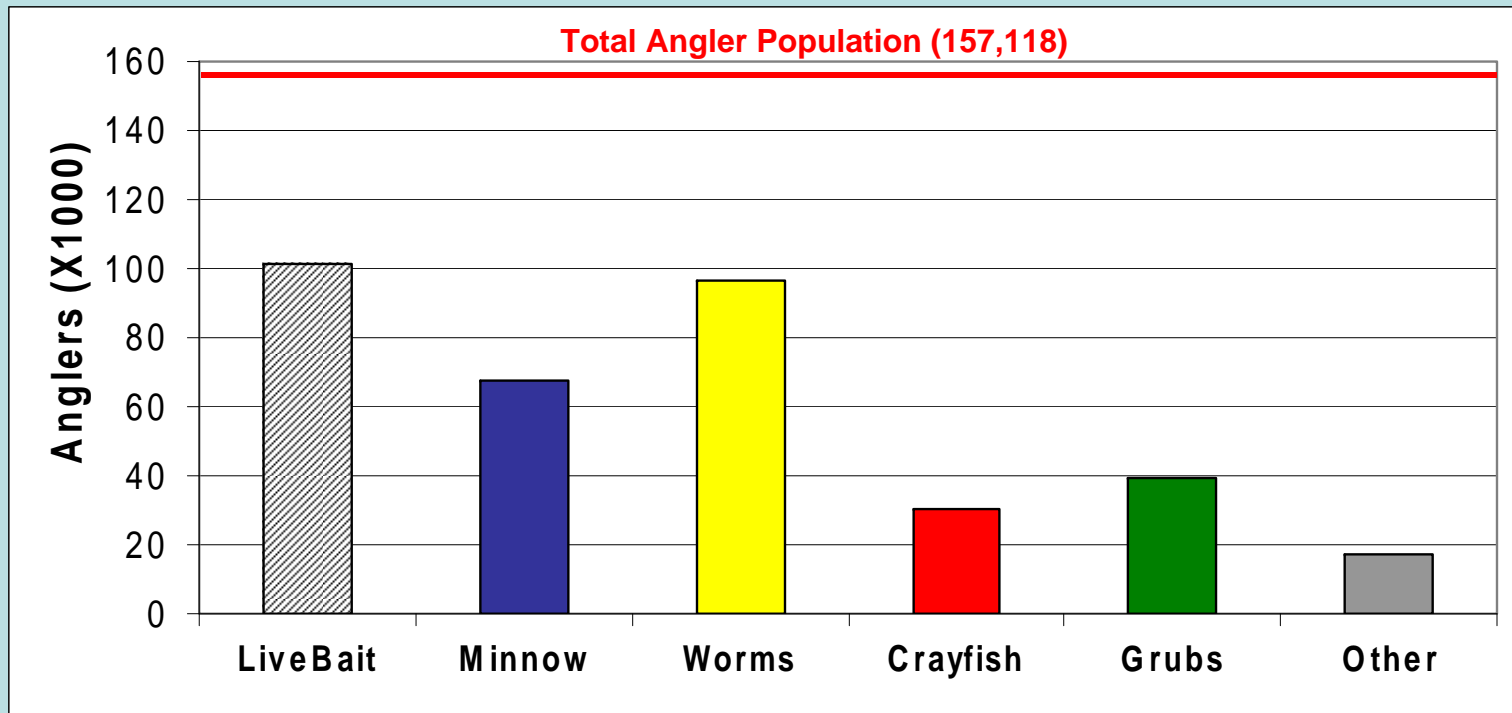
If you use live bait, where do you get it? (Circle one or more answer for each bait category that applies to you)

Minnnows/Shiners	Earthworms/ Nightcrawlers	Crayfish	Grubs/Mealworms/ Waxworms/Maggots	Other (bait type you specified in Question 3)
a. catch my own b. bait/tackle shop c. internet d. convenience store e. vending machine f. other _____ _____	a. catch my own b. bait/tackle shop c. internet d. convenience store e. vending machine f. . other _____ _____	a. catch my own b. bait/tackle shop c. internet d. convenience store e. vending machine f. other _____ _____	a. catch my own b. bait/tackle shop c. internet d. convenience store e. vending machine f. other _____ _____	a. catch my own b. bait/tackle shop c. internet d. convenience store e. vending machine f. other _____ _____

