

What makes invasive
species so successful?

Definitions

- Non-native: Alien, outside its native range
 - Exotic, introduced, weedy, non-indigenous
 - Not normally part of ecosystem
 - Established, self-sustaining population
- '10% rule'
 - ~10% survive
 - ~10% of these become invasive
- Human activities involved
- What is an invasive species? –one that is aggressive and threatens local biodiversity.

Common Characteristics of Successful Invasives

- Few natural enemies
 - Predators
 - Competitors
 - Parasites and diseases
- High reproductive rate
- Long lived
- Good dispersal
- Generalists
- Pioneer species

Why worry about invasive species?

- Tend to crowd out /replace native species
- Can severely damage ecosystem health
- Harm human activities (agriculture, forestry, fisheries, recreation)
 - \$137 billion/ year in damages and pest control costs
(Pimentel, 2000)



USDA

\$37 million loss to
mid-Atlantic apple
production in 2010
alone

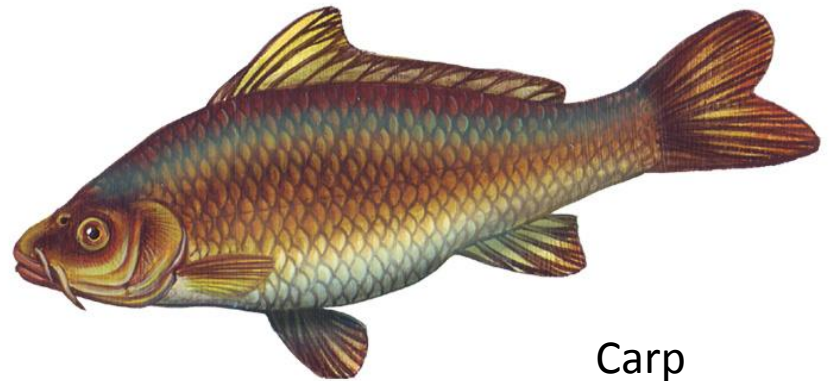
There are more than 100 invasive species in the Hudson River, including many of our most familiar plants and animals



