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Some Aspects of Territorial Behavior of the Fantail Darter

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Some Aspects of Territorial Behavior of the Fantail Darter[1]

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Abstract. Striped fantail darters, *Etheostoma flabellare lineolatum*, were maintained in small aerated aquaria and fed tubificid worms. Darters over I inch long established and defended territories usually no larger than a nook under rocks. Darters, over 2 inches long, selected covers open on both sides, but medium-sized darters selected smaller, more secluded covers. Dominance in selection of territory was associated with size, although established darters might maintain their covers against larger newcomers. Stone bottom was selected over pebble and pebble over sand. Pigmentation seemed to show an effect in habitat selection.

Fantail darters are usually found on the gravel bottom of shallow riffle areas in small streams but are also found on gravel beach areas of some lakes in much of eastern United States (Hubbs and Lagler 1947). Specimens for the present study were collected from riffle areas of Bluff Creek, Boone County, Iowa. Fantails are hardy fish and readily adapt to living in an aquarium. Since they feed by sight, it was necessary to provide live, moving food comparable to the insect larva on which they normally feed. Tubificid worms were very satisfactory.

When put in aquaria, a darter usually selected a particular spot or territory where it remained much of the time and which it defended from other darters. A variety of substrate materials were put in the aquaria to determine habitat preference. Cover was established in several aquaria by setting up three-cornered rock houses or lean-to type structures. This type of structure served two purposes: (1) the behavior of darters could be easily observed, even while they were under cover; (2) the darters themselves could see in more directions thus increasing the possibilities for occurrences of defensive and agressive behavior. The selection of habitats and covers could be noted as the number of darters in an aquarium was increased. The following order of habitat preferences was recorded: (1) small-sized cover—something which a darter could get under but which contained space enough for only one darter; (2) large cover—something which covered but was more or less exposed on more than one side, usually taken over and defended only by the largest darters; (3) large rocks which offered partial shelter to those

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under its edges; (4) aquaria corners which, although providing no cover, could be easily defended. As far as the aquarium bottom was concerned, stones were preferred over pebbles, and pebbles were preferred over sand.

Apparently, conditions of natural environment are necessary to induce territory establishment with accompanying aggressive and defensive behavior. Individuals kept in the reserve tank, which did not contain substrate material, did not set up territories but, instead, ranged over the entire tank.

In territorial defense, there is a form of step-releaser in aggressive action. An intruder could sometimes approach a territory holder from behind and get within 2 or 3 inches before being noticed. Upon discovery the two darters would face each other for an indefinite time, with their fins erect until the intruder made any sort of movement. This movement on the part of the intruder, regardless of its proximity to the cover, was necessary to cause a charge by the occupant. Then the occupant, with fins erect, dashed at the intruder which fled with fins relaxed. If contact was made, it was in the form of head butts, accompanied by attempts to bite the opponent.

Size of darter affected territorial behavior, but did not seem to affect the size of the defended territory. The smallest darters of about 1 inch in length did not set up defended territories nor did they remain under covers even when these were available. The largest darters, 2 to 2½ inches long, defended only to the extent of their covers. The medium-sized darters of 1 to 1½ inches also defended only to the extent of their covers but, once provoked, were more aggressive and were observed on occasion to chase an intruder half the length of an aquarium.

Darters which set up territories in the open, defended a much larger area. This was exemplified in an extreme case by a medium-sized fantail which oriented itself around an air hose and vigorously defended an entire pebbled area of 60 square inches, approximately 1/3 of the aquarium floor area. Those individuals with no defended territories seemed to stay in a given area although this may have been due to adjacent territorial boundaries.

Unlike the size of defended territory, the size of cover depended somewhat on the size of the occupant. Medium-sized darters would not establish themselves under a cover which was large and exposed on more than one side. If one of the three stones were removed, making a lean-to closed at one side, a previously non-territorial darter or one that had been established in a second choice habitat readily took to this new structure and defended it. The larger darters apparently liked more room in

which to move and, in preference to smaller covers, readily took up residence under roof-houses as large as 4 square inches.

Size of darter played a large part in selection of prime habitat. In all observations, when fantails of varied sizes were introduced at the same time to a tank with a single cover or when a cover was introduced to a tank in which no cover had been previously established, the largest fantail always entered the cover and began immediate defense. If the dominant fantail was removed, the second largest took his place.

It appears that prior occupancy has some influence in dominance, at least when the prior occupant was the largest individual. In one experiment, the dominant darter was removed from the cover of an aquarium for a period of 5 days. As usual, the second largest darter took his place. When the prior occupant was returned to the aquarium, it immediately went under the cover and chased out the second darter, which after several attempts to remain there, returned to a corner where it had been previously established. The main thing noted here was, that although the second darter tried to get back under the cover many times, at no time did it attempt to attack the prior occupant. This would seem to indicate recognition of him as being the prior occupant and the dominant darter. It is doubted that a small prior occupant could regain a cover taken over by a larger darter. However, long-established darters successfully defended against newly introduced larger ones. Fantails of all sizes, removed for awhile from their aquaria, upon return seemed to quickly recognize their position and go directly to their previous habitat.

In each aquarium one of the extra coverless darters seemed to orient itself about the air hose. Some virtually wrapped themselves around the nozzle. If the air hose was moved, regardless of the change in substrate, the darter moved with it.

One instance of non-territorial aggression was observed. A small darter was pecking at a worm on the outside of the aquarium glass in a feeding experiment. The dominant darter of the tank came over from his cover about 5 inches away to try to take this worm, and the small one chased him away. Both of these fantails were out of their territories at the time so the attack on a darter about three times its own size must have been induced in defense of food and not because of boundaries. It was also interesting to note that the larger fantail was not so dominant away from his cover. Perhaps then, non-territorial aggression is not as highly correlated with size as territorial aggression seems to be.

During the course of the territory studies, it was discovered

that fantails of all sizes exhibited pigmentation changes and some were apparently influenced to choose background color of shades similar to themselves during the daylight hours. I became rather convinced of this by the unforeseen outcome of a dominance of size experiment. In one aquarium there were three covers and three darters differing in size. The three darters were light in color as were the covers and sand bottom. My idea was to introduce another medium-sized darter and to observe which of the three sizes he would attempt to displace. He made no attempt on the largest, was chased off by medium, and was offered no resistance by the smallest. Thinking I had accomplished something, I was surprised to find the next day that this darter had gone to the opposite end of the aquarium and established himself in a corner where he has remained to this date. I was quite puzzled by this until I realized that he was quite dark in color and his corner was the only spot in the tank in which the sand had not covered the black aquarium cement.

At this time, there were three aquaria with four darters (three light and one dark colored) in each. It was now recognizable that in each case the dark darters were on dark backgrounds. One night I came into the room, turned on the lights, and went directly to the tanks. Momentarily, it seemed my eyes were playing tricks on me, for all 12 darters were strikingly dark in color against the light colored sand now illuminated by the ceiling lights directly overhead. Since then, this phenomena has been observed many times, and in all cases the pigmentation changed from dark to daytime light within a maximum time of 7 minutes after the lights came on. The areas most darkened are along the dorsal fins where they appear as blotches. From each of these blotches two dark bands extend slightly past the lateral line toward the ventral region. The ventral region, however, remains unchanged. During the day or with the lights on, the outlines of these areas of blotches and bands can be seen faintly through the parallel striping of the fantails but one is rather oblivious of them until seen once in a darkened condition.

These are but preliminary observations on darter behavior, but they indicate that darters can be readily used for comparative behavior studies and suggest that we can get an understanding of the ecological distributions of the various species through aquarium observations.

Literature Cited

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