- Anglers were allowed to choose more than one answer
- Numbers of anglers using bait were extrapolated from sub-sample response

Results:

- 9,236 surveys were successfully delivered
- 2,237 (24%) survey forms returned
- 101,095 (64%) of 157,118 anglers use live bait

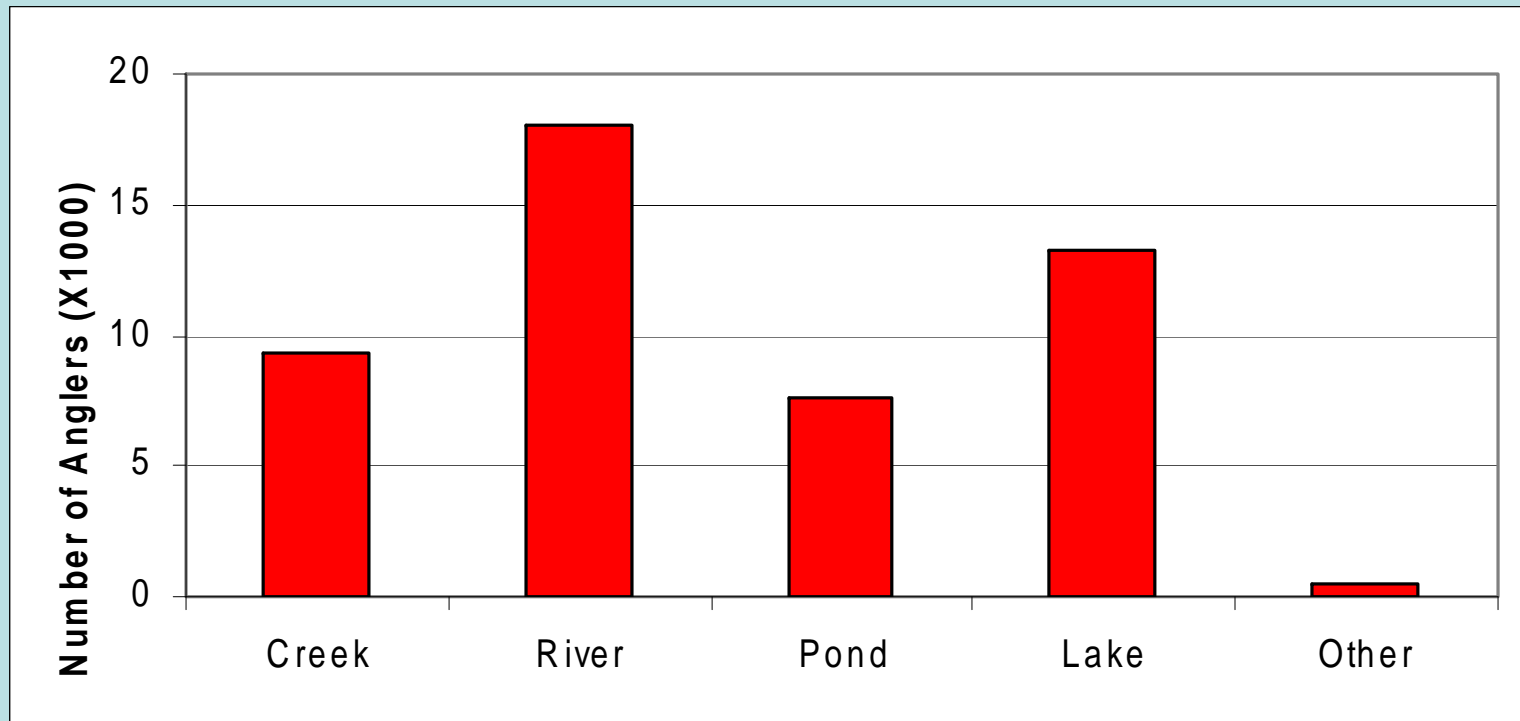


Results:

