Poster Session 3

Commons West, Easel 7

2:30 PM to 4:00 PM

Toxicity of Imidacloprid to Ghost Shrimp: Implications for the Control of Burrowing Shrimp in Willapa Bay and Grays Harbor, Washington

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Lisa Yuki (Lisa) Bloch, Senior, Aquatic & Fishery Sciences
Bryan Antonio (Bryan) Briones Ortiz, Senior, Biology (Ecology, Evolution & Conservation)
Mary Gates Scholar
Grace A. (Grace) Crandall, Senior, Aquatic & Fishery Sciences
Amanda Aulty Jolean Delaney, Senior, Aquatic & Fishery Sciences
Ariel Delos Santos, Senior, Aquatic & Fishery Sciences, Community, Environment, & Planning
Mentor: Christian Grue, Aquatic & Fishery Sciences
Mentor: Lisa Crosson, Aquatic & Fishery Science

Imidacloprid (IMI) is being sought as an alternative to the carbamate pesticide, carbaryl to control burrowing shrimp (ghost shrimp, *Neotropea californiensis*) in Willapa Bay and Grays Harbor. The shrimp destabilize sediments resulting in poor survival and low yields of the commercially harvested Pacific oyster. Previous laboratory tests indicate ghost shrimp are overtly affected (immobilized) when exposed to IMI at concentrations up to 1,500 ppb in artificial seawater (SW), but not killed and subsequently recover. Our objective was to determine the concentrations of IMI in SW that result in mortality of the shrimp and compare these levels to those known to affect other marine invertebrates, particularly Crustacea. Additionally, we quantified time to recovery in shrimp exposed to the concentrations tested. We exposed adult non-gravid females to 0, 10, 100, 1000, 10000, and 1000000 ppb (1,000 ppm) of the active ingredient (a.i.) (Nuprid®2F) in SW for 48 h (24-h static renewal; 5 individual shrimp per concentration) and quantified overt behavior, survival and water quality. All shrimp at concentrations $>$ 1 ppb were overtly affected, but none died. In the recovery test, 6-8 individual shrimp were exposed to 0, 10, 100, 1000, and 10000 ppb a.i. for 24 h (static) followed by 120 h in clean SW (static renewal). One shrimp exposed to 100 ppb died and time to recovery in survivors was concentration dependent. Results suggest ghost shrimp are very sensitive to IMI in terms of immobilization, but concentrations necessary to kill the shrimp exceed those for other marine invertebrates. The neurophysiology of Crustacea may not match the mode of action of IMI because most neural receptors in these species use glutamate as the neurotransmitter and not acetylcholine. Our results, coupled with the less than desired efficacy in the field, suggest IMI may not be an effective alternative to carbaryl.

Poster Session 4

Commons West, Easel 9

4:00 PM to 6:00 PM

Changes in Sea Otter Diet Diversity from the 1990s to the 2010s

Amanda Elisabeth (Amanda) Witt, Senior, Biology (General), Spanish
Mary Gates Scholar
Mentor: Kristin Laidre, Polar Science Center/APL and School of Aquatic and Fishery Sciences
Mentor: Jessica Hale, School of Aquatic and Fishery Sciences

Sea otters (*Enhydra lutris* spp.) play a significant role as a keystone species in shaping nearshore marine ecosystems of the northern Pacific coast through their primary diet of bottom-dwelling invertebrates, like sea urchins. Northern sea otters (*Enhydra lutris kenyoni*) were hunted to extinction from Washington State in 1911 due the fur trade of the 18th and 19th centuries, and remained locally extinct until their reintroduction to Washington State from Alaska in 1969 and 1970. We studied the foraging ecology of this species since this reintroduction, specifically how the diversity of prey species consumed by sea otters has changed from the 1990s to the present day. The prey switching hypothesis suggests that predators preferentially consume the most abundant prey species, then as a given prey item becomes rare, the predator will add a prey item of the next highest rank to their diet, increasing their diet diversity. Based off of this hypothesis, we expected sea otters in the 1990s to consume a lower diversity of prey species compared to recent years. Using sea otter diet data we collected from 2014-2016 as well as data collected by the U.S. Geological Survey from 2010-2011, we compared prey species diversity from 1990s data to

present day data with the Shannon-Wiener Diversity Index. Preliminary analyses suggest that sea otter diet in the 1990s consisted primarily of clams, while it consisted primarily of snails in the 2010s.