Area Descriptions from Snapper Grouper Amendment 36 and the System Management Plan

Below are excerpts from Amendment 36 on Area 51

Area 51 is an experimental artificial reef site, which was established by the South Carolina Department of Natural Resources (SCDNR) to investigate the feasibility of using artificial reef materials as an experimental Marine Protected Area (MPA). By monitoring and documenting the reef community development and fisheries production of an un-fished artificial reef area, and comparing this to regularly fished areas, the potential value of artificial reef-MPAs as a supplement to traditional methods of managing fisheries could be evaluated. Man made MPAs could also serve as effective demonstration sites in documenting the potential benefits that could be derived from larger scale MPAs where none existed at the time. Area 51 is a 1.5 nautical mile X 1.5 nautical mile (1.73 X 1.73 statute miles or 2.99 square statute miles) permitted artificial reef site located in approximately 70 feet of water off the South Carolina coast. Clusters of low profile concrete reef units have been placed in several locations within the boundaries of the permitted area.

To more accurately measure the productivity of the reef, it was necessary to eliminate public fishing pressure on it by limiting public awareness and, therefore, public use of the site during the study period. The US Army Corps of Engineers allowed SCDNR to utilize a special permitting process to by-pass the standard public comment period normally required for typical open access artificial reef sites.

Observations from Area 51:

- Total number of taxa was not significantly different between fished and unfished artificial reefs. However, total biomass was significantly greater at unfished artificial reef sites, while total numbers of fishes was greater at fished sites.
- Warsaw grouper have been observed in Area 51.

Analysis:

- Unfished artificial reefs had significantly higher abundance of commercially and recreationally important species (i.e., black sea bass, gag) while small, schooling baitfish (scad, cigar minnows) dominated at fished sites.
- Recruitment of juveniles and sub-adults was observed at all study sites but, over time, concentrations of black sea bass increased exponentially at unfished artificial reef sites and decreased exponentially at fished sites.

- Concentrations of black sea bass on unfished artificial reef sites were higher than in any previous similar study.
- Two years after cessation of all fishing activities, population levels of black sea bass remained near zero at fished sites but remained high at unfished artificial reef sites.
- Gonad analysis indicated spawning activity in black sea bass and gray triggerfish at the sites.
- Tagging studies revealed minimal movement between reef corners. After the initial tagging period (May-Aug), recaptures revealed 100% site fidelity during subsequent seasons. After a series of hurricanes passed by the coast (Arlene, Dennis, Floyd, Irene) there was migration from the sites.
- Very few tags were returned from off site; however, all off site recaptures were of fish originally tagged at unfished artificial reef sites, possibly because over-crowding at these sites prompted emigration.
- Trophic analysis showed that the artificial reefs served as a primary food source for both permanent and transient fish species and that reefs protected from harvest can enhance fisheries by increasing long-term habitat space, cover, and food.

Graduate student theses from Area 51

Gold, Hansje. 2001. Impact of the Removal of Black Sea Bass (Centropristis striata) from Artificial Reef Structures in the South Atlantic Bight.

Kauppert, Petra A. 2002. Feeding habits and trophic relationships of an assemblage of fishes associated with a newly established artificial reef off South Carolina.

Below is an excerpt from the System Management Plan describing Area 51

The SCDNR experimental artificial reef site designated as Area 51 was established April 24, 1998 to investigate the feasibility of using artificial reef materials as an experimental MPA. The preferred Spawning SMZ for Area 51 encompasses 1.5 mile X 1.5 miles of the permitted artificial reef site located in approximately 70 feet of water off the South Carolina coast on sandy bottom.

Habitat and Managed Species Characterization

The bottom composition of Area 51 is sandy bottom enhanced with artificial reef materials that were placed in the area beginning in 1998. SCDNR has been sampling this artificial reef site through the Artificial Reef Program. Forty-three species have been observed by SCDNR on the artificial reef including greater amberjack, red grouper, scamp, gag, warsaw grouper, and red snapper, which are focal species of the Spawning SMZs (**Table 1**). Neither the NMFS ROV study nor the SERFS has sampled this location.

Table 1. Species observed at Area 51 since the material has been placed in the area by SCDNR. Bolded species are focal species identified in Amendment 36. Source: Robert Martore, SCDNR.

Common Name	Scientific Name	Common Name	Scientific Name
Black Sea Bass	*Centropristis striata*	Southern Hake	*Urophycis floridana*
Bank Sea Bass	*C. ocyurus*	Barracuda	*Sphyraena barracuda*
Gray Triggerfish	*Balistes capriscus*	Remora	*Remora remora*
Red Grouper	***Epinephelus morio***	Cubbyu	*Pareques acuminatus*
Scamp	***Mycteroperca phenax***	Gulf Flounder	*Paralichthys albigutta*
Gag	***M. microlepsis***	Slippery Dick	*Halichoeres bivittatus*
Warsaw Grouper	***Hyporthodus nigritus***	Pearly Razor	*Xyrichtys novacula*
Red Snapper	***Lutjanus campechanus***	Tautog	*Tautoga onitis*
Vermillion Snapper	*Rhomboplites aurorubens*	Surgeonfish	*Acanthurus sp.*
Cobia	*Rachycentron canadum*	Spotted Goatfish	*Pseudupeneus maculatus*
Whitebone Porgy	*Calamus leucosteus*	Inshore Lizardfish	*Synodus foetens*
Sheepshead	*Archosargus probatocephalus*	Oyster Toadfish	*Opsanus tau*
Greater Amberjack	***Seriola dumerili***	Batfish	*Ogcocephalus sp.*
Spot	*Leiostomus xanthurus*	Southern Stingray	*Dasyatis americana*
White Grunt	*Haemulon plumierii*	Nurse Shark	*Ginglymostoma cirratum*
Pigfish	*Orthopristis chrysoptera*	Sandbar Shark	*Carcharhinus plumbeus*
Blue Angelfish	*Holacanthus bermudensis*	Spotted Moray	*Gymnothorax moringa*
Atlantic Spadefish	*Chaetodipterus faber*	Round Scad	*Decapterus punctatus*
Spottail Pinfish	*Diplodus holbrooki*	Scup	*Stenotomus chrysops*
Pinfish	*Lagodon rhomboides*	Reef Butterflyfish	*Chaetodon sedentarius*
Tomtate	*Haemulon aurolineatum*	Loggerhead Sea Turtle	*Caretta caretta*
Planehead Filefish	*Stephanolepis hispidus*		

