POTENTIAL OF VIDEO TECHNIQUES TO MONITOR DIVERSITY, ABUNDANCE AND SIZE OF FISH IN STUDIES OF MARINE PROTECTED AREAS

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Abstract

This paper briefly reviews applications of single-video and stereo-video techniques to help survey fish community composition and relative abundance, and fish length and weight. These techniques have potential application to the initial surveys of candidate habitats for Marine Protected Areas, and to the subsequent monitoring necessary to manage them. Remote video techniques can be used in shelf depths beyond the limits of diver-based Underwater Visual Census (UVC), and stereo-video systems can also be used to complement and enhance normal UVC by allowing very precise and accurate estimates of fish morphometrics (and hence weight). Some video techniques are very cost-effective and can help remove some major sources of observer bias in underwater observations, by removing the need for skilled observers in the field and by allowing simultaneous collection of a much wider suite of information in a permanent record that can be analysed later. This medium is directly accessible to an unlimited audience. Baited, remote video techniques offer a non-intrusive, depth-independent assessment tool with the advantages of both diver-based observation and capture techniques, but appropriate sampling statistics must be developed if relative abundance is to be measured adequately.

Keywords: stereo-video systems, baited video surveys, fish size, fish abundance, monitoring

INTRODUCTION

Fish and fisheries management have been the focus of many Marine Protected Area (MPA) programs – with the expectation that they will "work" by protecting unique or endangered species, maintaining biodiversity in representative areas, restoring degraded habitats, protecting breeding stocks and having a beneficial spill-over effect into adjacent areas (e.g. Sladek-Nowlis and Roberts 1999). Consequently, there has been much research interest in "Rapid Assessment Techniques" for initial surveys and robust monitoring techniques that balance field costs and data quality with the need for very long data series (e.g. Samoilys and Carlos 2000; Samway and Hatton 2001). Underwater Visual Census (UVC) has been the predominant survey tool in studies focussing on shallower coral reefs and temperate rocky reefs. More recently, however, there has been recognition that vast areas of deeper "inter-reef" and shelf habitats inaccessible to research divers are worthy of exploration and conservation, and that important bioregions there should be included in marine reserves (e.g. Pitcher *et al*. 1999). For example, only 6% of the Great Barrier Reef Marine Park is made up of shallow coral reefs, and the remainder below 20 m depth is very poorly surveyed and not included in fishery-independent monitoring programs. On tropical shelves these habitats can be dominated in clearer waters (~50–70 m depths) by phototrophic corals, seagrasses and algae, and in more turbid or deeper waters by filter-feeding gorgonians, sponges, ascidians and bryozoans (McManus 1997). In higher latitudes, kelp and seagrass communities can extend to 50 m, to be replaced by patches and "reefs" of sessile invertebrate communities in lower light regimes (see chapters in Andrew 1999).

With the exception of occasional use of staffed submersibles, UVC of fish communities is not possible in the vast habitats at these depths. Deeper fish surveys have relied mostly on extractive fishing techniques such as trawls, traps and lines depending on seabed topography (Gaudian *et al*. 1995; Newman *et al*. 1997; Wassenberg *et al*. 1997). There have also been promising tests of some video and hydro-acoustic techniques in topographically complex habitats (e.g. Parker *et al.* 1994; Gledhill *et al*. 1996).