- 30,675 anglers use live crayfish in Maryland

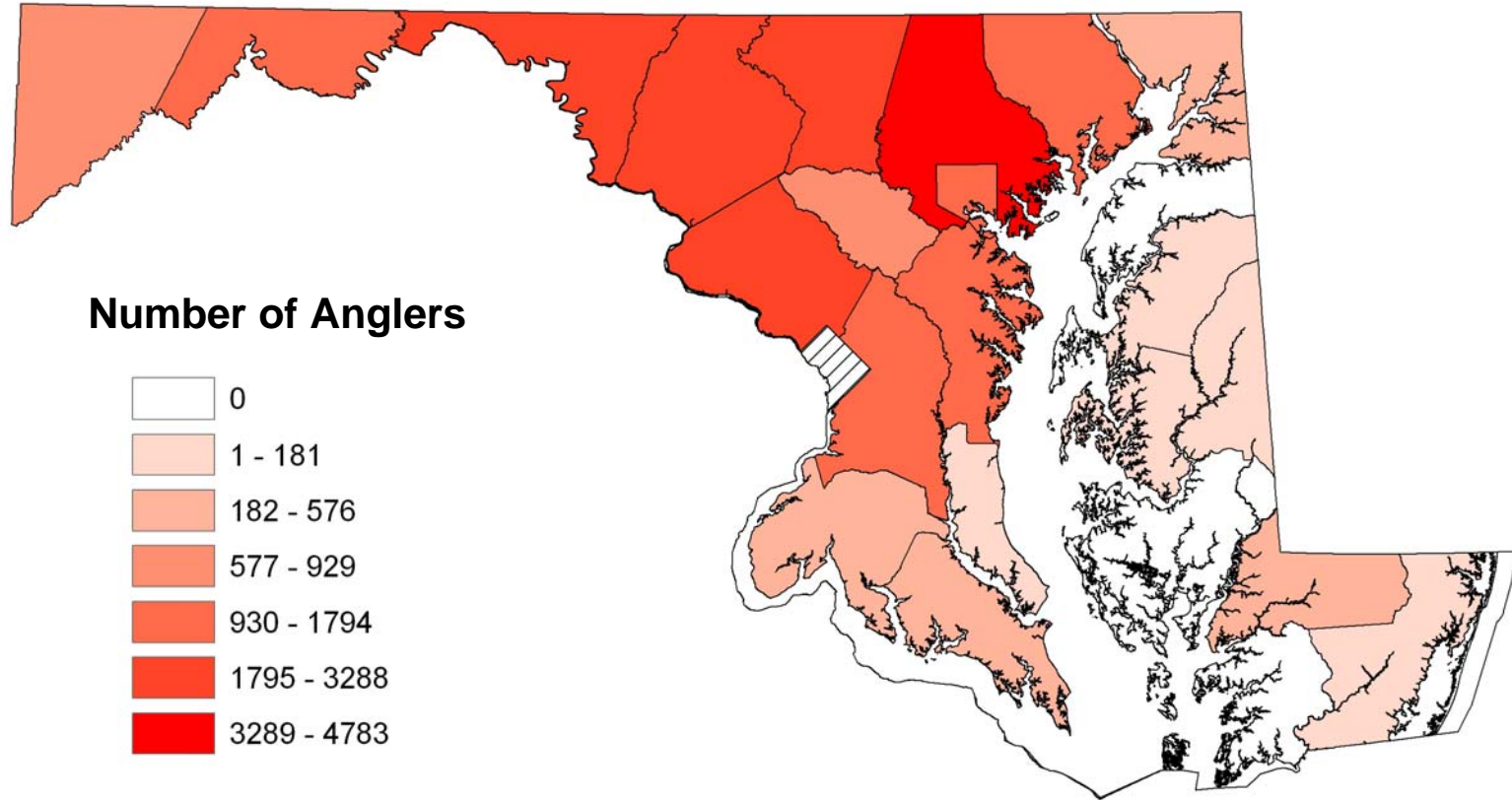


Where do anglers use live crayfish?



