DARTER AQUARIUMS: HABITAT DESIGNS AND CARE GUIDELINES

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Darters are the second largest family of North American fishes and only the minnows (Cyprinidae) have more species. With 150 known darter species, their diversity of form and color are enough to keep many hobbyists and biologists forever content.

However, darters are not for everyone. Almost all require a substantial amount of live food in their diet and cooler water to maintain their color and vigor. With the right conditions, they are fairly disease resistant, and despite notions to the contrary, easy to propagate in the home aquarium.

This article will attempt to detail aquarium designs and care and maintenance methods applicable to the darter tribe, Etheostomatini, in the family Percidae (freshwater perches). The information presented here is derived from over twenty years of the author's experience in collecting, keeping, and spawning darters.

Before getting to the heart of this subject, I would like to highly recommend two books to the darter researcher or aquarist: *Handbook of Darters* by Dr. Lawrence M. Page and *The American Darters* by Robert A. Kuehne and Roger W. Barbour. Both books are very good, and it's difficult to recommend one over the other. Although the books note that natural history is lacking for many species, all available information was consolidated at the time of publication and the reader can often generalize within some of the subgenus categories.

In order to better accommodate specific habitat needs of the various darters, I will describe five aquarium designs. The 150 species naturally inhabit nearly all the habitat types within their range. Lakes are perhaps the least preferred habitat, however, tessellated darters *(Etheostoma olmstedi)* are reported from lakes in the Northeast, Swamp Darters *(Etheostoma fusiforme)* in the East, and Iowa Darters *(Etheostoma exile)* in the Midwest. Based on my experience, swamps that host darters generally have some flowing water from a nearby river or springs.

The habitat designs described below include: sand, pool, riffle, swamp, and combination darter aquariums. Before dealing with specific strategies, some general considerations need to be discussed:

*Darters frequent rocks which may encourage aquarists to construct large rock piles. If this is done, glue the rocks together with silicone and keep in mind to design caves with ample space. Otherwise, dead fish or debris can become lodged and unknown to the aquarist. If silicone is not used, rock slides are inevitable from the constant and sudden movements of the fish. Ideally, it's better to scatter many single caves around the substrate where entrapment of fish is less likely.

*Minnows can also be kept in the aquarium, but large numbers will consume most of the food before reaching the bottom-dwelling darters. Feeding minnows cheaper foods 15 minutes prior to feeding the darters helps insure the latter are fed. Generally, small schools of minnows work best in a mixed community aquarium.

*Larger sculpins and madtoms are tough, belligerent fishes which should not be kept with darters.

*If filtration capacity allows, aggressive darters do best when slightly crowded. Like African cichlids, one fish will not take over the whole aquarium.

*Common aquarium plants are recommended, but native plants have seasonal quirks and can be difficult to maintain year-round.

*Darters are very nervous fish which should have a full aquarium cover to prevent jumping.

*Start with more common species and build on your experience. Many darters are threatened or endangered and we don't want to put them in further jeopardy.

*Often aquarium journals advise not to use rocks unless purchased at a pet shop. There is always some risk rocks can leach toxic substances. However, if rocks come from water inhabited by darters, they're probably safe. Limestone is a good candidate which is usually very common and also acts as a buffer preventing the pH of aquarium water from becoming acidic.

*Two methods of filtration are recommended: powerheads and outside power filters. On a long tank, it's best to position the outside power filter on the side of the aquarium, which will maximize water flow. The author prefers powerheads which are used to create a stream aquarium. However, there are a couple of drawbacks. Powerheads slightly raise water temperatures and when fully submerged generate the most heat. Aeration is highly recommended either using the powerhead accessory or an air pump. This will counteract low dissolved oxygen levels occurring in warmer water and also provides surface agitation.

I. Sand Habitat

Species: All *Ammocrypta* spp. (sand darters) & glassy darters *(Etheostoma vitreum)*.

Setting up a sand bottomed aquarium and making it attractive requires ingenuity on the part of the aquarist. A sand tank is not necessary to keep sand darters, but is recommended to duplicate the species habitat for observing and/or studying natural behaviors (e,g,. breeding). One alternative the aquarist may opt for is sectioning off an area of a larger aquarium and incorporating a sand substrate into a regular darter community tank. This micro-habitat can be created using aquarium silicone to bond rocks or pebbles into a shallow wall or barrier. This works well, but over time the sand will become inundated with gravel. After flushing out the sand darters, simply siphon out the old sand and gravel and replenish with clean sand.

A whole sand tank will be easier to maintain, but various factors should be taken into consideration. Undergravel filtration is virtually out of the question. However, an outside power or canister filter will adequately keep the water clean, but be sure the intake stems are well screened. Sand darters are very skinny and can fit into some surprisingly small openings. They also do not function as the best filtration medium. On small aquariums, a sponge filter which is cleaned on a regular basis will suffice. Additional aeration should be provided if there is little or no perceptible current circulating through the aquarium.

