**Appendix A:** Supplementary material for “Effects of land use characteristics, physiochemical variables and river connectivity on fish assemblages in a lowland basin”

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**Table A1** Connectivity variables for the four connectivity groups in the Lake Chaohu Basin. The Kruskal-Wallis tests were conducted to detect differences of variables among groups. Values are averages (ranges).

|  |  |  |
| --- | --- | --- |
| Physicochemical variables | River-connectivity group | *p* value |
| Group 1 (n=9) | Group 2 (n=8) | Group 3 (n=19) | Group 4 (n=21) |
| **ROrder** | **4.67(2-5)** | **4.13(4-5)** | **2.89(1-4)** | **2.43(1-3)** | **<0.001\*\*\*** |
| **Link** | **250.22(156-567)** | **52(32-82)** | **12.89(1-37)** | **7.38(1-21)** | **<0.001\*\*\*** |
| **BLink\_Lf** | **279.56(108-970)** | **60.38(5-119)** | **13.68(0-45)** | **4.95(0-16)** | **<0.001\*\*\*** |
| **BLink\_R** | **353.22(215-537)** | **49.38(26-84)** | **10.21(0-33)** | **5.81(0-18)** | **<0.001\*\*\*** |
| **BLink** | **632.78(394-1423)** | **109.75(70-199)** | **23.89(0-59)** | **10.76(0-28)** | **<0.001\*\*\*** |
| **CLink** | **18(2-39)** | **25.88(1-78)** | **21.05(4-68)** | **53.05(32-85)** | **<0.001\*\*\*** |
| **DLink** | **239.11(161-499)** | **60(26-94)** | **14.05(5-29)** | **8.1(1-22)** | **<0.001\*\*\*** |
| Down\_L (km) | 1290.5(13.02-3911) | 1700.35(63.37-6957) | 874.07(10.9-7329) | 2016(11.8-16500) | 0.420 |
| Up\_L (km) | 1227.53(131.1-5231) | 1504.04(29.43-3930) | 997.75(11.48-4852) | 1414.17(13.11-4840) | 0.826 |
| LSS | 0.51(0.05-0.99) | 0.55(0.01-0.94) | 0.56(0.04-0.98) | 0.46(0.01-0.99) | 0.909 |

\*\*\*Correlation is significant at the 0.001 level.

ROrder, stream order; Link, stream-link magnitude; BLink\_Lf, number of branches along a path to the left; BLink\_R, number of branches along a path to the right; BLink, branch link; CLink, confluence link; DLink, downstream link; Down\_L, downstream segment length; Up\_L, upstream segment length; and LSS , the location of sampling site.

**Table A2** Physicochemical variables for the four connectivity groups in the Lake Chaohu Basin. The Kruskal-Wallis tests were conducted to detect differences of variables among groups. Values are averages (ranges).

|  |  |  |
| --- | --- | --- |
| Physicochemical variables | River-connectivity group | *p* value |
| Group 1 (n=9) | Group 2 (n=8) | Group 3 (n=19) | Group 4 (n=21) |
| pH | 8.39(7.4-9.87) | 8.22(6.93-9.87) | 8.25(7.5-10.16) | 8.06(7.23-9.19) | 0.619  |
| DO(mg/L) | 10.72(6.14-18.22) | 9.82(3.22-18.22) | 8.86(0.85-13.45) | 9.86(1.46-16.94) | 0.896  |
| EC(μs/cm) | 158.56(69-221) | 185.75(41-323) | 201.74(33-576) | 191.9(41-616) | 0.939  |
| TDS(mg/L) | 0.12(0.05-0.17) | 0.14(0.03-0.26) | 0.15(0.03-0.4) | 0.14(0.04-0.29) | 0.952  |
| Alka(mg/L) | 35.18(0-59.36) | 40.99(14.13-62.19) | 60.7(19.79-115.89) | 44.82(8.48-132.85) | 0.088 |
| Turb(NTU) | 14.22(0.9-30.9) | 8.6(0.9-20.4) | 21.78(0.1-116.1) | 10.75(0.3-34.8) | 0.414  |
| TN(mg/L) | 0.63(0.09-2.11) | 0.52(0.08-2.11) | 2.64(0.17-15.85) | 0.60(0.09-4.99) | 0.595  |
| NH4+-N(mg/L) | 0.49(0.13-1.8) | 0.76(0.06-2.74) | 0.14(0.04-0.73) | 0.21(0.04-1.04) | 0.082  |
| **NO3--N(mg/L)** | **1.72(0.66-2.7)** | **1.94(0.45-4.97)** | **3.77(0.57-17.87)** | **1.70(0.48-5.55)** | **0.006\*\*** |
| **TP(mg/L)** | **0.06(0.02-0.26)** | **0.05(0.01-0.24)** | **0.20(0.01-1.05)** | **0.03(0-0.06)** | **0.013\*** |
| **PO43+\_P(mg/L)** | **0.11(0.04-0.34)** | **0.08(0.02-0.34)** | **0.41(0.02-2.66)** | **0.05(0.01-0.11)** | **0.020\*** |
| **DOC(mg/L)** | **4.55(3.03-7.59)** | **5.13(3.18-7.21)** | **7.17(2.34-16.81)** | **4.72(1.45-8.03)** | **0.041\***  |
| **Elevation(m)** | **22(12-33)** | **50.25(18-123)** | **57.63(8-387)** | **63.24(7-159)** | **0.023\*** |
| Temp(oC) | 18.77(15.99-25.25) | 17.83(13.32-25.25) | 18.76(10.96-25.89) | 17.85(12.3-25.23) | 0.495  |
| **Width(m)** | **149.22(40-320)** | **61.38(10-108)** | **48.16(4-240)** | **20.67(3-150)** | **<0.001\*\*\*** |
| **Depth(m)** | **4.12(0.9-7)** | **2.21(0.8-4)** | **1.98(0.3-4)** | **0.99(0.3-5)** | **<0.001\*\*\*** |
| Flow(m/s) | 0.10(0-0.2) | 0.19(0-0.61) | 0.09(0-0.51) | 0.18(0-0.81) | 0.349 |
| Chl-a(ug/cm2) | 0.25(0.03-0.71) | 0.17(0.05-0.33) | 0.40(0.05-1.79) | 0.31(0.02-1.27) | 0.899 |

