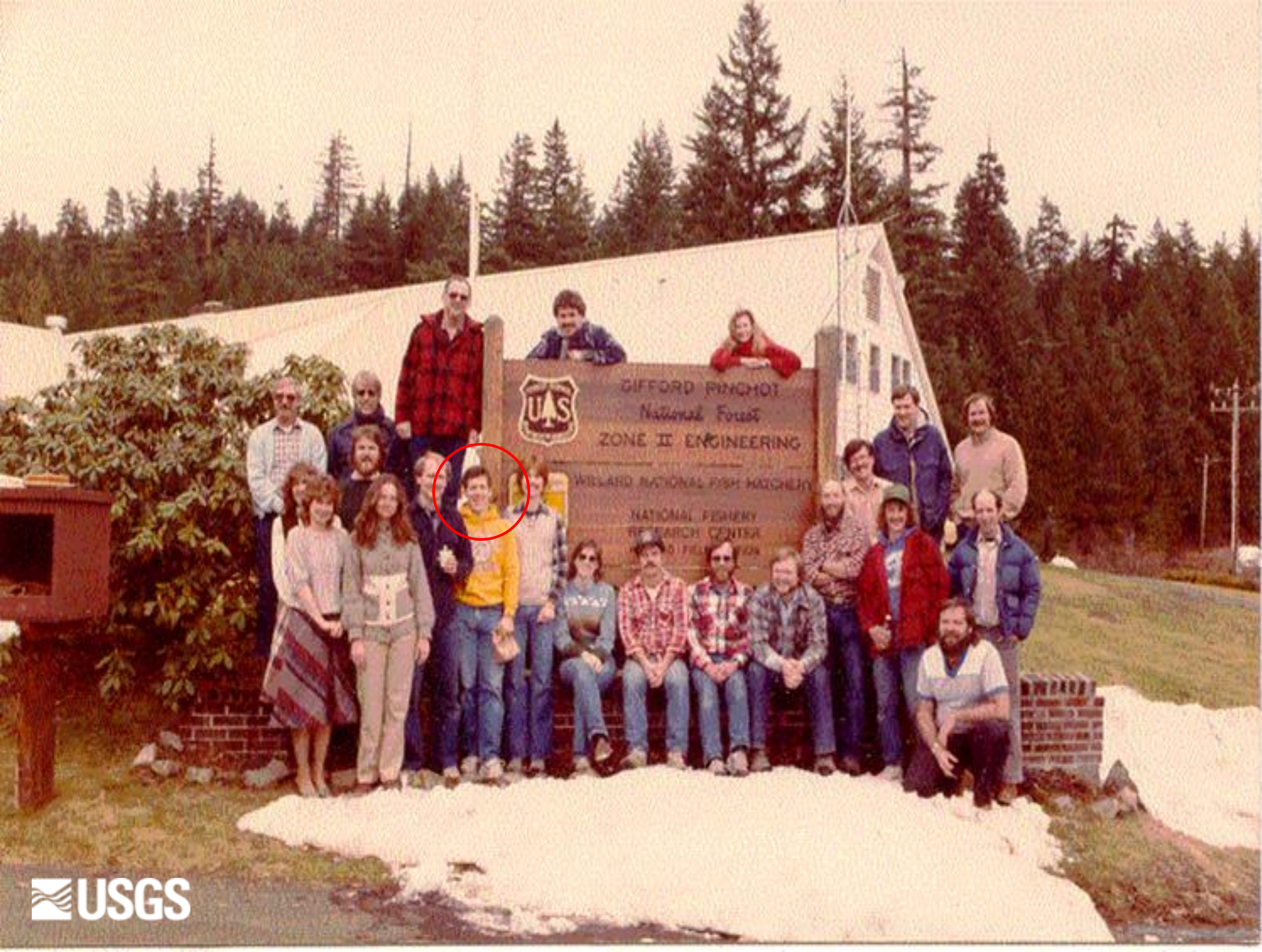


Piscivorous predation dynamics in the Columbia River basin and the need for a more food web-based approach

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Transactions of the American Fisheries Society 120:405-420, 1991

Feeding of Predaceous Fishes on Out-Migrating Juvenile Salmonids in John Day Reservoir, Columbia River

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Transactions of the American Fisheries Society 120:448-458, 1991

Estimated Loss of Juvenile Salmonids to Predation by Northern Squawfish, Walleyes, and Smallmouth Bass in John Day Reservoir, Columbia River