Sand tends to compact itself. Uneaten food or other organic matter will often (and quickly) turn the sand black which can create an anaerobic bacterial bloom. One easy way to solve this dilemma is to add a small sucker (catostomid) to the aquarium. The sucker's feeding activity will assure the sand gets churned over and will effectively scavenge uneaten food.

Madtoms *(Noturus spp.)* are not always good tank mates because the skinny sand darter can easily end up as food for a widemouthed ictalurid. Valisneria plants located in the rear or side sections of the sand aquarium will add subtle beauty to an otherwise dull tank. Sporadically placed rocks should not hurt the sand darters, but are rare in the species natural habitat. However, buried rocks would interfere with the substrate diving habits of the sand darters. Once again, the casual keeper of sand darters will usually find it unnecessary to maintain sand in the aquarium. The author has successfully kept western sand darters *(Ammocrypta clara)* for over a year in a gravel substrate aquarium.

II. Pool Habitat

Species: snubnose darter (subgenus Ulocentra), stippled darter *(Etheostoma punctulatum)*, and most *Percina spp.*

This is perhaps the most versatile of our proposed designs and should be at least 20 gallons - larger is better. Aside from creating a pool effect, the larger tank is necessary to accommodate the typically larger darter species (e.g., stippled darters and *Percina spp.*). To facilitate keeping the midwater darters as well as the bottom dwellers, smaller rocks and caves should be landscaped in the front of the aquarium while leaving the upper levels free of plants or rocks. Towards the rear, plants and/or rocks and driftwood could be stacked to simulate a river bank. Currents should be moderate but not strong. A bubble wand or other long airstone in the back will provide additional and gentle aeration. In this type of set-up, it might be best to aim the powerhead or outside filter outflow straight across the width of the aquarium. This will hasten water movement, yet maintain a gentle flow through the main portion of the tank. Some trial and error may be necessary to accommodate each species preferences. Minnows work well in this design, but numbers should be kept to a minimum which will assure darters receive their fair share of food. A school of silversides (Atherinidae) makes a nice addition to the upper levels of the aquarium. Plants will often occur in natural pools and positioning aquatic plants to the rear or sides will enhance the natural decor. Aquatic plants that do well in the colder aquarium include, but are not limited to: Elodea, Valisneria, Java Fern, Bacopa, and some varieties of Echinodorus (Amazon sword plants). Because a pool tank can be relatively large, many mini-habitats can be provided such as a sand habitat in one corner. A careful positioning of the water outflow will also create conditions favorable to riffle species as well.

III. Riffle Habitat

Species: Nothonotus darters: rainbow *(Etheostoma caeruleum)* and orangethroat darters *(E. spectabile)*, most Oligocephalus darters: saddled *(E. tetrazonum)*, greenside *(E. blennioides)*, and banded *(E. zonale)* darters, etc.

Most darter keepers will select this design because of the multitude of darter species preferring riffles. A larger aquarium equipped with equally large powerheads may be used, but for the riffle tank, smaller is generally better. A 10-26 gallon aquarium is ideal, however, this author has used plastic shoe boxes with modified equipment quite successfully. Depth is not nearly as important as horizontal space. If used in a small tank, a powerhead should be the type that emerges out of the water because submersibles could warm water to lethal temperatures. In larger aquariums, submersibles are rarely a problem because heat generated from the pump motor is safely dissipated. With both powerheads and outside power filters, direct the water outflow down the long dimension of the tank. The bottom should be strewn with rocks forming caves. The more the better as long as rock piling is limited. Very few aquatic plants can withstand the onslaught of fast-moving water, but Cryptocorynes do well in the riffle tank if temperatures do not drop below 60 degrees (F) for an extended period of time. Fontinalis may grow well in the darter tank, but the author's limited experience with this species has not met with great success. In this design, the recommended minnows include Phoxinus (redbelly dace), Rhinichthys, and Macrhybopsis chubs. Shale should be utilized when preparing an aquarium for darters of the Catonotus subgenus (e.g., fantail and spottail darters). Algae growth should be promoted when keeping darters that frequent riffles with algae mats (e.g., greenside *[Etheostoma blennioides]* and banded darters *[E. zonale]*). Many of the green darters will show enhanced coloration when kept in a tank with lush algae. To provide such growth, good lighting will be necessary. Choosing the right gravel substrate for any darter tank requires forethought; too-dark or too-light will heavily influence darter's color patterns and intensity. The commercial "natural" brands are best, but personal taste will determine the choice (Note: natural gravels differ regionally). In the riffle tank, use coarser grades of gravel which are typical in these habitats. If undergravel filtration is used, the bottom layer should be a standard grade of gravel and a larger grade and stones in the top layer. The

finer gravel will be necessary to provide an adequate filter bed for nitrifying bacteria to thrive in. Additional aeration may be optional if there is good water flow via the powerheads or outside power filter outflows

