FURTHER STUDIES ON THE ROLE OF THE KIDNEY IN THE LONG-HORNED SCULPIN (MYOXOCEPHALUS OCTODECIMSPINOSUS) DURING EXPOSURE TO A DILUTE ENVIRONMENT

James B. Claiborne and Dana C. McCullough
Department of Biology, Georgia Southern University, Statesboro, GA 30460

There have been very few studies on the contribution of the kidney towards acid-base regulation in marine teleosts (Heisler, in "Environmental Physiology of Fishes", ed. M.A. Ali pp. 123-162, 1980). In the previous bulletin we reported (Compton-McCullough et al., Bull. MDIBL 28,44-45, 1989) preliminary data indicating a role for renal excretion of H^+, especially during low salinity exposure (LSE; ~20 mM seawater). To further delineate the role of the kidney in both acid-base and ion regulation during LSE, we have continued our work according to the methods described previously (Compton-McCullough et. al., ibid.).

Table 1. Urine pH, flow and ion excretion rates in the long-horned sculpin during and after exposure to dilute salinities

	Seawater	LSE	Seawater
pH	7.18 ± .14 (9)	6.93 ± 18 (5)	6.71 ± 18 (4)
flow rate ($ml\ kg^{-1}\ h^{-1}$)	0.26 ± 0.04 (9)	0.58 ± 0.23 (5)*	0.50 ± 0.12 (4)*
Na^+ ($\mu mol\ kg^{-1}\ h^{-1}$)	18.1 ± 6.9 (9)	45.1 ± 20.8 (5)	45.6 ± 13.1 (4)*
Cl^- ($\mu mol\ kg^{-1}\ h^{-1}$)	19.7 ± 8.9 (6)	61.1 ± 27.3 (3)	40.2 ± 9.2 (4)
H^+ ($\mu mol\ kg^{-1}\ h^{-1}$)	3.4 ± 1.3 (5)	6.6 ± 3.4 (5)	5.0 ± 1.7 (4)
NH_4^+ ($nmol\ kg^{-1}\ h^{-1}$)	18 ± 9 (9)	32 ± 10 (5)	51 ± 17 (4)*

mean ± s.e. (n); * indicates significant increase ($p < 0.05$) between first seawater and subsequent group (Student's t-test for unpaired data, one-tailed).

Values for urine pH, flow rate, and excretion of Na^+, Cl^-, H^+ and NH_4^+ for a 24 hour control, LSE, and a second seawater period, are listed in Table 1. As might be adaptive for a teleost in a dilute medium, urine flow rate doubled following LSE exposure. While Na^+ and NH_4^+ loss increased significantly, and Cl^- excretion remained relatively constant, all of these losses amounted to less than 1% of the measured gill transfers for these ions (Claiborne & Evans, Mar. Biol. Lett. 2:123-130, 1981; J. Exp. Biol. 140:89-105, 1988). Urine H^+ excretion remained low, but confirming our previous work (ibid.), could compensate for a calculated ~9% of the net HCO_3^- lost by the fish during LSE (see Claiborne et. al., this bulletin). Funded by NSF DCM 86-02905 to JBC.