The Grand Beyond: Aquatic Foodbase of the Upper Colorado River Basin

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Introduction:

The Colorado River through Grand Canyon has low aquatic insect diversity:

- How does this compare to upstream river reaches?
- How do aquatic insect communities downstream of Flaming Gorge Dam and Glen Canyon Dam compare?

Methods:

How does sampling emergence with light traps compare to traditional benthic sampling?

- We collaborated with citizen scientists to collect samples of aquatic insects with light traps, allowing for unprecedented spatial and temporal coverage across a remote and rugged riverscape.
- Sampling emergent insects provides high quality specimens that can be identified to a fine taxonomic resolution and offers insight into the life cycles of aquatic insects.

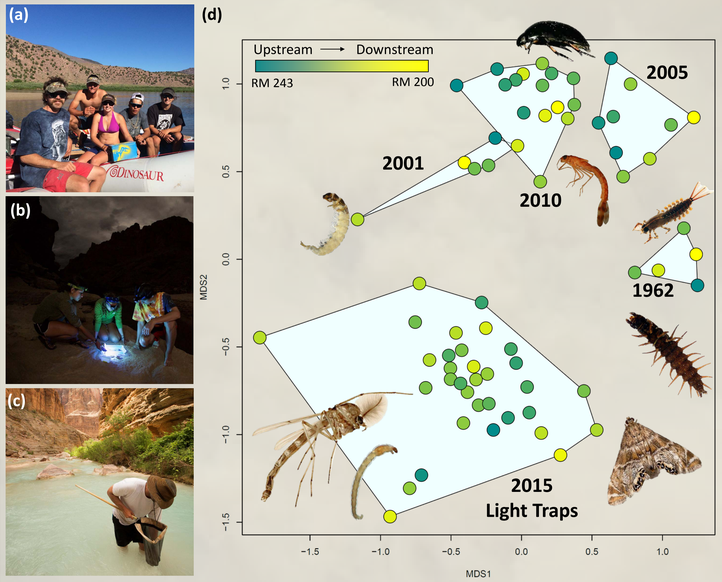

Fig. 1. **(a,b) Light traps sample the adult lifestages of aquatic insects, which differs from (c) traditional sampling methods that target juvenile life stages. (d) We compared species composition among benthic samples collected in Dinosaur National Monument (Miller et al. 2013) to light trap samples collected in the same reach in 2015. Species composition of samples varied with sampling year and sampling method.**

