Chapter 3 Results

# **Occupancy Modeling**

## Longnose Dace:

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| lnd.results.p  model npar AICc DeltaAICc weight Deviance  4 p(~1)Psi(~avwid + pctcbbl + pctSlope + med\_len + BRT\_100m) 7 242.5153 0.000000 5.529271e-01 227.66033  2 p(~pctcbbl)Psi(~avwid + pctcbbl + pctSlope + med\_len + BRT\_100m) 8 244.5436 2.028280 2.005545e-01 227.43588  6 p(~mFlow)Psi(~avwid + pctcbbl + pctSlope + med\_len + BRT\_100m) 8 244.7587 2.243410 1.801016e-01 227.65101  8 p(~pctcbbl + mFlow)Psi(~avwid + pctcbbl + pctSlope + med\_len + BRT\_100m) 9 246.7538 4.238557 6.641665e-02 227.35850  3 p(~1)Psi(~1) 2 274.3253 31.809993 6.842512e-08 14.31515  1 p(~pctcbbl)Psi(~1) 3 275.1556 32.640346 4.517590e-08 268.97786  5 p(~mFlow)Psi(~1) 3 276.3634 33.848156 2.469643e-08 270.18567  7 p(~pctcbbl + mFlow)Psi(~1) 4 277.2700 34.754726 1.569550e-08 268.97151  lnd.results.psi  model npar AICc DeltaAICc weight Deviance  2 p(~1)Psi(~avwid + pctcbbl + pctSlope + med\_len + BRT\_100m) 7 242.5153 0.00000 9.997523e-01 227.66033  3 p(~1)Psi(~avwid + pctcbbl + pctSlope) 5 259.1619 16.64666 2.427264e-04 248.71082  4 p(~1)Psi(~med\_len + BRT\_100m) 4 266.9726 24.45732 4.887129e-06 258.67410  1 p(~1)Psi(~1) 2 274.3253 31.80999 1.237200e-07 14.31515 |
| summary(lnd.results.p$p.Dot.Psi.global) #top model  Output summary for Occupancy model  Name : p(~1)Psi(~avwid + pctcbbl + pctSlope + med\_len + BRT\_100m)  Npar : 7  -2lnL: 227.6603  AICc : 242.5153  Beta  estimate se lcl ucl  p:(Intercept) 0.6905410 0.2290958 0.2415133 1.1395688  Psi:(Intercept) -5.1474816 1.0452673 -7.1962055 -3.0987576  Psi:avwid 1.1292159 0.2528426 0.6336443 1.6247875  Psi:pctcbbl 0.0140155 0.0116844 -0.0088859 0.0369168  Psi:pctSlope -0.0210111 0.0309589 -0.0816905 0.0396683  Psi:med\_len 0.0016317 0.0022946 -0.0028657 0.0061291  Psi:BRT\_100m -0.1375387 0.0399399 -0.2158210 -0.0592564  Real Parameter p  1 2 3  0.6660873 0.6660873 0.6660873  Real Parameter Psi  1  0.1696478  >  > lnd.results.p$p.Dot.Psi.global$results$real  estimate se lcl ucl fixed note  p g1 a0 t1 0.6660873 0.0509543 0.5600865 0.7576005  Psi g1 a0 t1 0.1696478 0.0417710 0.1025398 0.2675806 |
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## Southern Redbelly Dace:

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| |  | | --- | | srd.results.p  model npar AICc DeltaAICc weight Deviance  2 p(~1)Psi(~avgT + avdep + pctfines + med\_len + BRT\_100m) 7 253.1339 0.0000000 6.135489e-01 238.27893  4 p(~mFlow)Psi(~avgT + avdep + pctfines + med\_len + BRT\_100m) 8 254.0584 0.9245105 3.864509e-01 236.95071  1 p(~1)Psi(~1) 2 284.5240 31.3900635 9.366634e-08 16.67921  3 p(~mFlow)Psi(~1) 3 285.3329 32.1990159 6.250601e-08 279.15513  > #Two models <2 DeltaAICc  > summary(srd.results.p$p.Dot.Psi.global) #top model  Output summary for Occupancy model  Name : p(~1)Psi(~avgT + avdep + pctfines + med\_len + BRT\_100m)  Npar : 7  -2lnL: 238.2789  AICc : 253.1339  Beta  estimate se lcl ucl  p:(Intercept) 1.624430e-01 0.2400490 -0.3080530 0.6329390  Psi:(Intercept) -9.842362e+00 2.8293307 -15.3878500 -4.2968737  Psi:avgT 4.886556e-01 0.1622782 0.1705904 0.8067208  Psi:avdep 6.524987e+00 2.9944520 0.6558614 12.3941140  Psi:pctfines -7.635700e-03 0.0114258 -0.0300303 0.0147589  Psi:med\_len -8.677439e-05 0.0025719 -0.0051277 0.0049541  Psi:BRT\_100m -2.214255e-01 0.1346690 -0.4853767 0.0425256  Real Parameter p  1 2 3  0.5405217 0.5405217 0.5405217  Real Parameter Psi  1  0.0918079  > srd.results.p$p.Dot.Psi.global$results$real  estimate se lcl ucl fixed note  p g1 a0 t1 0.5405217 0.0596181 0.4235900 0.6531556  Psi g1 a0 t1 0.0918079 0.0638426 0.0220421 0.3119528  > summary(srd.results.p$p.flow.Psi.global) #2nd model  Output summary for Occupancy model  Name : p(~mFlow)Psi(~avgT + avdep + pctfines + med\_len + BRT\_100m)  Npar : 8  -2lnL: 236.9507  AICc : 254.0584  Beta  estimate se lcl ucl  p:(Intercept) -0.415953700 0.5560697 -1.5058503 0.6739428  p:mFlow 2.302377800 2.0069447 -1.6312339 6.2359895  Psi:(Intercept) -9.923993400 2.8838260 -15.5762930 -4.2716943  Psi:avgT 0.495378200 0.1663385 0.1693546 0.8214018  Psi:avdep 6.469377900 3.0698073 0.4525556 12.4862000  Psi:pctfines -0.007259100 0.0115693 -0.0299349 0.0154167  Psi:med\_len -0.000239252 0.0025410 -0.0052195 0.0047410  Psi:BRT\_100m -0.218558600 0.1325039 -0.4782662 0.0411490  Real Parameter p  1 2 3  0.5355637 0.5355637 0.5355637  Real Parameter Psi  1  0.0937626  > srd.results.p$p.flow.Psi.global$results$real  estimate se lcl ucl fixed note  p g1 a0 t1 0.5355637 0.0600660 0.4180419 0.6492645  Psi g1 a0 t1 0.0937626 0.0643118 0.0229326 0.3132267 | |

