

**Mini-Estuary Experiment Workshop  
Summary  
May 1-2, 2007  
Mexicali, Baja California, México**

**Introduction**

The Colorado River Delta is extremely resilient. Just add water and wetlands, backwater lagoons, and riparian corridors reappear. This is witnessed time and again when seepage from a canal or drainage water from a field finds its way back to one of the many distributaries or low-lying areas of the Delta. The natural environment is sustained by small amounts of water that are no longer valued for agriculture or municipal uses. These small amounts support many ecosystem services.

On May 1, 2007, we gathered in Mexicali to discuss how these ecological uses for water could be enhanced. The discussion at the “Mini-Estuary Experiment Workshop” revolved around the central question: *Can we create a mini-estuary below by using agricultural tail water released from above El Tapón?* The workshop helped us to define what we know about the system, what we need to know about the system and what our next steps will be. The combination of presentations, site reconnaissance, and lots of fruitful discussion was invaluable and provided a good basis to pursue this experiment.

**Site Description**

The Río Hardy, a tributary of the Colorado River, is sustained perennially with approximately 21,000 af of agricultural drainage water with an average salinity of 3-5 ppt. Starting near the Cerro Prieto geothermal facilities, it flows twenty-five miles before reaching the Colorado River. Five miles below the confluence is an area known as El Riñon, where El Tapón, a small check dam was built in 2001.

The construction of El Tapón started as a collaboration of local community

members who shared a vision to restore the Río Hardy and the Colorado River to promote sustainable economic, social, and cultural development. They recognized that a healthy ecosystem, one where there was consistent amounts of water, could be managed for fishing, navigation, tourism, and recreation, thereby supporting local interests. The water impounded upstream of El Tapón created habitat, such as cattail marshes, for birds and increased submerged areas for fish and other aquatic species. Downstream of El Tapón, the channel is long and narrow, and water quality and the habitats are influenced by the Río Hardy, the Ayala Drain, the arid climate, and the tides.



*El Tapón and El Riñon (Hinojosa-Huerta, 2007)*

An overflight video from April 2007 showed the long channel narrowing downstream until the surface flow disappeared, to be later filled by tidal water downstream of an emergent, but damp sandbar. The field trip during the workshop was also useful to evaluate the site, take some water, soil, vegetation, and clam samples, and see the influence of El Tapón and the Ayala Drain. On the morning of May 2<sup>nd</sup>, surface salinities ranged from about four to fifteen parts per thousand.



*Dr. Galindo-Bect on the river above El Tapón (Hyun, 2007)*

### **What do we know?**

Two presentations and the ensuing discussions highlighted what we know about the area. Dr. Salvador Galindo-Bect discussed his conceptual model of the Colorado River serving as a conduit for energy in the form of nutrients. Using river volume and estimated nitrogen concentrations, he modeled shrimp catch in the Upper Gulf of California, which was similar to actual catch. We discussed the limitations of catch data (unreported catch, changes in effort, etc.), and then agreed that many factors impact fisheries, not just nutrients, but salinity, nursery habitat area, recruitment, and fishing pressure. Three important points that emerged from this discussion were:

- The experiment will be biologically based; not an attempt to increase fish catch, but on how to restore estuarine conditions.
- The experiment will be small-scale, initially examining local environmental conditions.
- This experiment will monitor the ecosystem and ecosystem components, not solely concentrating on commercial species.

Then Dr. Osvel Hinojosa-Huerta gave a presentation on the Río Hardy fish

study that was conducted by Pronatura-Noroeste. In a comparison of sites upstream and downstream of El Tapón, they found differences in fish community structure, abundances, and weights, as well as differences in environmental conditions such as salinity, dissolved oxygen, and depth. Generally, they found that connectivity of marine and aquatic conditions was not affected by El Tapón, but more by conditions found further downstream. Overall, the continuation of this study was seen as essential to inform the Mini-Estuary Experiment. The survey's annual cost of approximately \$15,000 makes continuing monitoring practical. The Pronatura fish study and water quality data and analysis conducted by Dr. Jaqueline García-Hernández and others at CIAD show what we know about the area: water quality, nutrients, sediments, depth, water sources, vegetation and fish.

The discussion was further enhanced by local knowledge from Florentino Flores, a fisherman familiar with the area and the president of AEURHYC, the community group that built El Tapón. He reported that the sandbar between El Tapón and the Gulf of California is breached six days a month by the tides and is itself ephemeral, washing away and reestablishing itself on the scale of decades.



*Portaging over El Tapón (Hyun, 2007)*

### What do we need to know?

The field trip on May 2<sup>nd</sup> helped us to evaluate the site and highlighted the large geographic scope of the area. The fundamental unknowns are the frequency of the connection between the Upper Gulf of California and the Colorado River and if experimental releases from El Tapón will maintain or enhance this connection. As with any project, we are limited by time and money, but we can still develop a reasonable wish list of items to monitor to gain more information. We identified the following as important to monitor:

- Pronatura Fish Study
  - Salinity
  - Dissolved Oxygen
  - Temperature
  - pH
  - Depth
  - Dominant vegetation
  - Channel width
  - Fish abundance, diversity, biomass
- Primary productivity
- Shrimp larvae abundance
- Blue crab abundance
- Detritus composition
- Channel topography (five cross-sections)
- Depth levels (four piezometers)
- Tidal reach

### Next steps

Given what we know and what we would like to know, our next steps include creating a pre-proposal to send to potential funding agencies to gauge initial interest. We hope to do this by the end of May and then to pursue full funding pursuant with appropriate grant cycles. Possible funding agencies and organizations include:

- National Geographic
- National Science Foundation

- Universidad Autónoma de Baja California
- Training, Internships, Exchanges, and Scholarships (USAID)
- UC-MEXUS
- World Wildlife Fund
- Instituto Nacional de Ecología
- US-Mexico Science Foundation
- Fondo Mexicano
- SAGARPA
- US Fish and Wildlife Service
- Packard Foundation
- NORTH AMERICAN WETLANDS CONSERVATION ACT
- Environmental Protection Agency - Border 2012
- The Wildlife Society

### Thanks!

A final thanks to all the participants (list below) who generated great ideas, had useful suggestions, and who cheerfully woke up at 4 am to take a trip down the last stretches of the Colorado River.

If this project is of interest to you and you would like more information, please contact Karen Hyun at [khyun@email.uri.edu](mailto:khyun@email.uri.edu)

This workshop was sponsored by the Research Coordination Network for the Colorado River Delta. For more information about RCN work, please visit <http://geo.arizona.edu/rcnrd/>.



*Thanks to Juan Butron for getting the keys out of the car! (Hyun, 2007)*

### Mini Estuary Experiment Workshop Participant List

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AEURHYC - Asociación Ecológica de Usuarios del Río Hardy-Colorado

CEDES - Comisión de Ecología y Desarrollo Sustentable del Estado de Sonora

CIAD - Centro de Investigación en Alimentación y Desarrollo

CONANP - Comisión Nacional de Áreas Naturales Protegidas

SI – Sonoran Institute

UA – University of Arizona

UABC - Universidad Autónoma de Baja California

URI – University of Rhode Island

UW – University of Washington