OUT OF DRAFT 2 – IN A SAFE PLACE

# **Appendix**

Additionally, the distribution of urchins is wider, more uniform, and more likely to be within range of resources than the physical shelters provided by rocks and crevices (Day & Branch, 2002b) and therefore, sheltering beneath urchins increases the juvenile abalone’s distribution and access to food resources.

# Actual Values

***Weight***

Table 8.1.1 Descriptive statistics for weight (g) of all tanks, in terms of mean, standard deviation and variance, of *P. angulosus* urchins at the start of the experiment.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Tank | Diet | Temperature | Mean (g) | St. dev (g) | Var (g^2) | n |
| 1 | formulated | warm | 17.62 | 7.1 | 50.3714 | 19 |
| 2 | mixed | warm | 19.28 | 6.46 | 41.764 | 19 |
| 3 | formulated | ambient | 19.32 | 7.23 | 52.2206 | 19 |
| 4 | mixed | ambient | 14.68 | 6 | 35.9936 | 19 |
| 5 | mixed | warm | 17.06 | 6.78 | 45.9281 | 19 |
| 6 | ulva | warm | 17.11 | 5.47 | 29.9299 | 19 |
| 7 | kelp | ambient | 13.89 | 7.97 | 63.5988 | 19 |
| 8 | ulva | ambient | 18.26 | 6.94 | 48.1692 | 19 |
| 9 | ulva | warm | 16.43 | 7.82 | 61.1243 | 19 |
| 10 | kelp | warm | 14.72 | 5.69 | 32.3618 | 19 |
| 11 | kelp | ambient | 18.29 | 6.91 | 47.7743 | 19 |
| 12 | formulated | ambient | 14.97 | 6.4 | 40.942 | 19 |
| 13 | formulated | warm | 22.19 | 6.73 | 45.261 | 19 |
| 14 | mixed | warm | 14.99 | 8.62 | 74.2894 | 19 |
| 15 | ulva | ambient | 13.71 | 8.17 | 66.7072 | 19 |
| 16 | mixed | ambient | 13.64 | 6.63 | 43.9515 | 19 |
| 17 | ulva | warm | 15.85 | 5.82 | 33.8737 | 19 |
| 18 | kelp | warm | 14.75 | 6.88 | 47.3026 | 19 |
| 19 | formulated | ambient | 16.08 | 7.08 | 50.1406 | 19 |
| 20 | kelp | ambient | 19.73 | 9.23 | 85.2745 | 19 |
| 21 | kelp | warm | 17.16 | 5.63 | 31.6559 | 19 |
| 22 | ulva | warm | 18.78 | 8.29 | 68.7347 | 19 |
| 23 | mixed | ambient | 16.76 | 6.5 | 42.2491 | 19 |
| 24 | formulated | ambient | 16.62 | 5.84 | 34.0618 | 19 |
| 25 | mixed | warm | 16.28 | 8.16 | 66.5295 | 19 |
| 26 | formulated | warm | 17.44 | 5.79 | 33.4891 | 19 |
| 27 | ulva | ambient | 17.21 | 5.18 | 26.8821 | 19 |
| 28 | ulva | ambient | 17.83 | 7.92 | 62.7489 | 19 |
| 29 | kelp | warm | 16.18 | 6.89 | 47.5251 | 19 |
| 30 | formulated | warm | 18.45 | 5.87 | 34.5115 | 19 |
| 31 | mixed | ambient | 14.94 | 5.2 | 27.0348 | 19 |
| 32 | kelp | ambient | 19.39 | 8.27 | 68.4083 | 19 |