## Cottus:

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| cott.results.p  model npar AICc DeltaAICc weight Deviance  6 p(~mFlow)Psi(~avgT + BrBank + HAiFLS\_for + med\_len + BRT\_100m) 8 150.7615 0.000000 6.909436e-01 133.653830  8 p(~pctcbbl + mFlow)Psi(~avgT + BrBank + HAiFLS\_for + med\_len + BRT\_100m) 9 153.0275 2.265977 2.225318e-01 133.632150  4 p(~1)Psi(~avgT + BrBank + HAiFLS\_for + med\_len + BRT\_100m) 7 155.8212 5.059630 5.505009e-02 140.966190  2 p(~pctcbbl)Psi(~avgT + BrBank + HAiFLS\_for + med\_len + BRT\_100m) 8 156.9431 6.181530 3.141524e-02 139.835360  5 p(~mFlow)Psi(~1) 3 170.2823 19.520815 3.986129e-05 164.104560  7 p(~pctcbbl + mFlow)Psi(~1) 4 172.2666 21.505125 1.477965e-05 163.968140  3 p(~1)Psi(~1) 2 175.5223 24.760733 2.902136e-06 1.972209  1 p(~pctcbbl)Psi(~1) 3 176.5365 25.775025 1.747700e-06 170.358770 |
|  |
| |  | | --- | | summary(cott.results.p$p.flow.Psi.global) #top model  Output summary for Occupancy model  Name : p(~mFlow)Psi(~avgT + BrBank + HAiFLS\_for + med\_len + BRT\_100m)  Npar : 8  -2lnL: 133.6538  AICc : 150.7615  Beta  estimate se lcl ucl  p:(Intercept) 3.2449032 0.8350649 1.608176e+00 4.8816305  p:mFlow -8.1350875 3.2800203 -1.456393e+01 -1.7062475  Psi:(Intercept) -1.5184998 2.5753797 -6.566244e+00 3.5292446  Psi:avgT -0.1634808 0.1546166 -4.665293e-01 0.1395677  Psi:BrBank -0.5011336 0.6271327 -1.730314e+00 0.7280465  Psi:HAiFLS\_for 0.0345473 0.0112233 1.254970e-02 0.0565449  Psi:med\_len 0.0066727 0.0032448 3.127645e-04 0.0130326  Psi:BRT\_100m 0.0347556 0.0193838 -3.236800e-03 0.0727479  Real Parameter p  1 2 3  0.7810357 0.7810357 0.7810357  Real Parameter Psi  1  0.0669671  cott.results.psi  model npar AICc DeltaAICc weight Deviance  2 p(~mFlow)Psi(~avgT + BrBank + HAiFLS\_for + med\_len + BRT\_100m) 8 150.7615 0.000000 9.591327e-01 133.6538  3 p(~mFlow)Psi(~avgT + BrBank + HAiFLS\_for) 6 157.4448 6.683321 3.393235e-02 144.8085  4 p(~mFlow)Psi(~med\_len + BRT\_100m) 5 160.6364 9.874926 6.879642e-03 150.1853  1 p(~mFlow)Psi(~1) 3 170.2823 19.520815 5.533341e-05 164.1046 | |

summary(cott.results.psi$p.flow.Psi.global) #top model

Output summary for Occupancy model

Name : p(~mFlow)Psi(~avgT + BrBank + HAiFLS\_for + med\_len + BRT\_100m)

