Appendix 1

Area 25 Chum Salmon

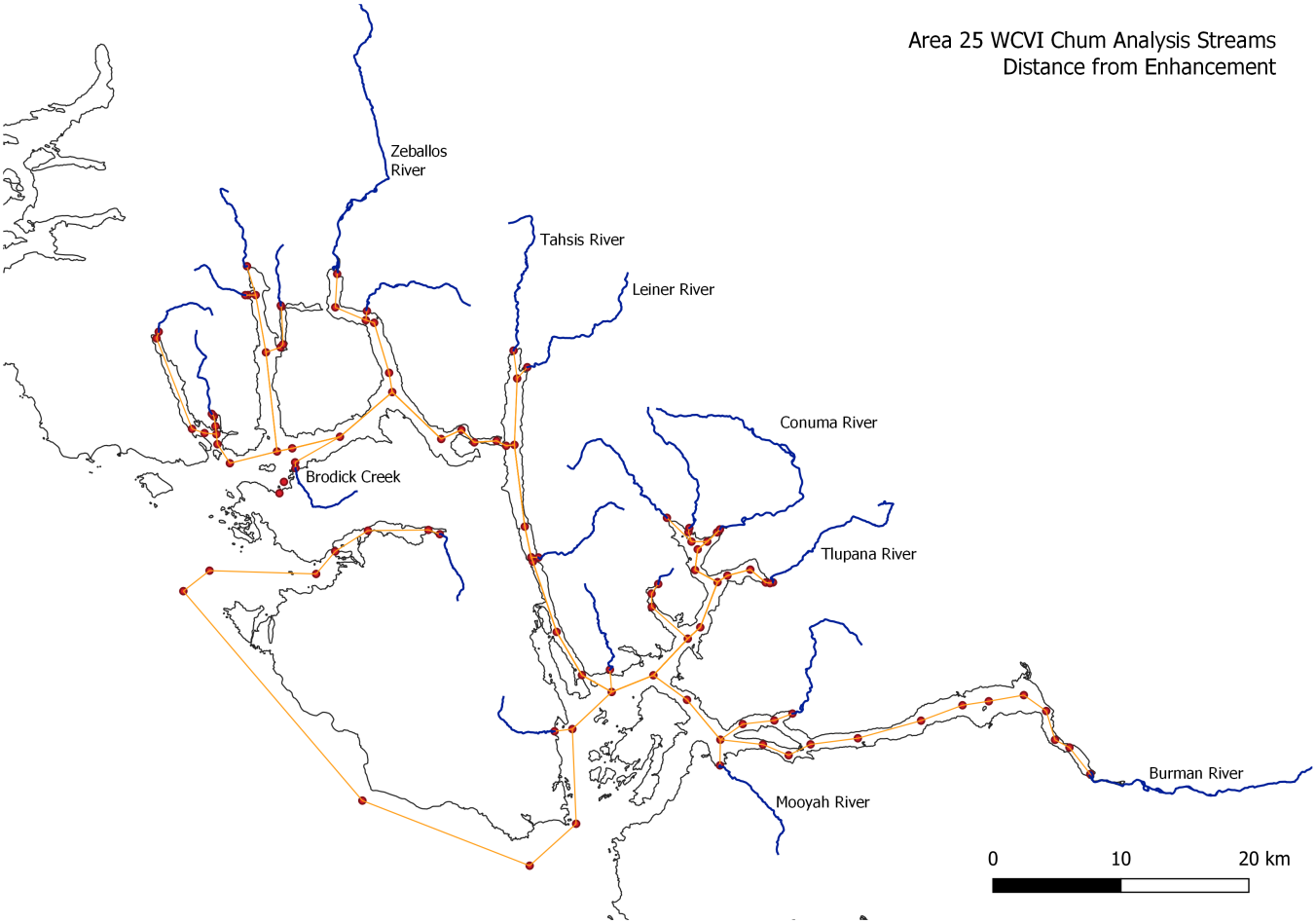
Coastland

2022-12-06

Contents

Study area

Area 25 Chum streams



Summary statistics