Table 8.1.2. Descriptive statistics for weight (g) of all tanks, in terms of mean, standard deviation and variance, of *P. angulosus* urchins at the after 4 weeks.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Tank | Diet | Temperature | Mean (g) | St. dev (g) | Var (g^2) | n |
| 1 | formulated | warm | 18.88 | 7.26 | 52.6949 | 19 |
| 2 | mixed | warm | 19.5 | 6.96 | 48.4683 | 19 |
| 3 | formulated | ambient | 20.43 | 7.5 | 56.3237 | 19 |
| 4 | mixed | ambient | 15.05 | 5.92 | 35.0205 | 19 |
| 5 | mixed | warm | 17.64 | 6.53 | 42.6362 | 19 |
| 6 | ulva | warm | 18.05 | 5.63 | 31.7518 | 19 |
| 7 | kelp | ambient | 13.98 | 8.12 | 65.911 | 19 |
| 8 | ulva | ambient | 18.62 | 6.96 | 48.4766 | 19 |
| 9 | ulva | warm | 16.79 | 7.98 | 63.7253 | 19 |
| 10 | kelp | warm | 14.15 | 5.54 | 30.7244 | 19 |
| 11 | kelp | ambient | 17.86 | 7.08 | 50.1473 | 19 |
| 12 | formulated | ambient | 16.41 | 7.1 | 50.4783 | 19 |
| 13 | formulated | warm | 23.14 | 6.72 | 45.1203 | 19 |
| 14 | mixed | warm | 15.48 | 8.61 | 74.198 | 19 |
| 15 | ulva | ambient | 13.9 | 8.31 | 69.116 | 19 |
| 16 | mixed | ambient | 14.25 | 6.93 | 48.0077 | 19 |
| 17 | ulva | warm | 16.39 | 5.8 | 33.6618 | 19 |
| 18 | kelp | warm | 13.93 | 6.96 | 48.4531 | 20 |
| 19 | formulated | ambient | 17.24 | 7.83 | 61.3526 | 19 |
| 20 | kelp | ambient | 19.75 | 8.99 | 80.7613 | 19 |
| 21 | kelp | warm | 17.13 | 5.71 | 32.6232 | 19 |
| 22 | ulva | warm | 19.86 | 7.76 | 60.258 | 19 |
| 23 | mixed | ambient | 17.08 | 6.89 | 47.4139 | 19 |
| 24 | formulated | ambient | 17.67 | 6.16 | 37.928 | 19 |
| 25 | mixed | warm | 16.83 | 8.27 | 68.32 | 19 |
| 26 | formulated | warm | 18.66 | 6.01 | 36.1585 | 19 |
| 27 | ulva | ambient | 17.24 | 6.33 | 40.0348 | 19 |
| 28 | ulva | ambient | 18.26 | 8.04 | 64.5841 | 19 |
| 29 | kelp | warm | 15.85 | 7.04 | 49.5105 | 19 |
| 30 | formulated | warm | 19.49 | 6.28 | 39.4706 | 19 |
| 31 | mixed | ambient | 15.8 | 5.51 | 30.398 | 19 |
| 32 | kelp | ambient | 19.02 | 8.21 | 67.4632 | 19 |

