PLASMA OSMOLARITY IN THE KILLIFISH, *FUNDULUS HETEROCLITUS*

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Killifish, *Fundulus heteroclitus*, can survive indefinitely in fresh or salt water, which implies osmoregulation in both conditions, since teleost plasma osmolality is about 300 mOsM. Data on *Fundulus* itself are sparse; since this is important to studies of behavioral osmoregulation (Kidder, Bull MDIBL 36:69, 1997), I have repeated and extended the studies (Zadunaisky *et al.*, J. Membrane Biol. 143:207, 1995) which showed only a transient change in plasma osmolality upon changing the fish from seawater to fresh water. A technique was developed for obtaining blood samples by infraorbital puncture, using a 100 µl heparinized capillary tube. This generally provided enough blood for 2-3 determinations with a Wescor 5520 vapor pressure osmometer.

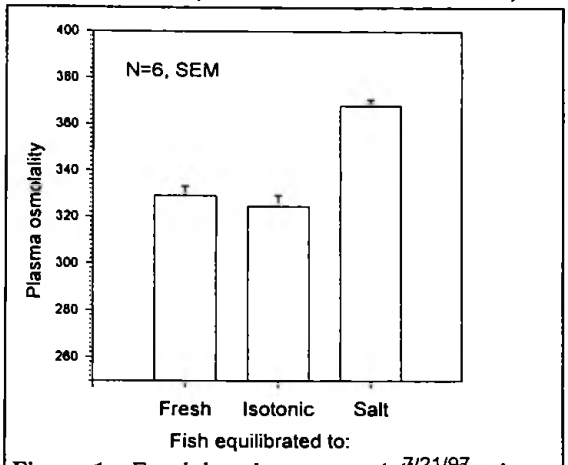

Figure 1. *Fundulus* plasma osmolality after long-term adaptation to water of three salanities. Fish adapted to seawater have a significantly ($P<0.001$) higher plasma osmolality than the other two classes, which do not differ.

Two experiments were performed. In the first series, fish were acclimated for at least 7 days to water of three different salinities; fresh water ($S<0.5$ ‰), isotonic water ($9.9<S<10.5$ ‰) and seawater ($S \approx 30$ ‰ at Salsbury Cove). The results are shown as Figure 1. All fish are above the 290 mOsM reported by Zadunaisky *et al.* as the steady state, and the fish allow their plasma osmolality to increase in sea water, which decreases their osmotic water loss. In a second series, fish adapted to seawater were sampled as a function of time after transfer to fresh water. Figure 2 shows the rapid decrease in plasma osmolality expected from the report of Zadunaisky *et al.*, (ibid.) but there was no recovery of osmolality, probably due to the lack of any significant salt concentration in the Bar Harbor Water Co. supply, and a continuous flushing of any excreted salt. Experience has subsequently shown high mortality in fish maintained in very low-salt water.

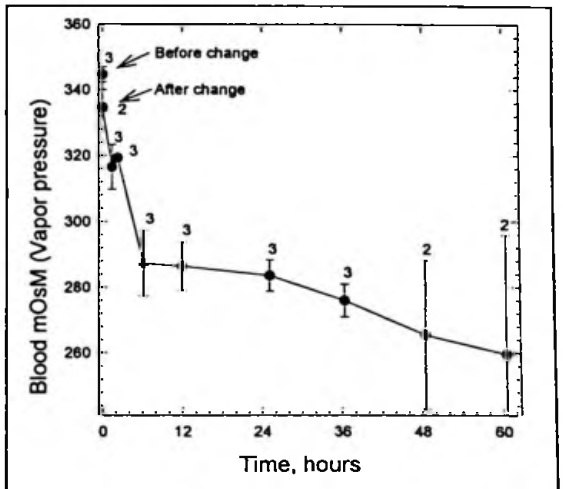

Figure 2. Change in blood osmolality following transfer to seawater-adapted fish to running fresh water. Numbers are replicate fish. A number of deaths occurred after 36 hours; for probable explanation, see text.

This method reliably measures the plasma osmolality of single *Fundulus*, allowing investigation of their responses to environmental changes, including their behavioral osmoregulation.

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