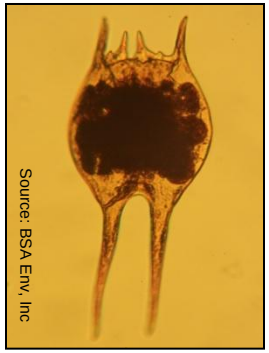
Lower Colorado River Multi-Species Conservation Program

Balancing Resource Needs

Characterization of Zooplankton Communities in Off-Channel Native Fish Habitats


Source: BSA Env, Inc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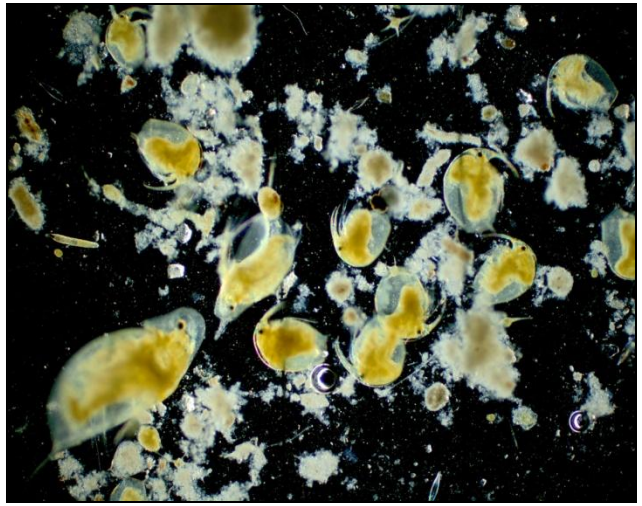


Overview

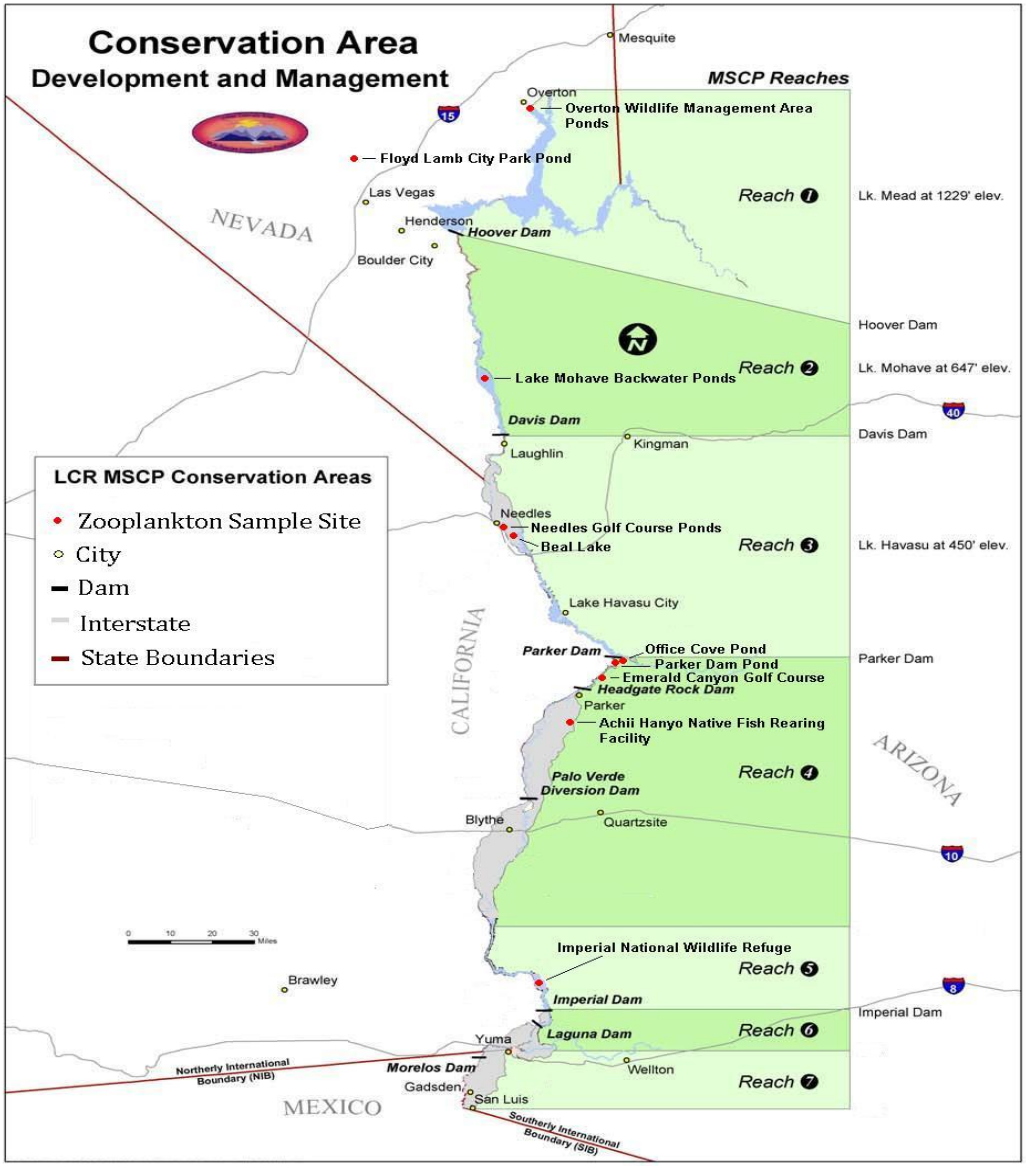
- Purpose
- Methods
- Results
- Discussion
- Limitations
- Ongoing and Future Work
- Future Considerations

Purpose

- Identify seasonal relative abundance and diversity of the zooplankton community in off-channel native fish habitats of the LCR.

- Identify specific zooplankters that maximize RASU survival from past studies and determine the potential for propagating those desired food items using controlled experiments.

- Determine dynamics of 1° productivity in off-channel habitats and what environmental conditions best suit RASU development.