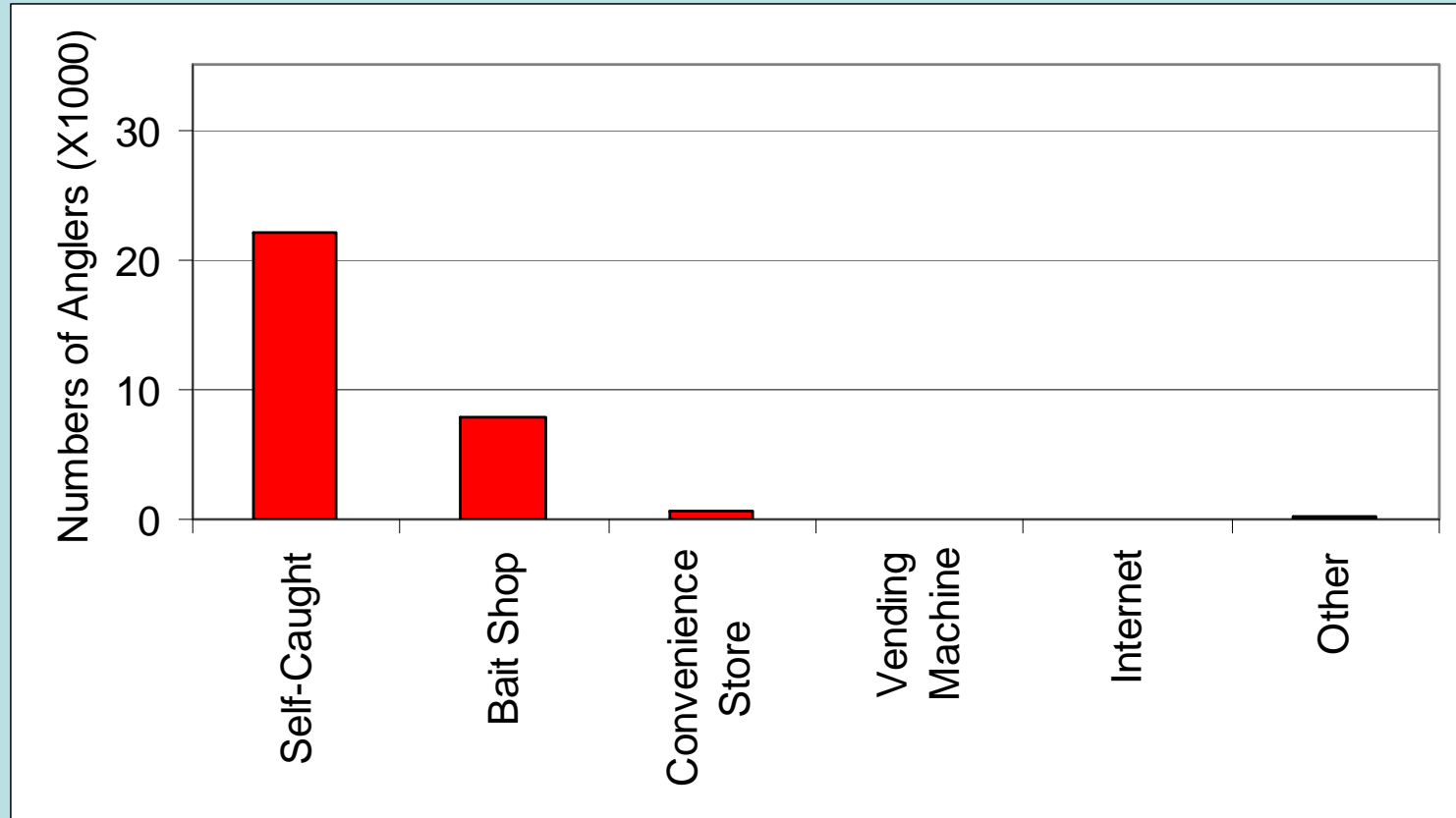
Results:

