Statistical report

**The effect of C&R and C&C on the latency of Nile tilapia to feed – Figure 1A**

**The differences between the treatments were examined using linear mixed-effect models. We set `treatment´ and ‘sampling’ as fixed factors, while `fish´ was included as a nested random term to account for their variation. Post-hoc comparisons were performed using Tukey HSD test.**

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| --- | --- | --- | --- | --- | --- |
| **Model** | **Comparison of lm with lme model** | | | | |
| **Df** | **AIC** | **Test** | **L. ratio** | **p** |
| **1 - latencyLme** | **18** | **1517.980** |  |  |  |
| **2 - latencyLm** | **16** | **1547.377** | **1 vs 2** | **33.39715** | **< 0.0001** |

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| --- | --- | --- | --- | --- |
| Effect | Linear mixed-effect model ANOVA | | | |
| numDF | denDF | F | p |
| Intercept | 1 | 106 | 8.705031 | 0.0039 |
| Treatment | 2 | 27 | 0.773732 | 0.4712 |
| Sampling | 4 | 106 | 0.663547 | 0.6187 |
| Treatment:Sampling | 8 | 106 | 0.431745 | 0.8996 |

**The effect of C&R and C&C on time to eat all pellets – Figure 1B**

**The differences between the treatments were examined using linear mixed-effect models. We set `treatment´ and ‘sampling’ as fixed factors, while `fish´ was included as a nested random term to account for their variation. Post-hoc comparisons were performed using Tukey HSD test.**

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| **Model** | **Comparison of lm with lme model** | | | | |
| **Df** | **AIC** | **Test** | **L. ratio** | **p** |
| **1 – timeEatLme** | **18** | **1890.372** |  |  |  |
| **2 - timeEatLm** | **16** | **1953.580** | **1 vs 2** | **67.20847** | **<0.0001** |

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| --- | --- | --- | --- | --- |
| Effect | Linear mixed-effect model ANOVA | | | |
| numDF | denDF | F | p |
| Intercept | 1 | 108 | 70.85567 | <0.0001 |
| Treatment | 2 | 27 | 0.06255 | 0.9395 |
| Sampling | 4 | 108 | 4.44274 | 0.0023 |
| Treatment:Sampling | 8 | 108 | 4.45622 | 0.0001 |

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| --- | --- | --- | --- |
| Post-hoc comparisons of samplings - Tukey HSD test (p < 0.05) | | | |
| Sampling comparison | Std..Error | z value | p |
| -24 - -48 | 42.61142 | 0.122033 | 0.99995 |
| 2 - -48 | 42.61142 | 2.870123 | 0.033475 |
| 24 - -48 | 42.61142 | 1.22033 | 0.739547 |
| 48 - -48 | 42.61142 | -0.3661 | 0.996176 |
| 2 - -24 | 42.61142 | 2.74809 | 0.047158 |
| 24 - -24 | 42.61142 | 1.098297 | 0.80751 |
| 48 - -24 | 42.61142 | -0.48813 | 0.988478 |
| 24 - 2 | 42.61142 | -1.64979 | 0.465405 |
| 48 - 2 | 42.61142 | -3.23622 | 0.010585 |
| 48 - 24 | 42.61142 | -1.58643 | 0.506106 |