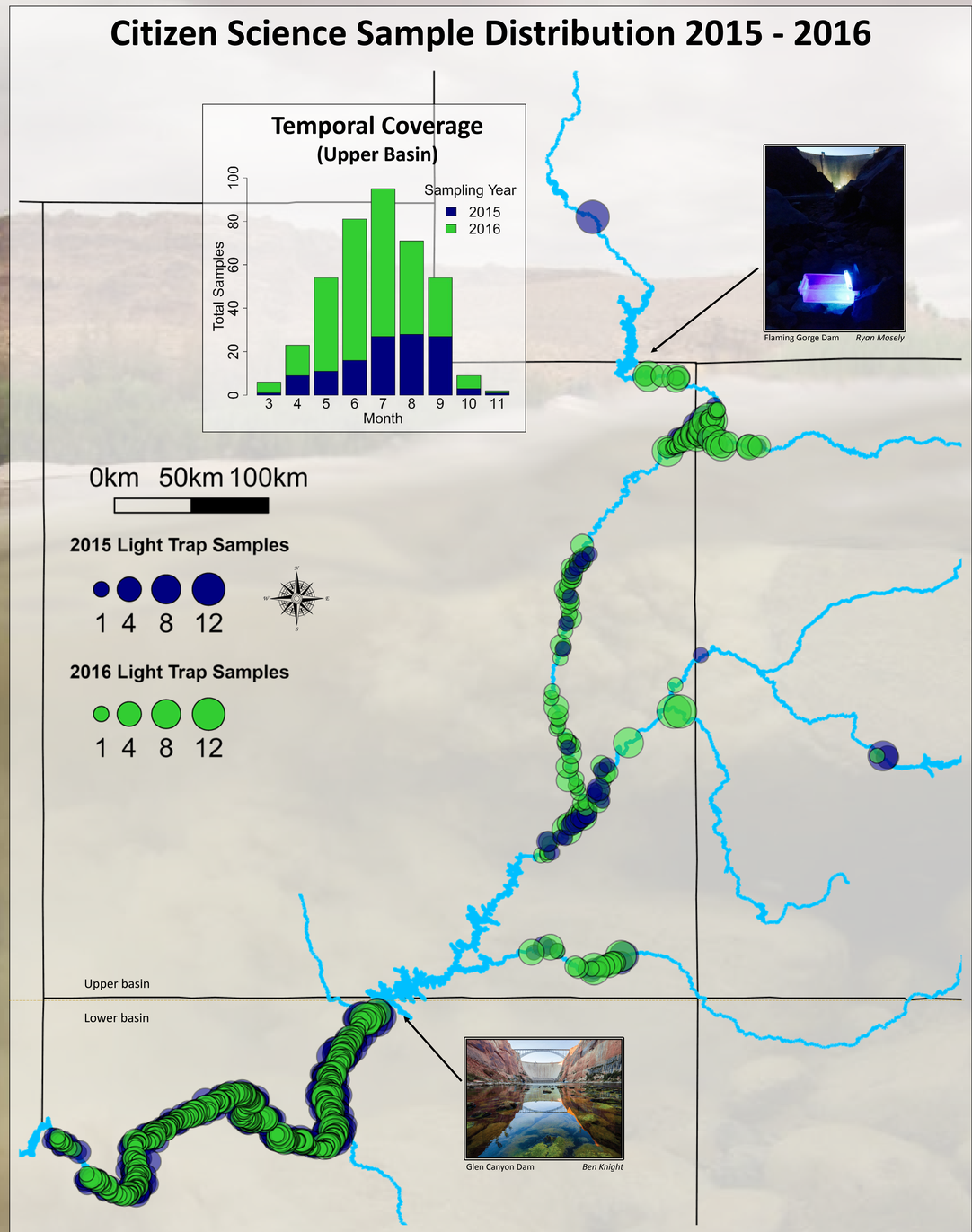

Fig. 2. **Citizen scientists collected 395 light trap samples from the upper Colorado River basin from 2015 to 2016, greatly expanding on a pre-existing monitoring program in the lower Colorado River basin (Kennedy et. al. 2016).**

References:

Kennedy et. al. 2016. Flow Management for Hydropower Extirpates Aquatic Insects, Undermining River Food Webs. BioScience 66 (7): 561-575.

Miller et. al. 2013. Contemporary and historic comparisons of aquatic macroinvertebrates in the regulated Green River and unregulated Yampa River within Dinosaur National Monument. Official report to NPS.

Diversity and abundance of aquatic insects in the upper basin is far greater than in the lower basin.

Results:

Upper vs lower basin:

- We identified 73 aquatic taxa in the upper basin and 28 aquatic taxa in the lower basin in 2015 samples
- The upper basin averaged 1,295 aquatic insects per sample, whereas the lower basin averaged 224 aquatic insects per sample.
- Upper basin had a greater mean Shannon diversity index (H = 0.99) than the lower basin (H = 0.66)

**preliminary results, 2015 data*

Green vs Colorado River:

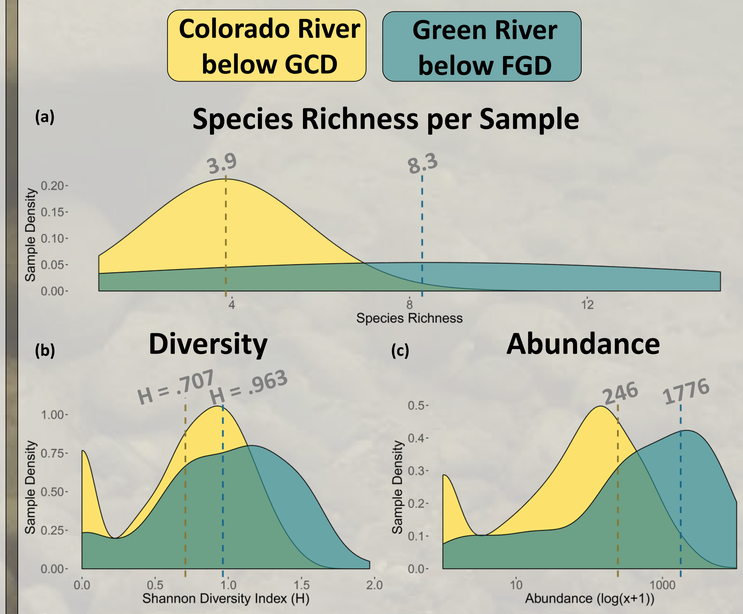

Fig. 3. **Comparison of light trap samples collected on the Green River downstream of Flaming Gorge Dam *(n* = 90*)* and the Colorado River downstream of Glen Canyon Dam (*n* = 1006) from May – November 2015. Upper basin samples had greater (a) species richness, (b) abundance, and (c) diversity (Shannon diversity index) per sample than samples collected in the lower basin.**