**Table S1.** Test of normality and test statistics for ecological parameters recorded in undisturbed and disturbed forests in Peninsular Malaysia.

**Table S1(a).** Test of normality for ecological parameters recorded in undisturbed and disturbed forests in Peninsular Malaysia.

Tests of Normality

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Ecology parameters | Vegetation Types | Kilmogorov-Smirnov (Lilliefors Significance Correction) | | | Shapiro-Wilk | | |
| **Statistic** | **df** | **Sig.** | **Statistic** | **df** | **Sig.** |
| Min Temp | Undisturbed | 0.142 | 30 | 0.128 | 0.923 | 30 | 0.032 |
| Disturbed | 0.139 | 30 | 0.145 | 0.955 | 30 | 0.225 |
| Max Temp | Undisturbed | 0.236 | 30 | 0.000 | 0.723 | 30 | 0.000 |
| Disturbed | 0.145 | 30 | 0.107 | 0.929 | 30 | 0.045 |
| Min RAH | Undisturbed | 0.153 | 30 | 0.072 | 0.862 | 30 | 0.001 |
| Disturbed | 0.206 | 30 | 0.002 | 0.856 | 30 | 0.001 |
| Max RAH | Undisturbed | 0.174 | 30 | 0.021 | 0.881 | 30 | 0.003 |
| Disturbed | 0.128 | 30 | 0.2 | 0.941 | 30 | 0.098 |
| Min Light | Undisturbed | 0.081 | 30 | 0.2 | 0.970 | 30 | 0.552 |
| Disturbed | 0.129 | 30 | 0.2 | 0.921 | 30 | 0.028 |
| Max Light | Undisturbed | 0.155 | 30 | 0.064 | 0.933 | 30 | 0.059 |
| Disturbed | 0.132 | 30 | 0.193 | 0.933 | 30 | 0.060 |

**Table S1(b).** Mann-Whitney test for ecological parameters recorded in undisturbed and disturbed forests in Peninsular Malaysia.

Test Statistics (Mann-Whitney Test)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Temperature (Min) | Temperature (Max) | Relative Air Humidity (Min) | Relative Air Humidity (Max) | Light Intensity (Min) | Light Intensity (Max) | Tree Bark Moisture (Min) | Tree Bark Moisture (Max) |
| Mann-Whitney U | 336 | 101.5 | 152 | 402 | 166 | 38 | 422 | 399.5 |
| Wilcoxon W | 801 | 566.5 | 617 | 867 | 631 | 503 | 887 | 864.5 |
| Z | -1.687 | -5.155 | -4.41 | -0.713 | -4.199 | -6.091 | -0.415 | -0.748 |
| Asymp. Sig.  (2-tailed) | 0.092 | 0 | 0 | 0.476 | 0 | 0 | 0.678 | 0.454 |

**Table S1(c):** Test of normality for ecological parameters recorded in adjacent undisturbed and disturbed forests in Peninsular Malaysia.

Tests of Normality

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Ecology parameters | Vegetation Types | Kilmogorov-Smirnov (Lilliefors Significance Correction) | | | Shapiro-Wilk | | |
| **Statistic** | **df** | **Sig.** | **Statistic** | **df** | **Sig.** |
| Min Temp | Undisturbed | 0.137 | 20 | 0.200 | 0.949 | 20 | 0.357 |
| Disturbed | 0.169 | 20 | 0.137 | 0.906 | 20 | 0.054 |
| Max Temp | Undisturbed | 0.222 | 20 | 0.011 | 0.948 | 20 | 0.335 |
| Disturbed | 0.108 | 20 | 0.200 | 0.963 | 20 | 0.599 |
| Min RAH | Undisturbed | 0.176 | 20 | 0.104 | 0.954 | 20 | 0.431 |
| Disturbed | 0.149 | 20 | 0.200 | 0.952 | 20 | 0.392 |
| Max RAH | Undisturbed | 0.150 | 20 | 0.200 | 0.942 | 20 | 0.263 |
| Disturbed | 0.150 | 20 | 0.2 | 0.922 | 20 | 0.107 |
| Min Light | Undisturbed | 0.181 | 20 | 0.086 | 0.934 | 20 | 0.188 |
| Disturbed | 0.190 | 20 | 0.058 | 0.850 | 20 | 0.005 |
| Max Light | Undisturbed | 0.205 | 20 | 0.027 | 0.861 | 20 | 0.008 |
| Disturbed | 0.116 | 20 | 0.200 | 0.950 | 20 | 0.369 |