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| --- | --- | --- | --- |
| Post-hoc comparisons of interactions - Tukey HSD test (p < 0.05) | | | |
| Interaction comparison | Std.Error | z value | p |
| -24 C&R - -24 C&C | 65.47120588 | 0.058040782 | 1 |
| -24 Control - -24 C&C | 65.47120588 | 2.145981552 | 0.65109131 |
| -48 C&C - -24 C&C | 42.61141631 | -0.122033024 | 1 |
| -48 C&R - -24 C&C | 65.47120588 | -0.447524978 | 0.999999978 |
| -48 Control - -24 C&C | 65.47120588 | 1.38075966 | 0.984360886 |
| 2 C&C - -24 C&C | 42.61141631 | 2.748089835 | 0.234320812 |
| 2 C&R - -24 C&C | 65.47120588 | 2.59350653 | 0.324307755 |
| 2 Control - -24 C&C | 65.47120588 | 0.209252294 | 1 |
| 24 C&C - -24 C&C | 42.61141631 | 1.098297218 | 0.998423442 |
| 24 C&R - -24 C&C | 65.47120588 | 0.603318657 | 0.999998862 |
| 24 Control - -24 C&C | 65.47120588 | 0.048876448 | 1 |
| 48 C&C - -24 C&C | 42.61141631 | -0.488132097 | 0.99999993 |
| 48 C&R - -24 C&C | 65.47120588 | 0.588044767 | 0.999999211 |
| 48 Control - -24 C&C | 65.47120588 | -0.343662526 | 0.999999999 |
| -24 Control - -24 C&R | 65.47120588 | 2.08794077 | 0.695042248 |
| -48 C&C - -24 C&R | 65.47120588 | -0.13746501 | 1 |
| -48 C&R - -24 C&R | 42.61141631 | -0.776787135 | 0.999972518 |
| -48 Control - -24 C&R | 65.47120588 | 1.322718878 | 0.989546597 |
| 2 C&C - -24 C&R | 65.47120588 | 1.730531742 | 0.901459336 |
| 2 C&R - -24 C&R | 42.61141631 | 3.89566962 | 0.007297467 |
| 2 Control - -24 C&R | 65.47120588 | 0.151211511 | 1 |
| 24 C&C - -24 C&R | 65.47120588 | 0.656777272 | 0.999996677 |
| 24 C&R - -24 C&R | 42.61141631 | 0.837803647 | 0.999930637 |
| 24 Control - -24 C&R | 65.47120588 | -0.009164334 | 1 |
| 48 C&C - -24 C&R | 65.47120588 | -0.375737695 | 0.999999998 |
| 48 C&R - -24 C&R | 42.61141631 | 0.814335758 | 0.999950026 |
| 48 Control - -24 C&R | 65.47120588 | -0.401703308 | 0.999999995 |
| -48 C&C - -24 Control | 65.47120588 | -2.22540578 | 0.590837643 |
| -48 C&R - -24 Control | 65.47120588 | -2.59350653 | 0.322387918 |
| -48 Control - -24 Control | 42.61141631 | -1.175741253 | 0.996785788 |
| 2 C&C - -24 Control | 65.47120588 | -0.357409027 | 0.999999999 |
| 2 C&R - -24 Control | 65.47120588 | 0.447524978 | 0.999999979 |
| 2 Control - -24 Control | 42.61141631 | -2.975728361 | 0.135310171 |
| 24 C&C - -24 Control | 65.47120588 | -1.431163498 | 0.978621547 |
| 24 C&R - -24 Control | 65.47120588 | -1.542662895 | 0.958764692 |
| 24 Control - -24 Control | 42.61141631 | -3.222141198 | 0.068916761 |
| 48 C&C - -24 Control | 65.47120588 | -2.463678465 | 0.412530939 |
| 48 C&R - -24 Control | 65.47120588 | -1.557936785 | 0.955750229 |
| 48 Control - -24 Control | 42.61141631 | -3.825265952 | 0.008961009 |
| -48 C&R - -48 C&C | 65.47120588 | -0.36810075 | 0.999999998 |
| -48 Control - -48 C&C | 65.47120588 | 1.460183889 | 0.974339348 |
| 2 C&C - -48 C&C | 42.61141631 | 2.870122859 | 0.176749492 |
| 2 C&R - -48 C&C | 65.47120588 | 2.672930758 | 0.275387146 |
| 2 Control - -48 C&C | 65.47120588 | 0.288676522 | 1 |
| 24 C&C - -48 C&C | 42.61141631 | 1.220330243 | 0.995271371 |
| 24 C&R - -48 C&C | 65.47120588 | 0.682742885 | 0.999994502 |
| 24 Control - -48 C&C | 65.47120588 | 0.128300676 | 1 |
| 48 C&C - -48 C&C | 42.61141631 | -0.366099073 | 0.999999999 |
| 48 C&R - -48 C&C | 65.47120588 | 0.667468995 | 0.999995984 |
| 48 Control - -48 C&C | 65.47120588 | -0.264238298 | 1 |
| -48 Control - -48 C&R | 65.47120588 | 1.828284639 | 0.85760009 |
