Geomorphology of Grouper and Snapper Spawning Aggregation Sites in the Upper Florida Keys, USA

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EXTENDED ABSTRACT

Fish spawning aggregations (FSAs) are a vital part of the life cycle of many reef fishes. Globally, 120 reef fish species are known to reproduce in aggregations (SCRFA 2008); the resulting juveniles replenish reef fish populations, sustain fisheries, and support livelihoods in coastal communities. The sustainable management of grouper, snapper, and other reef fish fisheries, from both a fisheries and ecosystem perspective is, in large part, dependent on the protection and conservation of FSAs, as well as the ecological processes (e.g., migration to FSA sites, larval dispersal, and population connectivity) associated with spawning events.

The goal of the present research was to investigate the potential of using geomorphology to predict the locations of FSA sites, and to discuss potential management benefits and risks associated with such an approach. FSAs in the Caribbean, such as those in Belize (Heyman *et al.* 2004 and 2005) and elsewhere (Sadovy and Eklund 1999), are often associated with reef promontories that protrude into deep water and terminate with dramatic escarpments. Such promontories are not found along the Florida Keys coral reef tract. Thus, we asked whether FSA sites in the Florida Keys, USA, were associated with other geomorphological features on the seabed that could be reliably mapped and characterized with an off-the-shelf single beam echo sounder.

A commercial single beam acoustic seabed classification system [QTCView Series V (QTC-V); Quester Tangent Corp., Sidney, BC, Canada; see Gleason et al. 2006] was used to map historical FSA sites in the upper Florida Keys. Data processing was performed using IMPACT software (version 3.4, Quester Tangent Corp., Sidney, BC, Canada, 2004). Results showed that drowned, margin-parallel, rocky ridges, known locally as outlier reefs (Lidz et al. 1991, 2003), were features found in proximity to all the mapped FSA sites. FSA location appeared to be related to both the presence of outlier ridges and the occurrence of exposed hardbottom along those ridges. Assessment of additional FSA sites in the lower Florida Keys to increase sample size and refine apparent geomorphological signatures are planned.

The results indicated, first, that the QTC single-beam acoustic seabed classification system was an effective method for mapping outlier reefs in the Florida Keys, and, second, that outlier reefs were geomorphological features associated with upper Keys FSAs. Single-beam acoustic seabed classification systems therefore could be useful tools for rapid surveys during initial assessment of ecologically important sites or when considering them for protection. In fact, two of the FSA sites surveyed as part of this study were immediately adjacent to existing MPAs, and could have been considered for inclusion in those MPAs had managers been aware of their presence or at least been aware of the proximity of outlier reefs to the proposed MPA borders. A potential risk associated with identifying geomorphological signatures of FSA sites is that such knowledge could enable the identification and subsequent exploitation of FSA sites by fishers. However, given the preponderance of FSAs worldwide that have been known to fishers prior to their "discovery" by managers or researchers, it is likely that the potential management benefits of being able to identify and protect FSA sites outweigh the risk of enhanced exploitation of those sites.

LITERATURE CITED

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