Conservation Area
Development and Management
MSCP Reaches
Mesquite
Overton
Overton Wildlife Management Area Ponds
Floyd Lamb City Park Pond
Las Vegas
Henderson
Hoover Dam
Boulder City
NEVADA
Reach 1
Lk. Mead at 1229' elev.
Hoover Dam
Reach 2
Lk. Mohave at 647' elev.
Lake Mohave Backwater Ponds
Davis Dam
Davis Dam
Laughlin
Kingman
LCR MSCP Conservation Areas
Zooplankton Sample Site
City
Dam
Interstate
State Boundaries
Needles
Needles Golf Course Ponds
Beal Lake
Reach 3
Lk. Havasu at 450' elev.
Lake Havasu City
CALIFORNIA
Parker Dam
Office Cove Pond
Parker Dam Pond
Emerald Canyon Golf Course
Headgate Rock Dam
Parker Dam
Parker
Achii Hanyo Native Fish Rearing Facility
ARIZONA
Palo Verde Diversion Dam
Reach 4
Blythe
Quartzsite
Imperial National Wildlife Refuge
Reach 5
Brawley
Imperial Dam
Imperial Dam
Laguna Dam
Reach 6
Yuma
Wellton
Northerly International Boundary (NIB)
Morelos Dam
Reach 7
Gadsden
San Luis
MEXICO
Southerly International Boundary (SIB)

Methods

- Wisconsin-style plankton net (64µm).
- Sample transferred to 250mL amber bottle and preserved in Lugol's iodine solution (0.3mL:100mL).
- Water quality profiles (Surface-every 1m-Bottom).
- Samples analyzed by BSA Environmental Services, Inc.

Results

- Seasonal fluctuations observed.
- Mean zooplankton biomass (µg d.w./L) variable.
- Floyd Lamb City Park largest sized zooplankton community.
- Zooplankton groups dominated different sites.

Rotifer

Keratella spp: 0.15 - 0.25 mm

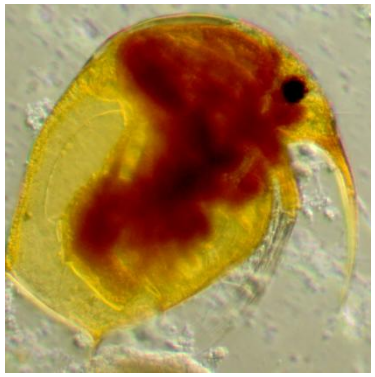
Copepod

Cyclopoid spp: 0.2 - 2 mm

Daphnia (Cladoceran)

