The following supplement accompanies the article

Experimental assessment of lionfish removals to mitigate reef fish community shifts on northern Gulf of Mexico artificial reefs

Kristen A. Dahl*, William F. Patterson III, Richard A. Snyder

*Corresponding author: kdahl@disl.org

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Table S1. Taxonomic groupings for small (<100 mm TL) demersal reef fishes, exploited fishery species (>200 mm TL) and small (<150 mm TL) pelagic planktivores.

Common Name	**Taxon**
Small Demersals	
Bank Butterflyfish	*Chaetodon aya*
Bank Sea Bass	*Centropristis ocyurus*
Barred Blenny	*Hypleurochilus bermudensis*
Beaugregory	*Stegastes leucostictus*
Bicolor Damselfish	*Stegastes partitus*
Blackbar Drum	*Pareques iwamotoi*
Blue Angelfish	*Holacanthus bermudensis*
Cocoa Damselfish	*Stegastes variabilis*
Cubbyu	*Equetus umbrosus*
Doctorfish	*Acanthurus chirurgus*
Gray Angelfish	*Pomacanthus arcuatus*
Greenband Wrasse	*Halichoeres bathyphilus*
Highhat	*Equetus acuminatus*
Honeycomb Cowfish	*Acanthostracion polygonius*
Jacknife Fish	*Equetus lanceolatus*
Leopard Toadfish	*Opsanus pardus*
Painted Wrasse	*Halichoeres caudalis*
Purple Reeffish	*Chromis scotti*
Queen Angelfish	*Holacanthus ciliaris*
Reef Butterflyfish	*Chaetodon sedentarius*
Saddle Bass	*Serranus notospilus*
Sand Perch	*Diplectrum formosum*
Scrawled Cowfish	*Lactophrys quadricornis*
Seaweed Blenny	*Parablennius marmoreus*
Sharpnose Puffer	*Canthigaster rostrata*
Slippery Dick	*Halichoeres bivittatus*
Spitlure Frogfish	*Antennarius scaber*
Spotfin Butterflyfish	*Chaetodon ocellatus*
Spotfin Hogfish	*Bodianus pulchellus*
Spotted Batfish	*Ogcocephalus Pantostictus*
Squirrelfish	*Holocentrus adscensionis*
Striated Frogfish	*Antennarius striatus*
Striped Burrfish	*Chilomycterus schoepfi*
Twospot Cardinalfish	*Apogon pseudomaculatus*
Unidentified Blennies	Blennidae

Common Name	**Taxon**
Unidentified Cardinalfishes	Apogonidae
Unidentified Damsels	Pomacentridae
Unidentified Gobies	Gobiidae
Unidentified Wrasses	Labridae
Whitespotted Soapfish	*Rypticus maculatus*
Wrasse Bass	*Liopropoma eukrines*
Yellowtail Reeffish	*Chromis enchrysura*
Fishery Species	
Almaco Jack	*Seriola rivoliana*
Cobia	*Rachycentron canadum*
Gag	*Mycteroperca microlepis*
Goliath Grouper	*Epinephelus itajara*
Gray Snapper	*Lutjanus griseus*
Gray Triggerfish	*Balistes capriscus*
Graysby	*Epinephelus cruentatus*
Greater Amberjack	*Seriola dumerili*
Jolthead Porgy	*Calamus bajonado*
King Mackerel	*Scomberomorus cavalla*
Lane Snapper	*Lutjanus synagris*
Lesser Amberjack	*Seriola fasciata*
Littlehead Porgy	*Calamus proridens*
Red Grouper	*Epinephelus morio*
Red Porgy	*Pagrus pagrus*
Red Snapper	*Lutjanus campechanus*
Saucereye Porgy	*Calamus calamus*
Scamp	*Mycteroperca phenax*
Sheepshead Porgy	*Calamus penna*
Snowy Grouper	*Epinephelus niveatus*
Unidentified Porgies	Sparidae
Vermilion Snapper	*Rhomboplites aurorubens*
Whitebone Porgy	*Calamus leucosteus*
Pelagic Planktivores	
Blue Runner	*Caranx crysos*
Mackerel Scad	*Decapterus macarellus*
Bigeye Scad	*Selar crumenophthalmus*
Round Sardinella	*Sardinella aurita*
Unidentified Jacks	Carangidae

Table S2. Post hoc pairwise multiple comparisons (Tukey) for significant main test results from one-way repeated measures ANOVA testing effect of time (2009-2010 versus 2011-2012 versus 2013-2014) on reef fish diversity indices on nGOM artificial reefs. Items in bold type indicate significant pairwise comparisons.

