Rapid fish assemblage recovery following an ecosystem disruptive bloom of golden algae in Lake Texoma

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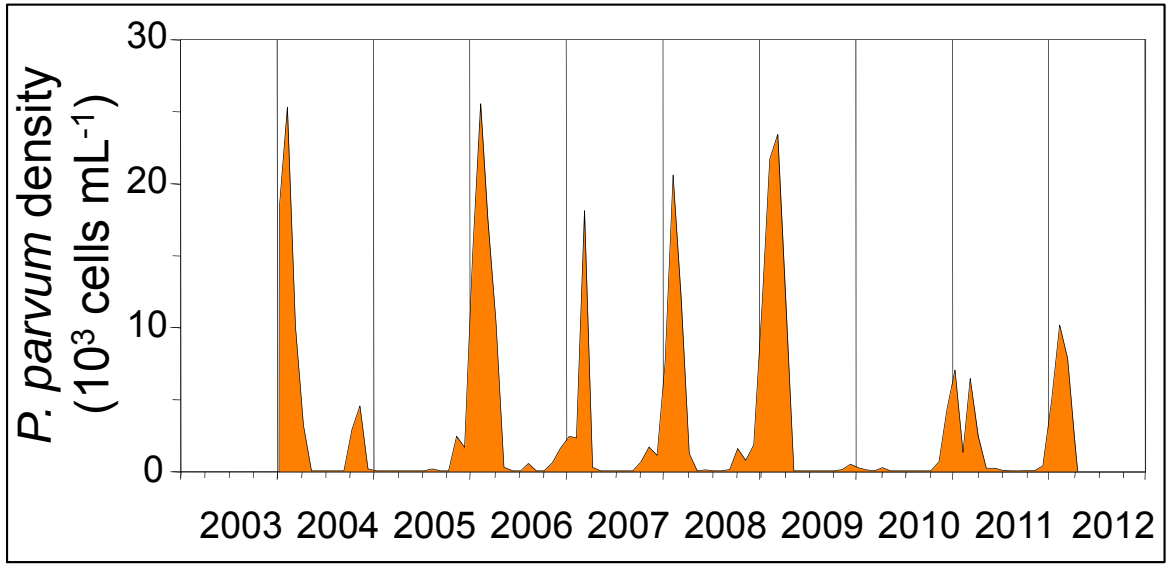
Introduction to Golden algae

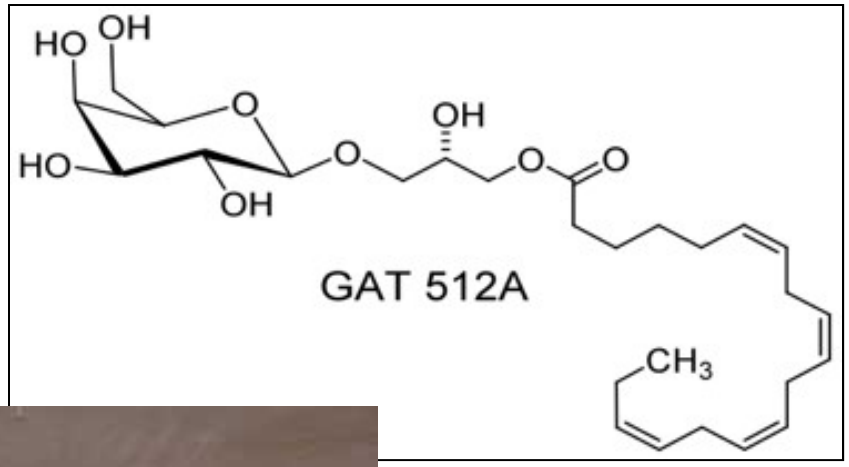
(*Prymnesium parvum*)

- Single celled protist, class Prymnesiophycae
- Originally classified from brackish/marine systems
- Blooms in late winter through early spring in North America
- Mixotrophic
- Produces toxins - released during direct contact or cell lysis

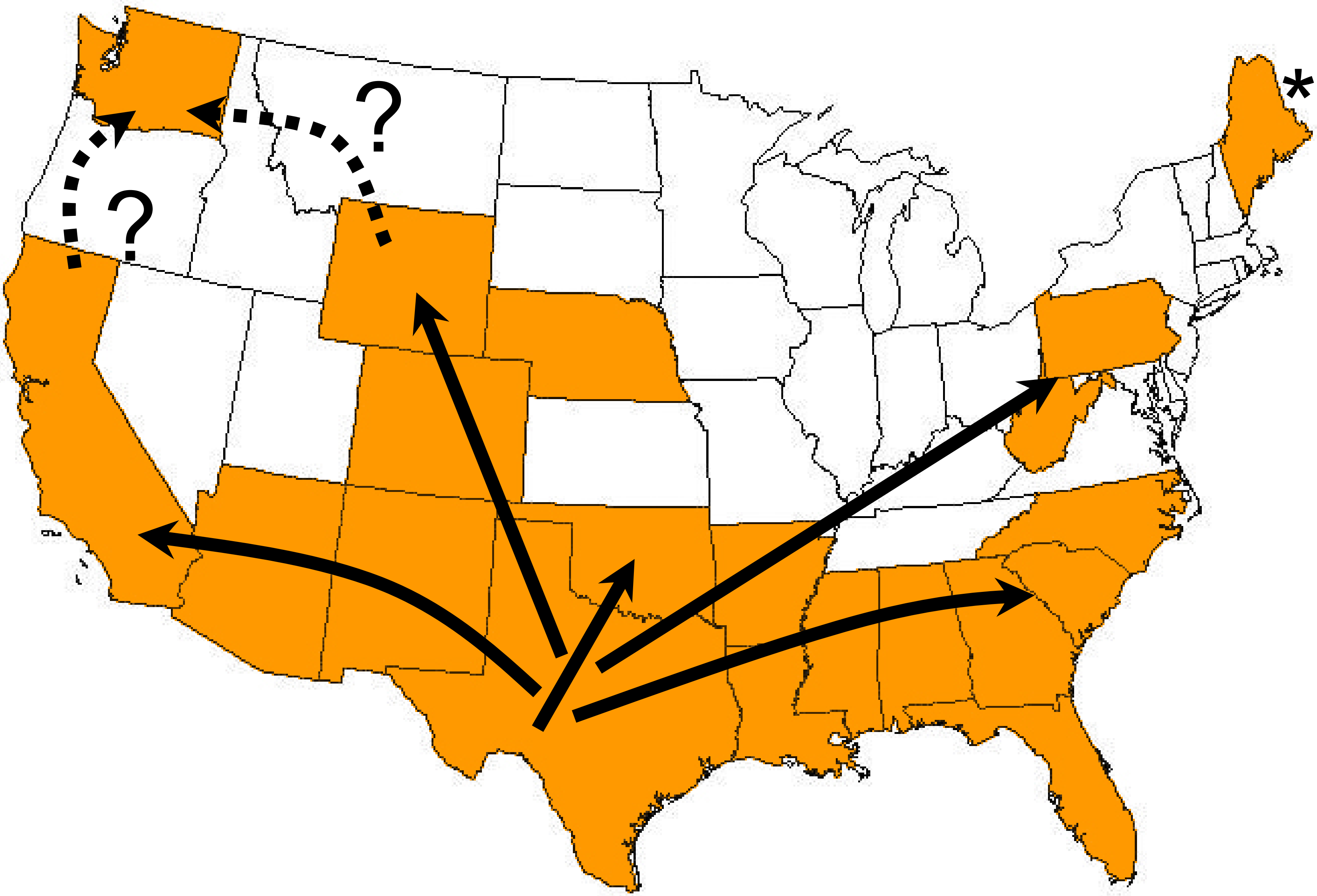


- Golden Algae Toxins (GATs)
- Cytotoxic, neurotoxic, hepatotoxic, hemolytic
- Thought to be used primarily to negatively affect predators or other algae
- Negative effects on fish are a byproduct
- Acts on the selective permeability of gill cells causing lysis and hemorrhaging
- Fish can escape toxicity after exposure

