Training Fish and Aquatic Invertebrates for Husbandry and Medical Behaviors

Allison L. Corwin, BS(Biology)

KEYWORDS

- Fish • Fishes • Aquatic invertebrates • Operant conditioning • Training • Learning
- Husbandry • Aquarium

KEY POINTS

- Outside of training animals for research purposes, very little peer-reviewed literature exists on training fishes and aquatic invertebrates.
- An animal's ability to learn is an essential component to training.
- The fundamentals of training fishes and invertebrates are similar to those of other animals.
- To develop an effective and useful training regime for fishes and aquatic invertebrates, the framework of the SPIDER method can be used: Setting goals, Planning, Implementing, Documenting, Evaluating, and Readjusting.
- Training a fish or aquatic invertebrate can provide early indication of health status prior to seeing physical signs of illness.

INTRODUCTION

Taking care of fishes and aquatic invertebrates has been an age-old tradition since the Roman Empire.[1] Throughout history it has progressed beyond just raising fish for food. It has developed into a well-established, personal hobby as well as a profession. Today there are more than 400 nonprofit and commercially affiliated professional aquariums around the world, and an estimated 151.1 million freshwater and 8.61 million saltwater fishes owned as personal pets in the United States alone.[2] This increasing popularity has led to an interest in advancing the quality of care and medical treatment of these species. Training fishes and aquatic invertebrates is one of the many ways that care can be improved.

Apart from training animals for research purposes, very little peer-reviewed literature exists on training fishes and aquatic invertebrates. However, over the past few years aquarists have started to report the ability to train these animals for husbandry

Animals, Science and the Environment, Disney's The Seas®, 2020 North Avenue of the Stars, Lake Buena Vista, FL 32830, USA
E-mail address: Allison.Corwin@disney.com

and medical purposes in non–peer-reviewed journals, magazines, and conference proceedings. The goals of training fishes and aquatic invertebrates vary depending on the need of the animal, the trainer, and the facility. Training projects with fishes and invertebrates for husbandry and medical needs are usually centralized around at least one of the following goals: nutrition and dietary management, voluntary animal handling/capture techniques, and voluntary participation in medical procedures, leading to the overall aim of providing better animal care and enrichment to fishes and invertebrates in human care.

An animal's ability to learn is an essential component to training. Fishes and aquatic invertebrates are often perceived as evolutionary primitive species capable of only basic behaviors and instinctual responses; however, the more caretakers and researchers investigate these species, the more is learned about their complex behavioral repertoires and their extensive learning capabilities.

In an ever-changing aquatic environment, the ability to learn is critical to a fish's and invertebrate's livelihood. Since the 1800s experimentation in both wild and aquarium settings have demonstrated that fishes have similar learning capacities to those of birds and mammals.[3] For example, studies have shown that fishes can learn through observational, spatial, and aversion learning, enabling them to learn migration routes,[4] find food sources,[5] orient in their surroundings,[6] and avoid predators and unpalatable foods.[7]

The learning capabilities of aquatic invertebrates have been studied to a lesser extent with the exception of the class Cephalopoda, which includes animals such as octopus and cuttlefish. With no protective armament and short life spans, cephalopods benefit from the ability to learn to ensure their survival. Most experiments with cephalopods have demonstrated the learning potential of these animals through visual and tactile discrimination,[8] spatial learning using mazes in the laboratory and in the wild,[9,10] and avoidance learning.[11] Every species and individual animal may differ in their capabilities, but understanding that they can learn can lay the foundation for many useful training programs.

TRAINING FUNDAMENTALS

The fundamentals of training fishes and invertebrates are similar to those of other animals. A basic process of learning, such as classical conditioning, is often used in a research setting to test sensory abilities of fishes and invertebrates by using their natural reflexes in response to a learned association to a neutral stimulus. Operant conditioning is a type of learning process whereby the animal's voluntary behavior (or response) in the presence of a cue (or stimulus) is determined by its consequences, such as obtaining desired items/events or avoiding aversives.[12] This learning process with an emphasis on positive reinforcement is typically the primary method used when teaching more complex behaviors, such as those needed for husbandry or medical behaviors. Positive reinforcement is often used to train an animal to target (touch some part of its body to another object), and is a useful training tool in aquatic environments.[12]

In most fish and aquatic invertebrate training, primary reinforcers (such as food), which serve a biological need of the animal, are used as the desired consequence in positive reinforcement training. Successful trainers find the correct dietary amount to achieve suitable nutrition as well as to maintain animal motivation. Secondary reinforcers can be used as well.

Secondary reinforcers are objects or events (stimuli) that through pairing with a primary reinforcer can themselves become reinforcing. These types of reinforcers can be used to help shape a desired behavior if food is no longer of interest or if the allotted amount of food has already been distributed.[12] A bridging stimulus is a secondary reinforcer that