Table 8.1.3. Descriptive statistics for weight (g) of all tanks, in terms of mean, standard deviation and variance, of *P. angulosus* urchins at the after 8 weeks.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Tank | Diet | Temperature | Mean (g) | St. dev (g) | Var (g^2) | n |
| 1 | formulated | warm | 19.99 | 7.41 | 54.867 | 19 |
| 2 | mixed | warm | 20.47 | 6.89 | 47.4198 | 19 |
| 3 | formulated | ambient | 22.72 | 8.32 | 69.2303 | 16 |
| 4 | mixed | ambient | 16.59 | 6.01 | 36.1658 | 19 |
| 5 | mixed | warm | 18.87 | 6.23 | 38.8186 | 19 |
| 6 | ulva | warm | 19.3 | 5.38 | 28.9925 | 19 |
| 7 | kelp | ambient | 13.88 | 8.18 | 66.8324 | 19 |
| 8 | ulva | ambient | 19.68 | 7.56 | 57.108 | 16 |
| 9 | ulva | warm | 17.37 | 7.87 | 61.9862 | 19 |
| 10 | kelp | warm | 14.94 | 5.36 | 28.6934 | 12 |
| 11 | kelp | ambient | 17.97 | 7.99 | 63.7908 | 12 |
| 12 | formulated | ambient | 18.27 | 7.11 | 50.615 | 19 |
| 13 | formulated | warm | 23.97 | 6.55 | 42.952 | 19 |
| 14 | mixed | warm | 16.86 | 8.62 | 74.3562 | 19 |
| 15 | ulva | ambient | 15.18 | 8.18 | 66.9169 | 16 |
| 16 | mixed | ambient | 15.97 | 7.14 | 51.034 | 17 |
| 17 | ulva | warm | 17.15 | 5.56 | 30.9516 | 19 |
| 18 | kelp | warm | 15.25 | 7.71 | 59.4627 | 15 |
| 19 | formulated | ambient | 19.17 | 8.13 | 66.1694 | 18 |
| 20 | kelp | ambient | 21.57 | 8.6 | 73.9394 | 14 |
| 21 | kelp | warm | 16.74 | 5.79 | 33.4755 | 19 |
| 22 | ulva | warm | 20.67 | 7.63 | 58.2224 | 18 |
| 23 | mixed | ambient | 18.5 | 7.34 | 53.8874 | 19 |
| 24 | formulated | ambient | 19.75 | 6.7 | 44.8302 | 17 |
| 25 | mixed | warm | 18.6 | 8.52 | 72.6662 | 19 |
| 26 | formulated | warm | 20.1 | 6.08 | 36.9106 | 19 |
| 27 | ulva | ambient | 19.51 | 5.45 | 29.7481 | 16 |
| 28 | ulva | ambient | 19.21 | 8.21 | 67.4352 | 19 |
| 29 | kelp | warm | 17.25 | 7.4 | 54.8009 | 13 |
| 30 | formulated | warm | 21.51 | 5.87 | 34.4628 | 18 |
| 31 | mixed | ambient | 17.04 | 5.8 | 33.5914 | 19 |
| 32 | kelp | ambient | 20.79 | 6.49 | 42.1843 | 13 |

Table 8.1.4. Descriptive statistics for weight (g) of all tanks, in terms of mean, standard deviation and variance, of *P. angulosus* urchins at the after 13 weeks.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Tank | Diet | Temperature | Mean (g) | St. dev (g) | Var (g^2) | n |
| 1 | formulated | warm | 20.31 | 7.27 | 52.9097 | 18 |
| 2 | mixed | warm | 21.58 | 6.96 | 48.4486 | 17 |
| 3 | formulated | ambient | 24.17 | 8.44 | 71.2403 | 15 |
| 4 | mixed | ambient | 18.63 | 6.13 | 37.5615 | 18 |
| 5 | mixed | warm | 20.74 | 6.27 | 39.3043 | 18 |
| 6 | ulva | warm | 20.25 | 5.78 | 33.3526 | 17 |
| 8 | ulva | ambient | 21.21 | 7.65 | 58.5474 | 14 |
| 9 | ulva | warm | 18.46 | 7.79 | 60.7417 | 19 |
| 12 | formulated | ambient | 19.56 | 7.34 | 53.9176 | 18 |
| 13 | formulated | warm | 24.29 | 6.43 | 41.294 | 18 |
| 14 | mixed | warm | 17.9 | 8.29 | 68.7212 | 18 |
| 15 | ulva | ambient | 16.74 | 8.14 | 66.1864 | 14 |
| 16 | mixed | ambient | 17.36 | 8.09 | 65.4172 | 13 |
| 17 | ulva | warm | 17.93 | 5.47 | 29.9158 | 18 |
| 19 | formulated | ambient | 20.66 | 8.6 | 73.9368 | 16 |
| 22 | ulva | warm | 21.31 | 7.76 | 60.2145 | 17 |
| 23 | mixed | ambient | 20.53 | 8.22 | 67.5477 | 18 |
| 24 | formulated | ambient | 20.85 | 6.96 | 48.4965 | 15 |
| 25 | mixed | warm | 19.97 | 8.66 | 74.9715 | 18 |
| 26 | formulated | warm | 20.94 | 6.09 | 37.0816 | 18 |
| 27 | ulva | ambient | 21.41 | 5.01 | 25.057 | 13 |
| 28 | ulva | ambient | 20.38 | 8.14 | 66.33 | 19 |
| 30 | formulated | warm | 22.6 | 5.99 | 35.8858 | 17 |
| 31 | mixed | ambient | 18.51 | 6.18 | 38.24 | 18 |