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Abundance and Distribution of Northern Squawfish, Walleyes, and Smallmouth Bass in John Day Reservoir, Columbia River

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Transactions of the American Fisheries Society 120:421-438, 1991

Rates of Consumption of Juvenile Salmonids and Alternative Prey Fish by Northern Squawfish, Walleyes, Smallmouth Bass, and Channel Catfish in John Day Reservoir, Columbia River

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Objectives

- 1. Review some principles of predation**
- 2. Discuss some aspects of predation dynamics in the CRB**
- 3. The missing links: increasing our understanding via food web-based studies**

Some general principles of predation

- 1. Predation is a major force influencing the demographics of prey populations and community structure**
- 2. Predation has direct and indirect effects**
- 3. Cascading effects of predation are particularly important in pelagic communities**
- 4. Predators are, or often can be, selective**

Direct effects of predation

1. Actual killing and eating of prey
2. Occurs between two species
3. Can control prey populations
4. Can extirpate some species
5. Alters absolute and relative abundances and species diversity of prey





Indirect effects of predation

1. Requires an intermediary species to occur
2. Arise because interactions between species are not independent of other species
3. Five basic types:
 - exploitative competition
 - trophic cascades
 - apparent competition
 - indirect mutualism
 - interaction modifications



Cascading trophic interactions: Oneida Lake

WAL → YLP

YLP → Daphnia

As YLP ↓, Daphnia ↑

As Daphnia ↑, algae ↓

∴ water clarity ↑

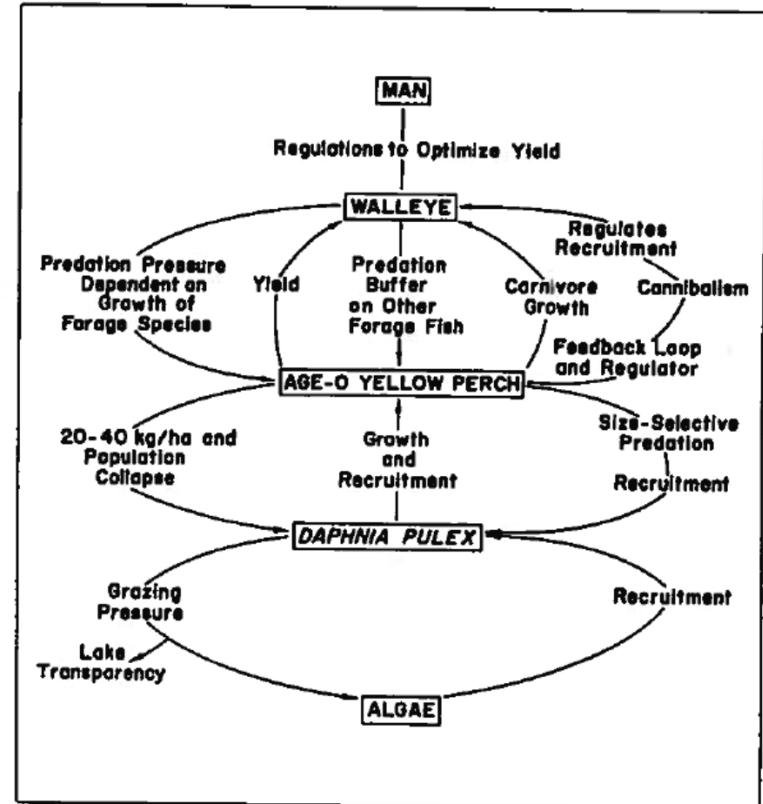


Figure 8.9. Trophic level interactions in the Oneida Lake food chain. Arrows indicate direction of greatest impact.

Selective predation

1. Can select by size, species, or prey condition
2. Alters size or age structure of prey populations
3. Can alter species composition of the community
4. Selecting for “substandard” prey alters the impact of predation



