

***The Impact of Fluctuating Flows on
Mainstem Colorado Aquatic Invertebrates***
By Sabra Purdy

It is well documented that the presence of the Glen Canyon Dam has altered the mainstem Colorado in numerous physical and ecological ways. Pomeroy et. al. (2000) believed that the main contributor to the low abundance and diversity of aquatic invertebrates in the Grand Canyon was the loss of allochthonous carbon inputs due to the dam. This loss has certainly influenced the ecology of the river downstream of the Paria and Little Colorado rivers, where water clarity is not sufficient to grow algae and aquatic macrophytes. However, it is my contention that the largest contributor to the dearth of invertebrates in the mainstem is due more to the dramatic daily fluctuations in water level associated with hydropower operations at Glen Canyon Dam. Throughout our trip, we witnessed daily changes in water level anywhere from 3 to 10 feet, leaving yards of likely looking habitat high above the water line for hours.

The virtual absence of high volume floods over the past 40 years has created an opportunity for marsh-type vegetation to take hold along beaches and backwaters. This habitat was not historically present, but is now prevalent throughout the canyon. This new marsh habitat would be excellent for hosting aquatic invertebrates as it provides refuge from predators, abundant food sources, protects invertebrates from fast current and is warmer than the main channel due to the shallower water. However, these marshes are left high and dry on a daily basis, and no aquatic invertebrates were found in them or in the backwaters when they were sampled. If water levels did not fluctuate so greatly the marsh habitat would likely be colonized by a chewer/shredder dominated assemblage feeding on the emergent macrophytes, and detritus that collects in the backwaters, as well as primary predators.

It is unlikely that the mainstem Colorado is completely devoid of invertebrate life, but it is very difficult to sample the permanently wetted areas as they are in the deeper parts of the channel and the water is generally flowing at a fairly high velocity there. The cobble habitat associated with tributaries has the greatest potential for hosting invertebrates because it has solid substrate with plenty of refugia from high water velocities and is directly linked with the tributaries where much higher abundance and

diversity of invertebrates exist. Backwaters provide good habitat for oligochaetes and other detritivores, however much of the backwater habitat is exposed each day, decreasing the availability of these areas for invertebrate colonization.

We took gut contents from a Carp (*Cyprinus carpio*) caught at Poncho's Kitchen (RM 136.5), just below Deer Creek Falls and found an oligochaetes, a very large *Gammarus lacustris*, and a Blephariceridae (Diptera) larva. We had not seen *G. lacustris* anywhere on the mainstem or in the tributaries at this point, and it was a very large specimen. Our guides told us that in the 1980s you had to be careful when filtering drinking water because the river was so full of *Gammarus* that scooping buckets out to filter would also gather large loads of shrimp. This is no longer the case on the river, and it is unclear whether the carp found that *Gammarus* in a tributary or in the mainstem. Blephariceridae larva, which prefer to cling to large boulders or submerged driftwood with suction cups along its abdomen, were not mentioned specifically in the literature that we assembled for species lists. Although we did not exhaust every possible resource for invertebrate species in the Colorado and its tributaries, it is possible that Blephariceridae have not been previously documented in the Grand Canyon.

In all, the mainstem of the Colorado is a highly disturbed ecosystem due to the presence of Glen Canyon Dam and the highly variable flows that erode sandbars and desiccate edge habitat on a daily basis. The lack of insect fauna found in the mainstem indicates the crucial role that the tributaries play in providing food to fish in the mainstem. Little is known about what food sources fish are utilizing, particularly the endangered Humpback Chub, whose numbers are steadily declining, despite hundreds of millions of dollars spent on stabilizing their numbers. Perhaps the decimation of the aquatic food base in the Grand Canyon has influenced the decline of the Chub. If the river was managed for steady flows, it is likely that insects would colonize the marsh, backwater, and cobble habitats that are unusable now and the food base could support greater numbers of fish, particularly the natives that are in such precipitous decline.

References

Pomeroy, K.E., J.P. Shannon, and D.W. Blinn. 2000. Leaf pack processing in an arid regulated river; Colorado River, Arizona. *Hydrobiologia* 434: 93-199.