(Henrikson et al. 2010)



In the Past Decade
From 1985-2001



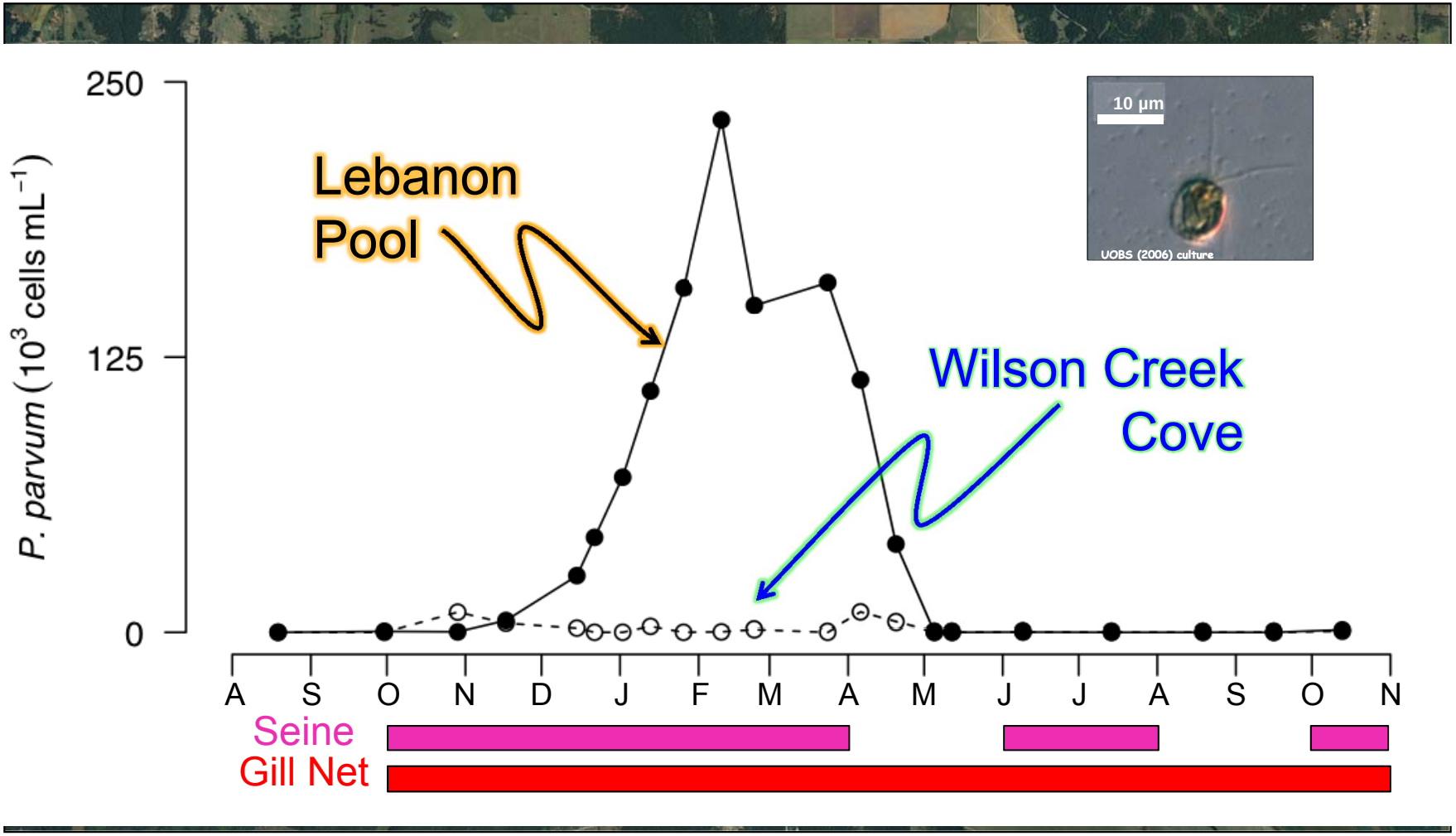
Question

- Do *Prymnesium parvum* blooms have residual effects on fish communities after fish kills (i.e.,does the community recover following a fish kill)?

Objective

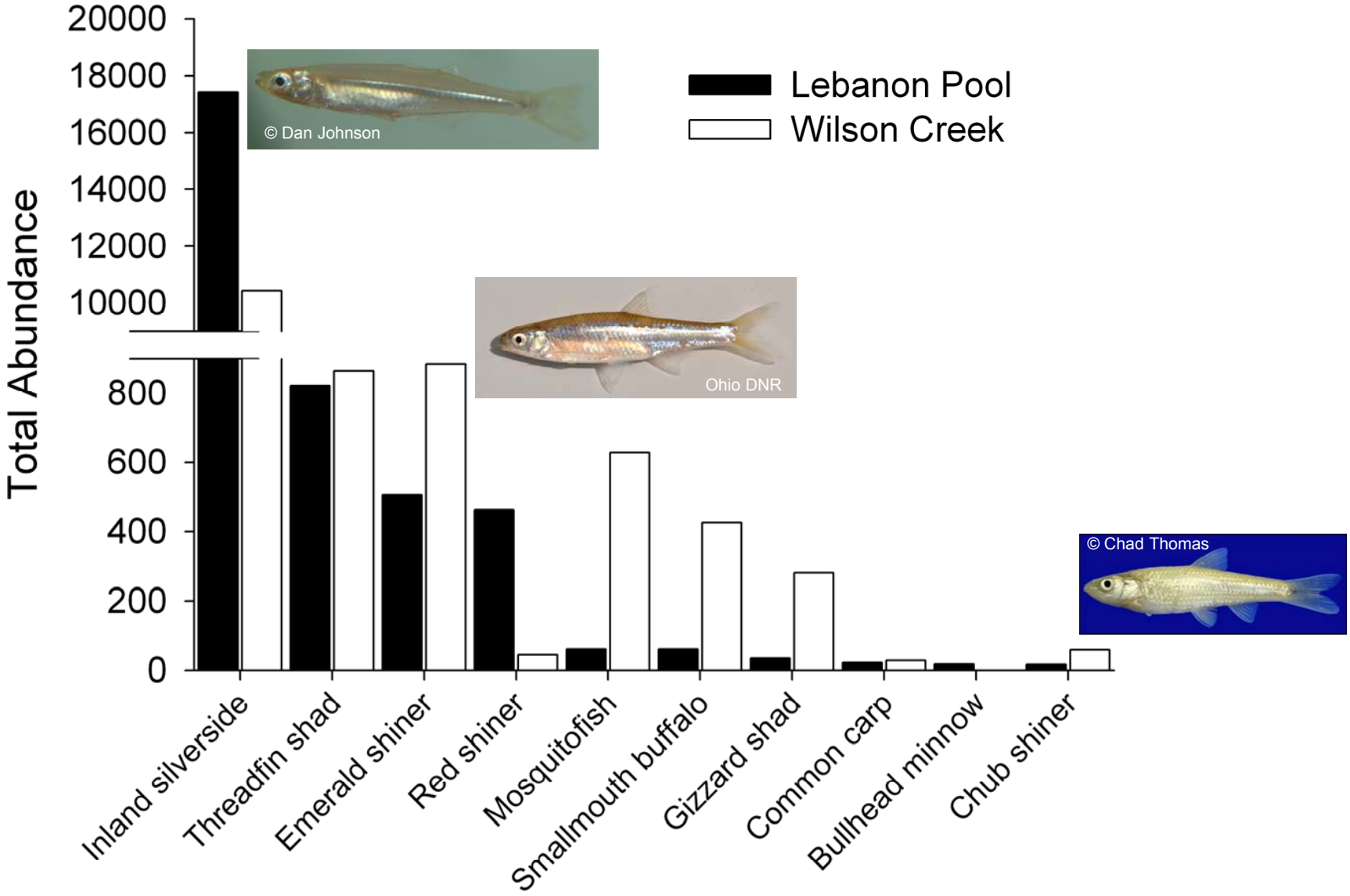
- Characterize the fish community before, during, and after a *P. parvum* bloom and fish kill.
- Compared a bloom site (Lebanon Pool) to a reference site (Wilson Creek Cove)
  - Species richness
  - Total abundance
  - Community composition
  - Size structure of dominant species