| 2 C&C - -48 C&R | 65.47120588 | 2.236097503 | 0.583643882 |
| 2 C&R - -48 C&R | 42.61141631 | 4.672456755 | 0.000211298 |
| 2 Control - -48 C&R | 65.47120588 | 0.656777272 | 0.999996678 |
| 24 C&C - -48 C&R | 65.47120588 | 1.162343033 | 0.99712861 |
| 24 C&R - -48 C&R | 42.61141631 | 1.614590782 | 0.940717677 |
| 24 Control - -48 C&R | 65.47120588 | 0.496401427 | 0.999999915 |
| 48 C&C - -48 C&R | 65.47120588 | 0.129828065 | 1 |
| 48 C&R - -48 C&R | 42.61141631 | 1.591122893 | 0.947565262 |
| 48 Control - -48 C&R | 65.47120588 | 0.103862452 | 1 |
| 2 C&C - -48 Control | 65.47120588 | 0.407812864 | 0.999999994 |
| 2 C&R - -48 Control | 65.47120588 | 1.21274687 | 0.995485443 |
| 2 Control - -48 Control | 42.61141631 | -1.799987108 | 0.870933601 |
| 24 C&C - -48 Control | 65.47120588 | -0.665941606 | 0.999995989 |
| 24 C&R - -48 Control | 65.47120588 | -0.777441003 | 0.999972051 |
| 24 Control - -48 Control | 42.61141631 | -2.046399945 | 0.722903896 |
| 48 C&C - -48 Control | 65.47120588 | -1.698456573 | 0.91403465 |
| 48 C&R - -48 Control | 65.47120588 | -0.792714893 | 0.999964199 |
| 48 Control - -48 Control | 42.61141631 | -2.6495247 | 0.29011304 |
| 2 C&R - 2 C&C | 65.47120588 | 0.804934006 | 0.999956447 |
| 2 Control - 2 C&C | 65.47120588 | -1.579320231 | 0.950239755 |
| 24 C&C - 2 C&C | 42.61141631 | -1.649792616 | 0.92969991 |
| 24 C&R - 2 C&C | 65.47120588 | -1.185253868 | 0.996490112 |
| 24 Control - 2 C&C | 65.47120588 | -1.739696076 | 0.897778623 |
| 48 C&C - 2 C&C | 42.61141631 | -3.236221932 | 0.064838002 |
| 48 C&R - 2 C&C | 65.47120588 | -1.200527758 | 0.996012698 |
| 48 Control - 2 C&C | 65.47120588 | -2.132235051 | 0.661983345 |
| 2 Control - 2 C&R | 65.47120588 | -2.384254237 | 0.468824045 |
| 24 C&C - 2 C&R | 65.47120588 | -1.878688476 | 0.829328891 |
| 24 C&R - 2 C&R | 42.61141631 | -3.057865973 | 0.10895612 |
| 24 Control - 2 C&R | 65.47120588 | -2.544630082 | 0.356207478 |
| 48 C&C - 2 C&R | 65.47120588 | -2.911203443 | 0.158754195 |
| 48 C&R - 2 C&R | 42.61141631 | -3.081333862 | 0.100632268 |
| 48 Control - 2 C&R | 65.47120588 | -2.937169056 | 0.149139075 |
| 24 C&C - 2 Control | 65.47120588 | 0.505565761 | 0.999999889 |
| 24 C&R - 2 Control | 65.47120588 | 0.394066363 | 0.999999996 |
| 24 Control - 2 Control | 42.61141631 | -0.246412837 | 1 |
| 48 C&C - 2 Control | 65.47120588 | -0.526949207 | 0.999999802 |
| 48 C&R - 2 Control | 65.47120588 | 0.378792473 | 0.999999998 |
| 48 Control - 2 Control | 42.61141631 | -0.849537592 | 0.999916963 |
| 24 C&R - 24 C&C | 65.47120588 | -0.111499397 | 1 |
| 24 Control - 24 C&C | 65.47120588 | -0.665941606 | 0.999995942 |
| 48 C&C - 24 C&C | 42.61141631 | -1.586429315 | 0.94852875 |
| 48 C&R - 24 C&C | 65.47120588 | -0.126773287 | 1 |
| 48 Control - 24 C&C | 65.47120588 | -1.05848058 | 0.998951445 |
| 24 Control - 24 C&R | 65.47120588 | -0.554442209 | 0.999999629 |
| 48 C&C - 24 C&R | 65.47120588 | -0.92101557 | 0.999786746 |
| 48 C&R - 24 C&R | 42.61141631 | -0.023467889 | 1 |
| 48 Control - 24 C&R | 65.47120588 | -0.946981183 | 0.999702359 |
| 48 C&C - 24 Control | 65.47120588 | -0.366573361 | 0.999999999 |
| 48 C&R - 24 Control | 65.47120588 | 0.539168319 | 0.999999739 |
| 48 Control - 24 Control | 42.61141631 | -0.603124754 | 0.9999989 |
| 48 C&R - 48 C&C | 65.47120588 | 0.90574168 | 0.999822137 |
| 48 Control - 48 C&C | 65.47120588 | -0.025965613 | 1 |
| 48 Control - 48 C&R | 65.47120588 | -0.931707293 | 0.999753922 |

