

A Long-Term Algal Turf Scrubber™ Freshwater Native Fishes Biome

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by

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I first read about the success of algal turf scrubbing for freshwater aquaria biomes in Walter Adey's beautiful 1991 book, *Dynamic Aquaria*. The front cover's beautiful and serene picture of the earth sphere cradled safely in two cupped hands set against a light blue background seemed to promise the kind of aquarium environment every hobbyist strives to achieve.

A few years after obtaining the book, I was pleasantly surprised to learn that an ATS™ commercial aquaculture/mariculture facility—called Inland Aquatics—was being installed in my home town of Terre Haute, Indiana. “But that’s probably for saltwater,” I thought, hastily arranging for an introductory guided tour of the facility, which was still under construction.

After signing a very formal non-disclosure release, I was on my way to one of the most exciting discoveries of my aquarium hobby career. I was pleasantly surprised to learn that part of this 40,000 gallon-plus facility was being devoted to a closed freshwater system using ATS™ technology. And it didn't take long for Morgan Lidster, the facility's talented entrepreneurial owner, to install a 200 gallon ecoTarium™ devoted entirely to native freshwater fishes. A long-time hobbyist himself, Lidster had cut his fishkeeping teeth by seining all manner of freshwater species from local creeks.

The first Inland Aquatics “all native” freshwater biome was installed in 1995, and it's one of the facility's most popular biomes (Fig. 1). As a regular part of Inland Aquatic's Educational Program, the freshwater natives tank occupies the dominant center position in the classroom. Many of the fishes in the tank have been in it from

the start. At various times the tank has been occupied by a heavily populated community of fishes, Asian clam (*Corbicula fluminea*), and a myriad of freshwater snails, the most magnificent being the golden apple snail.

## Fish Species

Fish species that have been kept in the main tank's water column include:

|                     |                 |
|---------------------|-----------------|
| channel catfish     | white bass      |
| rock bass           | black bullhead  |
| warmouth            | shortnose gar   |
| yellow bullhead     | redeer sunfish  |
| common goldfish     | largemouth bass |
| longear sunfish     | fathead minnow  |
| smallmouth bass     | green sunfish   |
| northern hog sucker | spotted bass    |
| bluegill            | stoneroller     |

Several darter species, several minnow and shiner species, frogs, snails, crawfish, and ghost shrimp have been maintained in the refugium, as well as freshwater puffers (*Tetraodon cutcutia*). The refugium is, in effect, a tank-within-a-tank, where sensitive and vulnerable species can be kept safely out of reach of the main water column predators, but sharing the same water and ATS™ technology with the main tank.

Perhaps the most exciting and informative display in the freshwater natives ecoTarium™ has been the occasional introduction of shortnose gar from the waters of the nearby Wabash River. The behavior and feeding habits



**Fig. 1.** 200-gallon ATS™ freshwater ecoTarium™ maintained at Inland Aquatics for over four years with no water changes. Photo by Morgan Lidster.

of the gar have fascinated many tour groups and classes, and the gar themselves have been identified by many as their favorite fish on display.

### **Food and Feed Products**

Food for ecoTarium™ residents has included trout chow (automatic feeder), standard flake feed, and, occasionally, Omega-3 enriched San Francisco Bay brine shrimp. Periodically, live food is offered in the form of red worms, fathead minnows and striped shiners.

### **Aquascaping**

Aquascaping was added during the tank's initial setup. A large, prominent, natural oak stump was placed slightly left of center. A broad alluvial flare created by speckled white and green granite boulders, cobble, rocks,

and pebbles, begins in the right rear portion of the tank and fans outward toward the center, spreading toward the stump. The top of the granite boulders is approximately a foot above the substrate, and the flare gently tapers downward to the left, where it disappears into the substrate near the base of the stump.

Substrate for the initial setup was composed of an initial layer of washed pea gravel-and-sand mix spread over the entire tank and refugium floors to a thickness of zero (in the front of the tank) to about 4.5 inches (in the back of the tank), creating a diverse topography. Rock and wood items were placed directly on top of the initial layer of substrate to assist in retaining the initial substrate layer.