Sampling

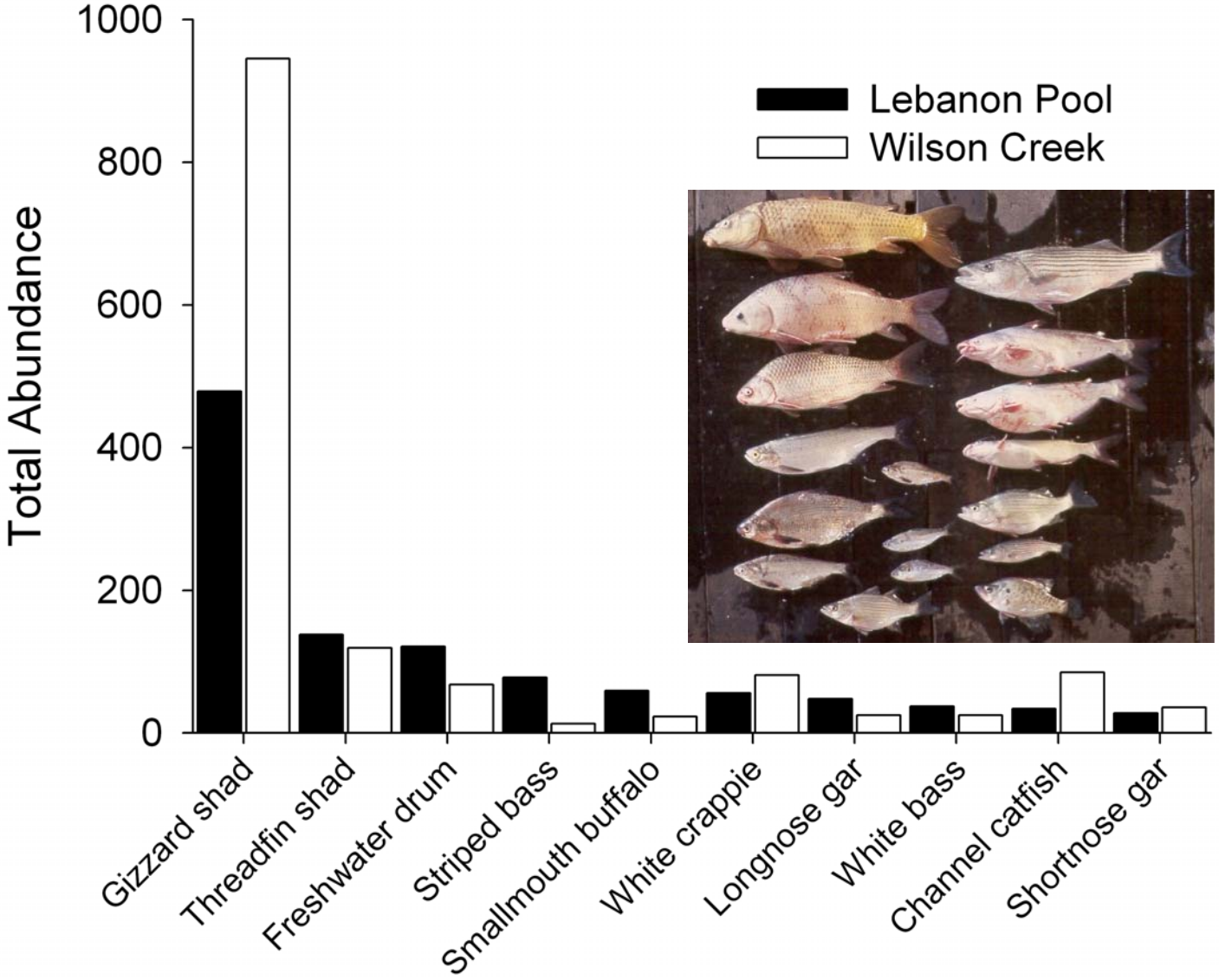


Monthly sampling regime including seining and gill nets (Oct 2008-Oct 2009).