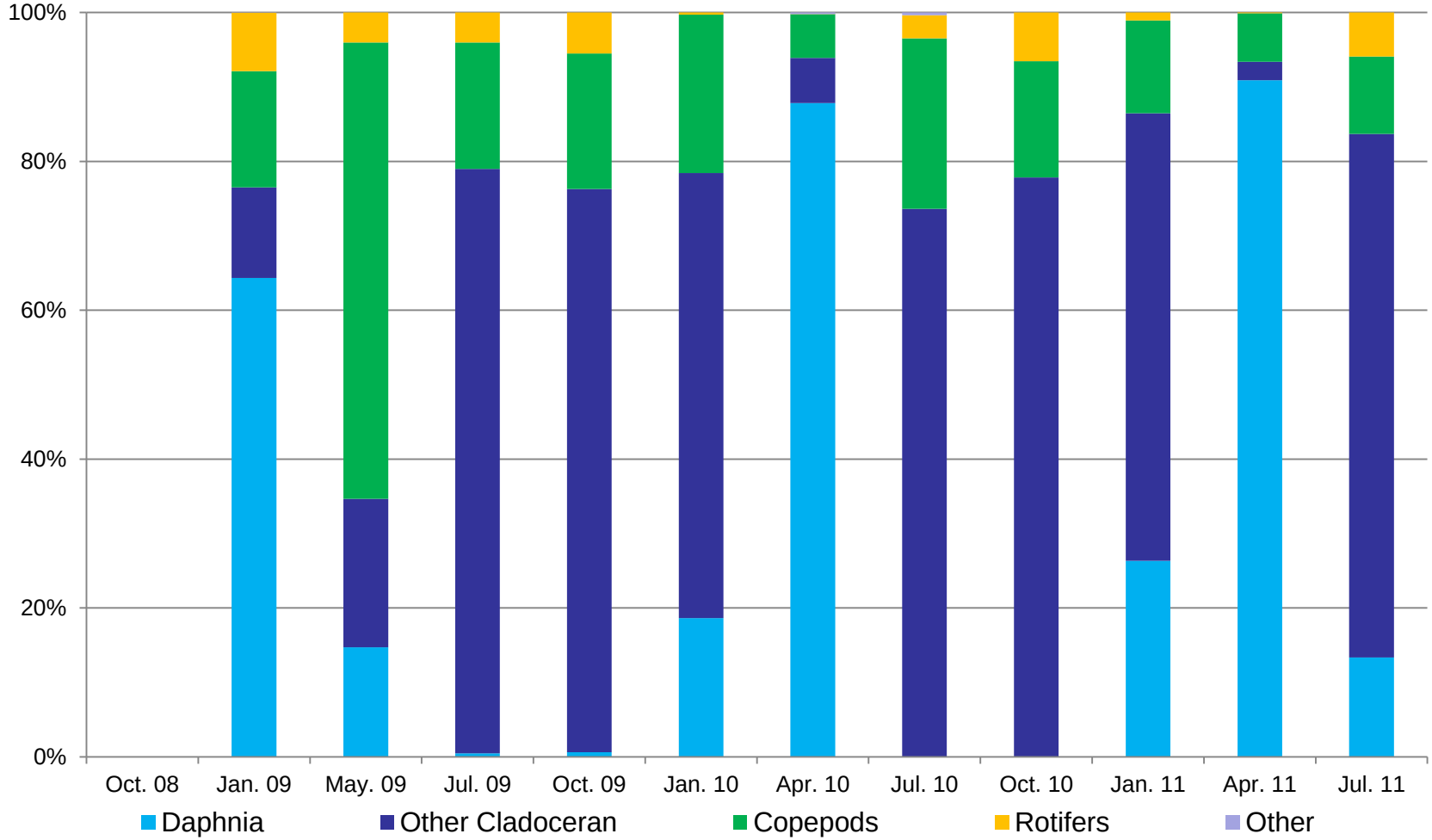
Daphnia spp: 2 - 3 mm

Other Cladoceran



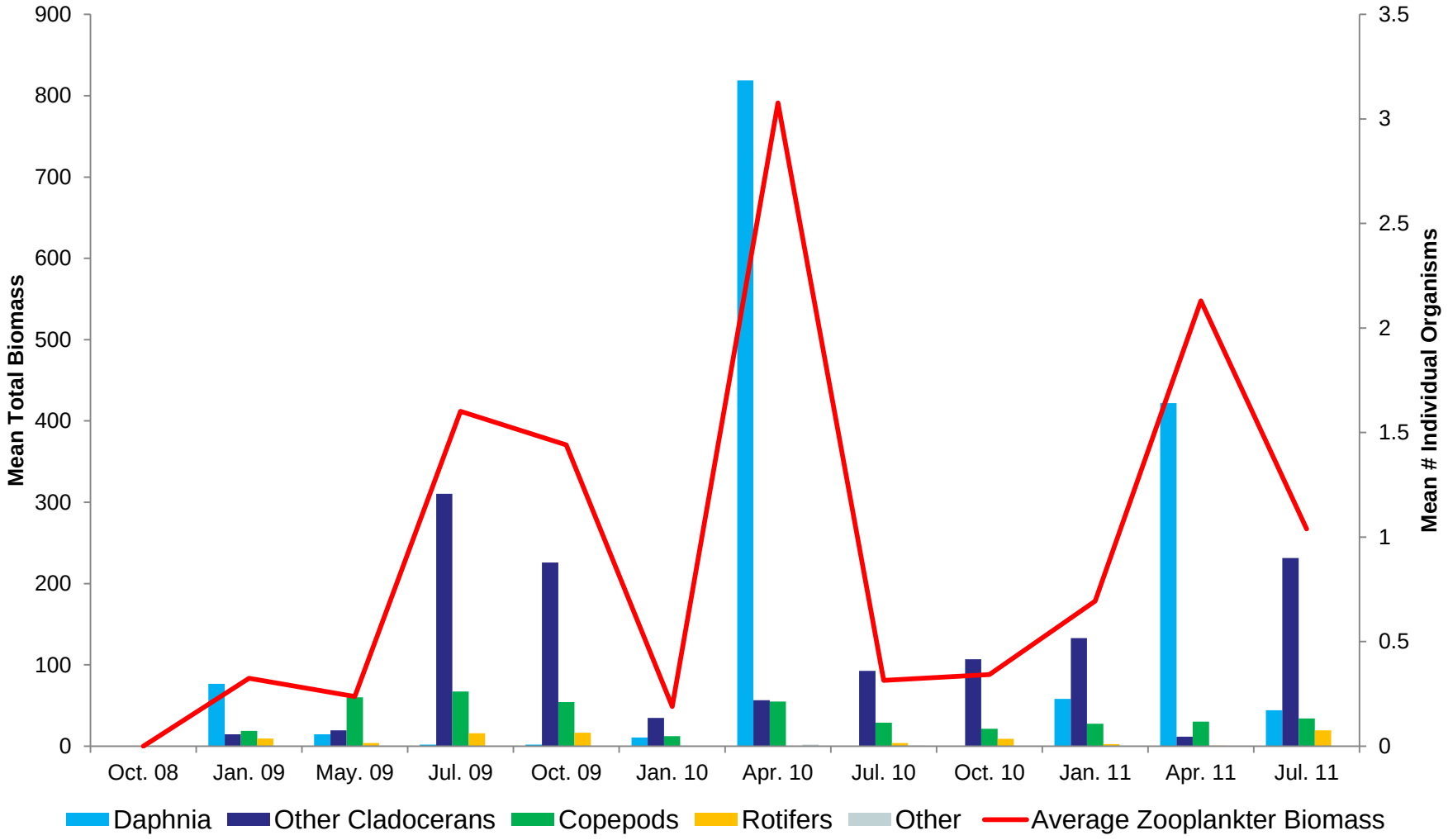
Bosmina spp: <0.3 - 0.5 mm

Floyd Lamb City Park

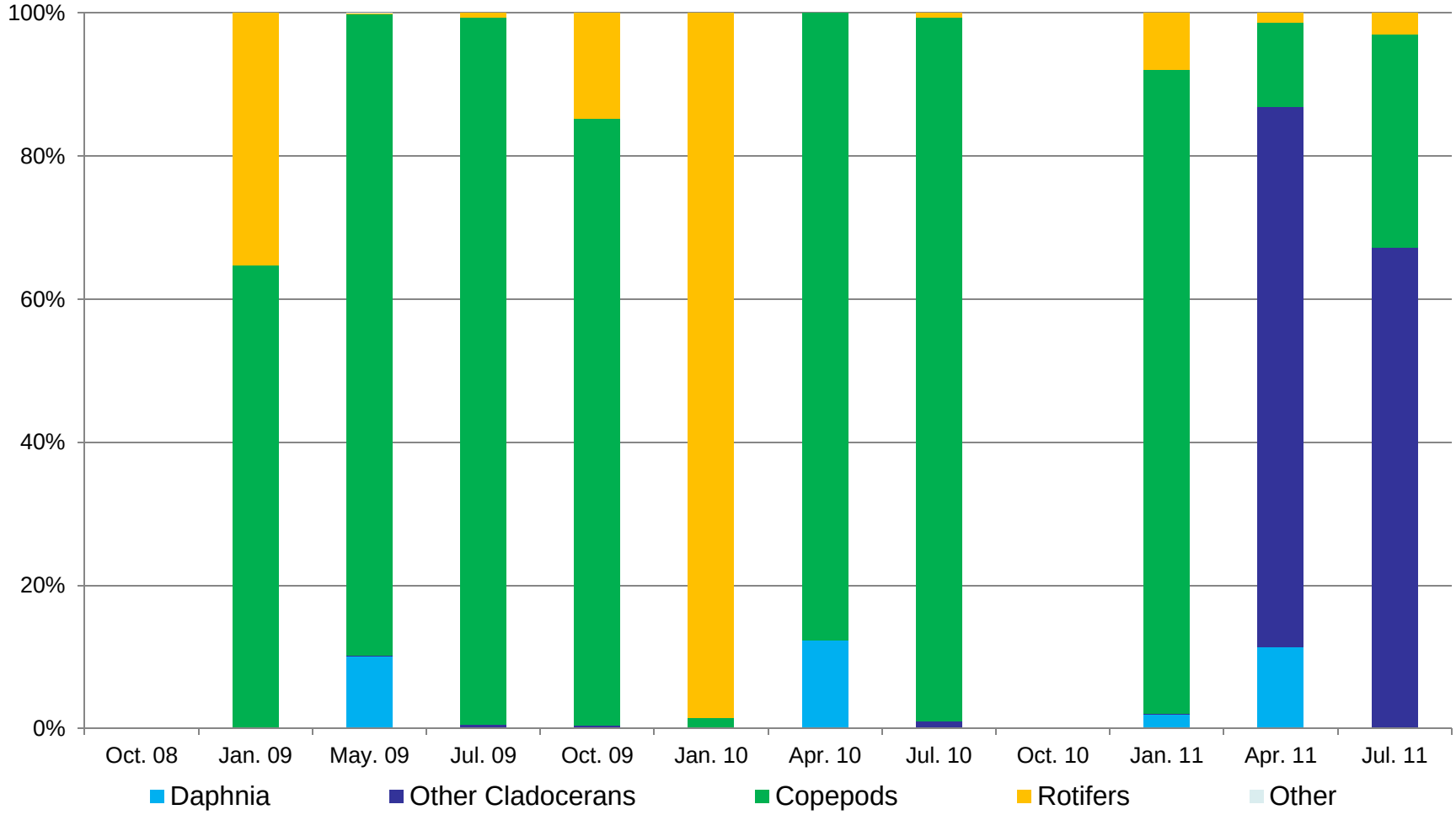


Floyd Lamb City Park

Zooplankton Biomass (ug/L)