**The effect of C&R and C&C on latency for the first aggressive behavior – Figure 2A**

**The differences between the treatments were examined using linear mixed-effect models. We set `treatment´ and ‘sampling’ as fixed factors, while `fish´ was included as a nested random term to account for their variation. Post-hoc comparisons were performed using Tukey HSD test.**

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| --- | --- | --- | --- | --- | --- |
| **Model** | **Comparison of lm with lme model** | | | | |
| **Df** | **AIC** | **Test** | **L. ratio** | **p** |
| **1 - latencyFALme** | **21** | **660.2796** |  |  |  |
| **2 - latencyFALm** | **19** | **680.3572** | **1 vs 2** | **24.07756** | **< 0.0001** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Effect | Linear mixed-effect model ANOVA | | | |
| numDF | denDF | F | p |
| Intercept | 1 | 135 | 353.4277 | <0.0001 |
| Treatment | 2 | 27 | 1.5457 | 0.2314 |
| Sampling | 5 | 135 | 8.4361 | <0.0001 |
| Treatment:Sampling | 10 | 135 | 1.5996 | 0.1130 |

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| --- | --- | --- | --- |
| Post-hoc comparisons of samplings - Tukey HSD test (p < 0.05) | | | |
| Sampling comparison | Std. Error | z value | p |
| -24 - -48 | 0.5441 | -0.989 | 0.322495 |
| 2 - -48 | 0.5441 | -1.551 | 0.120793 |
| 6 - -48 | 0.5441 | -1.986 | 0.047005 |
| 24 - -48 | 0.5441 | -3.378 | 0.000729 |
| 48 - -48 | 0.5441 | -4.524 | 0.000006 |
| 2 - -24 | 0.5441 | -0.562 | 0.574039 |
| 6 - -24 | 0.5441 | -0.997 | 0.318808 |
| 24 - -24 | 0.5441 | -2.389 | 0.016895 |
| 48 - -24 | 0.5441 | -3.535 | 0.000408 |
| 6 - 2 | 0.5441 | -0.435 | 0.663709 |
| 24 - 2 | 0.5441 | -1.827 | 0.067718 |
| 48 - 2 | 0.5441 | -2.973 | 0.002950 |
| 24 - 6 | 0.5441 | -1.392 | 0.163898 |
| 48 - 6 | 0.5441 | -2.538 | 0.011144 |
| 48 - 24 | 0.5441 | -1.146 | 0.251770 |

**The effect of C&R and C&C on number of bites – Figure 2B**

**The differences between the treatments were examined using linear mixed-effect models. We set `treatment´ and ‘sampling’ as fixed factors, while `fish´ was included as a nested random term to account for their variation. Post-hoc comparisons were performed using Tukey HSD test.**

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| **Model** | **Comparison of lm with lme model** | | | | |
| **Df** | **AIC** | **Test** | **L. ratio** | **p** |
| **1 - bitesLme** | **21** | **662.7410** |  |  |  |
| **2 - bitesLm** | **19** | **724.0321** | **1 vs 2** | **65.29105** | **< 0.0001** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Effect | Linear mixed-effect model ANOVA | | | |
| numDF | denDF | F | p |
| Intercept | 1 | 135 | 140.08958 | <0.0001 |
| Treatment | 2 | 27 | 0.67787 | 0.5161 |
| Sampling | 5 | 135 | 3.05702 | 0.0120 |
| Treatment:Sampling | 10 | 135 | 0.79600 | 0.6327 |

|  |  |  |  |
| --- | --- | --- | --- |
| Post-hoc comparisons of samplings - Tukey HSD test (p < 0.05) | | | |
| Sampling comparison | Std. Error | z value | p |
| -24 - -48 | 0.51669 | 0.021 | 0.9834 |
| 2 - -48 | 0.51669 | 0.296 | 0.767 |
| 6 - -48 | 0.51669 | 1.469 | 0.1419 |
| 24 - -48 | 0.51669 | 0.969 | 0.3324 |
| 48 - -48 | 0.51669 | 2.133 | 0.0329 |
| 2 - -24 | 0.51669 | 0.275 | 0.783 |
| 6 - -24 | 0.51669 | 1.448 | 0.1476 |
| 24 - -24 | 0.51669 | 0.949 | 0.3428 |
| 48 - -24 | 0.51669 | 2.112 | 0.0347 |
| 6 - 2 | 0.51669 | 1.173 | 0.2409 |
| 24 - 2 | 0.51669 | 0.673 | 0.5009 |
| 48 - 2 | 0.51669 | 1.837 | 0.0662 |
| 24 - 6 | 0.51669 | -0.5 | 0.6174 |
| 48 - 6 | 0.51669 | 0.664 | 0.5066 |
| 48 - 24 | 0.51669 | 1.164 | 0.2446 |

