Supplementary Material

# Supplementary Figures

NW

NE

SW

SE

100 m

100 m

**Figure S1.** Study area design for lionfish surveys and collections. Transect tapes were laid 100 m in each cardinal direction along the reef bottom from a central stainless-steel u-bolt. Lionfish surveys were conducted within a 50 m x 20 m area. Scientific divers started at the 75 m mark on the transect tape and swam in a sinusoidal pattern hovering above the transect line. Lionfish surveys ended at the 25 m mark. starting. Lionfish collections were restricted to each quadrant (NW, NE, SW, SE) demarcated by the transect lines..

# Supplementary Tables

**Table S1**. Mean lionfish density (ind. ha-1) estimates ± standard error (SE) for each buoy at EFGB and WFGB per cruise. The buoy is indicated by bank and buoy number (e.g., EFGB buoy 1 is denoted as EFGB1). Not all buoys were visited during each cruise. Lionfish density is reported as zero (0) if no lionfish were observed during surveys, while a dash (-) indicates that no survey was conducted at that buoy. The depth of each buoy is indicated in meters.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Buoy** | **Depth (m)** | **2015** | **2016** | **June 2018** | **August 2018** |
| EFGB1 | 19.5 | 32.2 ± 2.8 | - | 60 ± 5.6 | 102.6 ± 9.7 |
| EFGB3 | 19.8 | - | - | - | 33.3 ± 4.2 |
| EFGB4 | 18.6 | 10 ± 0 | 48.5 ± 6.9 | 0 ± 0 | 20 ± 0 |
| EFGB6 | 19.5 | 10 ± 0 | 21.4 ± 3.4 | - | - |
| WFGB1 | 23.8 | 16.7 ± 3.3 | 16.7 ± 2.1 | 10 ± 0 | 113.9 ± 5.4 |
| WFGB2 | 24.4 | 75.7 ± 10.7 | 30 ± 4.9 | - | 30 ± 4.9 |
| WFGB3 | 24.4 | 51 ± 1.6 | 42.5 ± 2.5 | 60 ± 6.6 | 117 ± 13.1 |

**Table S2.** ANOVA results comparing removal diver CPUE (kg diver hour-1)by cruise and bank. Asterisk (\*) denotes statistical significance: \*\*\**p* < 0.001.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Source** | **Partial SS** | **df** | **MS** | **F** | ***p*** |
| Model | 4953.013 | 4 | 1238.253 | 162.96 | 0.000 |
| Cruise | 4839.596 | 3 | 1613.198 | 212.30 | 0.000\*\*\* |
| Bank | 5.949 | 1 | 5.949 | 0.78 | 0.376 |
| Residual | 12796.014 | 1684 | 7.599 |  |  |
| Total | 17749.027 | 1688 | 10.515 |  |  |

**Table S3.** Tukey-post hoc results comparing mean CPUE differences by cruise. The model coefficient, standard error (SE), p-value, and 95% confidence interval are reported. Asterisk (\*) denotes statistical significance: \*\*\**p* < 0.001.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Cruise** | **Coefficient** | **SE** | ***p*** | **95% Confidence Interval** |
| Jun-18 vs. Aug-18 | -2.703 | 0.194 | 0.000\*\*\* | -3.201 | -2.205 |
| 2016 vs. Aug-18 | -3.668 | 0.174 | 0.000\*\*\* | -4.115 | -3.221 |
| 2015 vs. Aug-18 | -3.709 | 0.188 | 0.000\*\*\* | -4.192 | -3.225 |
| 2016 vs. Jun-18 | -0.965 | 0.215 | 0.000\*\*\* | -1.517 | -0.413 |
| 2015 vs. Jun-18 | -1.006 | 0.226 | 0.000\*\*\* | -1.588 | -0.423 |
| 2015 vs. 2016 | -0.040 | 0.209 | 0.997 | -0.579 | 0.499 |

**Table S4.** ANCOVA results comparing lionfish weight-length-relationships by sex, cruise, and bank. Asterisk (\*) denotes statistical significance: \*\*\**p* < 0.001.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Source** | **Partial SS** | **df** | **MS** | **F** | ***p*** |
| Model | 23937119 | 6 | 3989519.8 | 673.67 | 0.000 |
| TL (mm) | 20499757 | 1 | 20499757 | 3461.59 | 0.000\*\*\* |
| Sex | 84483.713 | 1 | 84483.713 | 14.27 | 0.000\*\*\* |
| Cruise | 112908.2 | 3 | 37636.066 | 6.36 | 0.000\*\*\* |
| Bank | 1.862 | 1 | 1.862 | 0.00 | 0.9859 |
| Residual | 3571001.2 | 603 | 5922.058 |  |  |
| Total | 27508120 | 609 | 45169.327 |  |  |

**Table S5.** Tukey-post hoc results comparing lionfish weight-length relationship differences by sex. The model coefficient, standard error (SE), p-value, and 95% confidence interval are reported. Asterisk (\*) denotes statistical significance: \*\*\**p* < 0.001.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sex** | **Coefficient** | **SE** | ***p*** | **95% Confidence Interval** |
| Male vs. Female | 32.782 | 4.295 | 0.000\*\*\* | 24.348 | 41.2163 |

**Table S6.** Tukey-post hoc results comparing lionfish weight-length relationship differences by cruise. The model coefficient, standard error (SE), p-value, and 95% confidence interval are reported. Asterisk (\*) denotes statistical significance: \*\**p* < 0.01, \*\*\**p* < 0.001.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Cruise** | **Coefficient** | **SE** | ***p*** | **95% Confidence Interval** |
| Jun-18 vs. Aug-18 | -10.878 | 3.729 | 0.019 | -20.469 | -1.287 |
| 2016 vs. Aug-18 | -13.709 | 3.376 | 0.000\*\*\* | -22.391 | -5.028 |
| 2015 vs. Aug-18 | -0.257 | 3.627 | 1.000 | -9.585 | 9.071 |
| 2016 vs. Jun-18 | -2.831 | 4.168 | 0.905 | -13.549 | 7.886 |
| 2015 vs. Jun-18 | 10.621 | 4.374 | 0.072 | -0.627 | 21.869 |
| 2015 vs. 2016 | 13.453 | 4.077 | 0.005\*\* | 2.969 | 23.936 |

**Table S7.** ANCOVA results comparing total lengthby sex and bank when controlling for age. Asterisk (\*) denotes statistical significance: \*\**p* < 0.01, \*\*\**p* < 0.001.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Source** | **Partial SS** | **df** | **MS** | **F** | ***p*** |
| Model | 177739.67 | 3 | 59246.558 | 18.97 | 0.000 |
| Age | 124348.75 | 1 | 124348.75 | 39.81 | 0.000\*\*\* |
| Sex | 33011.541 | 1 | 33011.541 | 10.57 | 0.002\*\* |
| Bank | 55.467 | 1 | 55.467 | 0.02 | 0.894 |
| Residual | 293607.32 | 94 | 3123.482 |  |  |
| Total | 471346.99 | 97 | 4859.247 |  |  |