Abstract

On the Use of Stereo-Video System to Assess Microhabitat Preferences of the Spanish Toothcarp and Mosquitofish in Coastal Salt Marshes †

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Abstract: Stereo-video systems (hereafter SVS) have been widely applied to study fish ecology in marine coastal ecosystems and more recently in freshwater, especially in headwater streams, due to their dependence on water clarity. Here, we assess the use of these non-destructive methods to study microhabitat use, size structure, and the abundance of endangered Spanish toothcarp (*Apricaphanius iberus*) and the invasive mosquitofish (*Gambusia holbrooki*) in coastal salt marshes. Stereo-video measurements were obtained in situ by means of static pairs of GoPro HERO7 cameras in different shallow coastal lagoons of northeastern Spain. The analysis of stereo-video recordings were processed using the open-source videogrammetry software VidSync 1.661 in order to identify the species, sex, and total length of each fish as well as their relative position in the water column. A total of ninety 17.5 min long stereo-video clips containing more than 7300 fish positions were processed for this study. Fish assemblage and population size structure gathered with this method were compared with catches at the same places using fyke nets. The accuracy and precision of fish-length estimation using SVS was also tested in the lab. SVS revealed differential water-column use, with Spanish toothcarp occurring in a lower-water column. Larger mosquitofish tended to use the upper part of the water column, whereas no clear ontogenetic shift was observed for the Spanish toothcarp. Fyke nets and SVS yielded a similar species composition and considerably correlated with abundances for two species, particularly for mosquitofish, across the six coastal ponds. The size structure varied significantly with the two techniques, with fyke nets apparently being more size-selective as the smallest mosquitofish were underrepresented in fyke nets compared with SVS. Our results suggest that SVS is a non-destructive method that does not require capturing and handling the fish, and they also suggest that it is an ideal technique for studying endangered species, with enormous potential to improve the knowledge of microhabitat use and the behavior of fish species in natural conditions.

Keywords: *Apricaphanius iberus*; coastal lagoons; *Gambusia holbrooki*; microhabitat use; underwater videogrammetry; water column

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