Using EcoViz to depict blue rockfish (*Sebastes mystinus*) movements in the Carmel Bay State Marine Conservation Area

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Introduction

Identification of the underlying structure, casual relationships, and feedback interactions between fish and habitat attributes of the seafloor is critical for marine reserve planning. Due to the often controversial nature of marine reserve designations, the success of marine reserves will be evaluated in a socio-political context. Consequently, it is not only critical to have robust science underlying the reserve design and management, but it is equally important that the results of any research and monitoring activities be disseminated to diverse stakeholder groups in a way. that is both transparent and instructive. Compelling new visualization techniques can significantly advance these efforts and consequently enhance management of marine ecosystems. The primary objective of this study is to use EcoViz to produce detailed, three-dimensional, digital animations depicting blue rockfish (*Sebastes mystinus*) movements as mediated by kelp cover and seafloor within the Carmel Bay State Marine Conservation Area

Methods and Materials

In the summer of 2008 two individual *Sebastes mystinus* were tagged with V13P continuous transmitters in the vicinity of the Carmel Bay. The transmitters were inserted through a 2 cm incision 1 cm into the peritoneal cavity of the fish. The incision was then closed using surgical staples (Figure 1). After surgery each fish was released and followed continuously from a surface vessel using a side mounted V10 directional hydrophone and a VR100 acoustic receiver (Figure 2). Fish were tracked over multiple daylight periods for up to a month after tagging. The position of each fish was determined at 15 minute intervals using the VR100 GPS.

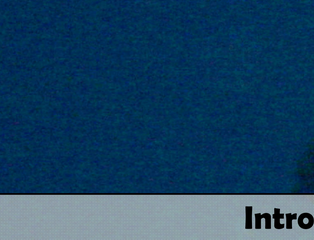


Figure 1: Sebastes mystinus after being surgically implanted with a V13 transmitter

Figure 2: VR100 and V10 directional hydrophone

The EcoViz approach was then implemented within the Tarsier Environmental Modeling Framework, which provides a PC-based software platform for visualizing diverse environmental data and models of complex systems (Figure 3). The Tarsiar program was then used to develop a three-dimensional digital animation that demonstrate how *Sebastes mystinus* move relative to attributes of the seafloor and habitat availability. The detailed x,y,z coordinates produced for each fish by the active tracking was superimposed over high resolution bathymetric maps of the seafloor, and the resulting animation followed each tagged fish as it moved through the study area.

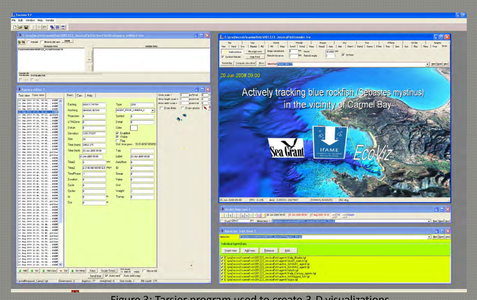
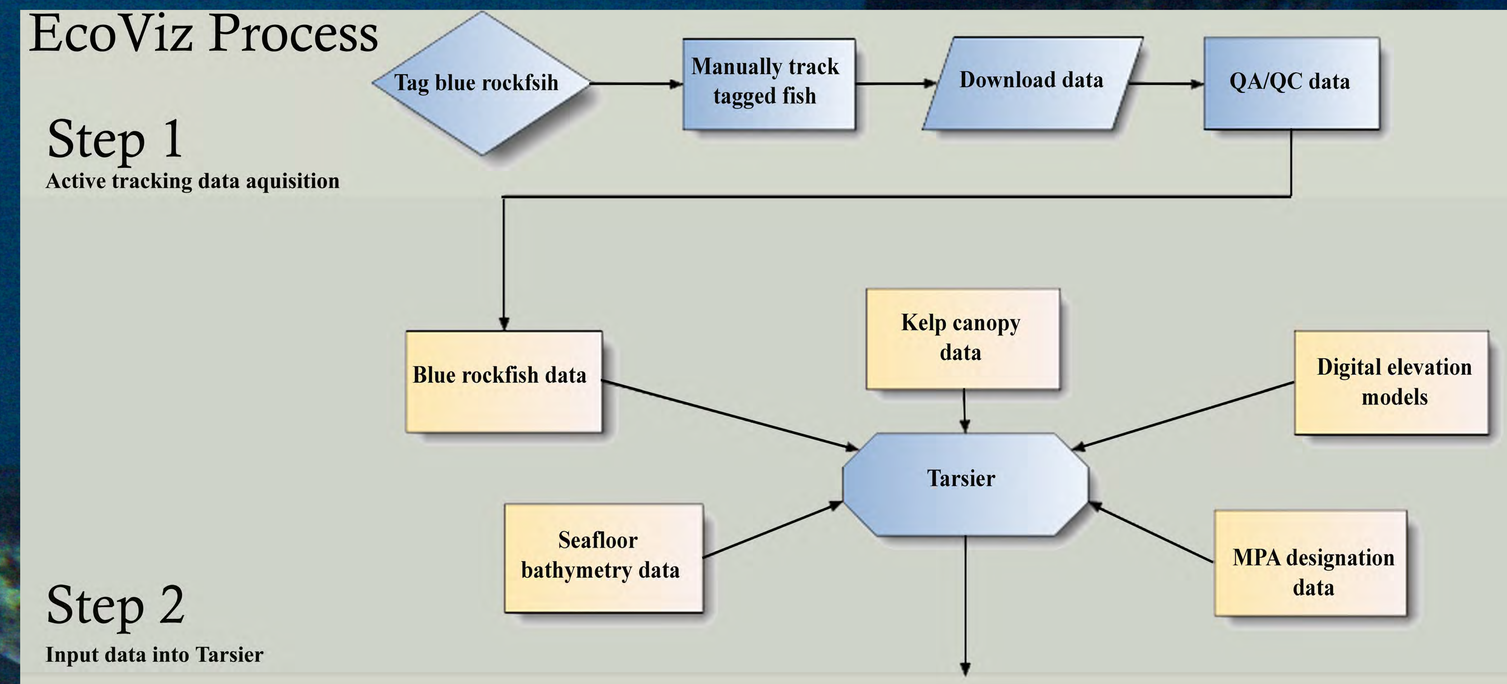


Figure 3: Tarsier program used to create 3-D visualizations

EcoViz Process



Results

The two individual *Sebastes mystinus* exhibited different behaviors over the course of this study. The individual tracked inside the Carmel Bay State Marine Conservation Area exhibited shallow water swimming behavior. The available kelp canopy could mediate this individual's shallow water swimming behavior. The individual tracked outside the Carmel Bay State Marine Conservation Area exhibited deep-water swimming behavior. The seafloor topography could mediate this individual's deep water swimming behavior.

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DEM: National Oceanic and Atmospheric Administration
Kelp Canopy: California Department of Fish and Game