IV. Swamp Habitat

Species: Iowa darter *(Etheostoma exile)*, swamp darter *(E. fusiforme)*, mud darter *(E. asprigene)*, johnny darter *(E. nigrum)*, and several other *Etheostoma spp.*

The swamp tank will most resemble the typical tropical aquarium (minus the heater). The tank need not be large and 5-30 gallons will suffice. Thick plant growth and pieces of driftwood will constitute the primary decor. Black gravel substrate works best to depict a mud bottom. Sand is occasionally found in swamp habitats and could be introduced whole or as part of the substrate (refer back to sand habitat section). An abundance of rooted aquatic plants should utilize and absorb most waste products from the sand. Undergravel or canister filters will provide sufficient filtration. The force of outflow from an outside power filter or powerhead in most situations would be too strong. Since this setup calls for slow moving water, the choices of aquatic plants will be much more extensive than for the other habitat designs. The one limiting factor might be their over wintering tolerance. At room temperature, cabomba, myriophyllum, anacharis, dwarf water lilies, cardamine, and many others do well. Some duckweed floating on the surface can round out the natural plant elements of the aquarium. Rocks are pretty much uncommon in swamps and as natural decoration should be omitted or limited. If the use of rock is still desired, two types are appropriate for the swamp tank: black shale rock can be situated to blend in with the black gravel bottom. Petrified wood is better yet and often imitates rotting wood. Driftwood often floats and may have to be weighted or wired down. Recommended tank mates could include a small school of some colorful southern minnow species, mudminnows, northern redbelly dace *(Phoxinus eos)*, or some mild-mannered native killifish.

V. The Combination Darter Aquarium.

This design combines elements of the first three strategies to accommodate various species of diverse habitats. For obvious reasons, the swamp habitat type cannot be incorporated. The combination of habitats will entail the use of a larger aquarium and the standard 55 gallon is ideal. The positioning of the water outflow over rocks scattered on the substrate yet allowing mild flow through other portions of the aquarium will provide habitat conditions favorable to both pool and riffle species. One optional alternative for this design could include a sand corner addition for burrowing sand darters *(Ammocrypta ssp.)*.

Care and Maintenance

Overall, the same aquarium maintenance methods used on other native fishes can be applied to the darter tank. However, water changes should be done more frequently depending on temperature and filter effectiveness. If there is undergravel filtration, stir the gravel during the water change. With the present day use of chloramine and chlorine in many water systems, check with the local water company to determine how to treat your water accordingly. Chloramine is a very effective darter slayer. Airstones and diffusers should be closely monitored because any loss in output could be disastrous under crowded conditions. Filtration media should be changed regularly. Depending on climate, the most difficult thing may be keeping the aquarium cool in summer, and though not mandatory, over wintering in cooler temperature when feasible will assure better spawning results in spring. Algae growth is not detrimental and should be permitted wherever practical. The pH can vary, but slightly alkaline water is the best bet if water from the collection site is not available. Swamp species generally live in softer water at pH of 6.8-7.0. Rock salt at a tablespoon for every 5 gallons of water is a good preventive measure for many common diseases. The two most important things to remember are to keep the aquarium cool and change the water often.

TAIL END

Reflections of a Fish Collector

Konrad Schmidt - St. Paul, MN

Where did They Go?

Before settlement, prairie covered southwestern Minnesota, but corn, soy beans, and other row crops eventually replaced and dominated the scene. Meandering streams also needed "improvement" and most have been channelized into straight ditches. In 1992, I was surveying fish communities for the Minnesota Department of Natural Resources in the Redwood River watershed to assess habitat and water quality. We had just finished a station on Three Mile Creek near Marshall, MN when a friendly farmer who owned the land pulled up to see what all the activity was about. We filled him in on the entire project. I had been curious about the stream's name and wondering if he knew the source. He told us that at one time you would have to walk three miles of stream to cover one mile on the ground. He was not surprised that we didn't find any game fish, but recalled 70 years ago in his youth when northern Pike and walleye were abundant. He also mentioned that he used to see weasels every where, but they too had disappeared. He ended his stories with a haunting comment, "Nothing has changed - where did they go?" I could hear concern and sincerity in his voice as I glanced upstream at the straightened stream channel which was tightly hemmed in with row crops. Yes, something had radically changed over this man's lifetime, but I did believe him that he could not see what it was.