Test	Species Richness *J*□	Diversity *H*'
2009-2010 vs 2011-2012	**<0.001**	**0.001**
2009-2010 vs 2013-2014	**<0.001**	0.153
2011-2012 vs 2013-2014	0.652	0.851

Table S3. Post hoc pairwise comparisons for significant main test results from PERMANOVA testing effect of removal treatment (Control, Clear-Once and Maintain-Clear) and sample timing on reef fish community structure of nGOM removal experimental artificial reefs. Items in bold type indicate significant pairwise comparisons.

A) Reef Fish Community

Pairwise Treatment Tests	p-value
Control vs Maintain-Clear	**0.007**
Control vs Clear-Once	**0.034**
Clear-Once vs Maintain-Clear	0.333

Pairwise Timing Tests	Dec 13	Mar 14	Jul 14	Dec 14	May 15	Aug 15
Dec 13	-	-	-	-	-	-
Mar 14	**0.026**	-	-	-	-	-
Jul 14	0.083	**0.021**	-	-	-	-
Dec 14	0.365	**0.017**	0.128	-	-	-
May 15	0.276	**0.032**	**0.011**	0.442	-	-
Aug 15	0.205	**0.002**	**0.017**	0.388	**0.036**	-

B) Exploited Reef Fishes

Pairwise Timing Tests	Dec 13	Mar 14	Jul 14	Dec 14	May 15	Aug 15
Dec 13	-	-	-	-	-	-
Mar 14	**0.014**	-	-	-	-	-
Jul 14	**0.045**	0.181	-	-	-	-
Dec 14	**0.005**	**<0.001**	0.069	-	-	-
May 15	**0.008**	**0.002**	**0.048**	0.584	-	-
Aug 15	**<0.001**	**<0.001**	**0.002**	0.089	**0.009**	-

C) Small Demersal Reef Fishes

Pairwise Timing Tests	Dec 13	Mar 14	Jul 14	Dec 14	May 15	Aug 15
Dec 13	-	-	-	-	-	-
Mar 14	0.083	-	-	-	-	-
Jul 14	**0.001**	**0.029**	-	-	-	-
Dec 14	**<0.001**	**<0.001**	**0.002**	-	-	-
May 15	**0.016**	0.133	**0.016**	0.097	-	-
Aug 15	**0.003**	**0.018**	**0.001**	**0.046**	0.340	-

Table S4. Post hoc pairwise multiple comparisons (Tukey) for significant main test results from two-way repeated measures ANOVA testing effect of removal treatment (Control, Clear-Once and Maintain-Clear) and sample timing on reef fish diversity indices and number of individuals on nGOM removal experimental artificial reefs. Significant main test results were found only for sample timing for A) species richness and B) number of individuals. Items in bold type indicate significant pairwise comparisons.

A)	Sample Timing					
Sample Timing	Dec 13	Mar 14	July 14	Dec 14	May 15	Aug 15
Dec 13	-	-	-	-	-	-
Mar 14	**<0.001**	-	-	-	-	-
Jul 14	0.765	**0.026**	-	-	-	-
Dec 14	0.989	**0.003**	0.980	-	-	-
May 15	0.996	**<0.001**	0.445	0.869	-	-
Aug 15	0.892	**<0.001**	0.368	0.809	1.000	-