**Table S1(d).** Mann-Whitney test for ecological parameters recorded in adjacent undisturbed and disturbed forests in Peninsular Malaysia.

Test Statistics (Mann-Whitney test)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Temperature (Min) | Temperature (Max) | Relative Air Humidity (Min) | Relative Air Humidity (Max) | Light Intensity (Min) | Light Intensity (Max) | Tree Bark Moisture (Min) | Tree Bark Moisture (Max) |
| Mann-Whitney U | 131.5 | 0 | 0 | 11 | 105 | 26 | 176 | 117 |
| Wilcoxon W | 341.5 | 210 | 210 | 221 | 315 | 236 | 386 | 327 |
| Z | -1.855 | -5.417 | -5.425 | -5.129 | -2.57 | -4.707 | -0.652 | -2.249 |
| Asymp. Sig. (2-tailed) | 0.064 | 0.000 | 0.000 | 0.000 | 0.010 | 0.000 | 0.515 | 0.025 |

**Table S1(e).** Test of normality for ecological parameters recorded in undisturbed forests and logging sites in Peninsular Malaysia.

Tests of Normality

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Ecology parameters | Vegetation Types | Kilmogorov-Smirnov (Lilliefors Significance Correction) | | | Shapiro-Wilk | | |
| **Statistic** | **df** | **Sig.** | **Statistic** | **df** | **Sig.** |
| Min Temp | Undisturbed | 0.193 | 20 | 0.050 | 0.872 | 20 | 0.013 |
| Disturbed | 0.167 | 20 | 0.143 | 0.922 | 20 | 0.106 |
| Max Temp | Undisturbed | 0.300 | 20 | 0.000 | 0.681 | 20 | 0.000 |
| Disturbed | 0.106 | 20 | 0.200 | 0.929 | 20 | 0.149 |
| Min RAH | Undisturbed | 0.247 | 20 | 0.002 | 0.792 | 20 | 0.001 |
| Disturbed | 0.144 | 20 | 0.200 | 0.924 | 20 | 0.116 |
| Max RAH | Undisturbed | 0.183 | 20 | 0.077 | 0.933 | 20 | 0.180 |
| Disturbed | 0.206 | 20 | 0.026 | 0.927 | 20 | 0.136 |
| Min Light | Undisturbed | 0.089 | 20 | 0.2 | 0.960 | 20 | 0.552 |
| Disturbed | 0.282 | 20 | 0 | 0.872 | 20 | 0.013 |
| Max Light | Undisturbed | 0.164 | 20 | 0.165 | 0.950 | 20 | 0.372 |
| Disturbed | 0.172 | 20 | 0.123 | 0.826 | 20 | 0.002 |

**Table S1(f).** Mann-Whitney test for ecological parameters recorded in undisturbed forests and logging sites in Peninsular Malaysia.

Test Statistics (Mann-Whitney test)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Temperature (Minimum) | Temperature (Maximum) | Relative Air Humidity (Minimum) | Relative Air Humidity (Maximum) | Light Intensity (Minimum) | Light Intensity (Maximum) | Tree Bark Moisture (Minimum) | Tree Bark Moisture (Maximum) |
| Mann-Whitney U | 21 | 1 | 0 | 74 | 9 | 31 | 168.5 | 102.5 |
| Wilcoxon W | 231 | 211 | 210 | 284 | 219 | 241 | 378.5 | 312.5 |
| Z | -4.844 | -5.384 | -5.418 | -3.42 | -5.167 | -4.572 | -0.855 | -2.645 |
| Asymp. Sig. (2-tailed) | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.393 | 0.008 |

**Table S1(g).** Test of normality for daily course of temperature recorded in undisturbed and disturbed forests in Peninsular Malaysia.

