

Figure S1. Responses over time in ventilatory parameters of hagfish (N = 6 per each treatment) exposed (from top to bottom) to 0 (no addition control), 5, 10, and 20 mM NH₄HCO₃ as high environmental ammonia (HEA) treatments, in Series I. Exposure to 10 mM NaHCO₃ (N = 6) as a bicarbonate control treatment, and 10 mM NH₄Cl (N = 6) as an alternate form of HEA were also evaluated. Means ± 1 S.E.M. ‘M’ in panels G, H, I, J, K, and L indicates percent mortality out of N = 6. Asterisk (*) indicates significant difference (p < 0.05) from pre-exposure control value (“C”).

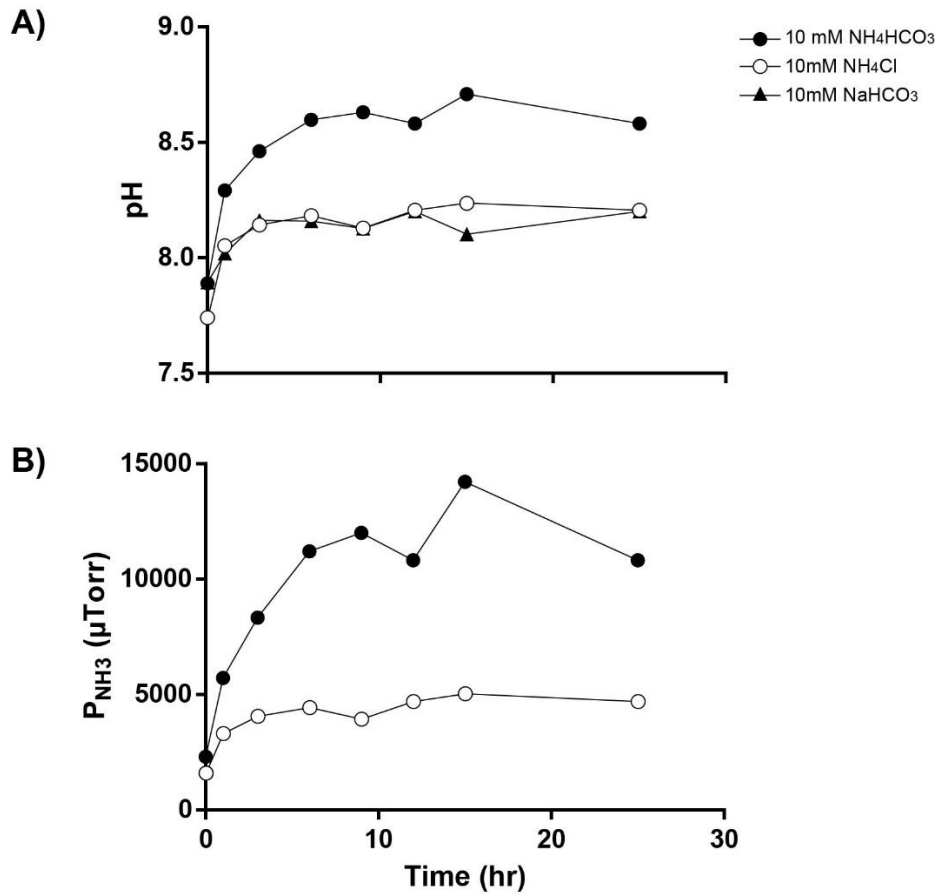


Figure S2. (A) Changes in pH over time of sea water (30 ppt) containing either 10 mM NH_4HCO_3 , 10 mM NH_4Cl , or 10 mM $NaHCO_3$, and continuously bubbled with air, in Series I. The sea water containing 10 mM NH_4HCO_3 , was alkalized to a greater extent than in the other two treatments. (B) Calculated P_{NH_3} levels over time in the 10 mM NH_4HCO_3 or 10 mM NH_4Cl exposures, based on the pH values recorded in panel (A).