Excerpt from Snapper Grouper Amendment 36 on Area 53

Due in part to the results obtained from work on the Area 51 reef site, the Council provided funding to replicate that study design in deeper water to specifically target a wider range of snapper grouper species. The permitting process and all reef parameters for the new site, designated Area 53, were identical to Area 51 except that water depth for this site is 105 feet. In addition to the dart tags that were used in Area 51, acoustic tags were also implanted in numerous fish of several larger species on Area 53 and receiver arrays established on all four corners of the permitted area to monitor site fidelity on the reef. Observations from Area 53:

- Diversity was not significantly different between fished and unfished artificial reef reefs. However, total abundance of black sea bass, gag, scamp, and gray triggerfish was significantly greater at unfished artificial reef sites.
- Gonad analysis indicated spawning activity in black sea bass, red porgy, and gray triggerfish at the sites.
- Tagging studies revealed high site fidelity for black sea bass, gag, scamp, red snapper, and gray triggerfish.
- Protected sites had significantly larger size and faster growth rates for black sea bass and gray triggerfish.
- Unfished reefs had greater biomass than exploited reefs, increasing the reproductive output and larval spillover of protected artificial reef systems.
- Warsaw grouper have been observed in Area 53.

Graduate student theses from Area 53 Burgess, Dany E. 2008. Development of Invertebrate Assemblages on Artificial Reef Cones off South Carolina: Comparison to an Adjacent Hard-Bottom Habitat

Kolmos, Kevin J. 2007. Succession and biodiversity of an artificial reef Marine Protected Area: A comparison of fish assemblages on protected and unprotected habitats.

One additional student, Jacqueline Shapo, attempted to examine the possibility of coral transplants onto the newly established reef cones to hasten invertebrate development but this attempt did not work out.

Excerpt from the System Management Plan describing Area 53

Due in part to the results obtained from work on the Area 51 reef site, the SAFMC provided funding to replicate the study design of Area 51 in deeper water in order to specifically target a wider range of snapper-grouper species. The permitting process and all reef parameters for the new site, designated Area 53, were identical to Area 51 except that water depth for this site was 105 feet. The preferred Spawning SMZ for Area 53 encompasses 1.5 mile X 1.5 miles of the permitted artificial reef site.

Habitat and Managed Species Characterization

The bottom composition of Area 53 is sandy bottom enhanced with artificial reef materials that were placed in the area beginning in 2003. Forty-two species have been recorded on the artificial reef including greater amberjack, scamp, gag, warsaw grouper, and red snapper, which are focal species of the Spawning SMZs (**Table 2**). Neither the NMFS ROV study nor the SERFS has sampled this location.

Table 2. Species observed at Area 53 since the material has been placed in the area by SCDNR. Bolded species are focal species identified in Amendment 36. Source: Robert Martore, SCDNR.

Common Name	Scientific Name	Common Name	Scientific Name
Black Sea Bass	*Centropristis striata*	Southern Hake	*Urophycis floridana*
Bank Sea Bass	*C. ocyurus*	Barracuda	*Sphyraena barracuda*
Gray Triggerfish	*Balistes capriscus*	Sand Perch	*Diplectrum formosum*
Queen Triggerfish	*B. vetula*	Cubbyu	*Pareques acuminatus*
Scamp	***Mycteroperca phenax***	Honeycomb Cowfish	*Acanthostracion polygonius*
Gag	***M. microlepsis***	Pearly Razor	*Xyrichtys novacula*
Warsaw Grouper	***Hyporthodus nigritus***	Sand Tilefish	*Malacanthus plumieri*
Red Snapper	*Lutjanus campechanus*	Blue Runner	*Caranx crysos*
Vermillion Snapper	*Rhomboplites aurorubens*	Jacknifefish	*Equetus lanceolatus*
Red Porgy	*Pagrus pagrus*	Spanish Hogfish	*Bodianus rufus*
Whitebone Porgy	*Calamus leucosteus*	Loggerhead Turtle	*Caretta caretta*
Banded Rudderfish	*Seriola zonata*	Frogfish	*Antennarius Sp.*
Greater Amberjack	***S. dumerili***	Nurse Shark	*Ginglymostoma cirratum*
Almaco Jack	*Seriola rivoliana*	Spotted Moray	*Gymnothorax moringa*
White Grunt	*Haemulon plumierii*	Lionfish	*Pterois volitans*
Blue Angelfish	*Holacanthus bermudensis*	Greater Soapfish	*Rypticus saponaceus*
Atlantic Spadefish	*Chaetodipterus faber*	Round Scad	*Decapterus punctatus*
Spottail Pinfish	*Diplodus holbrooki*	Scup	*Stenotomus chrysops*
Planehead Filefish	*Stephanolepis hispidus*	Reef Butterflyfish	*Chaetodon sedentarius*
Tomtate	*Haemulon aurolineatum*	Blenny	*Blenniidae Sp.*
Margate	*H. album*	Ocean Sunfish	*Mola mola*