Zebra mussels

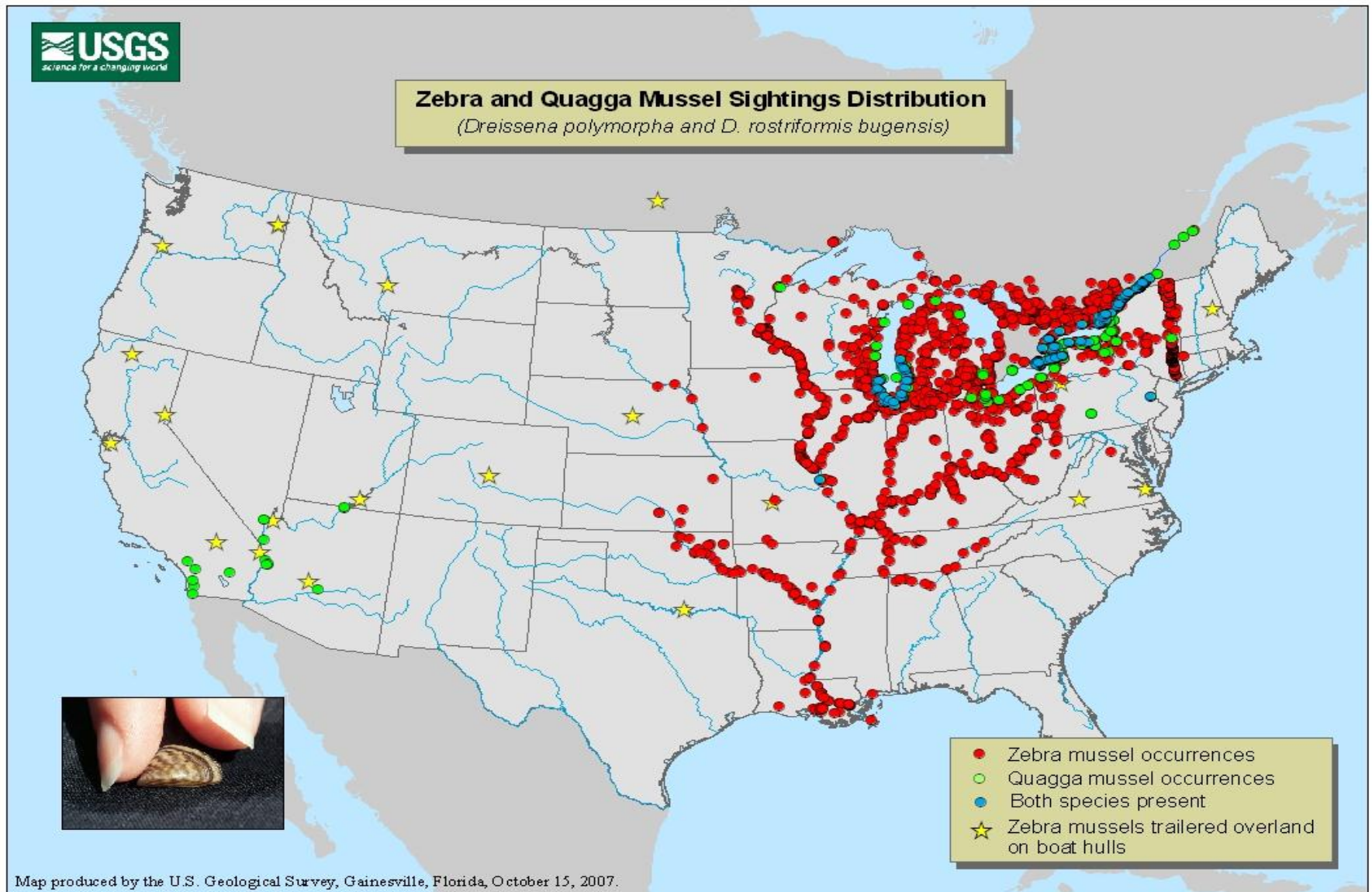


Seed from water chestnut plant



Carp

Extent of zebra mussels in the US



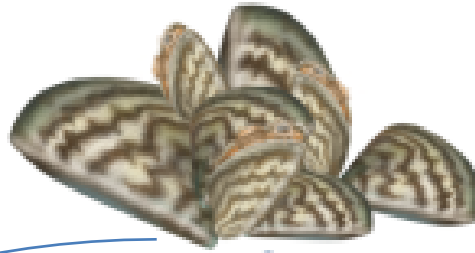
Life history

Mature at 1 year

Live 6 - 7 years

Growth

Up to 700,000 /m²



John C. Pomroy

Filter Feeding:

1 liter water /day

40,000-
1,000,000 eggs
/year



200,000,000
sperm

Warm water, external
fertilization

Larvae
(Veliger)
500,000 / m³

Filter feeders (plankton)
Eaten by some fish, ducks,
crayfish & crabs



USGS

Settle on hard
surfaces

Settling:

10,000 /m³ /day

95% die



Invasive zebra mussels

Cary IES

Native pearly mussels

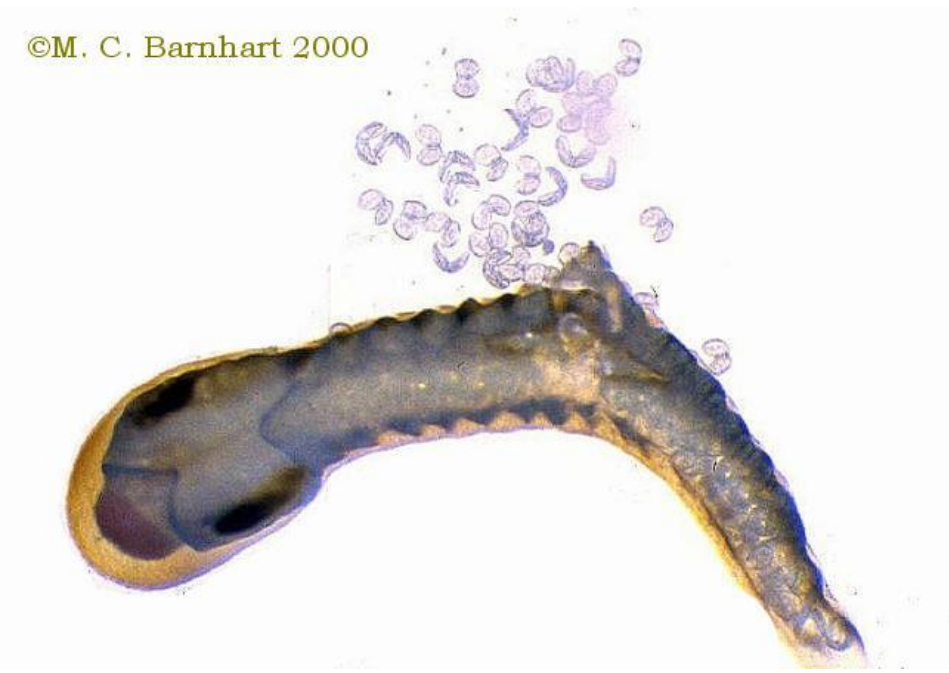


Cary IES

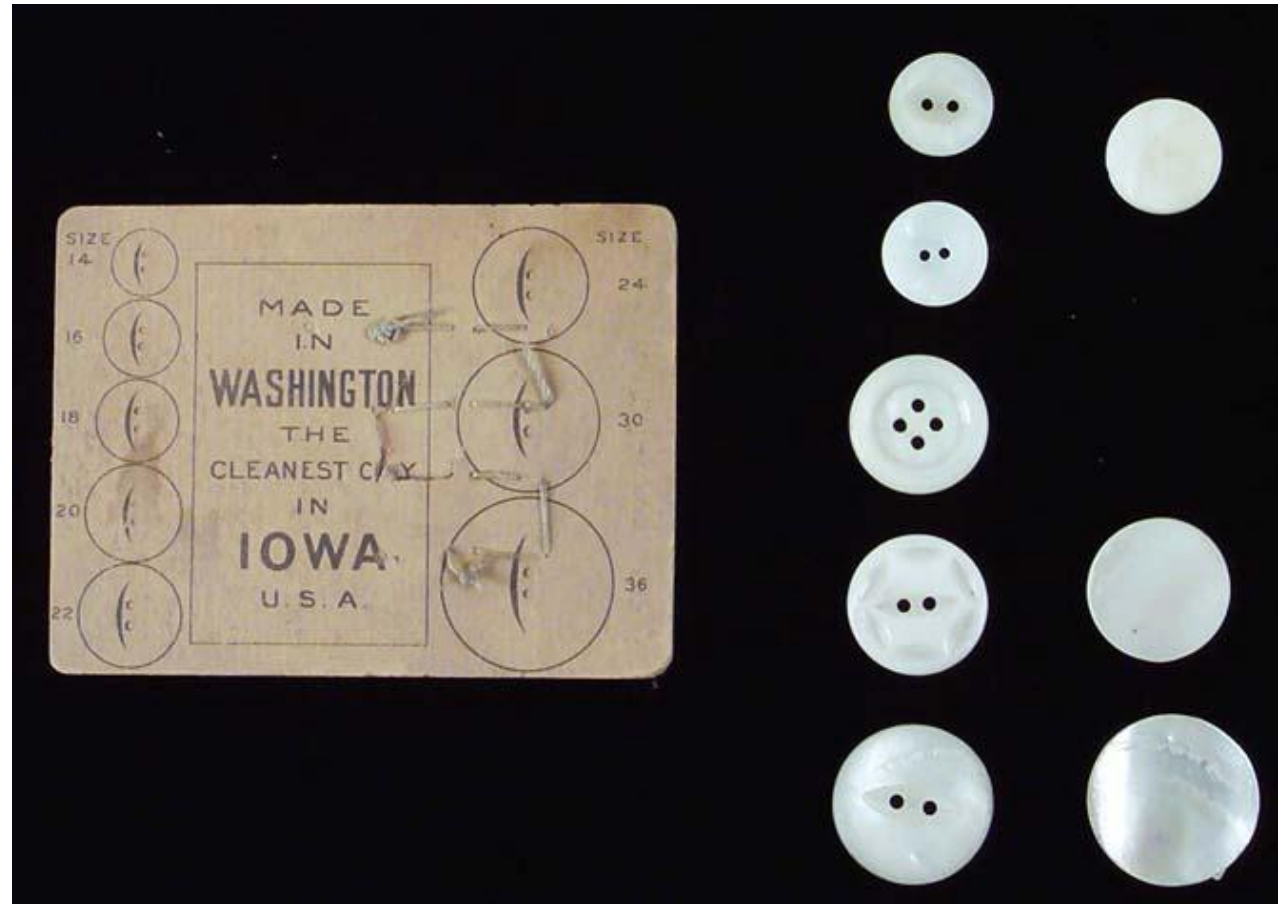
What do you think happened to the native pearly mussel population when the zebra mussels invaded?



Pearly Mussels Lure Fish then release their larvae (glochidia) which attach to the gills of the fish!