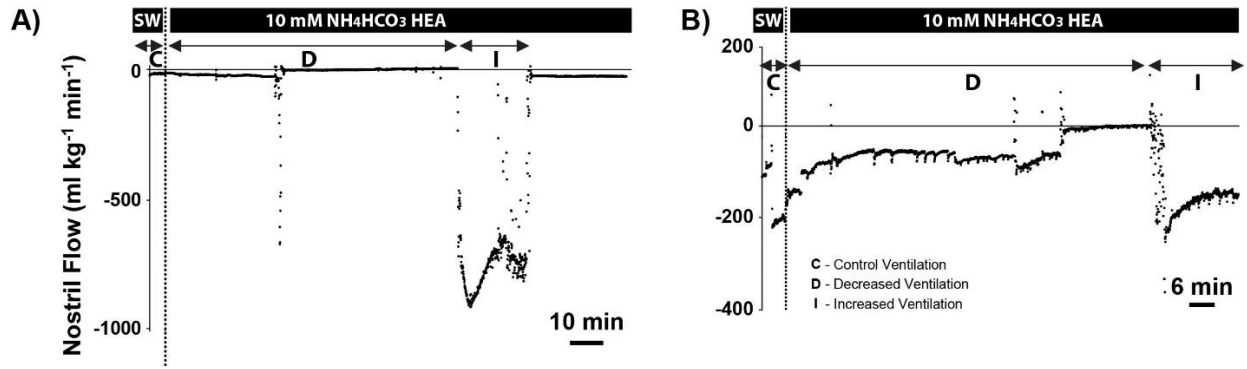


Figure S3. Two more examples (analogous to Fig. 3A) of flowmeter recordings of nostril ventilatory flow rate (measured directly via a flow probe placed in the nostril entrance) in hagfish exposed to 10 mM NH₄HCO₃ (HEA) in Series III. Note that these are flow recordings in contrast to the pressure recordings of Figs. 1 and 5. The data were recorded during the pre-exposure control period (“C”) during the period of greatest initial decrease (“D”), and greatest subsequent increase (“I”) in nostril ventilatory flow during the HEA treatment for each animal.

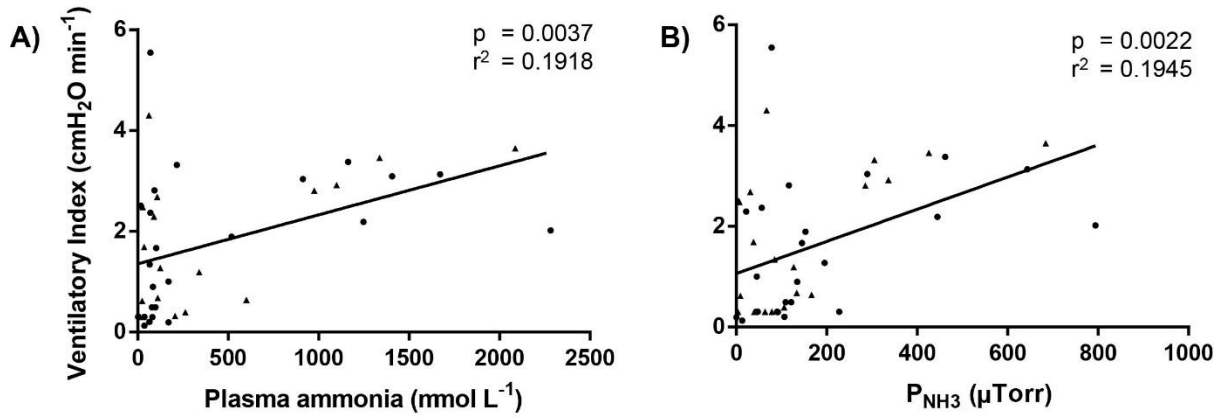


Figure S4. Correlation of ventilatory index with (A) total plasma ammonia concentration (T_{Amm}) and (B) gaseous ammonia tension (P_{NH_3}) in individual hagfish injected at a dose of $1,000 \mu\text{mol kg}^{-1}$ or $70 \mu\text{mol kg}^{-1}$ of ammonium salts (NH_4HCO_3 and NH_4Cl) in Series IV. The significance (p) and r^2 values are shown.