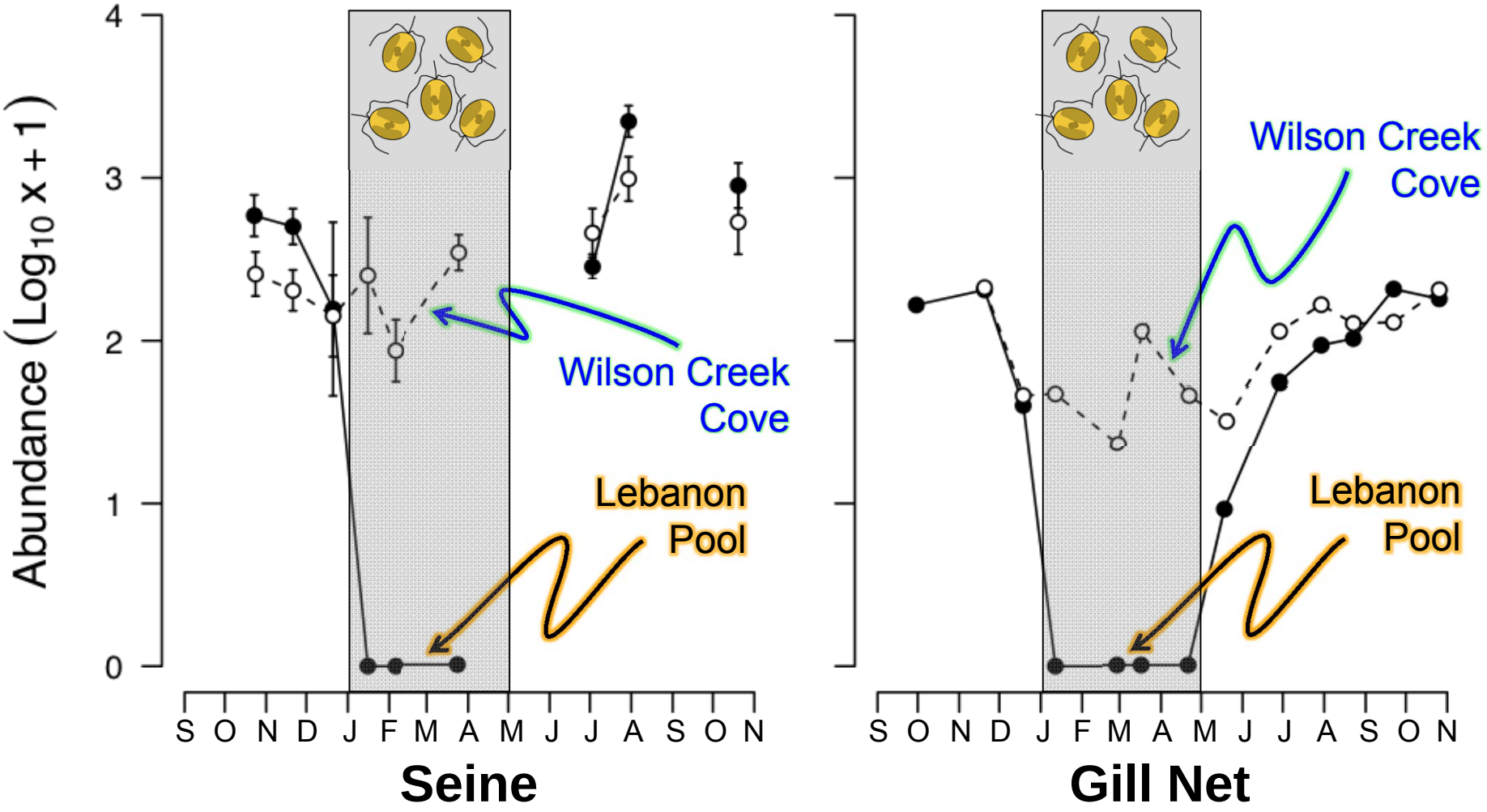
Seine


Total Abundance
20000
18000
16000
14000
12000
10000
800
600
400
200
0
Lebanon Pool
Wilson Creek
© Dan Johnson
Ohio DNR
© Chad Thomas
Inland silverside
Threadfin shad
Emerald shiner
Red shiner
Mosquitofish
Smallmouth buffalo
Gizzard shad
Common carp
Bullhead minnow
Chub shiner

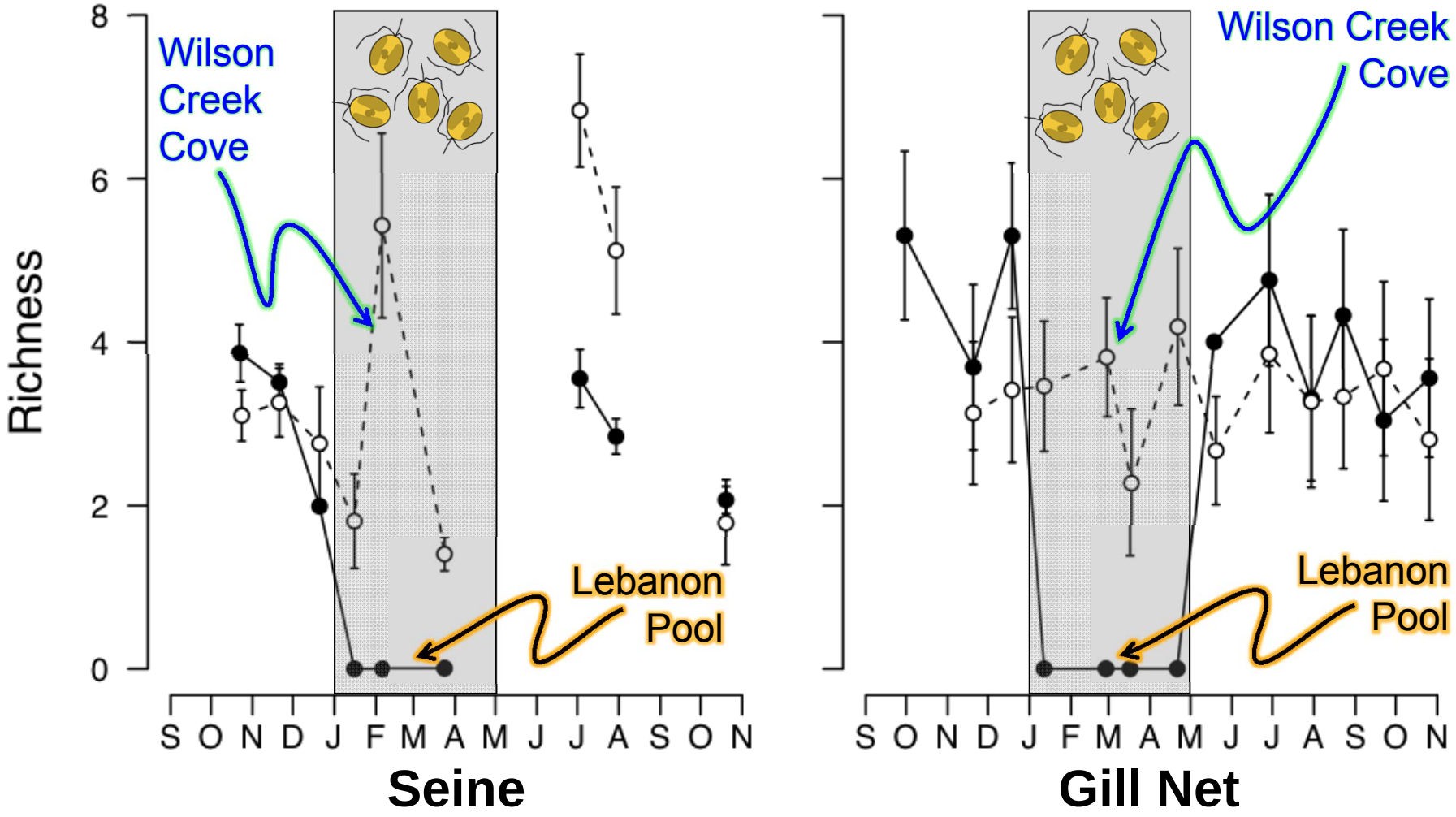
Gill net


Total Abundance
1000
800
600
400
200
0
Lebanon Pool
Wilson Creek
Gizzard shad
Threadfin shad
Freshwater drum
Striped bass
Smallmouth buffalo
White crappie
Longnose gar
White bass
Channel catfish
Shortnose gar