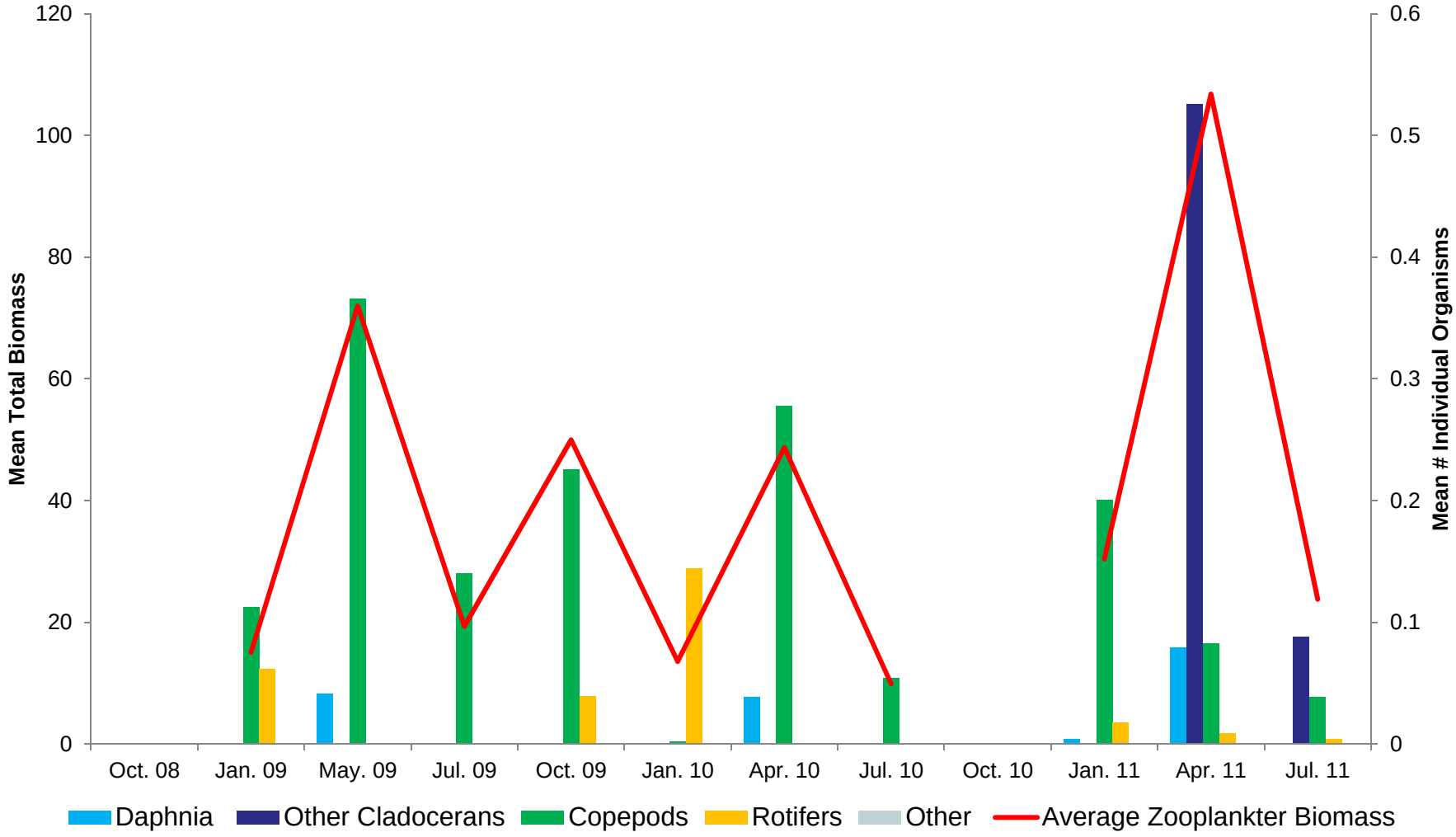


Yuma Cove Backwater (Lake Mohave)



Yuma Cove Backwater (Lake Mohave)

Zooplankton Biomass (ug/L)