B)	Sample Timing					
Sample Timing	Dec 13	Mar 14	July 14	Dec 14	May 15	Aug 15
Dec 13	-	-	-	-	-	-
Mar 14	0.994	-	-	-	-	-
Jul 14	0.937	0.999	-	-	-	-
Dec 14	1.000	0.988	0.909	-	-	-
May 15	0.804	0.466	0.247	0.850	-	-
Aug 15	0.135	**0.034**	**0.011**	0.165	0.823	-

Figure S1. Mean (±SE) density (fish × 100 m^{-2}) of tomtate (*Haemulon aurolineatum*), red snapper (*Lutjanus campechanus*), jacks, Family: Carangidae, gray triggerfish (*Balistes capriscus*), groupers, Family: Serranidae and small demersal fishes observed in remotely operated video samples at artificial reef study sites during spring 2009-winter 2010, fall 2011-summer 2012, and during the lionfish removal experiment described herein. Values for tomtate at control and maintain-clear reefs in summer 2015 were 484 (±464) and 520 (±523), respectively. Removals occurred between fall 2013 and spring 2014 (maintain-clear and clear-once), summer 2014 and fall 2014 (maintain-clear), and fall 2014 and spring 2015 (maintain-clear).

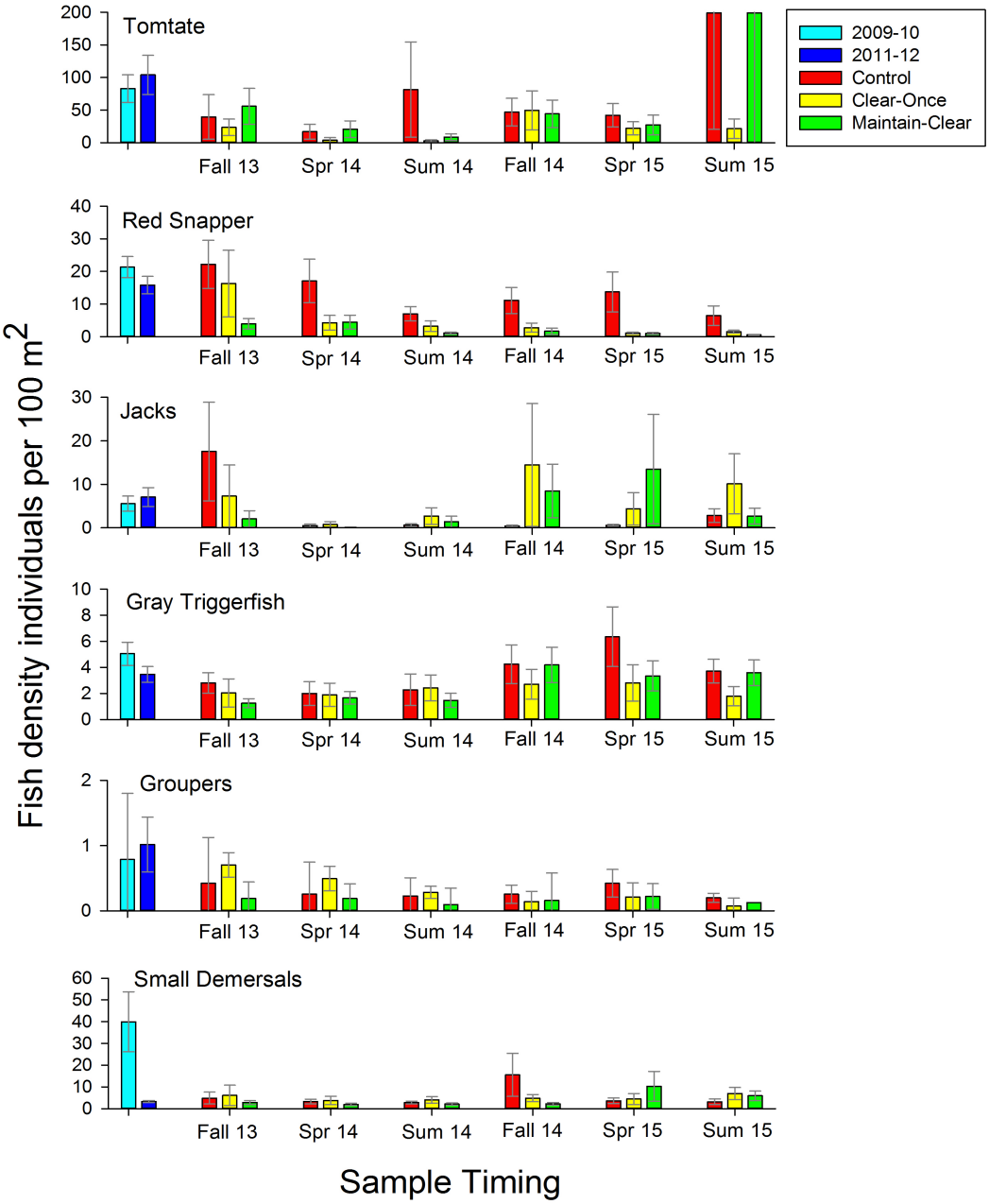

Figure S1. continued. Pelagic planktivorous fishes, twospot cardinalfish, (*Apogon psuedomaculatus*), gobies and blennies, Superfamily: Gobioidea, damsefishes, Family: Pomacentridae, slippery dick (*Halichoeres bivittatus*) and bank seabass (*Centropristis ocyurus*).