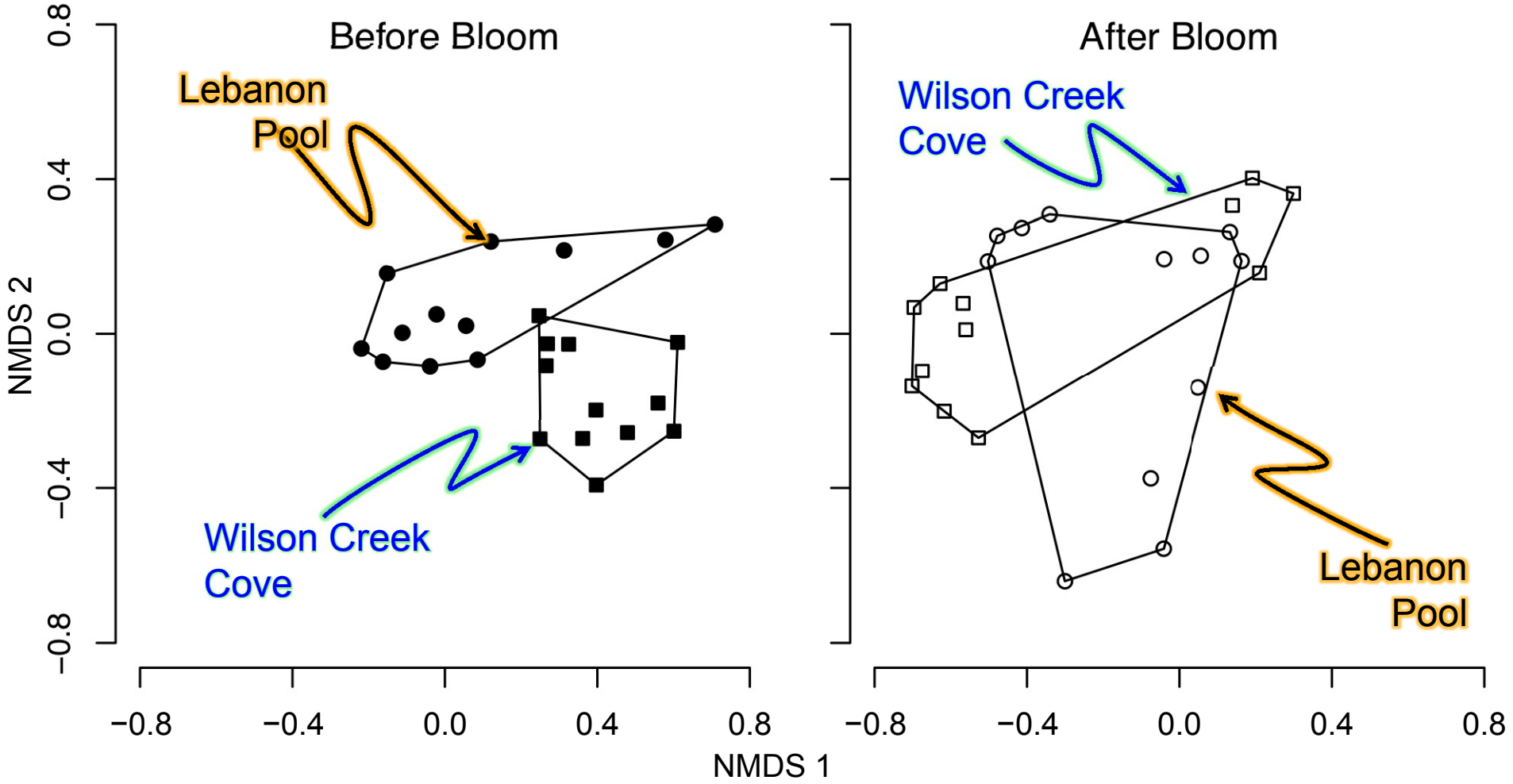
Abundance


Abundance (Log10 x + 1)
4
3
2
1
0
S O N D J F M A M J J A S O N
Seine
Wilson Creek Cove
Lebanon Pool
S O N D J F M A M J J A S O N
Gill Net
Wilson Creek Cove
Lebanon Pool

