

Supplementary material

Multispecies presence and connectivity around a designed artificial reef

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Table S1. Details of acoustically tagged animals

t_p , total presence (days); t_M , monitoring period (days); I_p , site presence index; AR, Designed artificial reef; NR, Dunbar reef; TL, total length; M, male; F, female; I, fish of indeterminate sex. L, Low power; H, High power; A, apparent survival; R, recaptured; U, undetected

| Animal | Fish ID code | TL (mm) | Sex | Estimated tag life (days) | Min. delay (s) | Max. delay (s) | Tag type | Power output | Date tagged | t_p | t_M | I_p | Location tagged & released | Status |
|----------------------|--------------|---------|-----|---------------------------|----------------|----------------|----------|--------------|-------------|-------|-------|-------|----------------------------|--------|
| Fiddler ray | B1 | 770 | M | 1021 | 400 | 800 | V9-1x | L | 28/06/2013 | 7 | 714 | 0.01 | AR | A |
| Fiddler ray | B2 | 840 | M | 61 | 190 | 290 | V9A-2x | H | 28/06/2013 | 32 | 65 | 0.49 | AR | A |
| Fiddler ray | B3 | 750 | M | 61 | 190 | 290 | V9A-2x | H | 28/06/2013 | 2 | 65 | 0.04 | AR | A |
| Fiddler ray | B4 | 790 | M | 61 | 190 | 290 | V9A-2x | H | 28/06/2013 | 50 | 65 | 0.77 | AR | A |
| Fiddler ray | B5 | 764 | M | 156 | 25 | 25 | V9A-2x | L | 25/07/2013 | 0 | 156 | 0 | AR | A |
| Fiddler ray | B6 | 800 | M | 1021 | 400 | 800 | V9-1x | L | 14/08/2013 | 32 | 662 | 0.05 | AR | A |
| Fiddler ray | B7 | 742 | M | 821 | 170 | 310 | V9-2x | L | 14/08/2013 | 53 | 670 | 0.08 | AR | A |
| Fiddler ray | B8 | 760 | M | 602 | 220 | 500 | V9AP-2L | L | 27/08/2013 | 402 | 601 | 0.67 | AR | A |
| Fiddler ray | B9 | 820 | M | 602 | 220 | 500 | V9AP-2L | L | 24/09/2013 | 286 | 593 | 0.48 | AR | A |
| Fiddler ray | B10 | 820 | M | 602 | 220 | 500 | V9AP-2L | L | 25/02/2014 | 28 | 473 | 0.06 | NR | A |
| Bluespotted flathead | F1 | 415 | I | 156 | 25 | 25 | V9A-2x | L | 14/08/2013 | 15 | 157 | 0.1 | NR | A |
| Bluespotted flathead | F2 | 383 | I | 156 | 25 | 25 | V9A-2x | L | 14/08/2013 | 0 | 157 | 0 | AR | U |
| Bluespotted flathead | F3 | 500 | I | 61 | 190 | 290 | V9A-2x | H | 14/08/2013 | 3 | 61 | 0.05 | AR | R |
| Bluespotted flathead | F4 | 500 | I | 61 | 190 | 290 | V9A-2x | H | 14/08/2013 | 2 | 61 | 0.03 | AR | A |
| Bluespotted flathead | F5 | 365 | I | 821 | 170 | 310 | V9-2x | L | 17/08/2013 | 0 | 667 | 0 | AR | A |
| Bluespotted flathead | F6 | 410 | I | 602 | 220 | 500 | V9AP-2L | L | 22/08/2013 | 64 | 602 | 0.11 | AR | A |
| Bluespotted flathead | F7 | 387 | I | 602 | 220 | 500 | V9AP-2L | L | 27/08/2013 | 1 | 601 | 0 | AR | A |
| Bluespotted flathead | F8 | 450 | I | 602 | 220 | 500 | V9AP-2L | L | 27/08/2013 | 0 | 593 | 0 | AR | A |
| Bluespotted flathead | F9 | 520 | I | 602 | 220 | 500 | V9AP-2L | L | 27/08/2013 | 12 | 66 | 0.18 | AR | R |
| Bluespotted flathead | F10 | 550 | I | 602 | 220 | 500 | V9AP-2L | L | 27/08/2013 | 1 | 600 | 0 | AR | A |
| Bluespotted flathead | F11 | 420 | I | 602 | 220 | 500 | V9AP-2L | L | 24/09/2013 | 2 | 602 | 0 | AR | A |
| Bluespotted flathead | F12 | 425 | I | 602 | 220 | 500 | V9AP-2L | L | 24/09/2013 | 0 | 602 | 0 | AR | U |
| Bluespotted flathead | F13 | 425 | I | 602 | 220 | 500 | V9AP-2L | L | 31/10/2013 | 19 | 592 | 0.03 | AR | A |
| Bluespotted flathead | F14 | 400 | I | 602 | 220 | 500 | V9AP-2L | L | 31/10/2013 | 6 | 592 | 0.01 | AR | A |
| Bluespotted flathead | F15 | 490 | I | 602 | 220 | 500 | V9AP-2L | L | 1/05/2014 | 16 | 410 | 0.04 | AR | A |
| Bluespotted flathead | F16 | 300 | I | 602 | 220 | 500 | V9AP-2L | L | 12/09/2014 | 130 | 276 | 0.47 | AR | A |
| Bluespotted flathead | F17 | 430 | I | 602 | 220 | 500 | V9AP-2L | L | 12/09/2014 | 0 | 276 | 0 | AR | A |
| Bluespotted flathead | F18 | 520 | I | 602 | 220 | 500 | V9AP-2L | L | 12/09/2014 | 24 | 276 | 0.09 | AR | A |