Table 8.1.5. Descriptive statistics for weight (g) of all tanks, in terms of mean, standard deviation and variance, of *P. angulosus* urchins at the after 18 weeks.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Tank | Diet | Temperature | Mean (g) | St. dev (g) | Var (g^2) | n |
| 1 | formulated | warm | 20.86 | 7.17 | 51.3513 | 18 |
| 2 | mixed | warm | 22.55 | 6.89 | 47.4575 | 16 |
| 3 | formulated | ambient | 23.53 | 8.24 | 67.8439 | 15 |
| 4 | mixed | ambient | 21.52 | 7.5 | 56.2624 | 18 |
| 5 | mixed | warm | 22.25 | 5.98 | 35.7588 | 18 |
| 6 | ulva | warm | 22.37 | 6.82 | 46.5223 | 17 |
| 8 | ulva | ambient | 22.42 | 7.84 | 61.4795 | 13 |
| 9 | ulva | warm | 19.07 | 7.61 | 57.8832 | 19 |
| 12 | formulated | ambient | 20.38 | 7.11 | 50.5622 | 18 |
| 13 | formulated | warm | 24.49 | 6.32 | 39.9653 | 18 |
| 14 | mixed | warm | 19.62 | 8.2 | 67.1733 | 18 |
| 15 | ulva | ambient | 18.51 | 7.76 | 60.2014 | 12 |
| 16 | mixed | ambient | 18.81 | 8.37 | 70.0828 | 12 |
| 17 | ulva | warm | 19.23 | 5.2 | 27.0423 | 18 |
| 19 | formulated | ambient | 22.6 | 8.48 | 71.8704 | 13 |
| 22 | ulva | warm | 21.73 | 7.43 | 55.1716 | 16 |
| 23 | mixed | ambient | 22.94 | 7.92 | 62.655 | 17 |
| 24 | formulated | ambient | 21.98 | 7.4 | 54.727 | 15 |
| 25 | mixed | warm | 21.31 | 8.42 | 70.9714 | 18 |
| 26 | formulated | warm | 19.57 | 5.89 | 34.7206 | 18 |
| 27 | ulva | ambient | 22.35 | 5.44 | 29.6476 | 13 |
| 28 | ulva | ambient | 21.3 | 8 | 63.9325 | 18 |
| 30 | formulated | warm | 22.64 | 5.74 | 32.9467 | 17 |
| 31 | mixed | ambient | 19.62 | 6.86 | 47.1272 | 18 |