Note: \* p<0.05, \*\* p<0.01, \*\*\* p<0.001

**Table A3** Land use and land cover for the four connectivity groups in the Lake Chaohu Basin. The Kruskal-Wallis tests were conducted to detect differences of variables among groups. Values are averages (ranges).

|  |  |  |
| --- | --- | --- |
| Land use and land cover | River-connectivity group | *p* value |
| Group 1 (n=9) | Group 2 (n=8) | Group 3 (n=19) | Group 4 (n=21) |
| **U\_Grass** | **0(0-0)** | **1.25(0-9.98)** | **1.49(0-28.33)** | **12.72(0-86.32)** | **0.018\*** |
| U\_Built | 9.18(0-21.46) | 9.5(0-13.93) | 21.56(0-84.98) | 7.57(0-54.3) | 0.080 |
| U\_Crop | 78.21(63.45-97.14) | 66.68(27.34-90.72) | 62.83(0-98.76) | 49.64(0-97.25) | 0.127 |
| **U\_Wood** | **1.39(0-12.47)** | **15.25(0-61.85)** | **10.83(0-100)** | **27.52(0-100)** | **0.002\*\*** |
| **U\_Water** | **11.22(0-31.16)** | **7.32(0-23.31)** | **3.29(0-39.3)** | **2.54(0-13.58)** | **0.032\*** |
| D\_Grass | 0(0-0) | 1.16(0-6.84) | 1.31(0-24.96) | 10.09(0-57.22) | 0.094 |
| D\_Built | 8.02(0-28.55) | 9.76(0-19.88) | 19.03(0-99.24) | 8.15(0-42.62) | 0.255 |
| D\_Crop | 81.04(62.05-94.97) | 66.53(28.8-93.2) | 65.81(0-98.6) | 53.95(0-96.4) | 0.081 |
| **D\_Wood** | **0(0-0)** | **12.98(0-56.08)** | **10.39(0-100)** | **24.87(0-100)** | **0.002\*\*** |
| **D\_Water** | **10.95(0-33.17)** | **9.56(0-35.79)** | **3.31(0-41.23)** | **2.94(0-13.15)** | **0.031\*** |
| **T\_Grass** | **0(0-0)** | **1.29(0-8.33)** | **1.41(0-26.81)** | **10.16(0-53.22)** | **0.023\*** |
| T\_Built | 8.44(0-22.94) | 9.78(0-18.71) | 19.89(0-89.66) | 8.07(0-44.31) | 0.179 |
| T\_Crop | 79.72(64.61-95.73) | 66.37(27.91-92.15) | 64.58(0-98.68) | 52.92(0-96.73) | 0.098 |
| **T\_Wood** | **1.1(0-9.87)** | **14.44(0-59.59)** | **10.7(0-100)** | **26.07(0-100)** | **0.001\*\*\*** |
| **T\_Water** | **10.75(0-32.06)** | **8.12(0-27.88)** | **3.37(0-40.12)** | **2.78(0-12.98)** | **0.045\*** |

Note: \* p<0.05, \*\* p<0.01, \*\*\* p<0.001

U\_Grass, U\_Built, U\_Crop, U\_Wood, and U\_Water represent the grassland, built-up land, cropland, woodland, and water body in the 1 km buffer along the upstream segment where sampling site located, respectively.