| Animal | Fish ID code | TL (mm) | Sex | Estimated tag life (days) | Min. delay (s) | Max. delay (s) | Tag type | Power output | Date tagged | t_p | t_M | I_p | Location tagged & released | Status |
|--------------------|--------------|---------|-----|---------------------------|----------------|----------------|----------|--------------|-------------|-------|-------|-------|----------------------------|--------|
| Port Jackson shark | PJ1 | 930 | M | 602 | 220 | 500 | V9AP-2L | L | 22/08/2013 | 19 | 602 | 0.03 | NR | A |
| Port Jackson shark | PJ2 | 950 | M | 602 | 220 | 500 | V9AP-2L | L | 22/08/2013 | 15 | 602 | 0.02 | NR | A |
| Port Jackson shark | PJ3 | 950 | M | 602 | 220 | 500 | V9AP-2L | L | 22/08/2013 | 11 | 602 | 0.02 | NR | A |
| Port Jackson shark | PJ4 | 950 | M | 602 | 220 | 500 | V9AP-2L | L | 22/08/2013 | 37 | 601 | 0.06 | AR | A |
| Port Jackson shark | PJ5 | 873 | M | 602 | 220 | 500 | V9AP-2L | L | 27/08/2013 | 32 | 602 | 0.05 | AR | A |
| Port Jackson shark | PJ6 | 640 | M | 602 | 220 | 500 | V9AP-2L | L | 27/08/2013 | 13 | 602 | 0.02 | AR | A |
| Port Jackson shark | PJ7 | 900 | M | 602 | 220 | 500 | V9AP-2L | L | 27/08/2013 | 6 | 602 | 0.01 | NR | A |
| Port Jackson shark | PJ8 | 660 | M | 602 | 220 | 500 | V9AP-2L | L | 27/08/2013 | 77 | 600 | 0.13 | AR | A |
| Port Jackson shark | PJ9 | 820 | M | 602 | 220 | 500 | V9AP-2L | L | 27/08/2013 | 29 | 600 | 0.05 | AR | A |
| Port Jackson shark | PJ10 | 910 | M | 602 | 220 | 500 | V9AP-2L | L | 27/08/2013 | 4 | 599 | 0.01 | AR | A |
| Port Jackson shark | PJ11 | 900 | M | 602 | 220 | 500 | V9AP-2L | L | 6/09/2013 | 0 | 602 | 0 | NR | A |
| Port Jackson shark | PJ12 | 985 | M | 602 | 220 | 500 | V9AP-2L | L | 6/09/2013 | 9 | 602 | 0.01 | NR | A |
| Port Jackson shark | PJ13 | 880 | M | 602 | 220 | 500 | V9AP-2L | L | 24/09/2013 | 1 | 602 | 0 | NR | A |
| Port Jackson shark | PJ14 | 1150 | F | 602 | 220 | 500 | V9AP-2L | L | 24/09/2013 | 11 | 599 | 0.02 | AR | A |
| Port Jackson shark | PJ15 | 960 | M | 602 | 220 | 500 | V9AP-2L | L | 24/09/2013 | 7 | 602 | 0.01 | AR | A |
| Port Jackson shark | PJ16 | 660 | M | 602 | 220 | 500 | V9AP-2L | L | 24/09/2013 | 19 | 602 | 0.03 | AR | A |
| Port Jackson shark | PJ17 | 1900 | F | 1212 | 140 | 240 | V13-1x | L | 31/10/2013 | 0 | 592 | 0 | NR | A |

