ON DRUGS: The Sedative Effects of Clove Oil on Post-metamorphose Juvenile Clownfish *Amphiprion ocellaris*

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Abstract

Handling fish for the purposes of experimental measurement (e.g., length; weight) can cause death (at worst) or interruption of behavior and activity during the experimental process (at best). Clove oil is a natural substance that can be used to anesthetize (or euthanize) fish. It is relatively inexpensive and is generally regarded as safe for the user and fish. We investigated doses of clove oil (2.5, 5, 10, 15, and 20 ppm) to successfully anesthetize (but not euthanize) juvenile Ocellaris clownfish *Amphiprion ocellaris* (16−43 mm; 0.1−1.75 g).

Background

- Anesthesia is common practice in scientific settings to perform procedures on animals which require subdued cooperation. Tricaine mesylate (Tricaine methanesulfonate, TMS, MS-222) is the go-to anesthetic in the aquaculture industry. Its effects are well understood and dosage rates have been documented for the scientific community to reference. Furthermore, MS-222 is regarded as safe for seafood intended for human consumption.
- MS-222 is a powerful synthetic drug and low dosage rates have not been well established for delicate ornamental aquatic animals. A need for a safe, dilute alternative is required by the marine ornamental aquaculture industry to safely study small aquatic specimens.

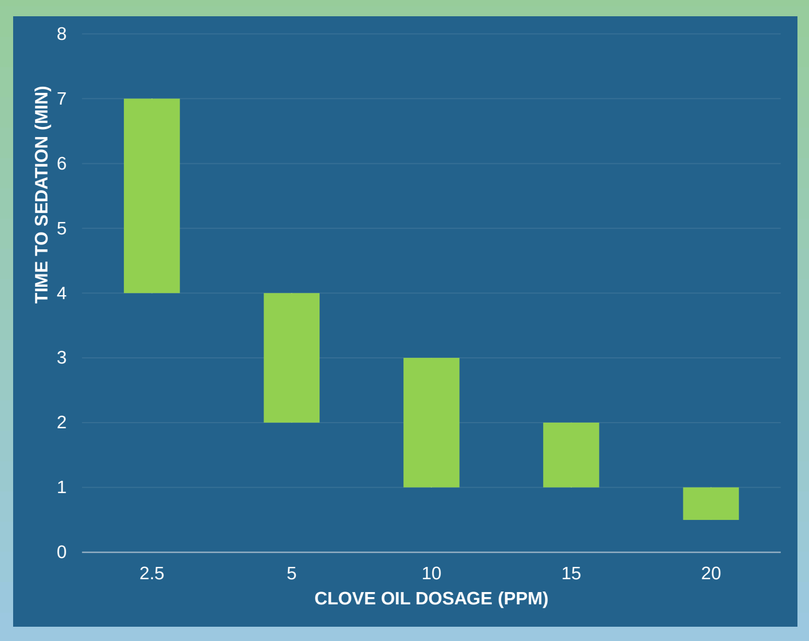
- Clove oil, *Eugenia caryophyllata,* is an excellent alternative that is safer to use and is derived from natural extracts. Sedation of marine ornamental fish using clove oil is not as well documented as MS-222 and dosage rates have only recently been speculated.

Methods

- Fish were immersed in their respective dosage in 500 ml clear plastic containers (13 x 12 x 7 cm). A timer was set and observations of respiration and activity level were recorded. Once anesthesia was achieved, each specimen was handled while data were collected for a length – weight relationship study. When the procedure was completed, the specimens were returned to a recovery tank where behavior observations of lasting effects were monitored.

Observations

- Fish immersed in 20 ppm immediately showed signs of stress within the first 20 seconds of being immersed. The fish then calmed after 30 seconds, became lethargic and showed loss of equilibrium between 45 seconds and one minute. The 15 ppm treatment did not exhibit the same stress as the 20 ppm treatment. After one minute in the 15 ppm treatment, the fish's respiration slowed and between 1.5 and 2 minutes, satisfactory anesthesia was achieved. The 10 ppm treatment affected the clownfish similarly, only requiring an additional 30 seconds until anesthesia was achieved. The fish exposed to the 5 ppm treatment showed no stress and started d to exhibit subdued behavior within seconds of immersion. Satisfactory anesthesia was reached at 4 minutes in the 5 ppm treatment. The 2.5 ppm treatment was of little effect on the fish. After 5 minutes was reached in the 2.5 ppm treatment, the fish was transferred to the 15 ppm treatment to properly anesthetize the specimens for subsequent measurements.



Results

- Each clove oil treatment subdued the juvenile clownfish. The anesthetized fish remained still while data was collected verifying the success of the clove oil method. Once placed in the recovery aquarium, the clownfish regained equilibrium and normal respiration within one minute. The 2.5 ppm treatment took longer to produce proper results than the other treatments, which was expected. The 20 ppm treatment quickly produced sedated fish; however, upon immediate immersion fish showed signs of stress to a point which may be undesirable.

Conclusions

All clove oil treatments were considered to be successful. No fatalities or lasting interruptions of behavior were observed. The two treatments that were considered less than ideal were the 2.5 and 20 ppm dosages. This renders a **suggested clove oil dosage rate of 5 to 15 ppm for juvenile *Amphiprion ocellaris*** between 16−43 mm; 0.1−1.75 grams, yielding sedation within 2 to 3 minutes, lasting for up to 5 minutes after removal from the treatment. It is noteworthy that the 2.5 ppm treatment could provide some use as an intermediary level of anesthetic in situations when full anesthesia is not necessary or preferred.

The clownfish are all healthy and growing as expected, months after the experiment was completed.