Crayfish use by County



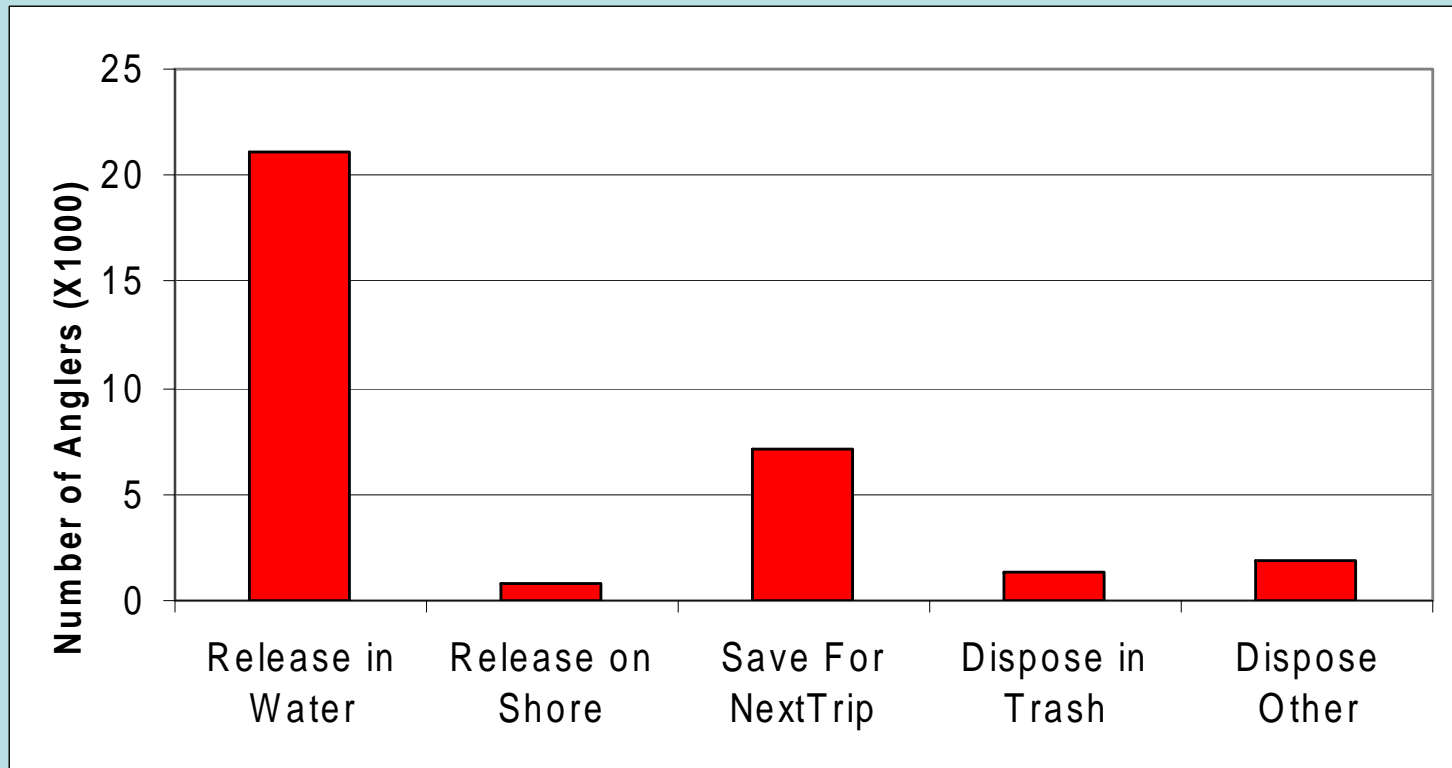
Results:

Where do anglers get their live crayfish?



