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RESEARCH ARTICLE

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A comparison of temperate reef fish assemblages recorded by three underwater stereo-video techniques

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Abstract Three underwater stereo-video techniques were used to sample the relative densities and species richness of temperate reef fish assemblages at three reef locations and two habitats (high- and low-relief reef) within Hamelin Bay, south-western Australia. The three techniques compared were diver-operated stereo-video strip transects, baited remote stereo-video and unbaited remote stereo-video. While unbaited remote stereo-video and diver-operated stereo-video transects recorded greater species richness at high compared to low-relief reefs, baited remote stereo-video recorded similar species richness at the two habitat types. The diver-operated stereo-video system was manoeuvred through caves and under overhangs recording small, cryptic, cave-dwelling species that were not recorded by either remote video techniques (*Trachinops noarlungae, Trachinops brauni, Chromis klunzingeri, Trachichthys australis*). Both remote video techniques recorded greater species richness and relative density of the most common species of Labridae, *Ophthalmolepsis lineolatus*. Baited remote video recorded the rarer, large predatory fish species (e.g. *Seriola hippos*, *Glaucosoma hebraicum, Heterodontus portusjacksoni*). None of the techniques sampled small cryptic fish families such as Gobiidae or Blenniidae. A combination of survey techniques is recommended for comprehensive fishery-independent studies that aim to sample broad components of fish assemblages.

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Introduction

Accurate and precise information on the length, density and diversity of fishes facilitates fishing-independent estimates of recruitment, fishing intensity and rates of recovery from fishing or other disturbances (McCormick and Choat 1987; Harvey et al. 2001a). Despite this information being vital for all ecological studies (Andrew and Mapstone 1987), there is no single technique that is able to measure changes in fish assemblages accurately and precisely without introducing its own biases (Lincoln-Smith 1989; Kingsford and Battershill 1998).

As the uses of destructive sampling techniques are, for the most part, prohibited in marine protected areas (MPAs) (Lipej et al. 2003; Willis et al. 2000; Willis and Anderson 2003), the application of observational techniques is widespread. The most common observational technique for studying shallow (< 20 m) reef fish assemblages is by SCUBA divers conducting an underwater visual census (UVC) (English et al. 1994). The limitations of UVC are numerous and well documented (e.g. Sale and Sharp 1983; Lincoln-Smith 1988, 1989; Watson et al. 1995; Watson and Quinn 1997; Thompson and Mapstone 1997); however, the method is frequently used. Examples of these biases include: the influence of a diver on fish behaviour (Chapman et al. 1974; Cole 1994), variation in diver-swimming speed (Lincoln-Smith 1988), failure to correctly estimate the length of individuals (Bell et al. 1985; Harvey et al. 2001a, b), and observer and inter-observer variability (Thompson and Mapstone 1997). Recently, researchers have begun to respond to repeated calls for comparisons of the abilities of different observational sampling techniques to reduce biases and to enhance the accuracy and precision of data obtained (e.g. Willis et al. 2000; Willis and Babcock 2000; Cappo et al. 2004; Harvey et al. 2004; Tessier et al. 2005).

An alternative and complementary observational sampling technique to UVC is video and a number of studies have compared fish assemblages recorded using