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BUREAU OF RECLAMATION

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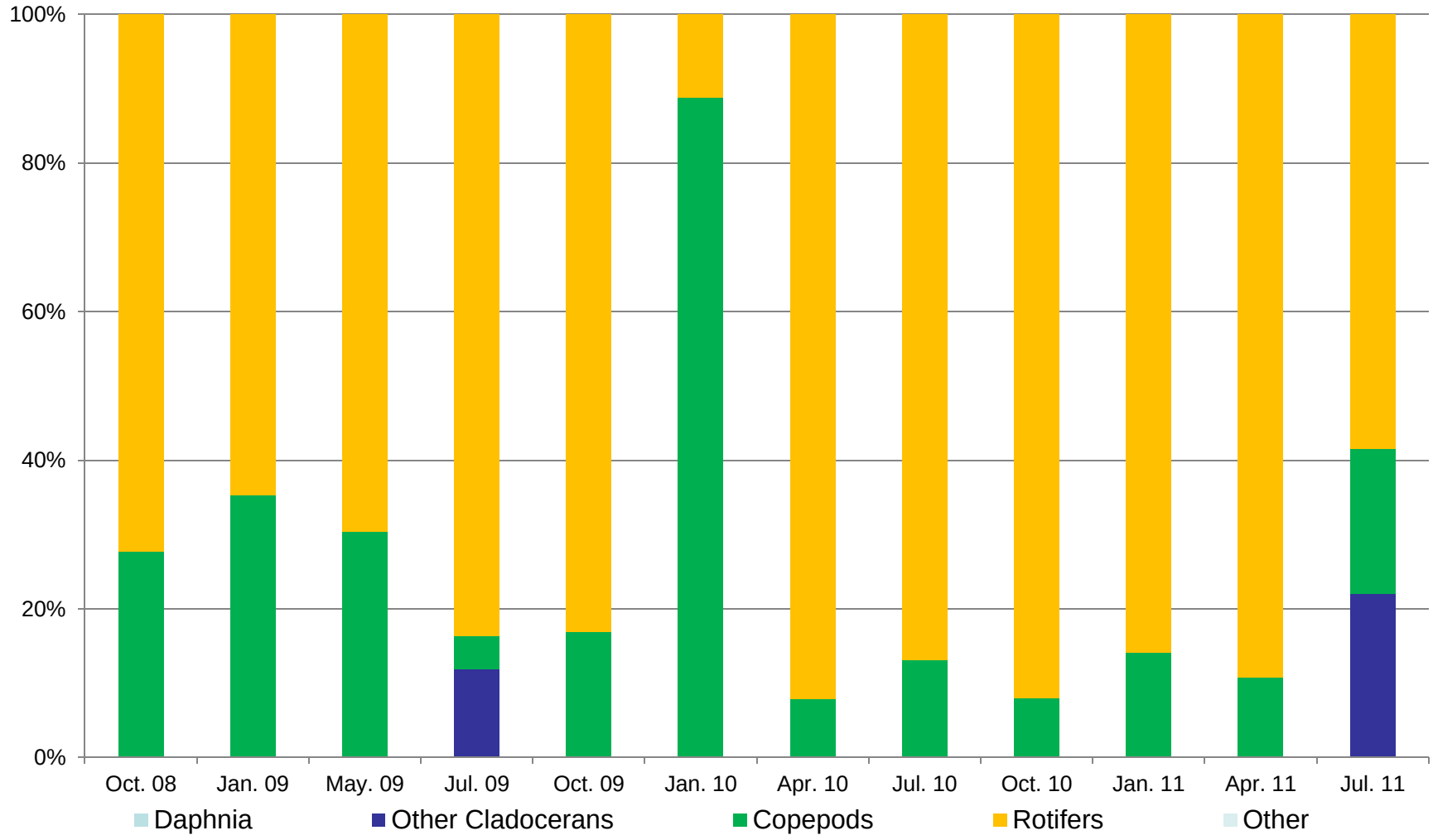
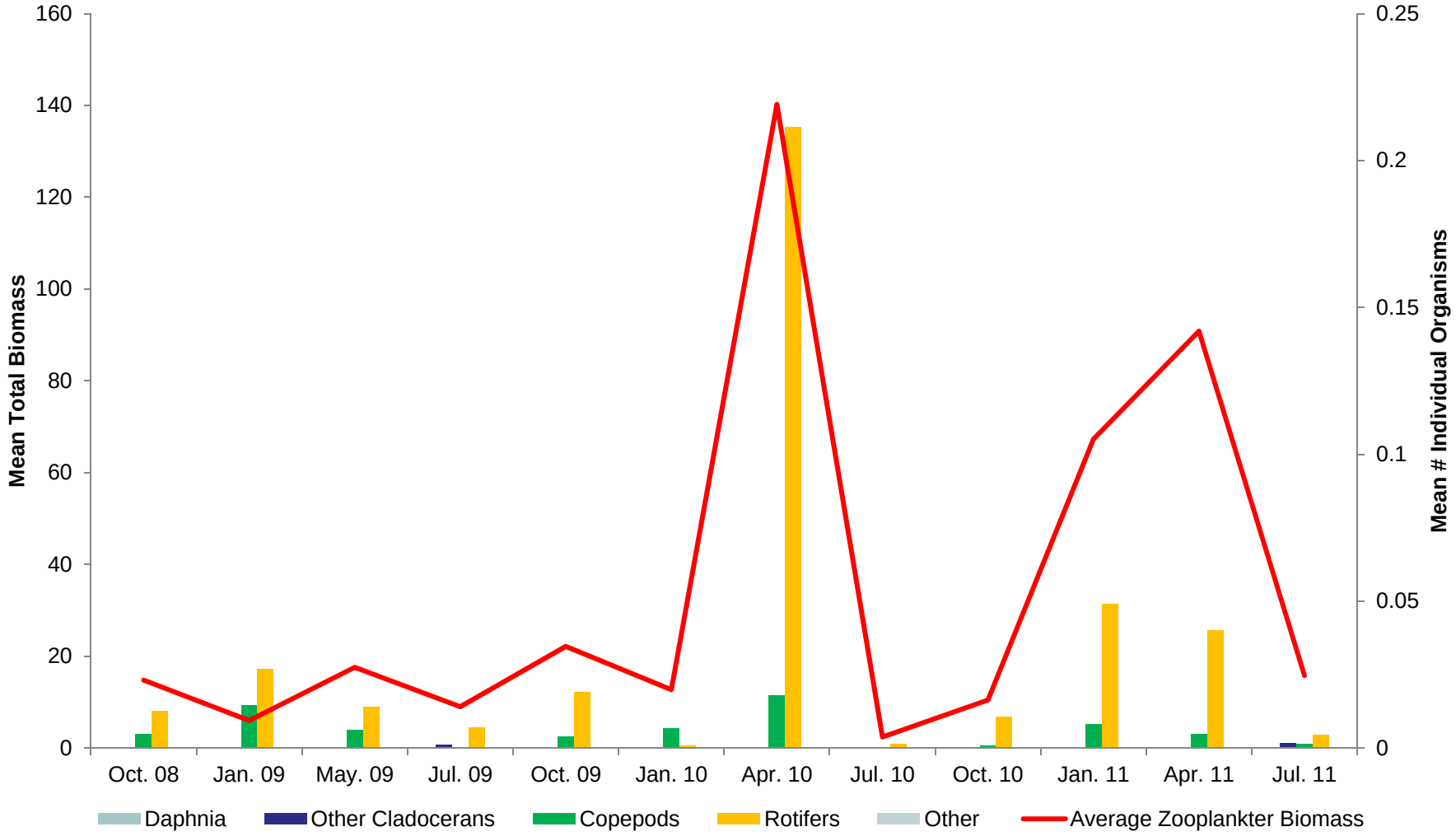
Office Cove


100%
80%
60%
40%
20%
0%
Oct. 08
Jan. 09
May. 09
Jul. 09
Oct. 09
Jan. 10
Apr. 10
Jul. 10
Oct. 10
Jan. 11
Apr. 11
Jul. 11
Daphnia
Other Cladocerans
Copepods
Rotifers
Other