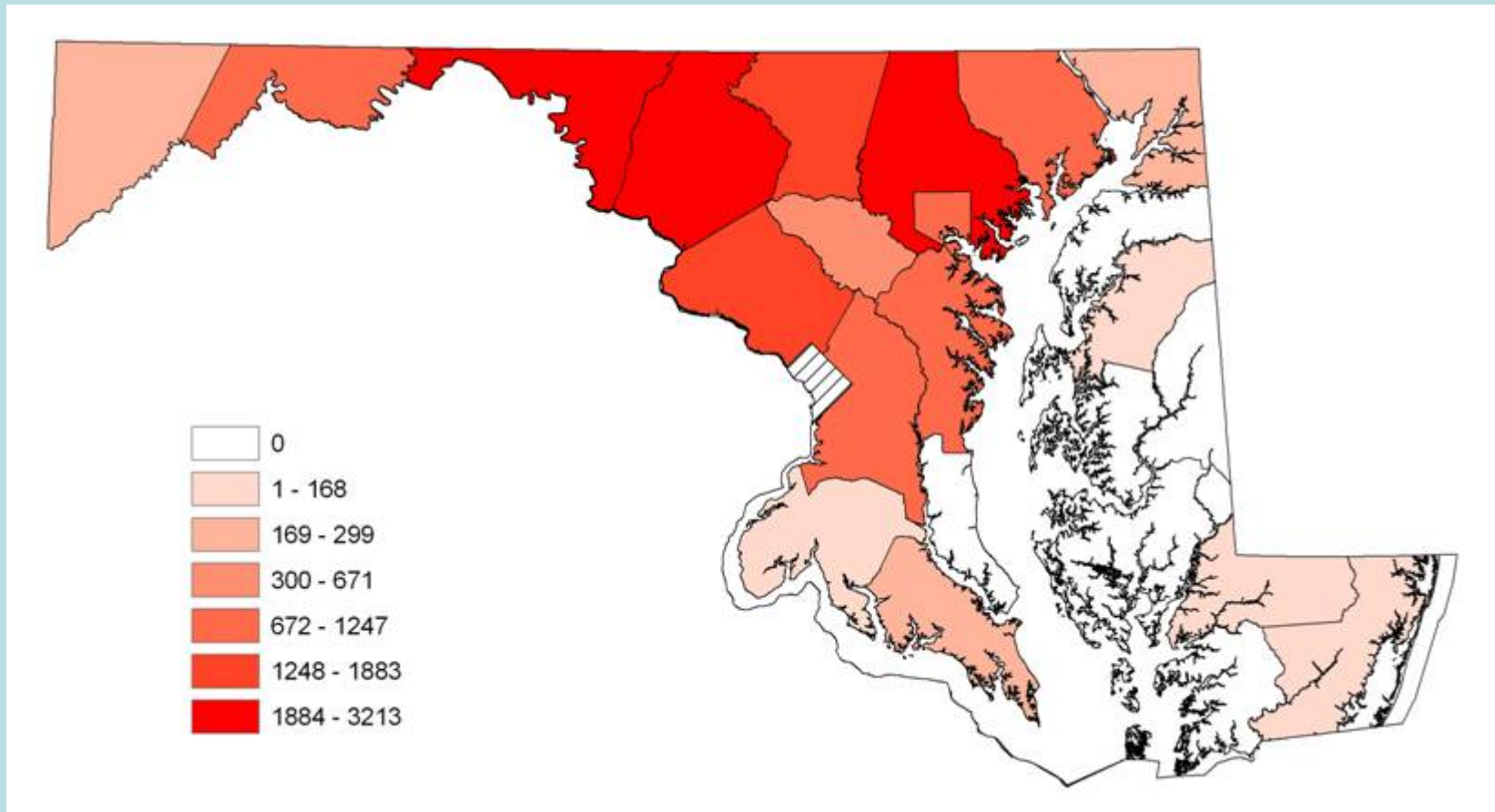
Results:

How do anglers dispose of unused crayfish?



Results:

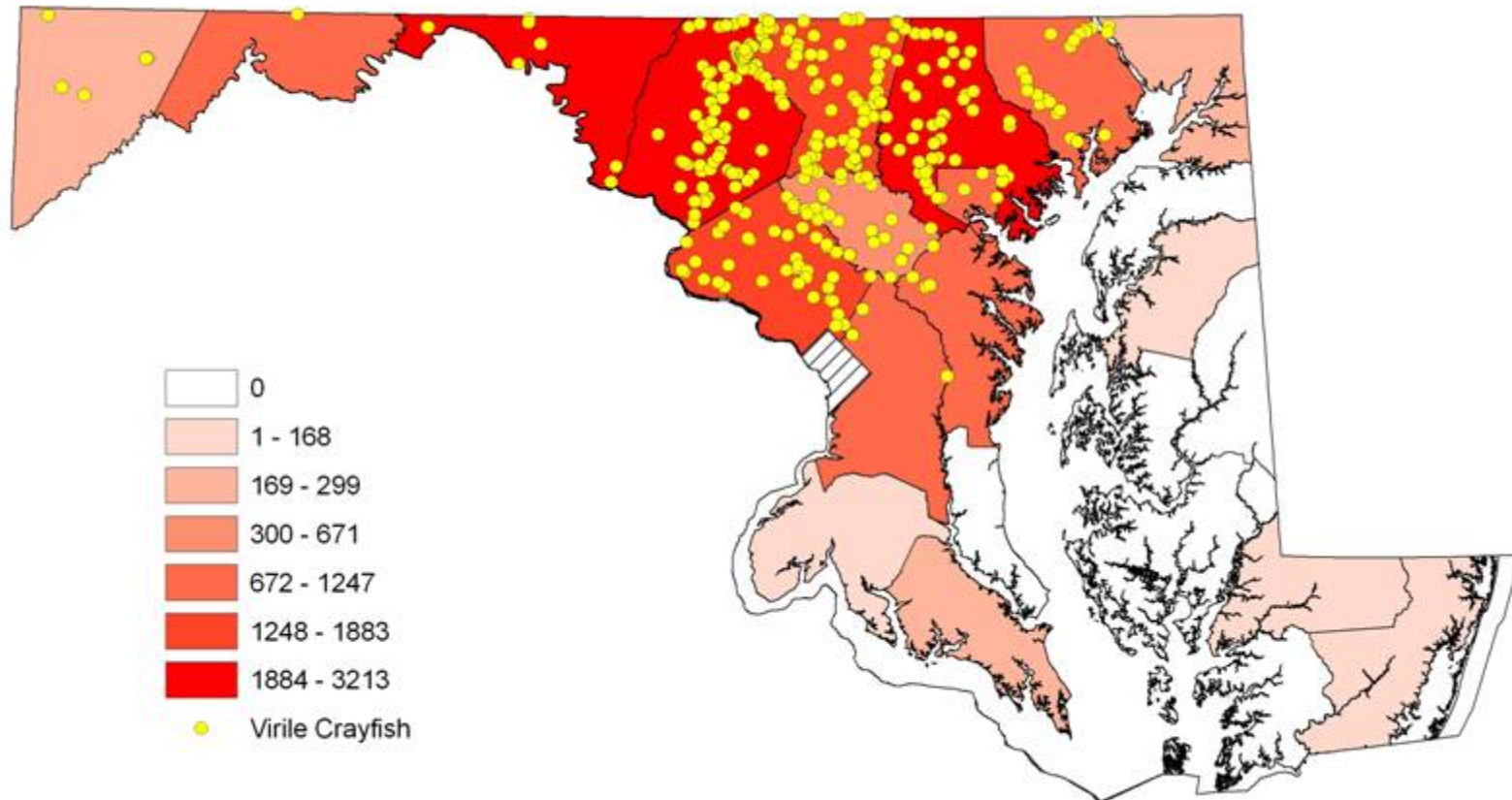
Number of Anglers Releasing Live Crayfish



Results:

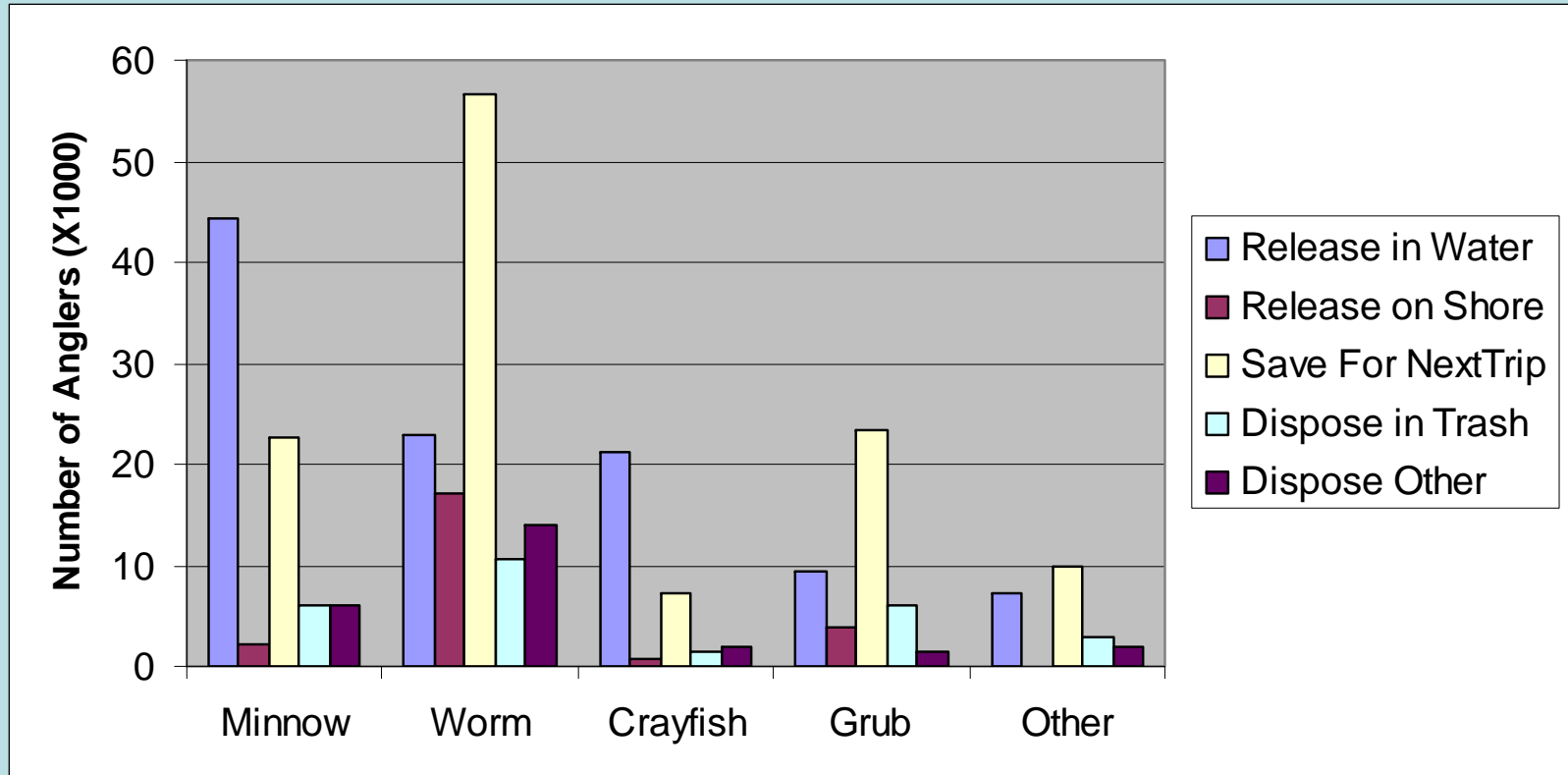


Number of Anglers Releasing Live Crayfish



Results:

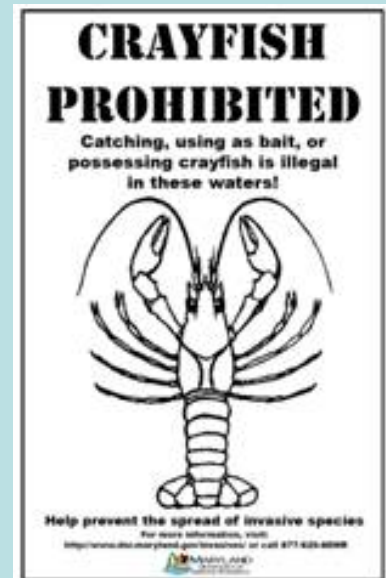
How do anglers dispose of other bait types?



- Majority of anglers release live crayfish and minnows into MD waters
- Worms and grubs are released on shore and in home gardens

MDNR Actions to Prevent Bait Introductions

- Developed “Black List” of aquatic nuisance species (2006)
- Obtained authority from the legislature to regulate bait in 2008
- Banned the catch, use, and possession of all crayfish in the Monocacy and Susquehanna rivers (July 2008)
- Currently considering a statewide ban on the use of crayfish as bait
- Currently re-defining “bait species” for use in MD regulations
- Developing “White List” of bait species



Summary

- **We have a BIG problem!**
 - A large number of anglers release live bait into or adjacent to MD waters
 - Most of this live bait is not native to Maryland.
- **We need to spread the word!**
 - Public education/outreach