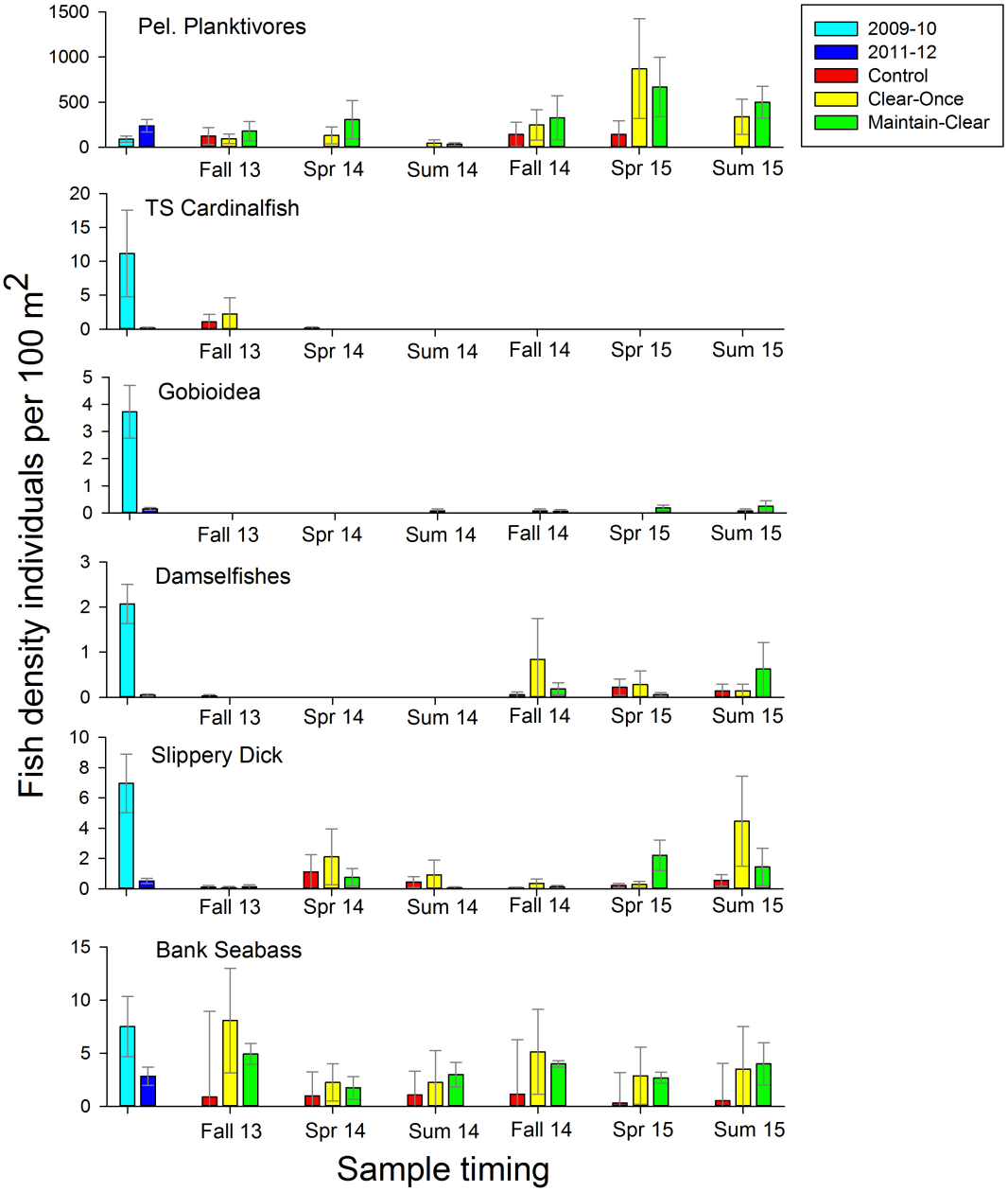

Figure S2. Total length distributions of lionfish estimated with a red laser scaler and remotely operated vehicle at control (no lionfish removal) artificial reef study sites from fall 2013 through summer 2015.

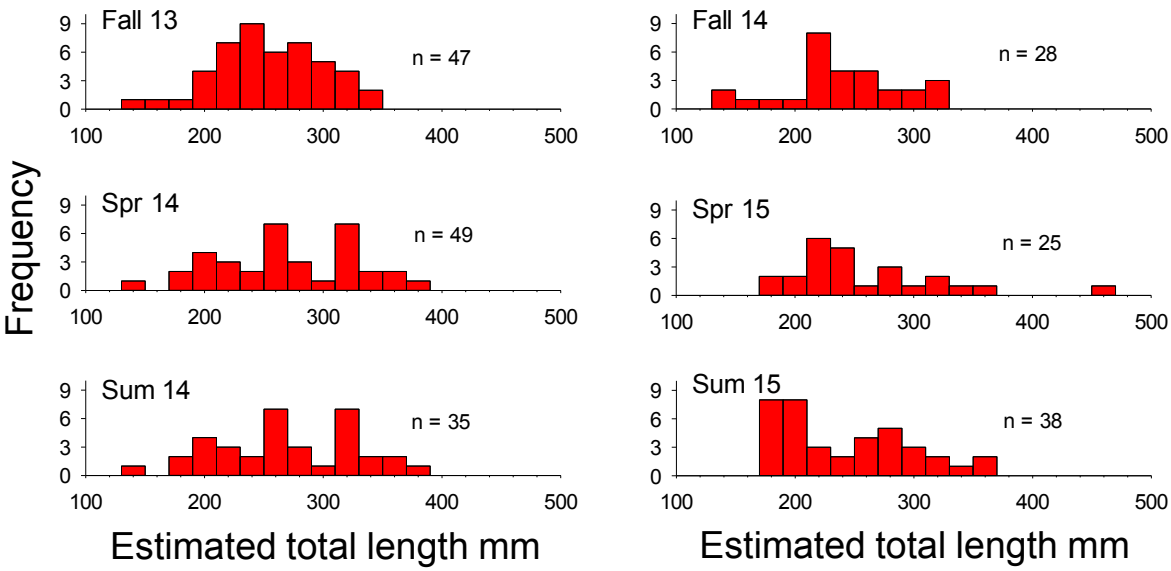

Figure S3. Total length distributions of lionfish removed from A) clear-once and B-E) maintain-clear study artificial reefs. Removals for panels A and B were made in February and March 2014, for panel C in July and August 2014, and for panel D between February and May 2015. Age distributions were estimated via age slicing via the von Bertalanffy growth function reported by Barbour et al. (2011) for lionfish from US Atlantic Ocean waters. Age distributions in panels E-H correspond to size distributions in panels A-D.