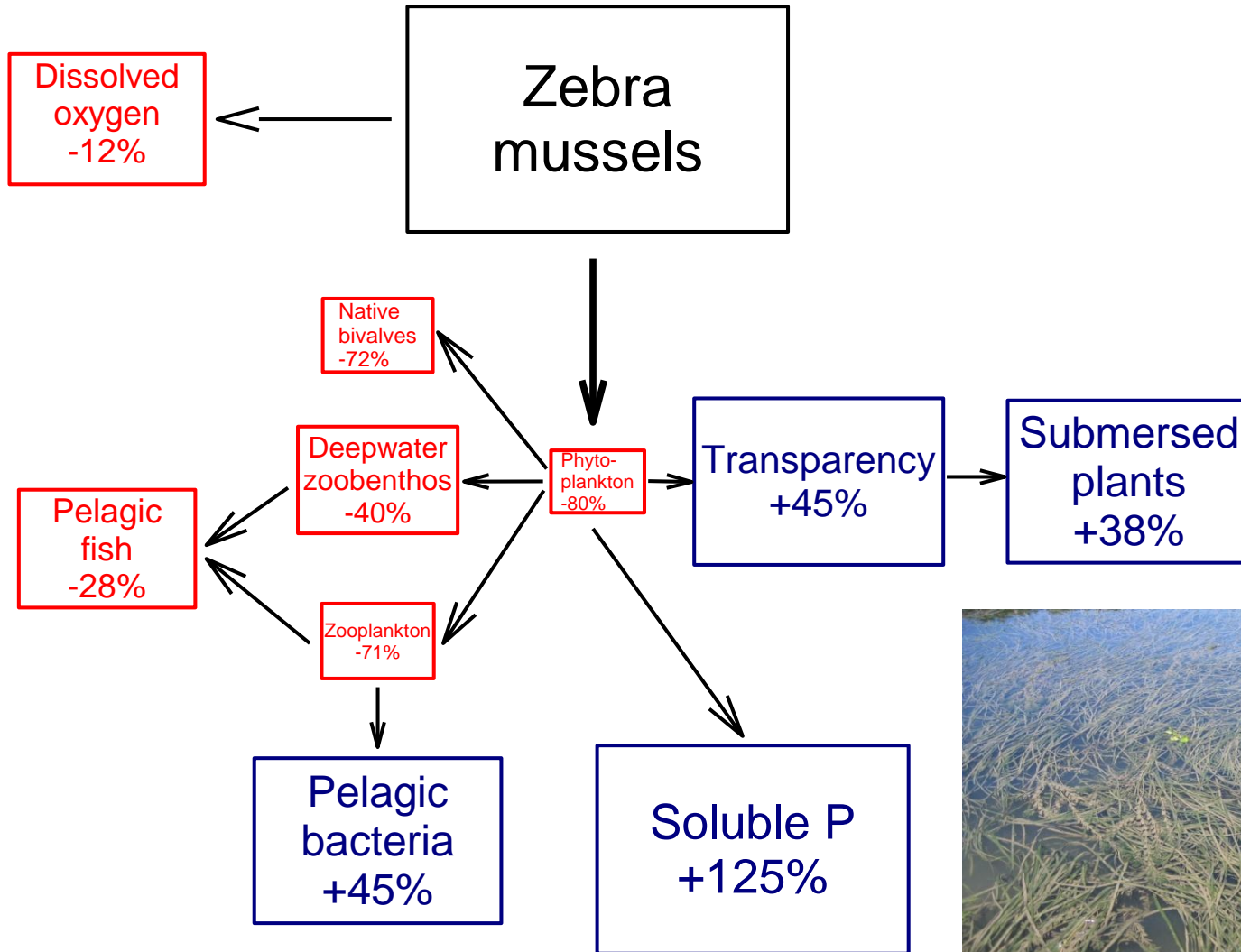


<http://www.youtube.com/watch?v=I0YTBj0WHkU>

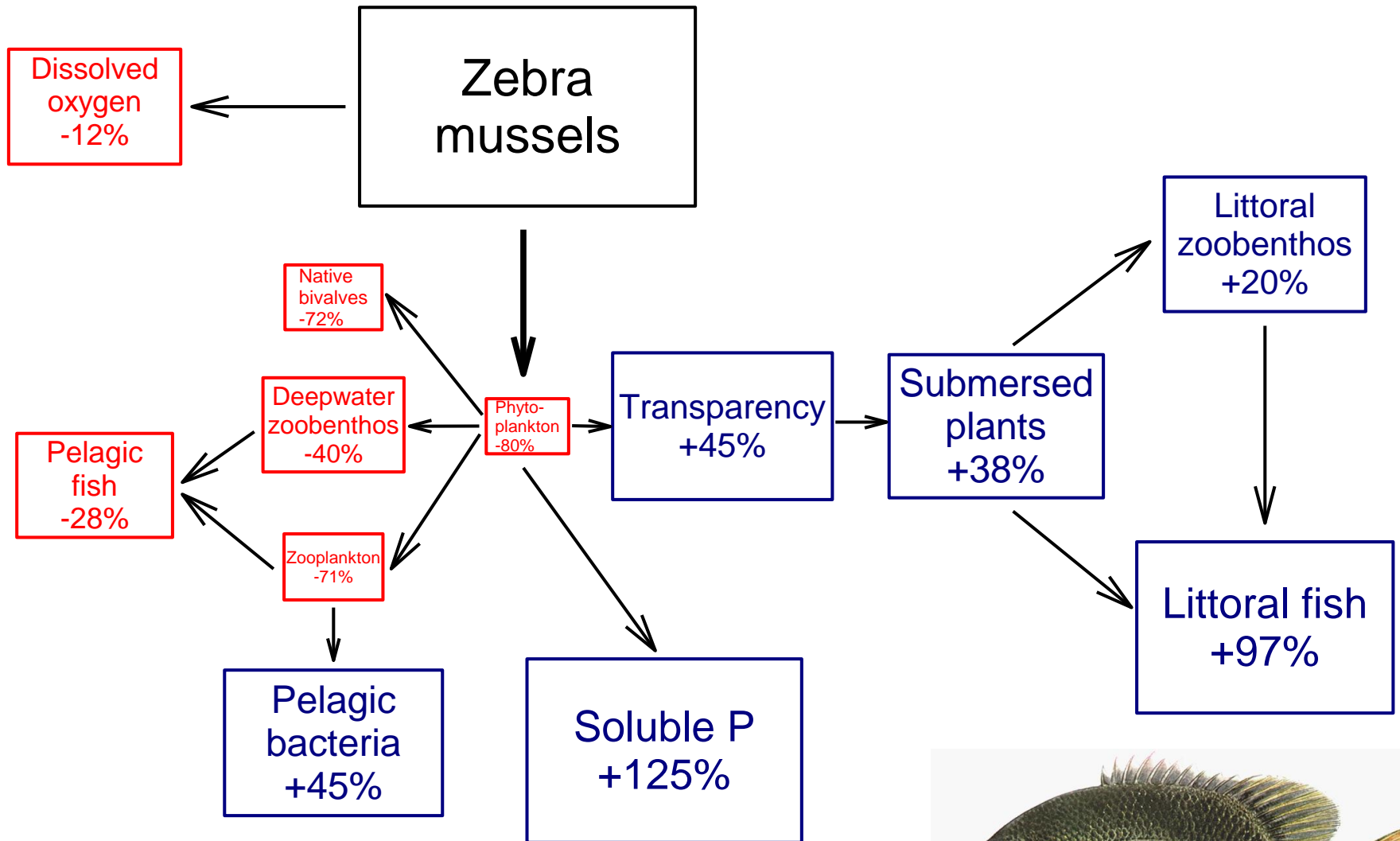


Illinois State Museum

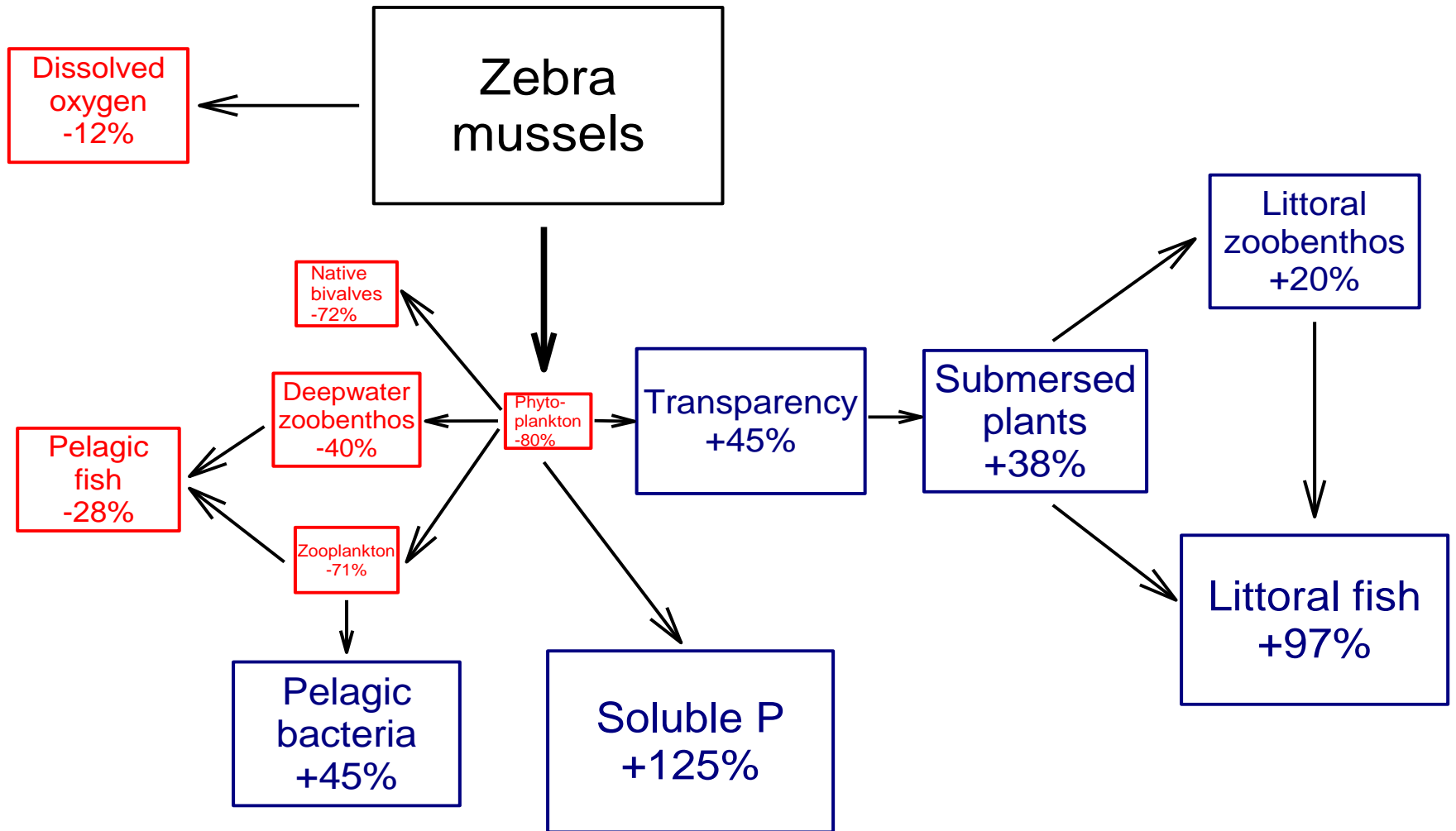
Early Invasion Years, 1993-2004