Species Richness



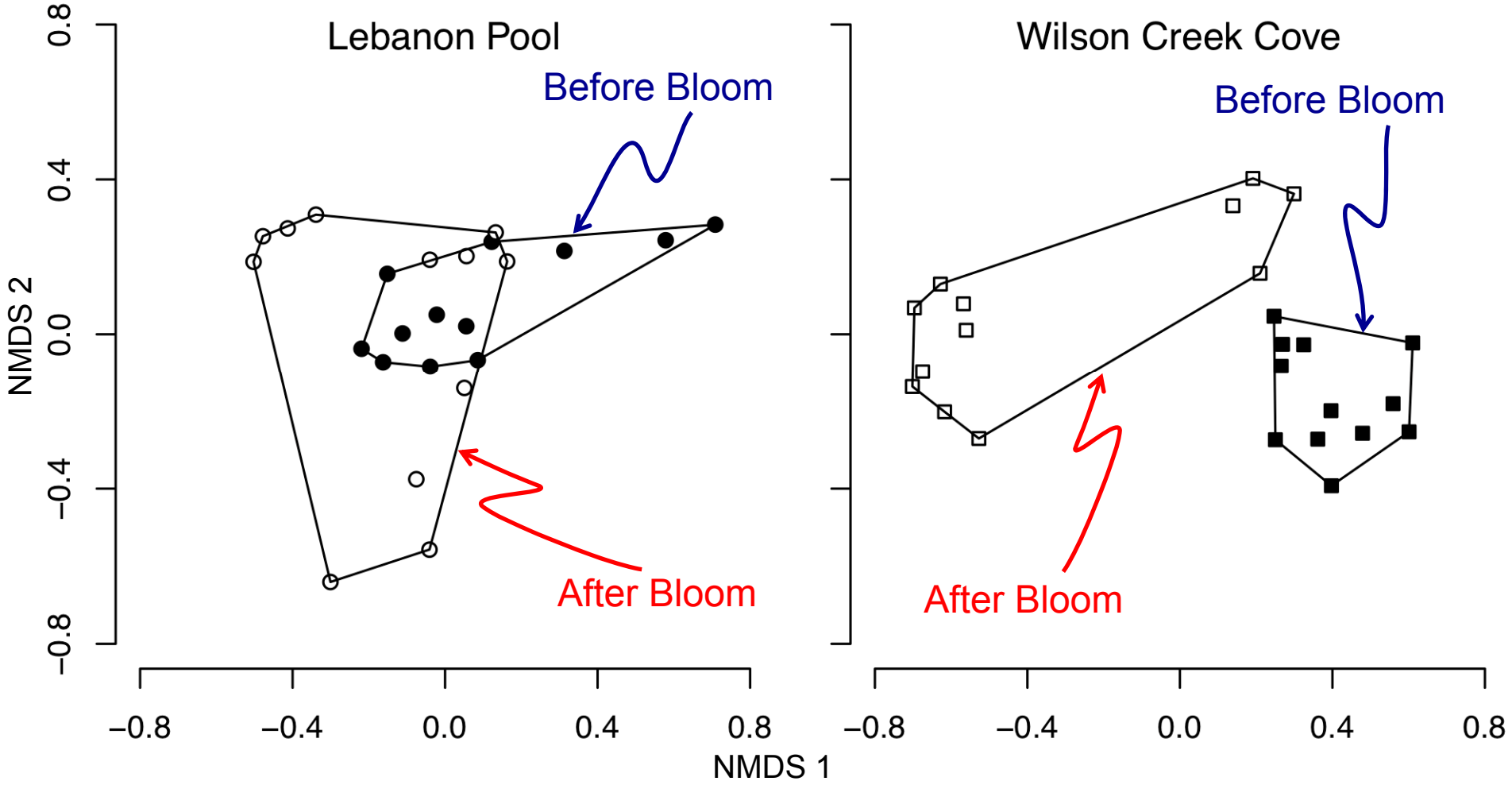
Between Site Assemblage Comparison



Different assemblages

Same assemblage

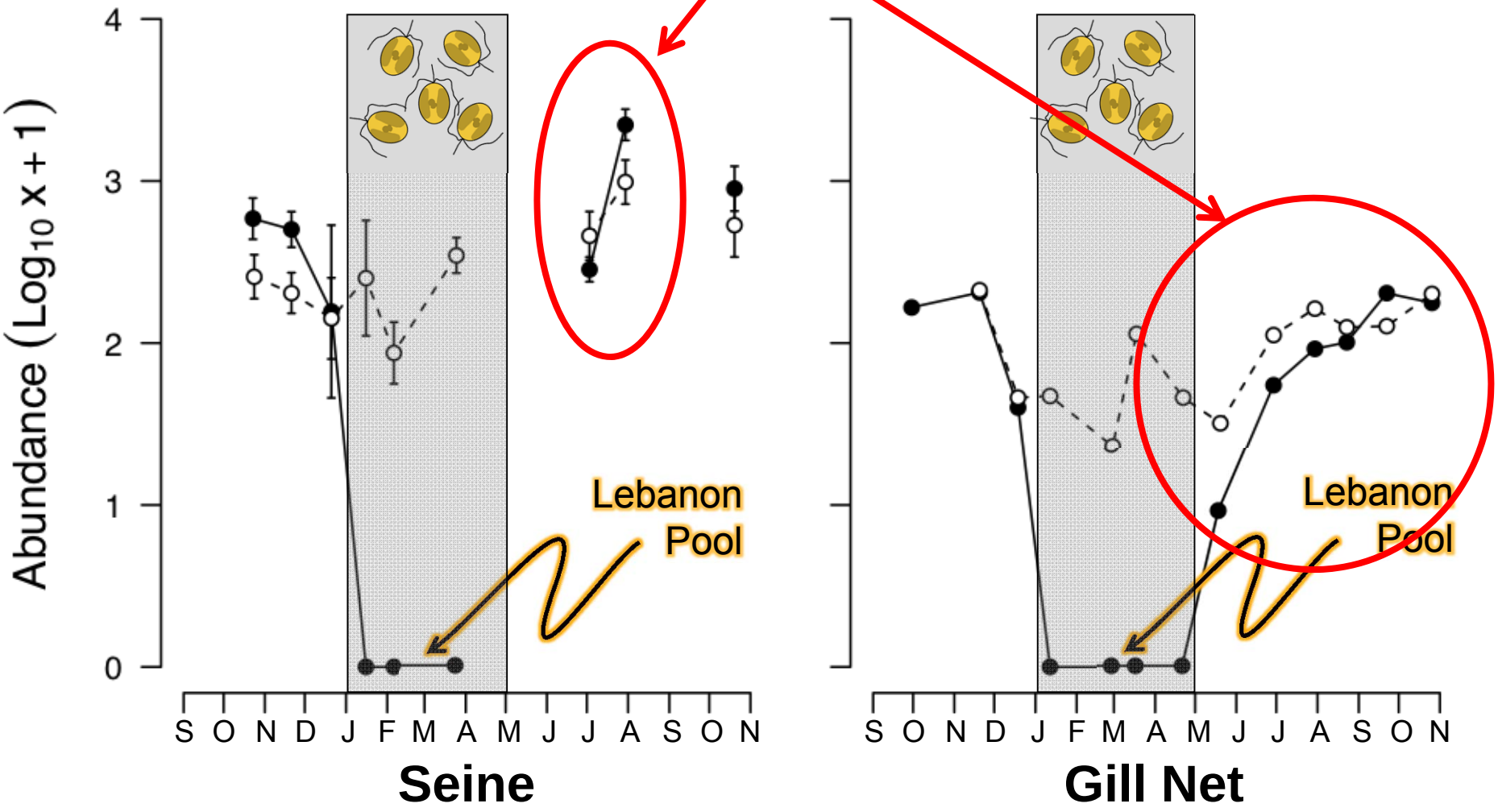
Before & After Bloom Community Comparison