Bubbleplot of escapement by enhancement rank

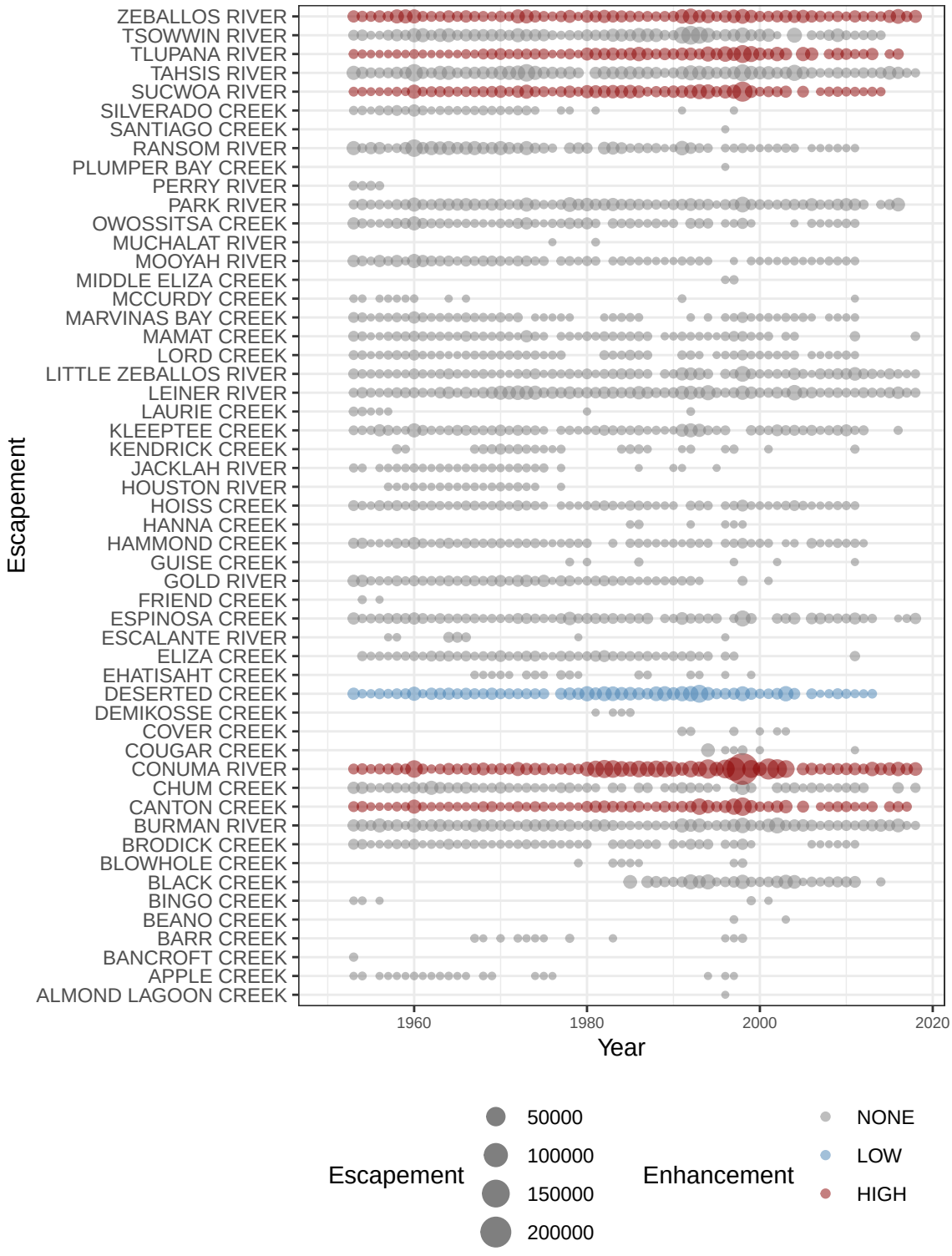


Figure 1: Escapement to all Area 8 chum streams in the PSE database.