Tests of Normality

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Hours | Vegetation types | Kilmogorov-Smirnov (Lilliefors Significance Correction) | | | Shapiro-Wilk | | |
| **Statistic** | **df** | **Sig.** | **Statistic** | **df** | **Sig.** |
| Morning | Undisturbed | 0.197 | 10 | 0.2 | 0.922 | 10 | 0.37 |
| Disturbed (non-logging) | 0.185 | 9 | 0.2 | 0.91 | 9 | 0.31 |
| Logging | 0.311 | 9 | 0.012 | 0.802 | 9 | 0.02 |
| Afternoon | Undisturbed | 0.116 | 10 | 0.2 | 0.977 | 10 | 0.95 |
| Disturbed (non-logging) | 0.216 | 9 | 0.2 | 0.925 | 9 | 0.43 |
| Logging | 0.239 | 9 | 0.148 | 0.874 | 9 | 0.14 |
| Late Afternoon | Undisturbed | 0.127 | 10 | 0.2 | 0.94 | 10 | 0.55 |
| Disturbed (non-logging) | 0.165 | 9 | 0.2 | 0.871 | 9 | 0.13 |
| Logging | 0.163 | 9 | 0.2 | 0.936 | 9 | 0.54 |

**Table S1(h).** Kruskal-Wallis test for daily course of temperature recorded in undisturbed and disturbed forests in Peninsular Malaysia.

Kruskal-Wallis test (Ranks)

|  |  |  |  |
| --- | --- | --- | --- |
| Hours | Vegetation types | N | Mean Rank |
| Morning | Undisturbed | 25 | 19.54 |
| Disturbed (non-logging) | 9 | 15.39 |
| Logging | 8 | 34.5 |
| Afternoon | Undisturbed | 21 | 20.33 |
| Disturbed (non-logging) | 17 | 23.68 |
| Logging | 16 | 40.97 |
| Late Afternoon | Undisturbed | 10 | 9.65 |
| Disturbed (non-logging) | 9 | 11.11 |
| Logging | 20 | 29.18 |

Kruskal-Wallis test (Test Statistics)

|  |  |  |  |
| --- | --- | --- | --- |
|  | Morning | Afternoon | Late Afternoon |
| Kruskal-Wallis H | 11.862 | 17.098 | 26.667 |
| df | 2 | 2 | 2 |
| Asymp. Sig. | 0.003 | 0 | 0 |

**Table S1(i).** Mann-Whitney test (Post-hoc test for the Kruskal-Wallis test) for daily course of temperature recorded in undisturbed and disturbed forests in Peninsular Malaysia.

Mann-Whitney test (Ranks) [Undisturbed vs Disturbed (non-logging)]

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Hours | Vegetation types | N | Mean Rank | Sum of Ranks |
| Morning | Undisturbed | 25 | 18.54 | 463.5 |
| Disturbed (non-logging) | 9 | 14.61 | 131.5 |
| Afternoon | Undisturbed | 21 | 18.24 | 383 |
| Disturbed (non-logging) | 17 | 21.06 | 358 |
| Late Afternoon | Undisturbed | 10 | 9.3 | 93 |
| Disturbed (non-logging) | 9 | 10.78 | 97 |

Mann-Whitney test (Test Statistics) [Undisturbed vs Disturbed (non-logging)]

|  |  |  |  |
| --- | --- | --- | --- |
|  | Morning | Afternoon | Late Afternoon |
| Mann-Whitney U | 86.5 | 152 | 38 |
| Wilcoxon W | 131.5 | 383 | 93 |
| Z | -1.015 | -0.778 | -0.572 |
| Asymp. Sig. (2-tailed) | 0.31 | 0.436 | 0.567 |