Early Invasion Years, 1993-2004



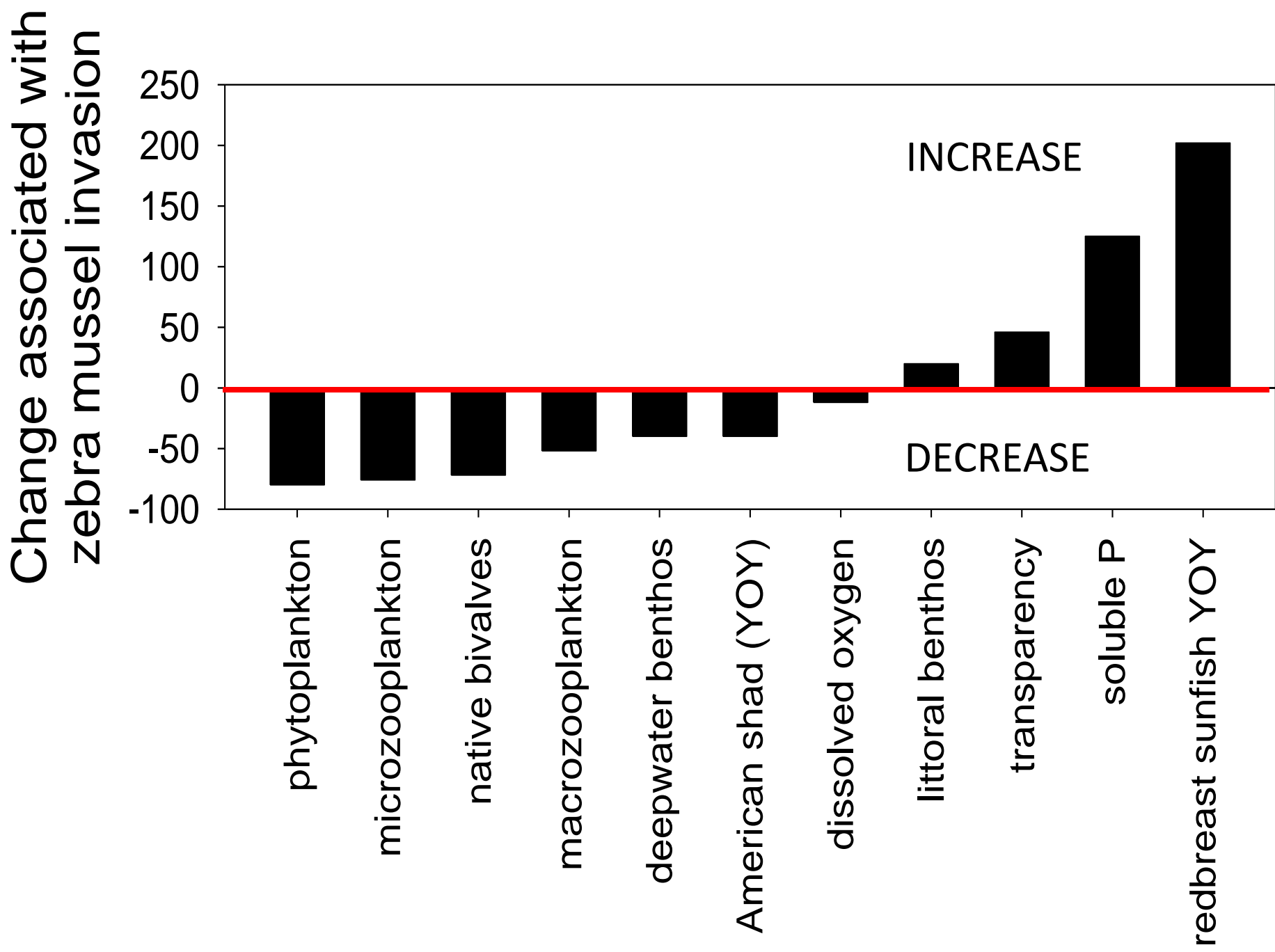
Early Invasion Years, 1993-2004



Food web in the open water

Food web in the shallows

[View: Results](#)



Zebra Mussels

Small
Medium
Large

- Scientists noticed a change in the numbers of different size classes beginning about 2005.
- What do you notice?
- Think about the food web: What do zebra mussels eat?
- Do different size classes eat different organisms?

Zebra Mussel Population Dynamics: Size Classes

PACE ET AL.