# SGR Values

Table 8.2.1. SGR’s (%growth/day) of all tanks

(A: week 0 – week 4, B: week 4 0 week 8, C: week 8 – week 13, D: week 13 – week 18)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Tank | Diet | Temperature | Treatment | SGR\_A | SGR\_B | SGR\_C | SGR\_D |
| 1 | formulated | warm | fw | 0.24 | 0.2 | 0.05 | 0.07 |
| 2 | mixed | warm | mw | 0.04 | 0.17 | 0.17 | 0.12 |
| 3 | formulated | ambient | fa | 0.19 | 0.37 | 0.19 | -0.07 |
| 4 | mixed | ambient | ma | 0.09 | 0.34 | 0.36 | 0.4 |
| 5 | mixed | warm | mw | 0.12 | 0.23 | 0.3 | 0.2 |
| 6 | ulva | warm | uw | 0.18 | 0.23 | 0.15 | 0.28 |
| 7 | kelp | ambient | ka | 0.02 | -0.02 | 0 | 0 |
| 8 | ulva | ambient | ua | 0.07 | 0.19 | 0.23 | 0.15 |
| 9 | ulva | warm | uw | 0.07 | 0.12 | 0.19 | 0.09 |
| 10 | kelp | warm | kw | -0.14 | 0.19 | 0 | 0 |
| 11 | kelp | ambient | ka | -0.08 | 0.02 | 0 | 0 |
| 12 | formulated | ambient | fa | 0.32 | 0.37 | 0.21 | 0.11 |
| 13 | formulated | warm | fw | 0.14 | 0.12 | 0.04 | 0.02 |
| 14 | mixed | warm | mw | 0.11 | 0.29 | 0.19 | 0.25 |
| 15 | ulva | ambient | ua | 0.05 | 0.3 | 0.31 | 0.28 |
| 16 | mixed | ambient | ma | 0.15 | 0.39 | 0.26 | 0.22 |
| 17 | ulva | warm | uw | 0.12 | 0.16 | 0.14 | 0.19 |
| 18 | kelp | warm | kw | -0.2 | 0.31 | 0 | 0 |
| 19 | formulated | ambient | fa | 0.24 | 0.37 | 0.23 | 0.25 |
| 20 | kelp | ambient | ka | 0 | 0.3 | 0 | 0 |
| 21 | kelp | warm | kw | -0.01 | -0.08 | 0 | 0 |
| 22 | ulva | warm | uw | 0.19 | 0.14 | 0.1 | 0.05 |
| 23 | mixed | ambient | ma | 0.07 | 0.28 | 0.33 | 0.31 |
| 24 | formulated | ambient | fa | 0.21 | 0.38 | 0.17 | 0.15 |
| 25 | mixed | warm | mw | 0.11 | 0.34 | 0.22 | 0.18 |
| 26 | formulated | warm | fw | 0.23 | 0.26 | 0.13 | -0.19 |
| 27 | ulva | ambient | ua | 0.01 | 0.43 | 0.29 | 0.12 |
| 28 | ulva | ambient | ua | 0.08 | 0.17 | 0.18 | 0.12 |
| 29 | kelp | warm | kw | -0.07 | 0.29 | 0 | 0 |
| 30 | formulated | warm | fw | 0.19 | 0.34 | 0.15 | 0 |
| 31 | mixed | ambient | ma | 0.19 | 0.26 | 0.26 | 0.16 |
| 32 | kelp | ambient | ka | -0.07 | 0.31 | 0 | 0 |

Table . Gonad histology of *P. angulosus* male testes and female ovaries depicting the respective gonad maturity stages ((1) recovery, (2) growing, (3) premature, (4) mature, (5) partly spawned, and (6) spent)

|  |  |  |
| --- | --- | --- |
| Gonad maturity stage | Male testes | Female ovaries |
| 1. Recovery |  |  |
| 1. Growing |  |  |
| 1. Premature |  |  |
| 1. Mature |  | A close-up of a cell  Description automatically generated |
| 1. Partly spawned | A close-up of a microscope  Description automatically generated | A close-up of a microscope  Description automatically generated |
| 1. Spent | A close-up of a microscope  Description automatically generated | A close-up of a microscope  Description automatically generated |

\*\*I don’t know where to put this:\*\*\*

## African and South African aquaculture

|  |
| --- |
| **Survival rate (%)**  **(mean ± se)** |
| 100.00 ± 0.00 |
| 100.00 ± 0.00 |
| 100.00 ± 0.00 |
| 100.00 ± 0.00 |
| 98.68 ± 1.32 |
| 100.00 ± 0.00 |
| 100.00 ± 0.00 |
| 100.00 ± 0.00 |
| 92.11 ± 3.40 |
| 98.68 ± 1.32 |
| 97.37 ± 2.63 |
| 100.00 ± 0.00 |
| 88.16 ± 3.95 |
| 98.68 ± 1.32 |
| 76.32 ± 8.18 |
| 76.32 ± 8.18 |
| 90.79 ± 3.31 |
| 98.68 ± 1.32 |
| 93.42 ± 6.58 |
| 98.68 ± 1.32 |
| 84.21 ± 5.26 |
| 98.68 ± 1.32 |
| 88.16 ± 4.49 |
| 98.68 ± 1.32 |
| 90.79 ± 7.56 |
| 98.68 ± 1.32 |
| 81.58 ± 4.59 |
| 97.37 ± 2.63 |
| 85.53 ± 5.84 |
| 96.05 ± 2.52 |
| 90.79 ± 7.56 |
| 98.68 ± 1.32 |
| 81.58 ± 4.56 |
| * 1. ± 2.63 |