The impact of antidepressants on hypoxia tolerance in Gulf toadfish, *Opsanus beta*

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**Background**
- Severely hypoxic or anoxic aquatic environments are found worldwide and have been on the rise.
- In August 2020, due to a hypoxia event in Biscayne Bay, FL, fish died, and most were Gulf toadfish.
- This was unexpected as toadfish are believed to be able to withstand hypoxia.
- The neurochemical serotonin (5-HT, 5-hydroxytryptamine) plays a role in the cardiovascular response to hypoxia.

**Objectives & Hypotheses**

**Objective 1:** Determine the time it takes for toadfish to lose equilibrium (tLOE) when in severe hypoxia and compare them to sheepshead minnow, *Cyprinodon variegatus variegatus*.

**Hypothesis 1:** Toadfish will have a significantly higher tLOE than the sheepshead minnow.

**Objective 2:** Assess if tLOE in toadfish is affected by blocking 5-HT uptake or degradation.

**Hypothesis 2:** Toadfish will have a significantly shorter tLOE when 5-HT uptake or degradation is inhibited.

**Methods**
- A tLOE apparatus was built that minimized movement.
- Oxygen saturation was maintained at 0.4% throughout trials.
- tLOE was recorded when the fish was unable to maintain dorsoventral orientation.
- Sheepshead minnow: tLOE was reported for male and female minnows as males are easily distinguishable.
- Gulf toadfish: 24 h before tLOE trials, toadfish were intraperitoneally injected with coconut oil (control), coconut oil overlaid with flubentiazol, and decymen-22 (FBD-treated), or coconut oil overlaid with clomiphene (M-treated).
- Statistics: Welch’s t-tests and one-way ANOVAs were used to determine significant differences for data analysis in R (P<0.05 considered statistically significant).

**Results**

**Discussion**

Hypothesis 1 was supported
- Toadfish are more hypoxia tolerant independent of size.
- tLOE presents the toadfish as being highly tolerant to hypoxic conditions.
- Further investigation of the physiological mechanisms conferring hypoxia tolerance in both species is needed.

Hypothesis 2 was not supported
- Hypothesized that the medications were metabolized during the trials.
- A single intraperitoneal injection may not be sufficient in hindering the hypoxia responses mediated by 5-HT.

Sheepshead minnow sex and weight investigation
- Average tLOE was lower than expected.
- Fish were lab-reared while the previous study collected their fish from a tidal pond.
- Potential implications of using lab-reared versus wild-caught.
- No change in hypoxia tolerance due to sex.
- Likely a species-specific trait as other species exhibit superior hypoxia tolerance in one sex.

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**References**