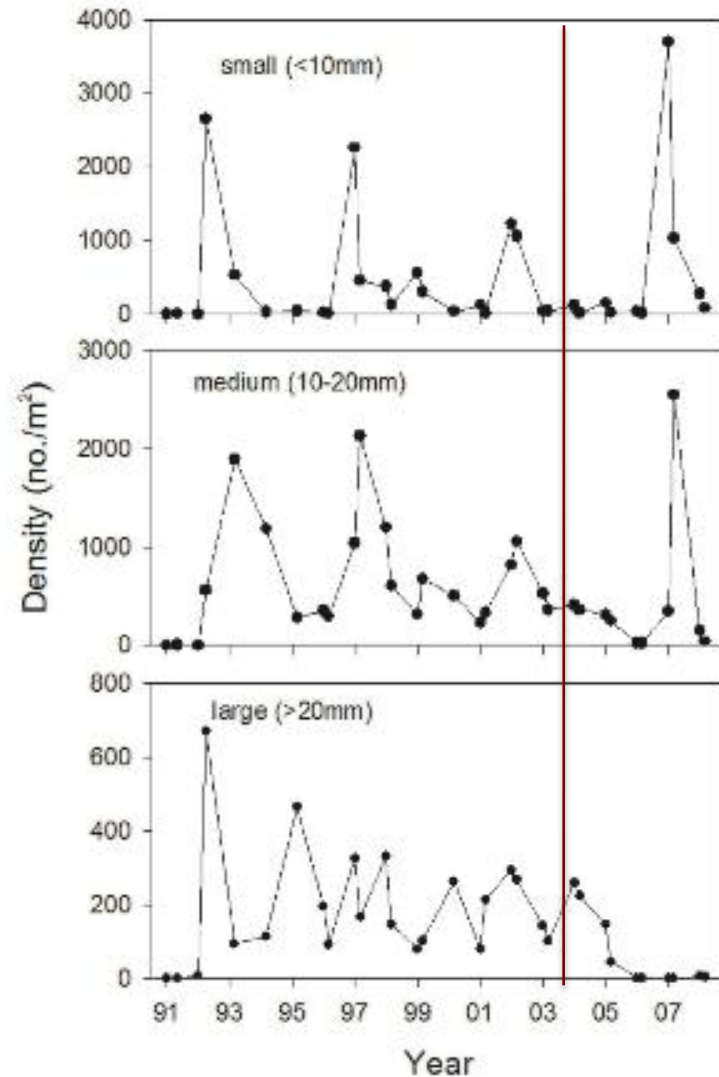
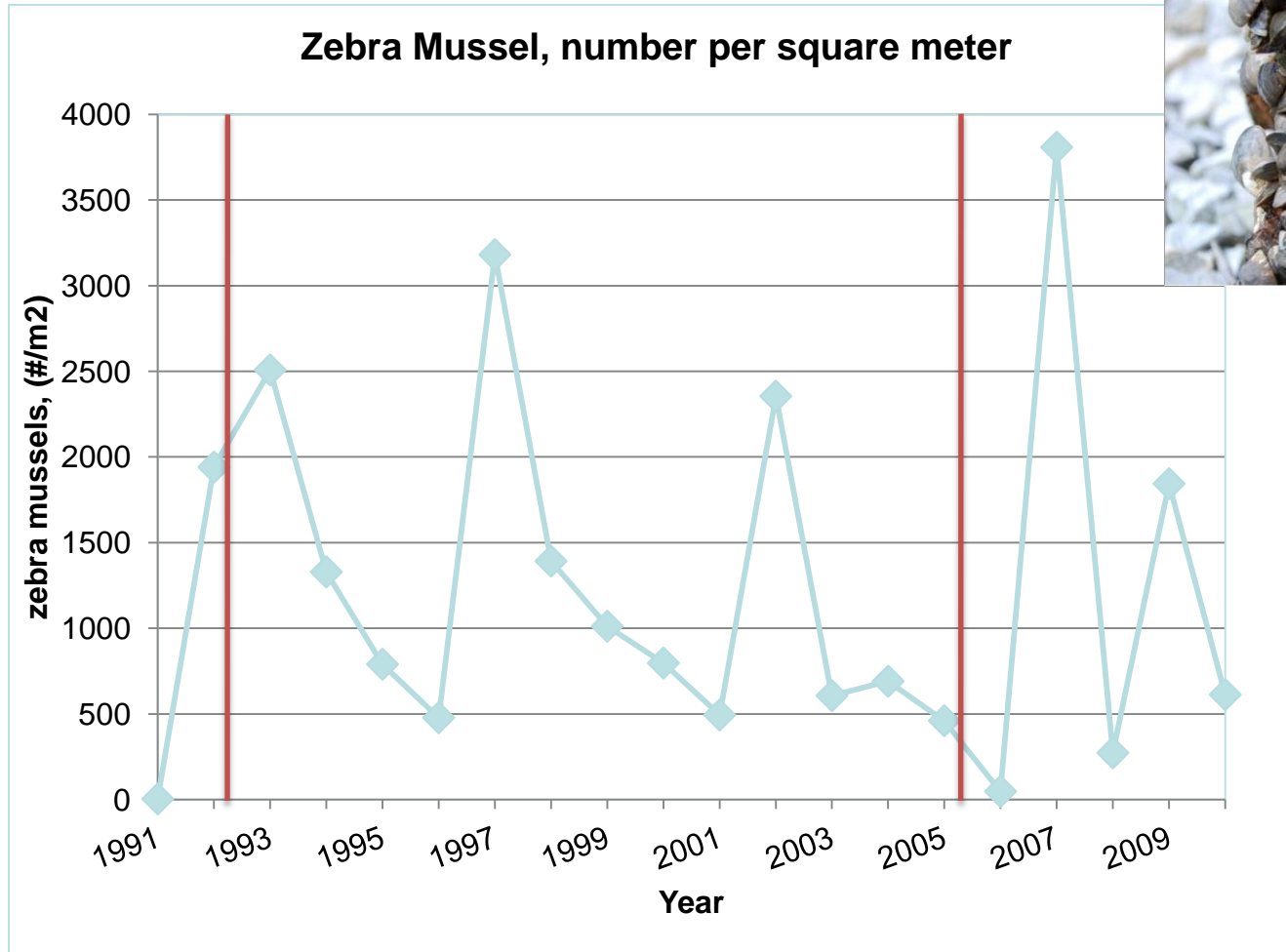
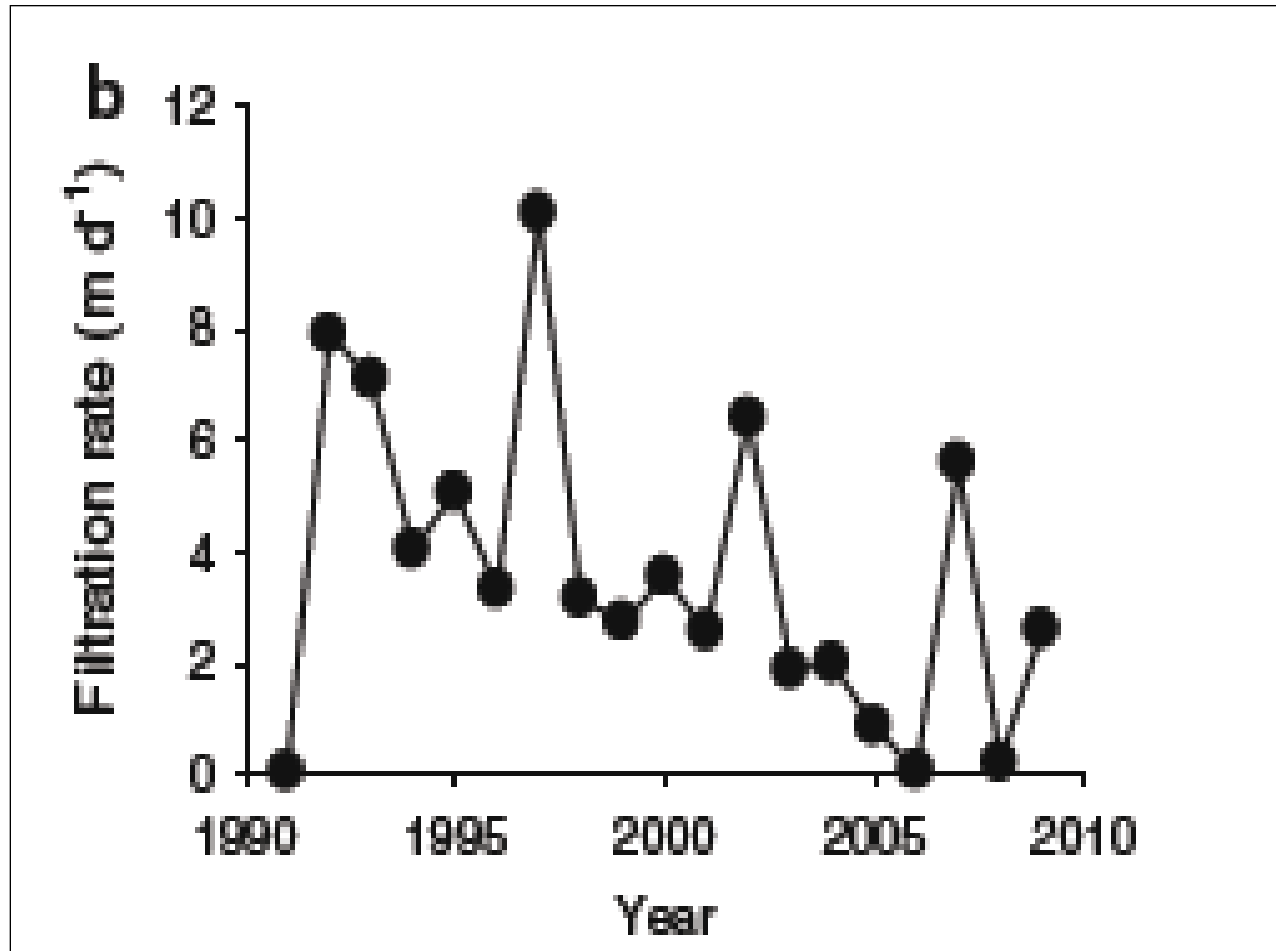