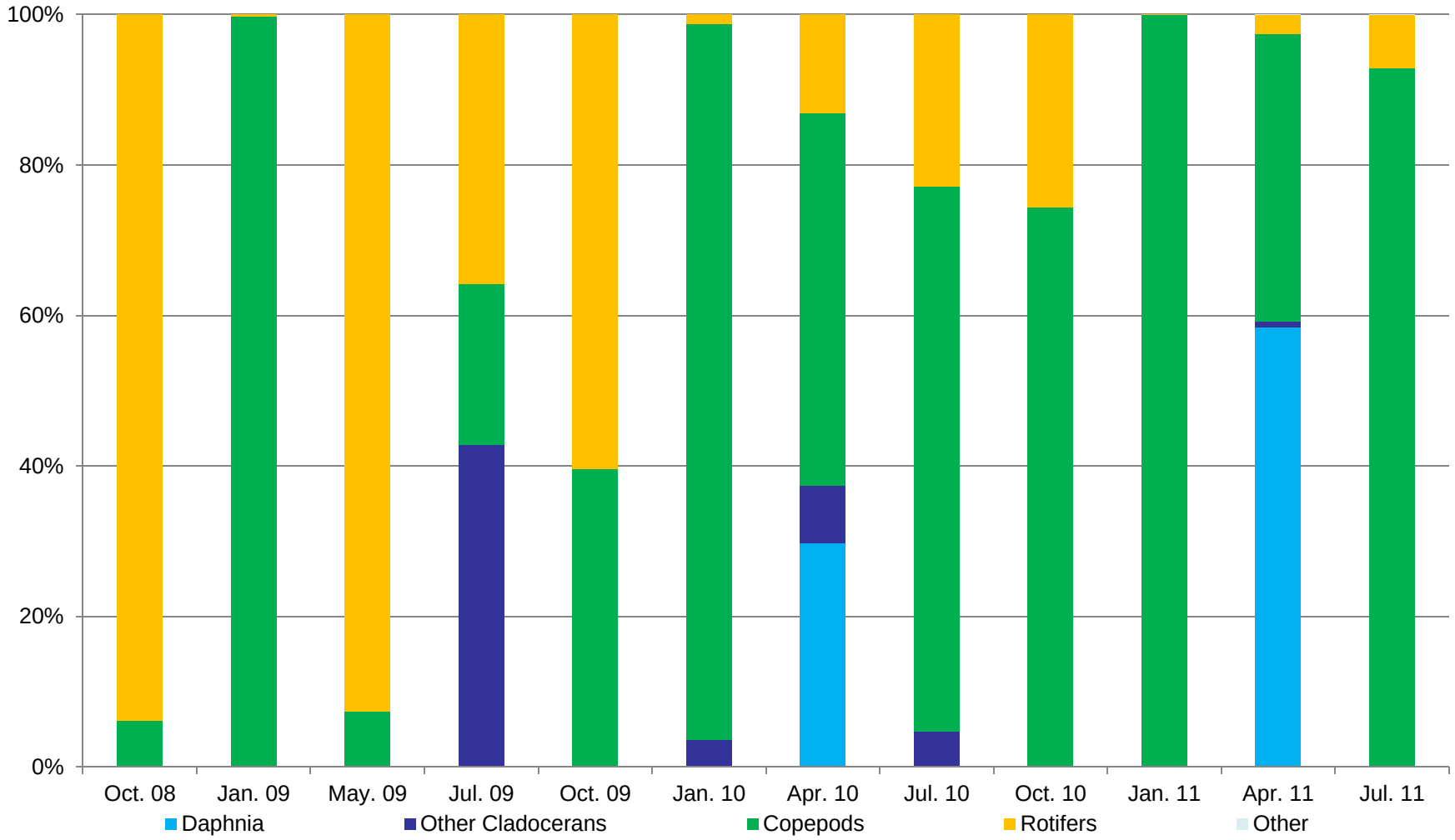
Office Cove

Zooplankton Biomass (ug/L)