✓ Size

✓ Diseased

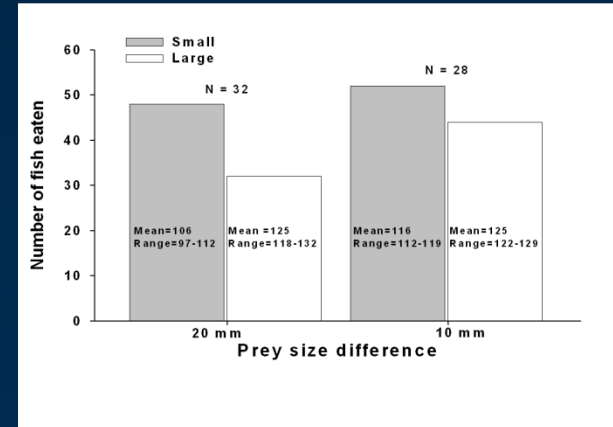
✓ Injured/descaled

✓ Physical stress

✓ Thermal stress

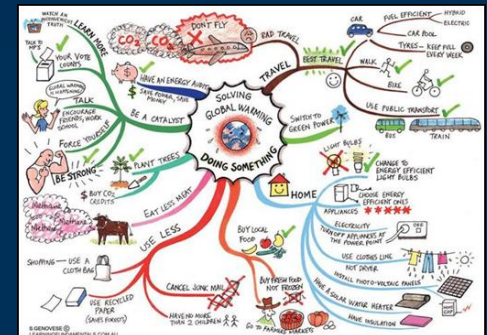
✓ Exposure to high TDG

✓ Live v. dead

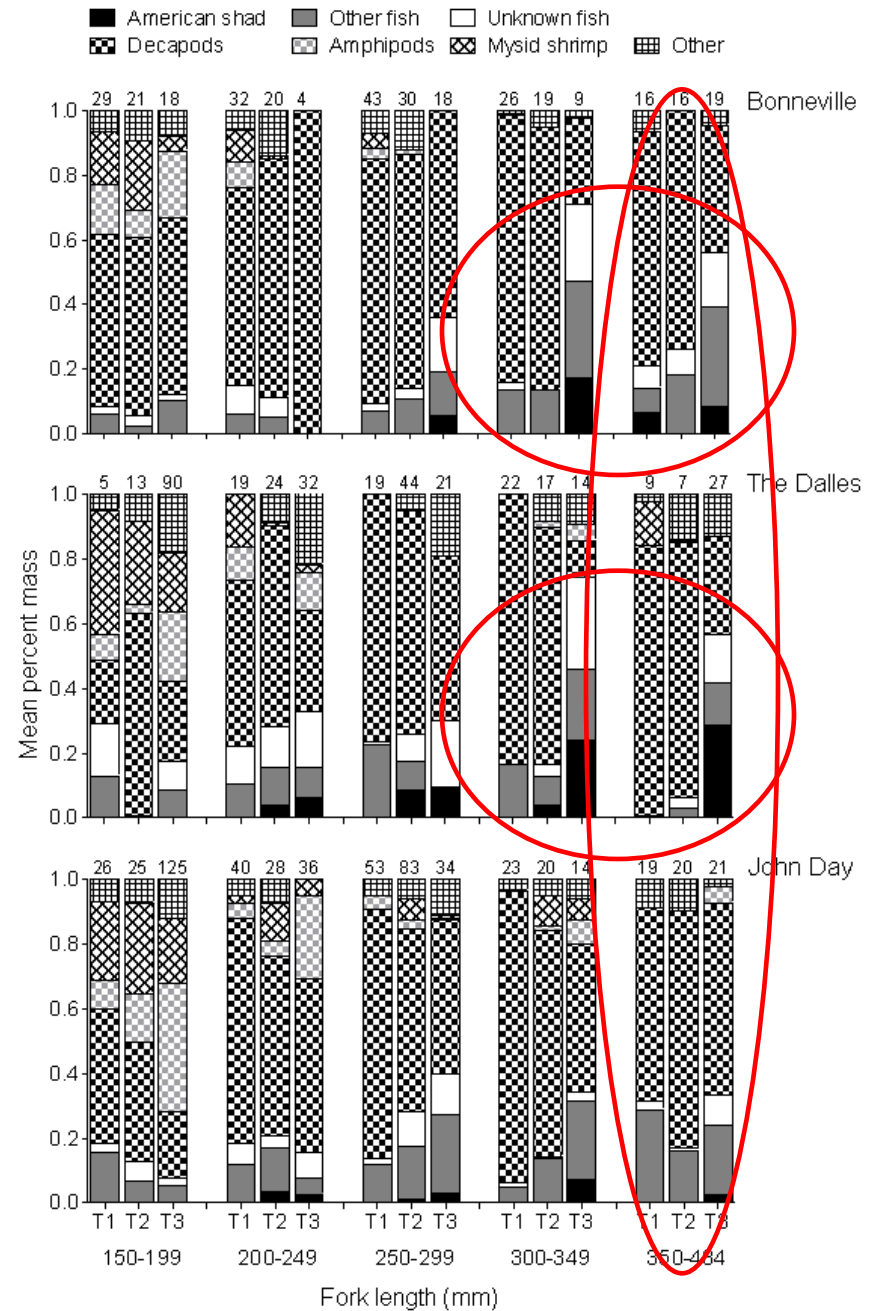


Predation dynamics in the CRB

1. Large number of potential interactions = many species
2. Predation varies seasonally
3. Predation varies spatially
4. Emerging issues: invasive species, climate change