Fig. 1. Zebra mussel population dynamics for small 0–10 mm, medium 10–20 mm, and large 20–30 mm size classes. Data are for the freshwater Hudson River estuary.

What does the population look like now?

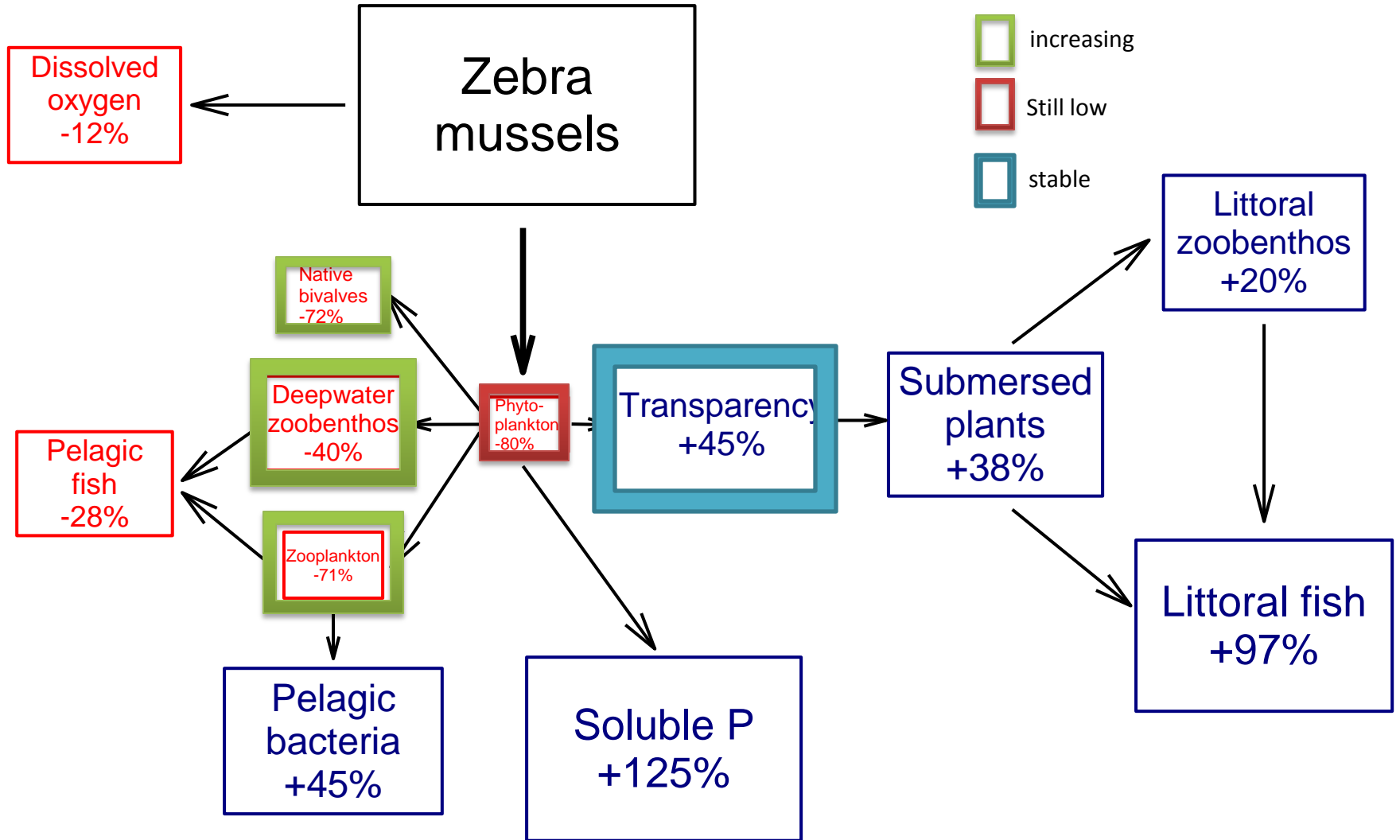


How much water do they filter?



Zebra mussels
filter all the
water in the
Hudson River
basin every 1-4
days.

Later Invasion Years, 2005-2009



Food web in the open water

Food web in the shallows



**Blue crabs
and
pumpkin seed fish**

**What was
eating the
large zebra
mussels?**