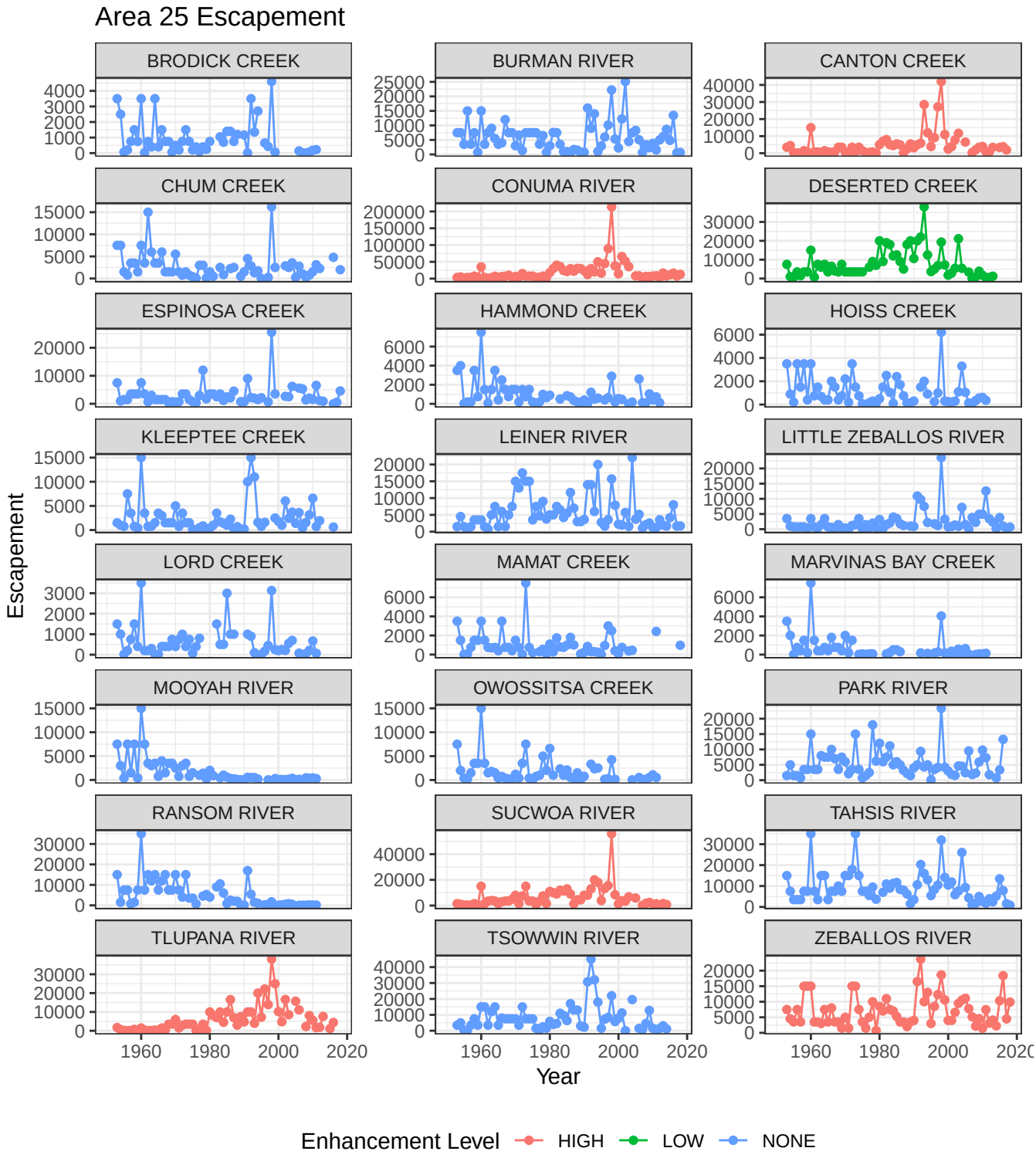


Figure 2: Escapement to all streams for Area 25 chum. Colour shows the stream enhancement level from the PSE database.

Table 1: Distance from Conuma River (major enhancement location for chum systems included in analysis)

Stream	Dist. from enhancement
BRODICK CREEK	61655
BURMAN RIVER	54299
CANTON CREEK	3718
CHUM CREEK	75361
CONUMA RIVER	0
DESERTED CREEK	16768
ESPINOSA CREEK	76904
HAMMOND CREEK	78677
HOISS CREEK	20255
KLEEPTEE CREEK	27400
LEINER RIVER	46500
LITTLE ZEBALLOS RIVER	58802
LORD CREEK	43611
MAMAT CREEK	73524
MARVINAS BAY CREEK	24133
MOOYAH RIVER	23265
OWOSSITSA CREEK	63067
PARK RIVER	70239
RANSOM RIVER	92551
SUCWOA RIVER	5286
TAHSIS RIVER	46465
TLUPANA RIVER	10890
TSOWWIN RIVER	30761
ZEBALLOS RIVER	63279

