Department of Parks and Wildlife

Information Sheet 90 / 2016
Science and Conservation Division

Assessing benthic assemblages from fish survey videos

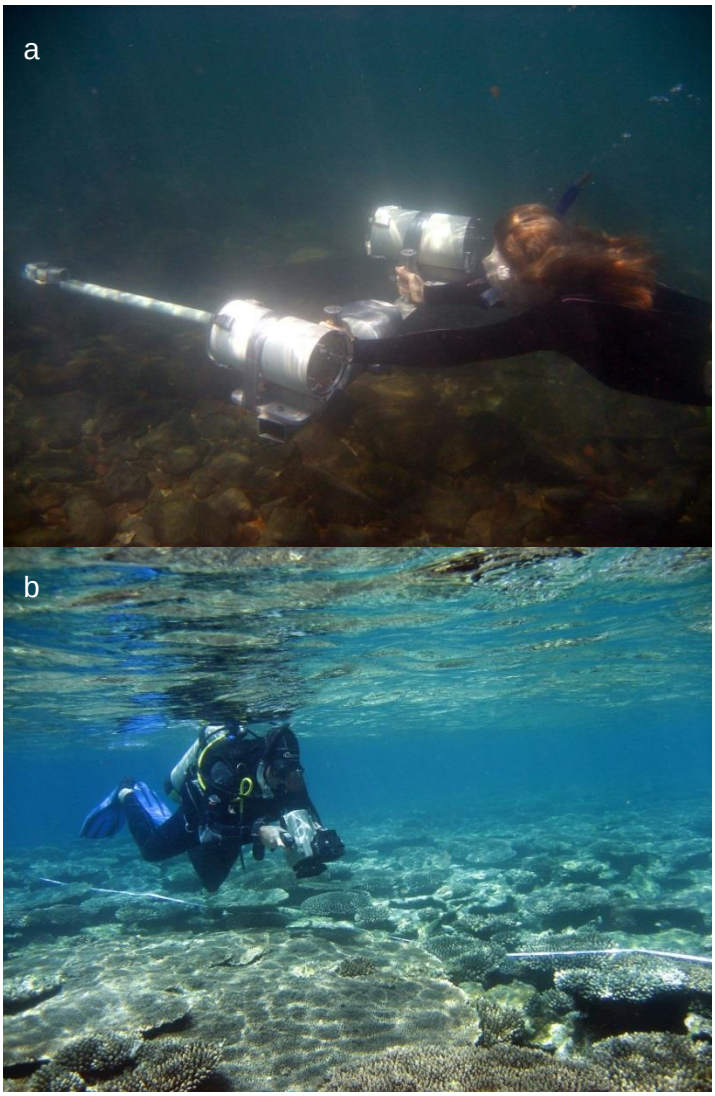
by Shaun Wilson shaun.wilson@dpaw.wa.gov.au 08 9219 9806, Thomas Holmes and George Shedrawi: Parks and Wildlife, Katherine Bennett, Danielle Collins, Tim Langlois and Dianne McLean: Oceans Institute, University of Western Australia

Background

The abundance and diversity of fish assemblages is closely linked to habitat composition and structure. As a consequence, research and monitoring programs that assess human impacts on fish communities often consider concurrent measures of habitat when distinguishing between the various drivers of change in fish assemblages. Of particular importance is the structural complexity of the habitat, as this gives an indication of refuge space, moderates key processes like recruitment and predation and is positively correlated with fish diversity.

In-water assessments of fish abundance and diversity are commonly carried out by divers identifying and counting fish within a predefined area, a process commonly referred to as underwater visual census (UVC). However information on fish assemblages is increasingly collected using video, which provides a permanent record and allows images to re-examined over time to identify taxa, verify findings or extract new information. Video collected to survey fish populations may also provide useful metrics of benthic habitat and could be used to simultaneously monitor the condition of benthic communities. The use of stereo-cameras for this purpose may be especially useful as it allows accurate measures of length which can be used to measure the height of habitat variables, a metric that has previously been used to assess habitat relief and structural complexity.

We developed protocols for assessing habitat composition and structural complexity from video footage collected to survey fish communities. Measures such as taxonomic composition and structural complexity (visual categorisation of the seascape, and reef height) were then compared to data collected from traditional methods commonly used in benthic monitoring programs (photo quadrats, rugosity) to determine if data from the two techniques were comparable.