Mann-Whitney test (Ranks) (Undisturbed vs Logging)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Hours | Vegetation types | N | Mean Rank | Sum of Ranks |
| Morning | Undisturbed | 25 | 14 | 350 |
| Disturbed (non-logging) | 8 | 26.38 | 211 |
| Afternoon | Undisturbed | 21 | 13.1 | 275 |
| Disturbed (non-logging) | 16 | 26.75 | 428 |
| Late Afternoon | Undisturbed | 10 | 5.85 | 58.5 |
| Disturbed (non-logging) | 20 | 20.33 | 406.5 |

Mann-Whitney test (Test Statistics) (Undisturbed vs Logging)

|  |  |  |  |
| --- | --- | --- | --- |
| Mann-Whitney test (Test Statistics) (Undisturbed vs Logging) | | | |
|  | **Morning** | **Afternoon** | **Late Afternoon** |
| Mann-Whitney U | 25 | 44 | 3.5 |
| Wilcoxon W | 350 | 275 | 58.5 |
| Z | -3.151 | -3.803 | -4.246 |
| Asymp. Sig. (2-tailed) | 0.002 | 0 | 0 |

Mann-Whitney test (Ranks) [Disturbed (non-logging) vs Logging]

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Hours | Vegetation types | N | Mean Rank | Sum of Ranks |
| Morning | Undisturbed | 9 | 5.78 | 52 |
| Disturbed (non-logging) | 8 | 12.63 | 101 |
| Afternoon | Undisturbed | 17 | 11.62 | 197.5 |
| Disturbed (non-logging) | 16 | 22.72 | 363.5 |
| Late Afternoon | Undisturbed | 9 | 5.33 | 48 |
| Disturbed (non-logging) | 20 | 19.35 | 387 |

Mann-Whitney test (Test Statistics) (Undisturbed vs Logging)

|  |  |  |  |
| --- | --- | --- | --- |
|  | Morning | Afternoon | Late Afternoon |
| Mann-Whitney U | 7 | 44.5 | 3 |
| Wilcoxon W | 52 | 197.5 | 48 |
| Z | -2.791 | -3.296 | -4.102 |
| Asymp. Sig. (2-tailed) | 0.005 | 0.001 | 0 |

**Table S1(j).** Kruskal-Wallis test for daily course of relative air humidity recorded in undisturbed and disturbed forests in Peninsular Malaysia.

Tests of Normality

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Hours | Vegetation types | Kilmogorov-Smirnov (Lilliefors Significance Correction) | | | Shapiro-Wilk | | |
| **Statistic** | **df** | **Sig.** | **Statistic** | **df** | **Sig.** |
| Morning | Undisturbed | 0.197 | 10 | 0.2 | 0.922 | 10 | 0.37 |
| Disturbed (non-logging) | 0.185 | 9 | 0.2 | 0.91 | 9 | 0.31 |
| Logging | 0.311 | 9 | 0.012 | 0.802 | 9 | 0.02 |
| Afternoon | Undisturbed | 0.116 | 10 | 0.2 | 0.977 | 10 | 0.95 |
| Disturbed (non-logging) | 0.216 | 9 | 0.2 | 0.925 | 9 | 0.43 |
| Logging | 0.239 | 9 | 0.148 | 0.874 | 9 | 0.14 |
| Late Afternoon | Undisturbed | 0.127 | 10 | 0.2 | 0.94 | 10 | 0.55 |
| Disturbed (non-logging) | 0.165 | 9 | 0.2 | 0.871 | 9 | 0.13 |
| Logging | 0.163 | 9 | 0.2 | 0.936 | 9 | 0.54 |

**Table S1(k).** Kruskal-Wallis test for daily course of relative air humidity recorded in undisturbed and disturbed forests in Peninsular Malaysia.