Table S2. Results from the Poisson GLM for the 50-m control tag

| | Estimate | s.e. | z-value | P-value |
|-----------|----------|-------|---------|-----------------|
| Intercept | 2.36 | 0.185 | 12.724 | <0.01 |
| hour_f1 | -0.038 | 0.071 | -0.529 | 0.597 |
| hour_f2 | 0.028 | 0.07 | 0.393 | 0.695 |
| hour_f3 | 0.017 | 0.072 | 0.232 | 0.816 |
| hour_f4 | -0.017 | 0.071 | -0.242 | 0.809 |
| hour_f5 | 0.008 | 0.07 | 0.107 | 0.915 |
| hour_f6 | -0.043 | 0.071 | -0.606 | 0.545 |
| hour_f7 | -0.099 | 0.072 | -1.373 | 0.17 |
| hour_f8 | -0.121 | 0.073 | -1.664 | 0.096 |
| hour_f9 | -0.051 | 0.072 | -0.715 | 0.475 |
| hour_f10 | -0.046 | 0.071 | -0.639 | 0.523 |
| hour_f11 | -0.067 | 0.072 | -0.935 | 0.35 |
| hour_f12 | 0.004 | 0.071 | 0.05 | 0.96 |
| hour_f13 | 0.002 | 0.071 | 0.035 | 0.972 |
| hour_f14 | -0.025 | 0.071 | -0.356 | 0.722 |
| hour_f15 | 0.04 | 0.069 | 0.571 | 0.568 |
| hour_f16 | -0.003 | 0.07 | -0.042 | 0.967 |
| hour_f17 | 0.007 | 0.07 | 0.097 | 0.923 |
| hour_f18 | -0.013 | 0.07 | -0.181 | 0.857 |
| hour_f19 | 0.039 | 0.071 | 0.556 | 0.579 |
| hour_f20 | 0.041 | 0.07 | 0.592 | 0.554 |
| hour_f21 | 0.01 | 0.07 | 0.139 | 0.89 |
| hour_f22 | 0.029 | 0.07 | 0.414 | 0.679 |
| hour_f23 | 0.01 | 0.07 | 0.14 | 0.889 |
| Temp | 0.011 | 0.009 | 1.229 | 0.219 |
| Rainfall | 0.002 | 0.002 | 0.657 | 0.511 |
| Height | 0.014 | 0.02 | 0.684 | 0.494 |

Table S3. Results from the Poisson GLM for the 200-m control tag

| | Estimate | s.e. | z-value | P-value |
|--------------------|-----------------|--------------|----------------|------------------|
| (Intercept) | 2.393 | 0.2 | 11.988 | < 0.01 |
| hour_f1 | 0.004 | 0.074 | 0.048 | 0.961 |
| hour_f2 | 0.009 | 0.074 | 0.116 | 0.908 |
| hour_f3 | -0.007 | 0.076 | -0.098 | 0.922 |
| hour_f4 | -0.033 | 0.075 | -0.44 | 0.66 |
| hour_f5 | -0.096 | 0.076 | -1.259 | 0.208 |
| hour_f6 | -0.078 | 0.076 | -1.027 | 0.305 |
| hour_f7 | -0.264 | 0.08 | -3.291 | 0.001 |
| hour_f8 | -0.196 | 0.079 | -2.464 | 0.014 |
| hour_f9 | -0.187 | 0.078 | -2.404 | 0.016 |
| hour_f10 | -0.106 | 0.076 | -1.387 | 0.165 |
| hour_f11 | -0.122 | 0.077 | -1.599 | 0.11 |
| hour_f12 | -0.016 | 0.075 | -0.215 | 0.83 |
| hour_f13 | -0.02 | 0.074 | -0.264 | 0.792 |
| hour_f14 | -0.022 | 0.075 | -0.3 | 0.765 |
| hour_f15 | 0.017 | 0.073 | 0.234 | 0.815 |
| hour_f16 | -0.013 | 0.074 | -0.171 | 0.864 |
| hour_f17 | 0.008 | 0.073 | 0.114 | 0.909 |
| hour_f18 | 0.017 | 0.073 | 0.23 | 0.818 |
| hour_f19 | -0.021 | 0.075 | -0.275 | 0.783 |
| hour_f20 | -0.104 | 0.076 | -1.371 | 0.17 |
| hour_f21 | 0.013 | 0.074 | 0.183 | 0.855 |
| hour_f22 | -0.061 | 0.075 | -0.81 | 0.418 |
| hour_f23 | -0.009 | 0.074 | -0.117 | 0.907 |
| Temp | 0.011 | 0.01 | 1.103 | 0.27 |
| Rainfall | -0.001 | 0.003 | -0.38 | 0.704 |
| Height | -0.067 | 0.022 | -3.038 | 0.002 |