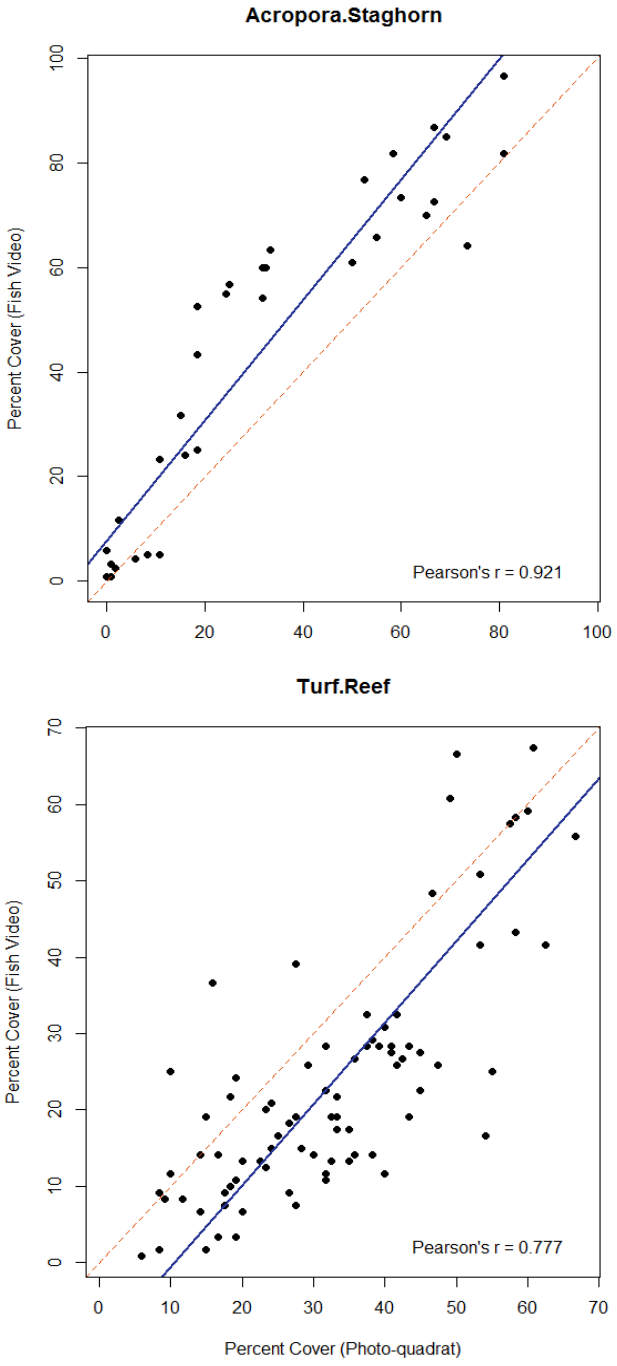


Above: Marine scientists collecting fish survey data using stereo-diver operated video (a) and capturing benthic images for photo quadrats to assess benthic assemblages (b).

Findings

Percent cover estimates of taxa which protrude vertically into the water column, such as branching corals and large fleshy macroalgae, were high when using video for fish monitoring. Conversely, estimates of low-profile habitats, such as rubble and turf algae, were high when using photo quadrats. Results differed because cameras used to collect photo quadrats are held perpendicular to the substrate, whilst cameras used for filming fish are held almost horizontal to the substrate and provide a different perspective of the seabed. Despite the techniques providing different assessments of benthic composition, strong relationships existed between estimates for some taxa and correction factors could be used to make data from the two techniques comparable.

Measures of habitat height from stereo-video footage provided estimates of structural complexity that were comparable with visual assessments of the seascape and measures of rugosity (linear distance covered by a chain fitted to the reef contour). Visual assessment of the seascape structure was also possible from video footage and when combined with video measures of habitat height provided assessments of structural complexity that correlated well with fish abundance and diversity.



Above: The relationship between benthic data collected using fish videos and photo quadrats for *Acropora* staghorn coral and turf algae. The black line is the linear model of best fit and the red dotted line is a theoretical model where estimates of benthos from fish video and benthic quadrats are equal.

Management Implications

Video collected primarily to survey the abundance and diversity of fish can also be used to assess fish habitat and structural complexity. Habitat data from fish videos may also be transformed so it is comparable to data collected using photo quadrats, potentially increasing data for spatial and temporal monitoring of broad benthic categories in a cost effective manner. This is particularly important after disturbance where increasing temporal and spatial coverage can increase understanding of the broad effects on benthic and fish communities. However, benthic data from fish video cannot replace data from photo quadrats that are typically used to monitor benthic communities as data from fish videos does not adequately capture components of the benthic community that are indicative of key processes such as recruitment.

For further information see: Bennett K, Wilson SK, Shedrawi G, McLean DL, Langlois TJ (2016) Can diver operated stereo-video surveys for fish be used to collect meaningful data on benthic coral reef communities? *Limnology and Oceanography: Methods* (DOI: 10.1002/lom3.10141).

Collins DL, Langlois TJ, Bond T, Holmes TH, Harvey ES, Fisher R, McLean DL (2016) A novel stereo-video method to investigate fish-habitat relationships. *Methods in Ecology and Evolution* (DOI: 10.1111/2041-210X.12650).

Produced and published by the Science and Conservation Division, Department of Parks and Wildlife, Western Australia,
Locked Bag 104, Bentley Delivery Centre, WA 6983