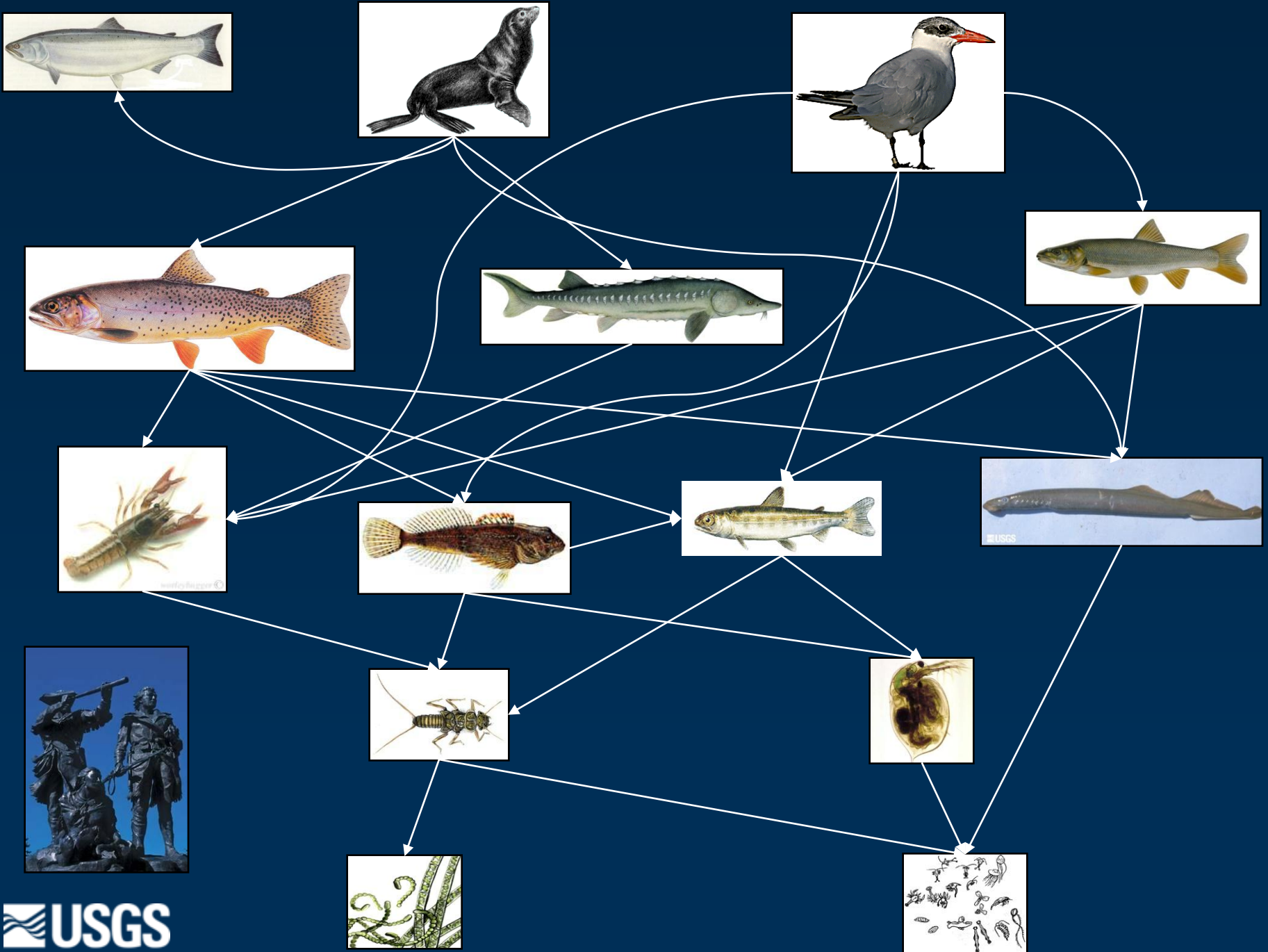
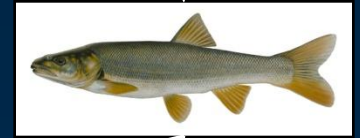