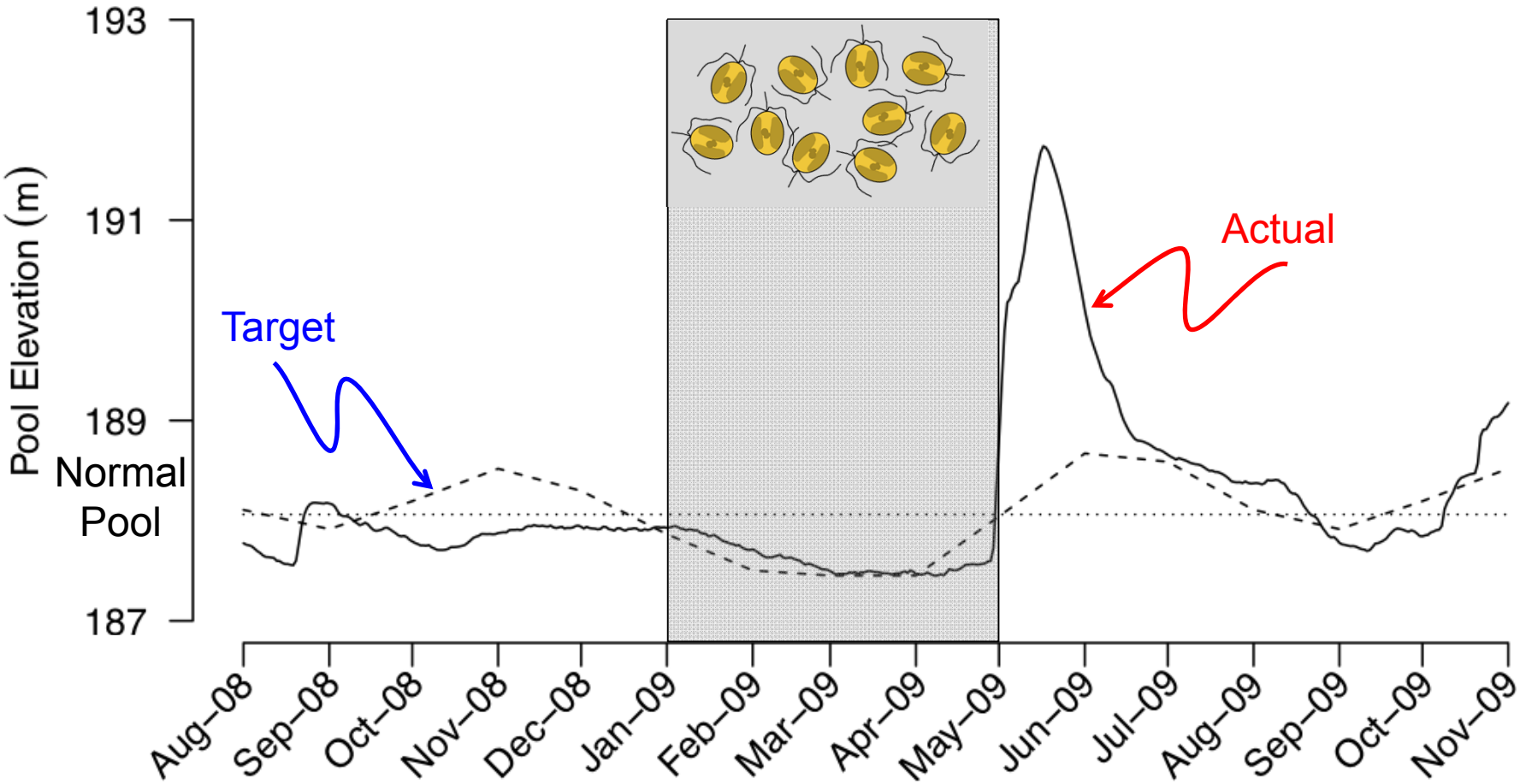
Same assemblage

Different assemblages

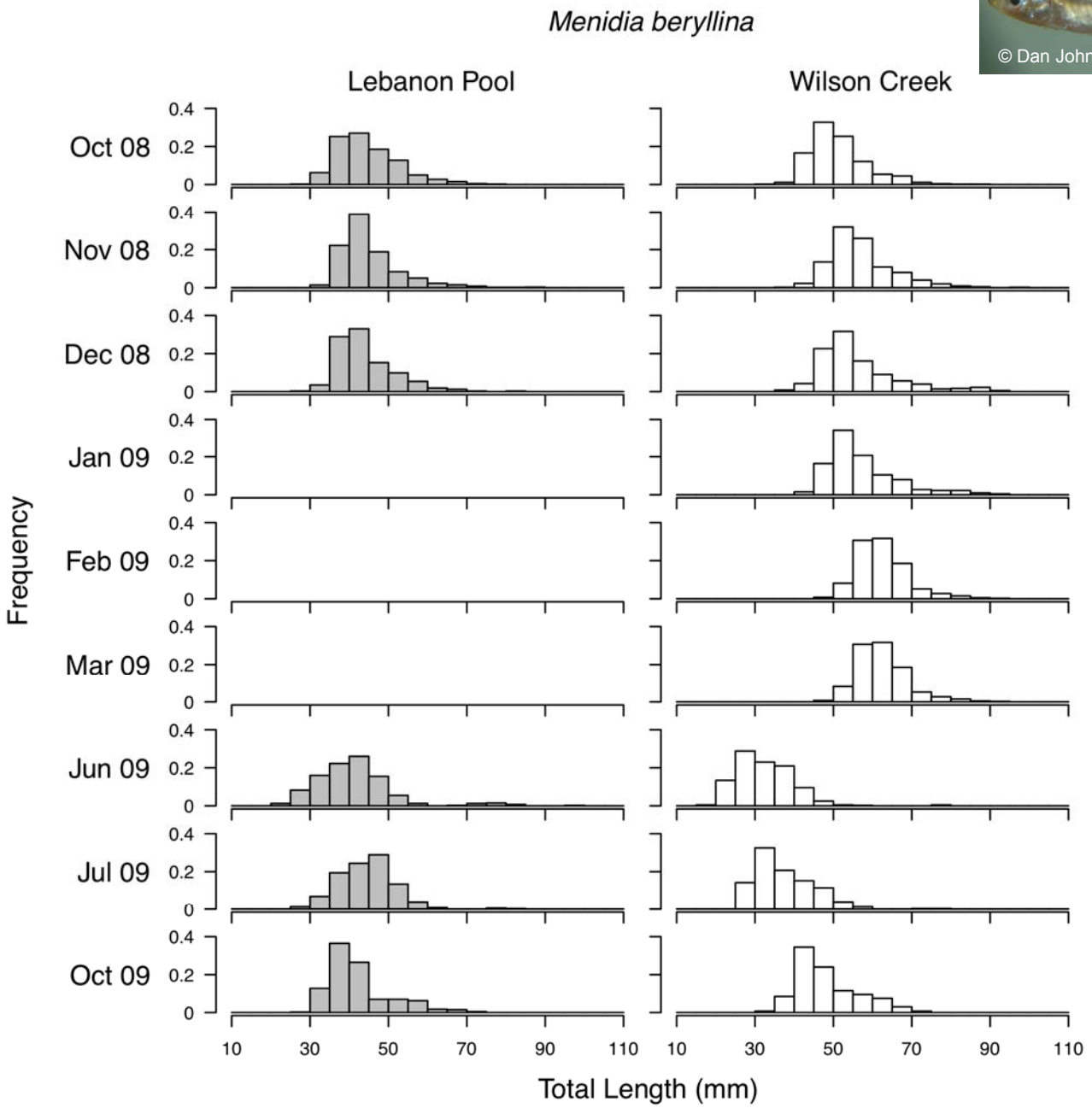
Where did the fish come from?