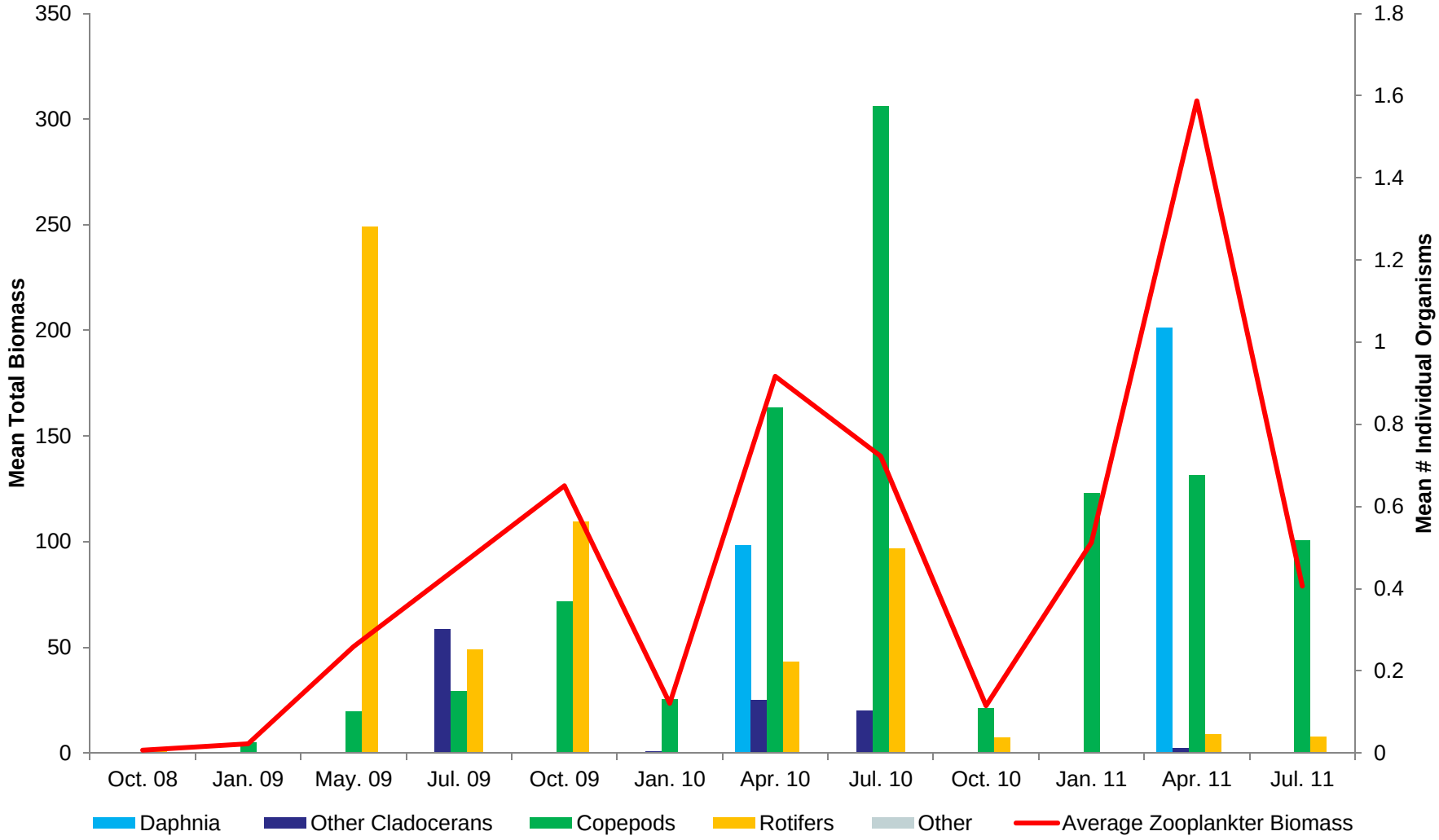
Balancing Resource Needs

Achii Hanyo (A1)



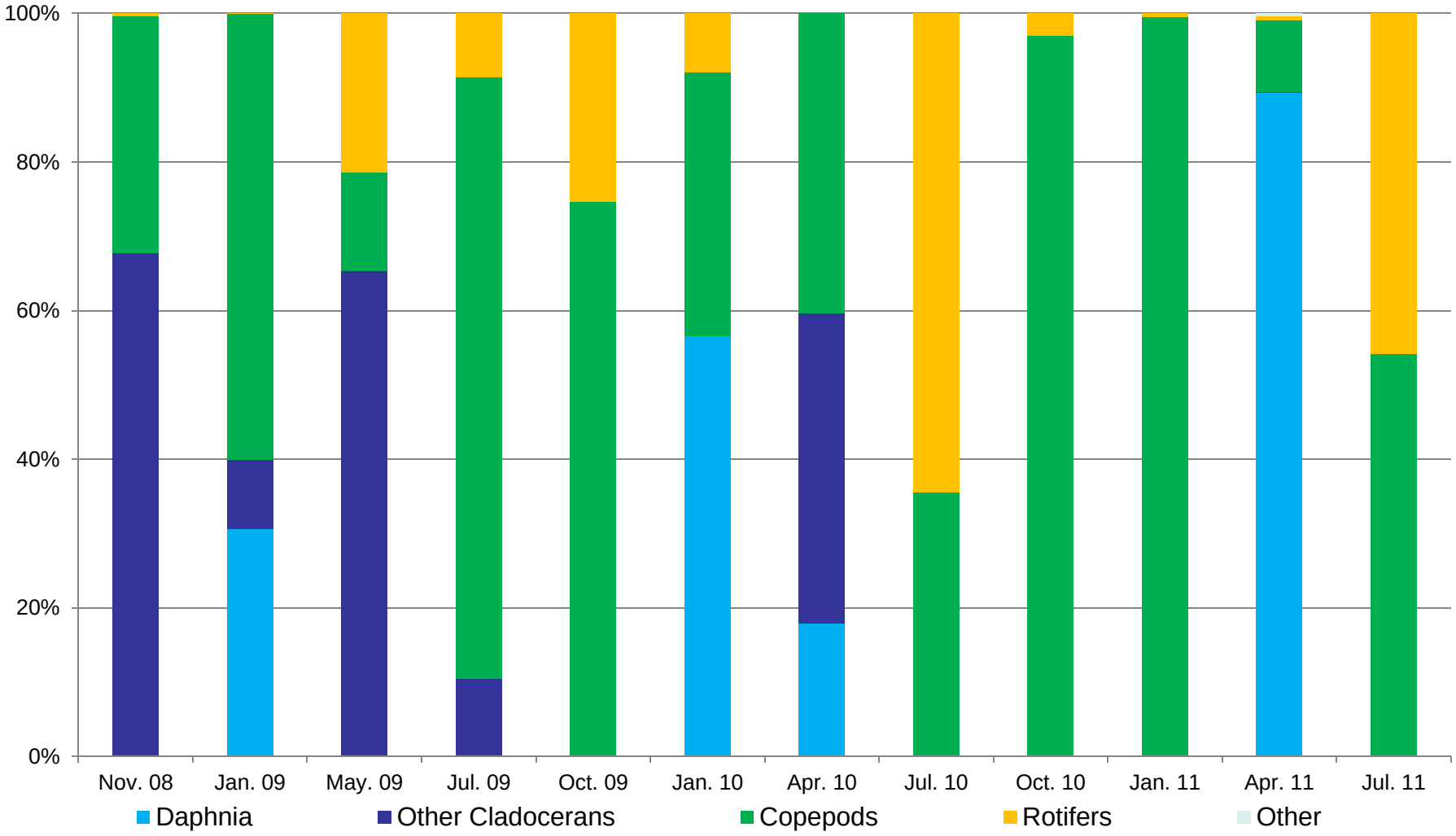
Achii Hanyo (A1)

Zooplankton Biomass (ug/L)