Predation by SMB varies by month and by reservoir



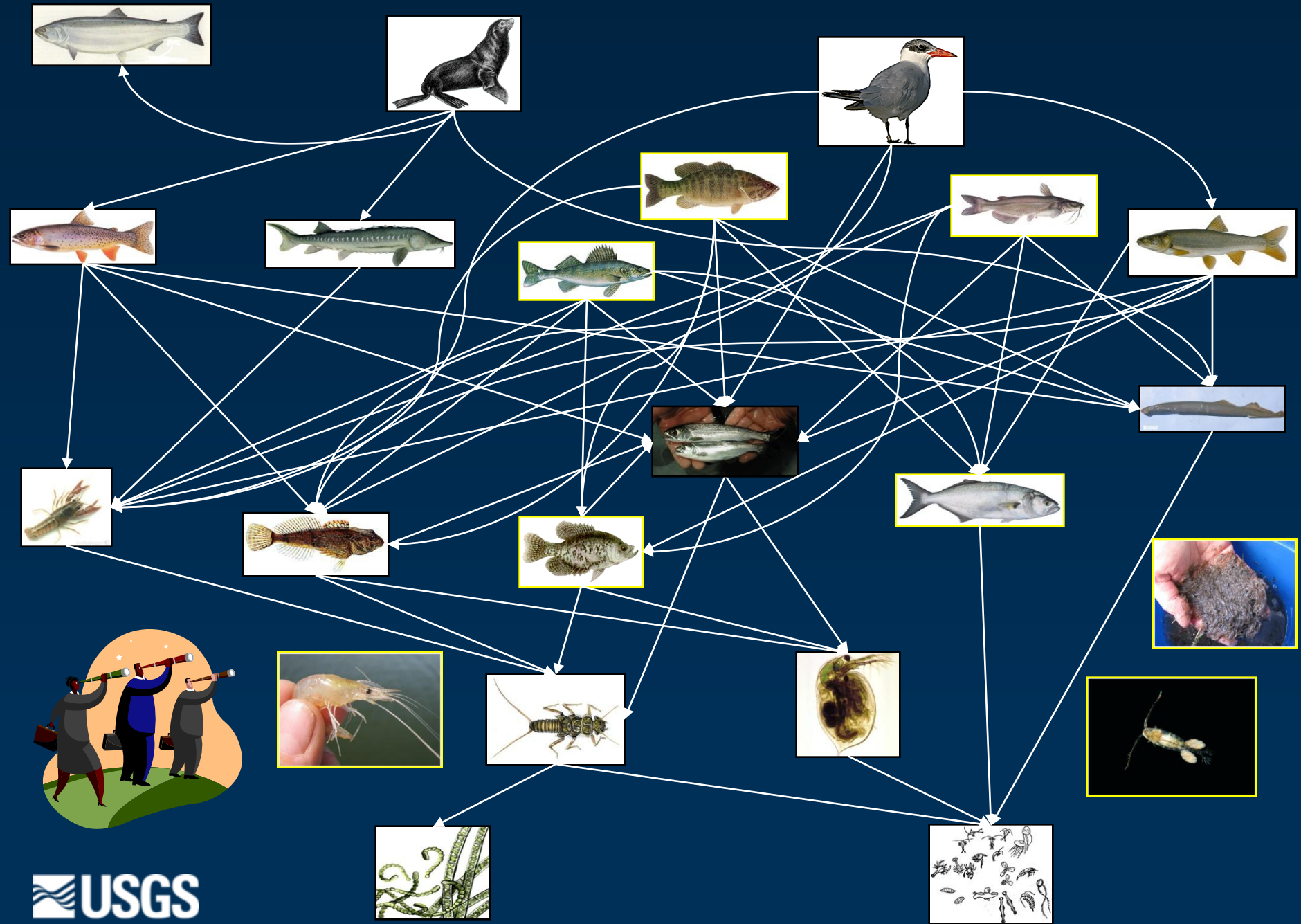
The missing links: implementing food web related research in the CRB











The importance of food web related research in the CRB

- 1. Reveal insights into underlying energy flow, productivity & resilience that single species approaches cannot**
- 2. Key trophic pathways and foods vary over time and space—a broad view is rare**
- 3. Food web structure and processes determine how the ecosystem functions collectively**

Some challenges

1. **A myriad of species—and more coming!?**
2. **Huge spatial scope**
3. **Ephemeral prey sources, e.g., salmonids**
4. **Simultaneous issues: disease, contaminants, climate change**