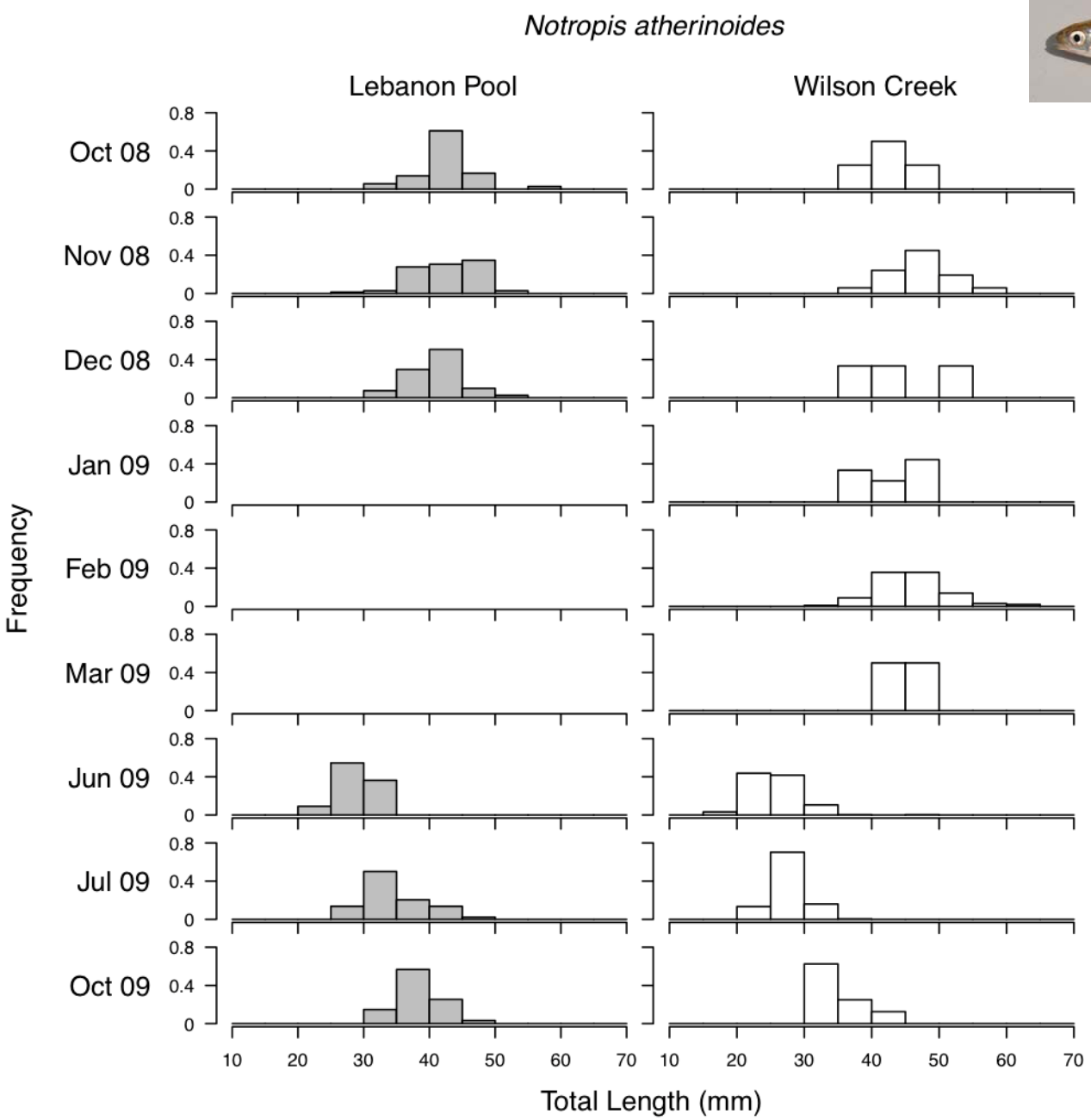
Where did the fish come from?



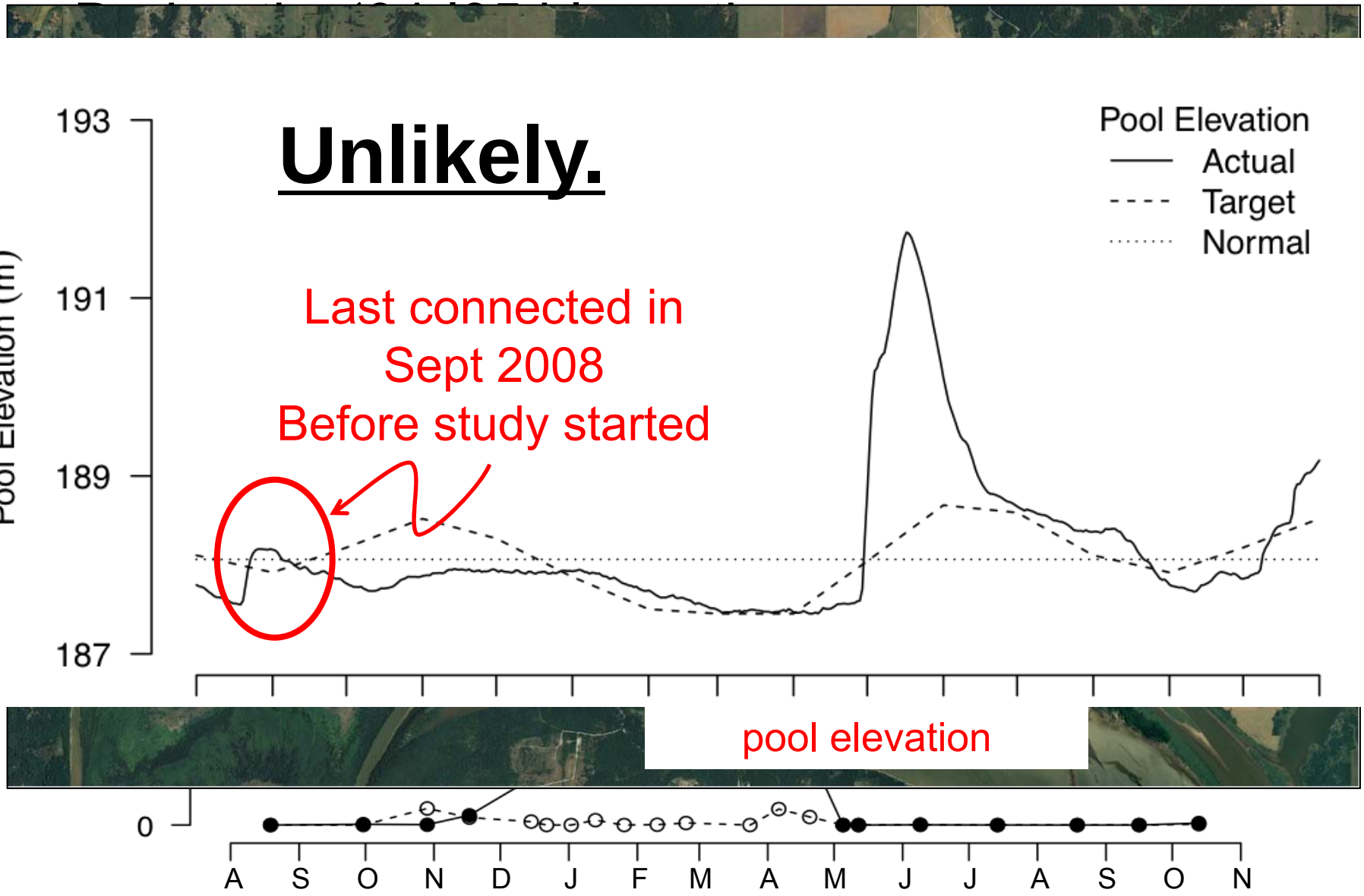

© Dan Johnson


Menidia beryllina
Lebanon Pool
Wilson Creek
Oct 08
Nov 08
Dec 08
Jan 09
Feb 09
Mar 09
Jun 09
Jul 09
Oct 09
Frequency
0.4
0.2
0
10
30
50
70
90
110
Total Length (mm)


Ohio DNR


Notropis atherinoides
Lebanon Pool
Wilson Creek
Oct 08
Nov 08
Dec 08
Jan 09
Feb 09
Mar 09
Jun 09
Jul 09
Oct 09
Frequency
0.8
0.4
0
10
20
30
40
50
60
70
Total Length (mm)

Interesting aspects…



Interesting aspects…

- During the ‘04-’05 bloom there were many dead fish on shore
- No dead fish on shore during ‘08-’09 bloom… Why?
- Water was toxic to fish
  - No difference in water quality between sites
- Did Fish escape?
  - Unlikely
- Birds ate them or they sank to the bottom

Conclusions

- Fish community recovered after kill
  - Localized fish kill (not every fish in the lake died)
  - Spring floods reestablished connection to reservoir community (source of immigrants)

- Lake-wide blooms could still have drastic effects on fisheries by limiting recovery

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Rapid recovery of a fish assemblage following an ecosystem disruptive algal bloom

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