

**Coral reef fish response to FKNMS management zones:  
the first ten years (1997-2007)**

Progress Report to the Florida Keys National Marine Sanctuary

by

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## ***Introduction***

On July 1, 1997, the Florida Keys National Marine Sanctuary (FKNMS) established a network of “no-take” marine reserves (NTMRs) along the Florida Keys Reef Track east of Key West, comprised of 22 Sanctuary Preservation Areas (SPAs) (mean = 0.85 km<sup>2</sup>, range 0.16 – 5.15 km<sup>2</sup>), and a larger (18.7 km<sup>2</sup>) Western Sambo Ecological Reserve (WSER) (US DOC 1996). This report focuses on research to assess the effectiveness of these NTMRs by comparing trends in population metrics between areas closed and open to fishing for key exploited reef fish species and two non-exploited reef species. We show trends from a four year baseline period before reserve establishment (1994-1997), to 10 years following reserve establishment (1998-2007). This report does not include results for the Tortugas region west of Key West which are reported elsewhere (Ault et al. 2002, 2005c, 2006, 2008).

## ***Methods***

Reef fishes were visually monitored *in situ* by highly trained and experienced SCUBA divers using the Reef fish Visual Census (RVC) methodology, a standard non-destructive, fishery-independent, spatially-explicit monitoring method (Bohnsack and Bannerot 1986, Bohnsack and Ault 1996, Bohnsack et al., 1999; Brandt et al., in review). RVC data include species composition of visually observed reef fishes and their abundance, size structure, and frequency of occurrence within 7.5 m radius circular plots. Ultimately, these data were used to determine trends in species composition, population abundance, and individual size throughout the Florida Keys, in specific geographically

defined areas, and by habitat. Data can be used to determine species-specific habitat associations and ontogenic habitat shifts, and assess reef fish population and community responses to ecosystem changes resulting from anthropogenic or natural disturbances, such as hurricanes, climate change, or effects of management measures employed to regulate fisheries.

RVC data used in this study were collected annually from 1994 through 2007 in coral reef habitat the along the Florida reef tract from Miami to Key West (Table 1). Baseline data were collected at various reefs in the Florida Keys from 1994 through 1997 before NTMRs were established in 1997. Because the final locations of FKNMS management zones was not determined with certainty until 1996, some previously monitored sites ended up in NTMRs while others remained in areas open fishing. In most years data were collected from May through August before hurricane disturbances. Figure 1 shows an example of the distribution of RVC sampling effort for 2007. During most of the baseline period (1994-1997) we did not know what reef areas would be included in the final FKNMS reserves boundaries for SPAs or ERs. Because of this, not all reef habitats were sampled every year from 1994 to 1996, therefore data for 1994-1997 were combined to form baselines for comparative purposes. When combined, the baseline included all representative reef habitats that are used in the subsequent stratified random sampling design. The final NTMR boundaries that were implemented in 1997 included reef areas with disproportionately more high relief coral habitat than is represented in the FKNMS (Table 2). As a result, we calculated two baseline ranges for various population metrics: One included sampling sites within the final NTMR boundaries and the second included sampling sites in areas that remained opened to fishing. The resulting baseline metric ranges differ among species due to their specific habitat preferences.

























