Kruskal-Wallis test (Ranks)

|  |  |  |  |
| --- | --- | --- | --- |
| Hours | Vegetation types | N | Mean Rank |
| Morning | Undisturbed | 10 | 17.95 |
| Disturbed (non-logging) | 9 | 16.56 |
| Logging | 9 | 8.61 |
| Afternoon | Undisturbed | 10 | 19.75 |
| Disturbed (non-logging) | 9 | 17.72 |
| Logging | 9 | 5.44 |
| Late Afternoon | Undisturbed | 10 | 18.65 |
| Disturbed (non-logging) | 9 | 18.61 |
| Logging | 9 | 5.78 |

Kruskal-Wallis test (Test Statistics)

|  |  |  |  |
| --- | --- | --- | --- |
|  | Morning | Afternoon | Late Afternoon |
| Kruskal-Wallis H | 6.966 | 16.374 | 14.981 |
| df | 2 | 2 | 2 |
| Asymp. Sig. | 0.031 | 0 | 0.001 |

**Table S1(l).** Mann-Whitney test (Post-hoc test for the Kruskal-Wallis test) for daily course of relative air humidity recorded in undisturbed and disturbed forests in Peninsular Malaysia.

Mann-Whitney test (Ranks) [Undisturbed vs Disturbed (non-logging)]

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Hours | Vegetation types | N | Mean Rank | Sum of Ranks |
| Morning | Undisturbed | 10 | 10.35 | 103.5 |
| Disturbed (non-logging) | 9 | 9.61 | 86.5 |
| Afternoon | Undisturbed | 10 | 10.75 | 107.5 |
| Disturbed (non-logging) | 9 | 9.17 | 82.5 |
| Late Afternoon | Undisturbed | 10 | 10.05 | 100.5 |
| Disturbed (non-logging) | 9 | 9.94 | 89.5 |

Mann-Whitney test (Test Statistics) [Undisturbed vs Disturbed (non-logging)]

|  |  |  |  |
| --- | --- | --- | --- |
|  | Morning | Afternoon | Late Afternoon |
| Mann-Whitney U | 41.5 | 37.5 | 44.5 |
| Wilcoxon W | 86.5 | 82.5 | 89.5 |
| Z | -0.286 | -0.613 | -0.041 |
| Asymp. Sig. (2-tailed) | 0.775 | 0.54 | 0.967 |

Mann-Whitney test (Ranks) (Undisturbed vs Logging)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Hours | Vegetation types | N | Mean Rank | Sum of Ranks |
| Morning | Undisturbed | 10 | 13.1 | 131 |
| Disturbed (non-logging) | 9 | 6.56 | 59 |
| Afternoon | Undisturbed | 10 | 14.5 | 145 |
| Disturbed (non-logging) | 9 | 5 | 45 |
| Late Afternoon | Undisturbed | 10 | 14.1 | 141 |
| Disturbed (non-logging) | 9 | 5.44 | 49 |

Mann-Whitney test (Test Statistics) [Undisturbed vs Disturbed (non-logging)]

|  |  |  |  |
| --- | --- | --- | --- |
|  | Morning | Afternoon | Late Afternoon |
| Mann-Whitney U | 14 | 0 | 4 |
| Wilcoxon W | 59 | 45 | 49 |
| Z | -2.538 | -3.674 | -3.349 |
| Asymp. Sig. (2-tailed) | 0.011 | 0 | 0.001 |

Mann-Whitney test (Ranks) [Disturbed (non-logging) vs Logging]

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Hours | Vegetation types | N | Mean Rank | Sum of Ranks |
| Morning | Undisturbed | 9 | 11.94 | 107.5 |
| Disturbed (non-logging) | 9 | 7.06 | 63.5 |
| Afternoon | Undisturbed | 9 | 13.56 | 122 |
| Disturbed (non-logging) | 9 | 5.44 | 49 |
| Late Afternoon | Undisturbed | 9 | 13.67 | 123 |
| Disturbed (non-logging) | 9 | 5.33 | 48 |

Mann-Whitney test (Ranks) [Disturbed (non-logging) vs Logging]

|  |  |  |  |
| --- | --- | --- | --- |
|  | Morning | Afternoon | Late Afternoon |
| Mann-Whitney U | 18.5 | 4 | 3 |
| Wilcoxon W | 63.5 | 49 | 48 |
| Z | -1.957 | -3.226 | -3.315 |
| Asymp. Sig. (2-tailed) | 0.05 | 0.001 | 0.001 |