D\_Grass, D\_Built, D\_Crop, D\_Wood, and D\_Water represent the grassland, built-up land, cropland, woodland, and water body in the 1 km buffer along the downstream segment, respectively.

T\_Grass, T\_Built, T\_Crop, T\_Wood, and T\_Water represent the grassland, built-up land, cropland, woodland, and water body in the 1 km buffer along the total segment, respectively.

**Table A4** Fish taxa richness and diversity indices in the four connectivity groups in the Lake Chaohu Basin. The Kruskal-Wallis tests were conducted to detect differences of variables among groups. Values are averages (ranges).

|  |  |  |
| --- | --- | --- |
| Fish taxa richness anddiversity indices | River-connectivity group | *p* value |
| Group 1 (n=9) | Group 2 (n=8) | Group 3 (n=19) | Group 4 (n=21) |
| Taxa richness | 6.89(3-13) | 6.13(4-11) | 7.53(1-14) | 5.48(1-12) | 0.119 |
| Total number of fish captured | 53.67(12-142) | 46.25(10-110) | 89.11(1-455) | 44(1-122) | 0.114 |
| Simpson | 1.31(0.68-1.78) | 1.38(0.85-2.01) | 1.27(0-1.88) | 1.13(0-2.22) | 0.513 |
| Shannon-Wiener | 0.63(0.25-0.92) | 0.7(0.47-0.9) | 0.57(0.33-1) | 0.68(0.32-1) | 0.099 |
| Buzas and Gibson's evenness | 1.11(0.6-1.59) | 1.16(0.67-1.77) | 1.14(0-1.71) | 0.95(0-1.9) | 0.482 |
| Margalef | 0.72(0.42-0.95) | 0.78(0.53-0.92) | 0.66(0.29-0.82) | 0.72(0.17-0.96) | 0.159 |
| Fisher's alpha | 2.46(0.89-3.98) | 2.36(1.2-3.86) | 2.16(0-3.12) | 2.17(0-5.71) | 0.733 |
| Berger-Parker | 0.54(0.29-0.83) | 0.46(0.32-0.77) | 0.55(0.29-1) | 0.56(0.19-1) | 0.625 |

**Table A5** Fish taxa richness and diversity indices in the river order groups in the Lake Chaohu Basin. Kruskal-Wallis tests were conducted to detect differences of variables among groups. Values are averages (ranges).

|  |  |  |
| --- | --- | --- |
| Fish taxa richness anddiversity indices | River-order group | *p* value |
| 1st-order (n=3) | 2nd-order (n=14) | 3rd-order (n=19) | 4th-order (n=12) | 5th-order (n=9) |
| Taxa richness | 4.67(3-6) | 7(1-13) | 5.89(1-10) | 7.58(4-14) | 6(3-10) | 0.492 |
| Total number of fish captured | 30.67(5-55) | 46.5(1-142) | 63.58(1-122) | 96.08(10-455) | 40.67(12-92) | 0.236 |
| Simpson | 1.24(1.06-1.38) | 1.3(0-2.22) | 1.05(0-1.88) | 1.39(0.85-2.01) | 1.34(0.68-1.78) | 0.477 |
| Shannon-Wiener | 0.78(0.66-0.96) | 0.68(0.25-1) | 0.58(0.32-1) | 0.59(0.33-0.9) | 0.7(0.39-0.92) | 0.149 |
| Buzas and Gibson's evenness | 1.01(0.68-1.24) | 1.11(0-1.9) | 0.93(0-1.71) | 1.22(0.67-1.77) | 1.13(0.6-1.59) | 0.649 |
| Margalef | 0.84(0.77-0.96) | 0.74(0.46-0.93) | 0.62(0.17-0.87) | 0.72(0.53-0.92) | 0.77(0.42-0.95) | 0.089 |
| Fisher's alpha | 2.18(1.66-3.17) | 2.72(0-5.71) | 1.74(0-3.15) | 2.46(1.1-3.86) | 2.28(0.89-3.98) | 0.232 |
| Berger-Parker | 0.44(0.4-0.5) | 0.52(0.19-1) | 0.62(0.29-1) | 0.5(0.33-0.77) | 0.5(0.29-0.83) | 0.415 |



**Figure A1.** Box plots of selected Land cover variables in the four connectivity groups. Kruskal-Wallis test of the variables among the four groups indicated significant differences between the groups (*p*<0.05). U\_Grass, U\_Wood, and U\_Water represent the grassland, woodland, and water body in the 1 km buffer around the upstream segment; D\_Wood and D\_Water represent the woodland and water body in the 1 km buffer around the downstream segment; T\_Grass, T\_Wood, and T\_Water represent the grassland, woodland, and water body in the 1 km buffer around the total segment where sampling site located.