After the rock and wood aquascape features were in place, an additional layer of one-half inch (a total of .75 gallon) of Substrate Gold™ (iron-rich clay) was placed in areas intended for heavy planting. This material was added to both the refugium and the main tank. A final

one-inch of finely ground red flint material was placed over the Substrate Gold™ to secure the clay.

The ecoTarium™ was initially filled with 200 gallons of untreated well water. A “seeded” starter-ATS™ screen had been prepared with freshwater algae species. Several fish species were added to the tank immediately after the initial filling.

### Plants

Plants flourish quite well in the tank, including a diverse selection of grasses, sedges, swords, lilies, and others (Table 1).

For me, the tank has served as a laboratory of sorts in developing patented vitreous Plant Anchors,™ which are designed to assist in the early development and establishment of root systems for freshwater plants. Prior to placing plants into Plant Anchors,™ they are soaked to saturation in either Kent “Freshwater Plant” micronutrient or Natural Gold™ plant food iron supplement. Plant Anchors™ have produced an unanticipated benefit in discouraging the uprooting of plants as a result of nesting activities, mostly from the *Lepomis* species in the tank.

### Lighting

Lighting for the main tank is composed of three 175W metal halide lamps (5500K) and two 5-foot standard

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**Table 1.** Plant species included in the ecoTarium™ native freshwater fishes biome.

*Cryptocoryne petchii*  
*Cryptocoryne wendtii*  
Argentine anacharis (*Egeria densa*)  
dwarf lilies (*Nuphar luteum*)  
crinkled or ruffled aponogeton (*Aponogeton crispus*)  
lanceleaf plant (*Aponogeton madagascariensis*)  
*Aponogeton ulvaceus*  
pygmy anubias  
*Anubias frazeri*  
watermeal (*Wolffia* sp.)  
*Limnophila sessiliflora*  
marbled melon sword (*Echinodorus osiris*)  
ozelot sword (*Echinodorus x ozelot*)  
Eurasian watermilfoil (*Myriophyllum spicatum*)  
coontail (*Ceratophyllum demersum*)  
fanwort (*Cabomba caroliniana*)  
common duckweed (*Lemna minor*)  
water hyacinth (*Eichhornia crassipes*)  
water lettuce (*Pistia stratiotes*)  
narrow leaf sedge (*Sagittaria subulata*)  
Italian vallisneria (*Vallisneria spiralis*)  
hornwort (*Ceratophyllum submersum*)

output fluorescent tubes. Lighting for the refugium is composed of dual 28W power compact fluorescents (5500K). The lights in the main tank and the refugium are connected to an in-house X-10 appliance control system. They're on from 9 a.m. to 9 p.m.

Lighting in the algal turf chamber is provided by four 2-foot VHO AquaSun™ tubes (5200K). These lights are also connected to the X-10 appliance control system, and they overlap the main tank/refugium schedule by two hours—on from 7 p.m. to 11 a.m.

### Water Quality

Water quality in the ecoTarium™ has been excellent, as it has been for the entire ATS™ system. In fact, water quality routinely checks in at the following values:

pH 8.2  
Dissolved oxygen 8.5-8.8 (above saturation)  
Hardness (very hard) alkalinity 240/total hardness 350-425  
Nitrates (zero)  
Phosphates (trace/periodic)  
Temperature (room temperature-seasonal)

Thanks to the water's high quality, diseases have been absent, and the tank supports a greater diversity of species—both flora and fauna—as compared to traditional aquarium systems.

No water changes have been performed for the ecoTarium™ for over four years. Untreated well water is used periodically to top-off the tank to replace water loss due to evaporation.

Based upon the four-year performance of the ecoTarium™ described here, ATS™ technology offers tremendous benefits for freshwater native fishes aquariums. Compared to conventional filtration and denitrification arrangements, the ATS™ biome is much closer to natural environmental conditions, allowing for a greater species diversity and population density, with a minimum amount of care by the aquarist.

*Attendees to the NANFA 1999 National Convention will be able to see an ATS™ aquarium fully stocked with native fishes.*