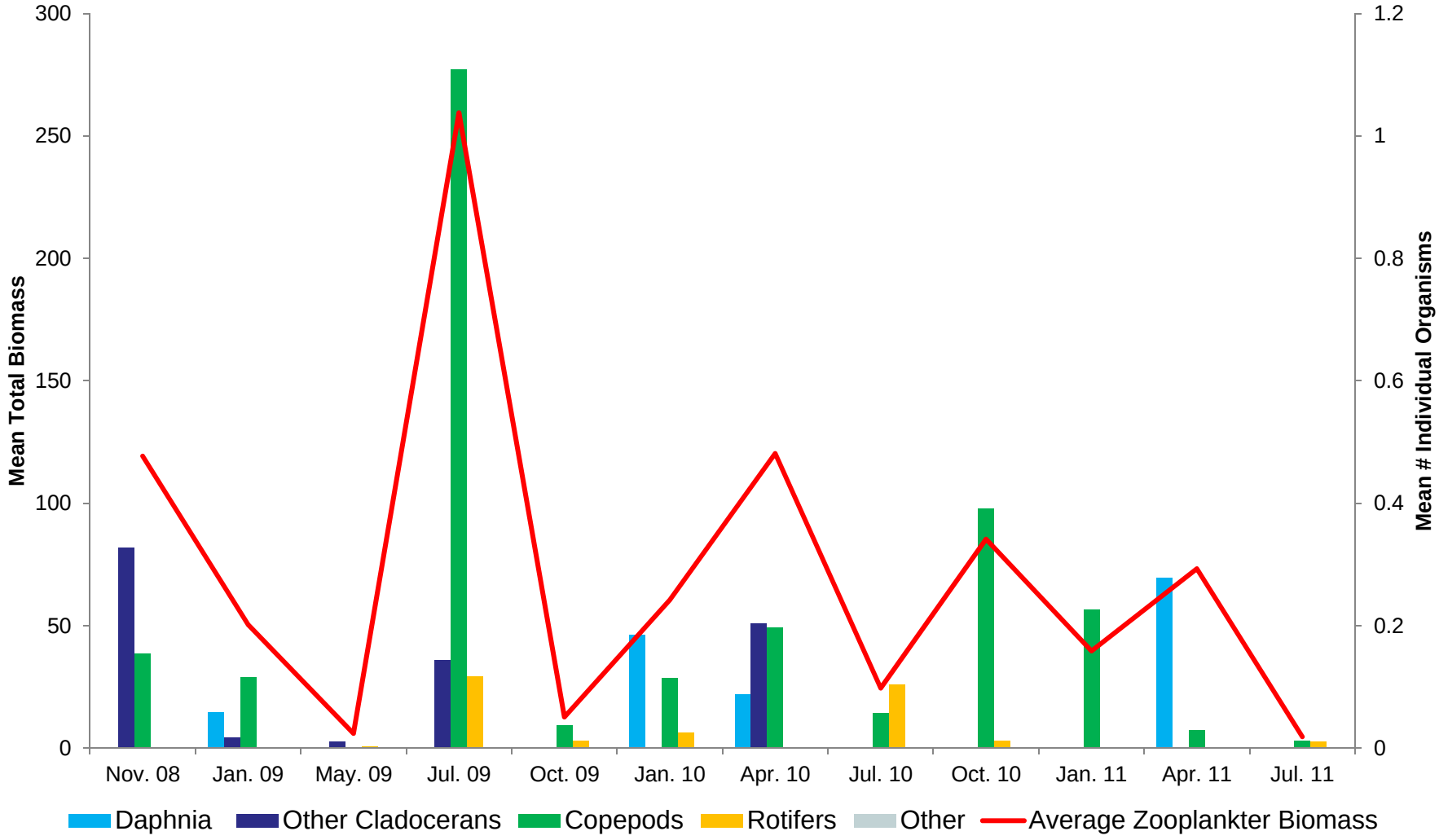
Balancing Resource Needs

Imperial NWR (I1)



Imperial NWR (I1)

Zooplankton Biomass (ug/L)



Balancing Resource Needs

Discussion

- Three years of quarterly sampling show highly variable trends in zooplankton composition across sites.

- Seasonal spikes in larger zooplankters observed in April sampling events.

- Floyd Lamb highly productive compared to all other sites for cladocerans.

Discussion

- Larval RASU showed positive selection for *Bosmina* in Yuma Cove Backwater (L. Mohave) and negative selection for copepods in the 1980s (Marsh & Langhorst 1988).

- Recent trend shows copepod dominance, although a cyclical shift may be occurring in this backwater to cladocerans.
  - *Bosmina* not detected in these samples, mainly non-*Daphnia* cladocerans.

Discussion

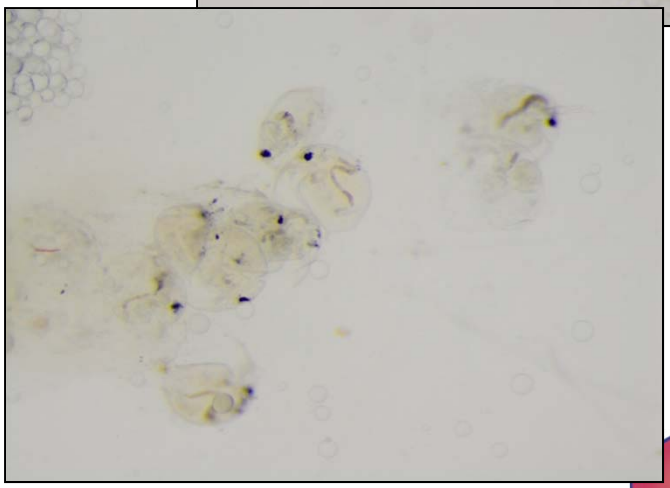
- Miller & Evans (1965) found RASU may feed primarily by taste owing to dominant gustatory centers and small size of the optic lobes.

- Zaret & Kerfoot (1975) argued the conspicuous eye of *Bosmina* cause fish to feed based on visual cues.

A.

B.

C.



Limitations

- Single tow from each pond not adequate in representation of the zooplankton community.
- Hydrology a limiting factor when attempting to mimic community at Floyd Lamb?
- Effects of fertilization needs more study.
- Role of phytoplankton community interactions not known at present.
- Environmental variability in 1º productivity regardless of management interventions must be taken into account.

Ongoing and Future Work

- Evaluation of enhancement of food resources in five Lake Mohave backwaters (9 Mile area) using experimental fertilization techniques.
  - Five experimental backwaters now sampled monthly.
    - N9Mile – Willow – NV Egg – NV Larvae – Control
- Additional sample sites added:
  - Beal Lake (3) -- Beal Slough (2) -- Big Bend Conservation Area (1) -- Cibola High Levee (1).
- Concurrent phytoplankton sampling has begun at several sites.

Future Considerations

1. Potential to enhance off-channel habitats with desirable zooplankton species for the enhancement of RASU grow-out phases?

2. Reduce number of sampling sites and intensify sampling effort at more productive/diverse sites?

3. Revisit L. Mohave spawning area zooplankton density assessment conducted by Golden & Holden (2001)?

References

Golden, M.E., and P.B. Holden. 2001. Comparison of water quality, zooplankton density, and cover in razorback sucker (*Xyrauchen texanus* [Abbott] spawning areas of Lake Mead and Lake Mohave. Prepared for the Department of Resources, Southern Nevada Water Authority. PR-749-2.

Marsh, P.C. 1987. Digestive tract contents of adult razorback suckers in Lake Mohave, Arizona-Nevada. *Trans. Am. Fish. Soc.* 116: 117-119.

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Miller, R.J., and H.E. Evans. 1965. External morphology of the brain and lips in catostomid fishes. *Copeia.* 1965 (4): 467-487.

Zaret, T.M., and W.C. Kerfoot. 1975. Fish predation on *Bosmina longirostris*: Body-size selection *vs.* visibility selection. *Ecology.* 56: 232-237.