Npar : 8

-2lnL: 133.6538

AICc : 150.7615

Beta

estimate se lcl ucl

p:(Intercept) 3.2449030 0.8350650 1.608176e+00 4.8816304

p:mFlow -8.1350873 3.2800206 -1.456393e+01 -1.7062468

Psi:(Intercept) -1.5185026 2.5753833 -6.566254e+00 3.5292487

Psi:avgT -0.1634807 0.1546167 -4.665295e-01 0.1395681

Psi:BrBank -0.5011333 0.6271336 -1.730315e+00 0.7280485

Psi:HAiFLS\_for 0.0345473 0.0112233 1.254960e-02 0.0565449

Psi:med\_len 0.0066727 0.0032448 3.127663e-04 0.0130326

Psi:BRT\_100m 0.0347556 0.0193838 -3.236800e-03 0.0727479

Real Parameter p

1 2 3

0.7810356 0.7810356 0.7810356

Real Parameter Psi

1

0.0669671

# **CPUE comparisons and modeling:**

## Comparisons of CPUE b/w sites with and without Brown Trout:

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> # Mann Whitney U / Wilcox Sign Rank Test

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> # using subsetted data -- only when SGCNs of interest are present

> #-----

> #LND

> #-----

> class(ldace$BRT)

[1] "factor"

> wilcox.test(ldace$LND\_CPUE ~ ldace$BRT, mu=0, alt="two.sided", conf.int=T, conf.level=0.95, paired=F,

+ exact=F)

Wilcoxon rank sum test with continuity correction

data: ldace$LND\_CPUE by ldace$BRT

W = 135, p-value = 0.9564

alternative hypothesis: true location shift is not equal to 0

95 percent confidence interval:

-1.777859 2.191316

sample estimates:

difference in location

0.04975342

> #-----

> #SRD

> #-----

> class(sdace$BRT)

[1] "factor"

> wilcox.test(sdace$SRD\_CPUE ~ sdace$BRT, mu=0, alt="two.sided", conf.int=T, conf.level=0.95, paired=F,

+ exact=F)

Wilcoxon rank sum test with continuity correction

data: sdace$SRD\_CPUE by sdace$BRT

W = 157.5, p-value = 0.2456

alternative hypothesis: true location shift is not equal to 0

95 percent confidence interval:

-0.3134583 4.5286369

sample estimates:

difference in location

0.4347949

> #no difference

> #-----

> #Cottus

> #-----

> class(cott$BRT)

[1] "factor"

> wilcox.test(cott$Cottus\_CPUE ~ cott$BRT, mu=0, alt="two.sided", conf.int=T, conf.level=0.95, paired=F,

+ exact=F)

Wilcoxon rank sum test with continuity correction

data: cott$Cottus\_CPUE by cott$BRT

W = 18, p-value = 1

alternative hypothesis: true location shift is not equal to 0

95 percent confidence interval:

-68.49425 49.15872

sample estimates:

difference in location

0.5416241

> #LND

> wilcox\_test(LND\_CPUE~BRT, data=ldace, distribution="exact") #p = 0.95

Exact Wilcoxon-Mann-Whitney Test

data: LND\_CPUE by BRT (0, 1)

Z = 0.072907, p-value = 0.9497

alternative hypothesis: true mu is not equal to 0

> #SRD

> wilcox\_test(SRD\_CPUE~BRT, data=sdace, distribution="exact") #p = 0.25

Exact Wilcoxon-Mann-Whitney Test

data: SRD\_CPUE by BRT (0, 1)

Z = 1.1797, p-value = 0.2457

alternative hypothesis: true mu is not equal to 0

> #Cottus

> wilcox\_test(Cottus\_CPUE~BRT, data=cott, distribution="exact") #p = 1

Exact Wilcoxon-Mann-Whitney Test

data: Cottus\_CPUE by BRT (0, 1)

Z = 0, p-value = 1

alternative hypothesis: true mu is not equal to 0

> #LND

> oneway\_test(LND\_CPUE~BRT, data=ldace,

+ distribution=approximate(B=9999)) #p = 0.95

Approximative Two-Sample Fisher-Pitman Permutation Test

data: LND\_CPUE by BRT (0, 1)

Z = -0.07401, p-value = 0.9424

alternative hypothesis: true mu is not equal to 0

> #SRD

> oneway\_test(SRD\_CPUE~BRT, data=sdace,

+ distribution=approximate(B=9999)) #p = 0.16

Approximative Two-Sample Fisher-Pitman Permutation Test

data: SRD\_CPUE by BRT (0, 1)

Z = 1.3951, p-value = 0.1637

alternative hypothesis: true mu is not equal to 0

> #Cottus

> oneway\_test(Cottus\_CPUE~BRT, data=cott,

+ distribution=approximate(B=9999)) #p = 0.91

Approximative Two-Sample Fisher-Pitman Permutation Test

data: Cottus\_CPUE by BRT (0, 1)

Z = 0.19465, p-value = 0.9166

alternative hypothesis: true mu is not equal to 0