**The effect of C&R and C&C on number of lateral confronts – Figure 2C**

**The differences between the treatments were examined using linear mixed-effect models. We set `treatment´ and ‘sampling’ as fixed factors, while `fish´ was included as a nested random term to account for their variation. Post-hoc comparisons were performed using Tukey HSD test.**

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| **Model** | **Comparison of lm with lme model** | | | | |
| **Df** | **AIC** | **Test** | **L. ratio** | **p** |
| **1 – lcLme** | **18** | **1327.241** |  |  |  |
| **2 - lcLm** | **16** | **1370.833** | **1 vs 2** | **47.59252** | **< 0.0001** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Effect | Linear mixed-effect model ANOVA | | | |
| numDF | denDF | F | p |
| Intercept | 1 | 135 | 65.92991 | < 0.0001 |
| Treatment | 2 | 27 | 1.09130 | 0.3501 |
| Sampling | 5 | 135 | 0.75028 | 0.5873 |
| Treatment:Sampling | 10 | 135 | 1.76947 | 0.0719 |

**The effect of C&R and C&C on number of threats – Figure 2D**

**The differences between the treatments were examined using linear mixed-effect models. We set `treatment´ and ‘sampling’ as fixed factors, while `fish´ was included as a nested random term to account for their variation. Post-hoc comparisons were performed using Tukey HSD test.**

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| --- | --- | --- | --- | --- | --- |
| **Model** | **Comparison of lm with lme model** | | | | |
| **Df** | **AIC** | **Test** | **L. ratio** | **p** |
| **1 – threatsLme** | **18** | **1138.119** |  |  |  |
| **2 - threatsLm** | **16** | **1151.309** | **1 vs 2** | **17.18989** | **< 0.0001** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Effect | Linear mixed-effect model ANOVA | | | |
| numDF | denDF | F | p |
| Intercept | 1 | 135 | 32.32552 | < 0.0001 |
| Treatment | 2 | 27 | 0.44907 | 0.6429 |
| Sampling | 5 | 135 | 1.39849 | 0.2288 |
| Treatment:Sampling | 10 | 135 | 0.55851 | 0.8451 |

**The effect of C&R and C&C on Confront Index – Figure 2E**

**The differences between the treatments were examined using linear mixed-effect models. We set `treatment´ and ‘sampling’ as fixed factors, while `fish´ was included as a nested random term to account for their variation. Post-hoc comparisons were performed using Tukey HSD test.**

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| --- | --- | --- | --- | --- | --- |
| **Model** | **Comparison of lm with lme model** | | | | |
| **Df** | **AIC** | **Test** | **L. ratio** | **p** |
| **1 - indexLme** | **21** | **353.8778** |  |  |  |
| **2 - indexLm** | **19** | **412.4266** | **1 vs 2** | **62.5488** | **< 0.0001** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Effect | Linear mixed-effect model ANOVA | | | |
| numDF | denDF | F | p |
| Intercept | 1 | 135 | 193.24573 | <0.0001 |
| Treatment | 2 | 27 | 0.71945 | 0.4961 |
| Sampling | 5 | 135 | 4.88385 | 0.0004 |
| Treatment:Sampling | 10 | 135 | 0.88258 | 0.5512 |

|  |  |  |  |
| --- | --- | --- | --- |
| Post-hoc comparisons of samplings - Tukey HSD test (p < 0.05) | | | |
| Sampling comparison | Std. Error | z value | p |
| -24 - -48 | 0.219774 | 0.363277 | 0.999177 |
| 2 - -48 | 0.219774 | 0.824817 | 0.96304 |
| 6 - -48 | 0.219774 | 1.69964 | 0.532034 |
| 24 - -48 | 0.219774 | 1.879055 | 0.415075 |
| 48 - -48 | 0.219774 | 3.273692 | 0.013518 |
| 2 - -24 | 0.219774 | 0.46154 | 0.997392 |
| 6 - -24 | 0.219774 | 1.336363 | 0.764726 |
| 24 - -24 | 0.219774 | 1.515778 | 0.654062 |
| 48 - -24 | 0.219774 | 2.910415 | 0.042015 |
| 6 - 2 | 0.219774 | 0.874823 | 0.95257 |
| 24 - 2 | 0.219774 | 1.054238 | 0.899226 |
| 48 - 2 | 0.219774 | 2.448875 | 0.139824 |
| 24 - 6 | 0.219774 | 0.179415 | 0.999974 |
| 48 - 6 | 0.219774 | 1.574052 | 0.615753 |
| 48 - 24 | 0.219774 | 1.394637 | 0.730357 |