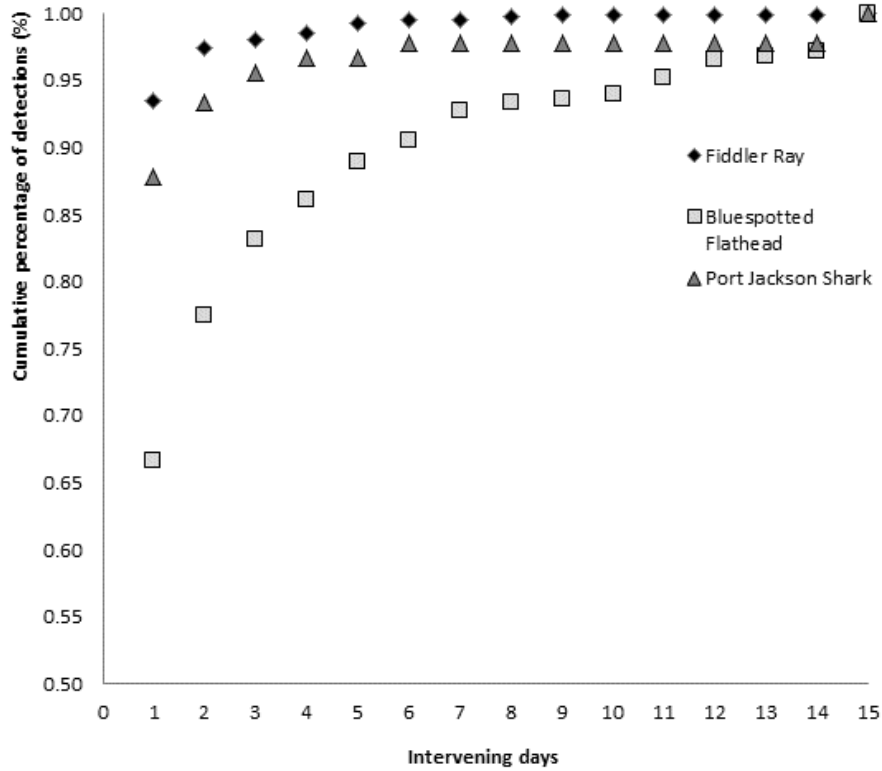


Fig. S1. Cumulative percentage (%) of detections of fiddler ray, bluespotted flathead and Port Jackson shark in study area during monitoring period.

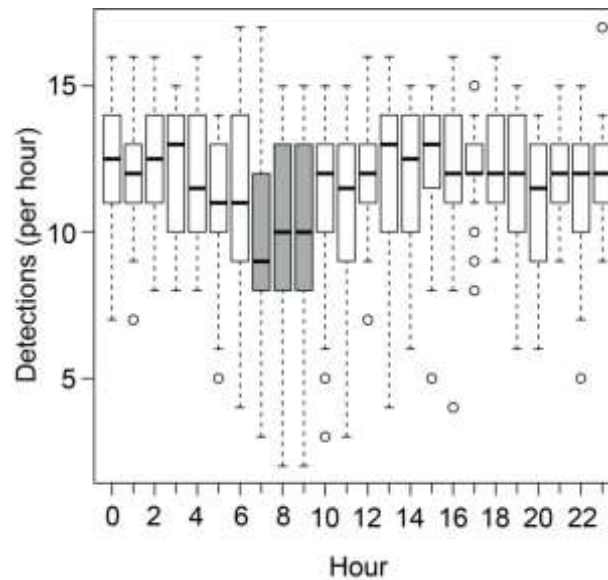


Fig. S2. Quantile boxplots of the detection frequency (detections per hour) for the control tag placed 200 m from the receiver. The detection frequency was significantly lower from 0700 to 0900 hours (shaded grey; see Table S2).