Hatchery releases to area

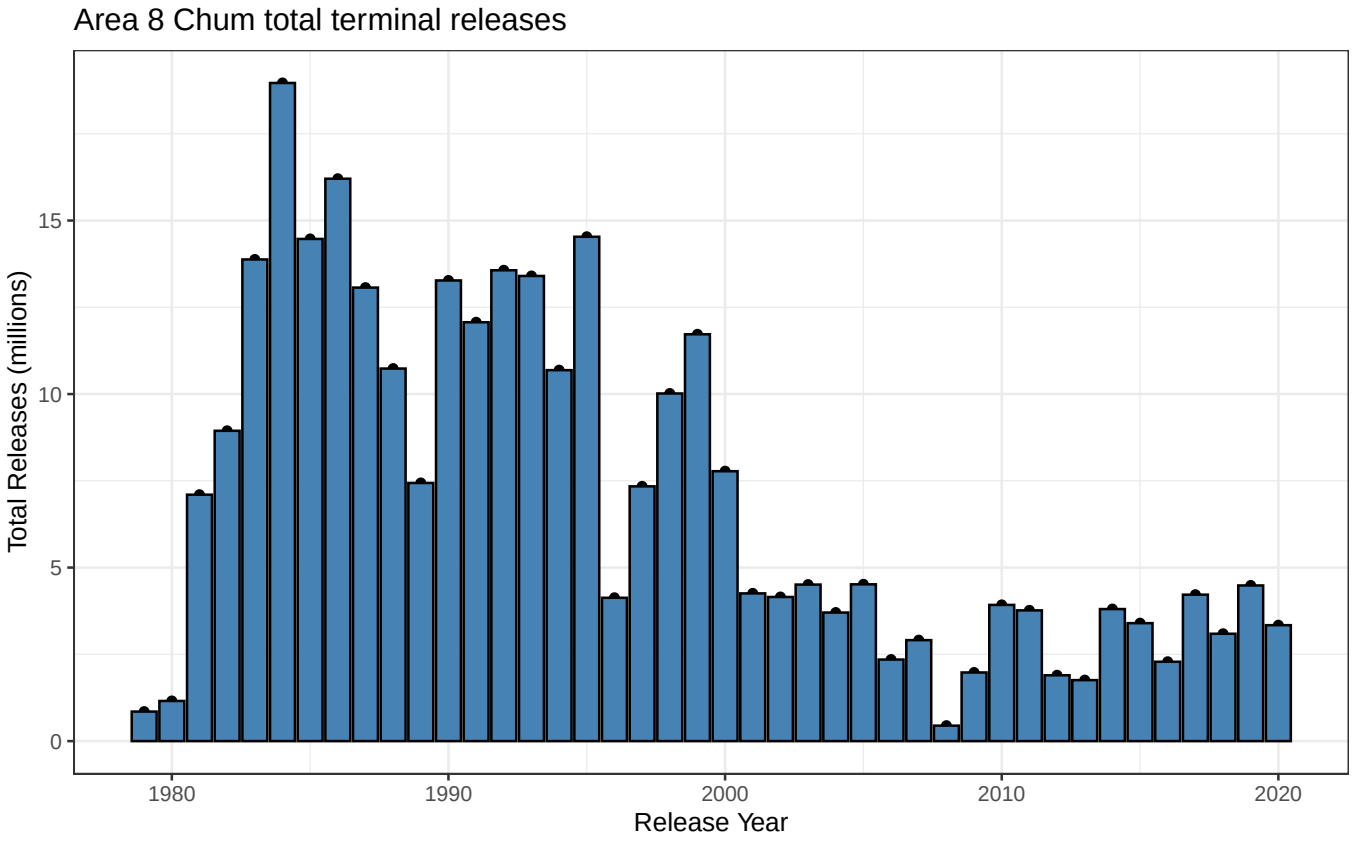


Figure 3: Total hatchery chum salmon releases in Area 25

Releases by system

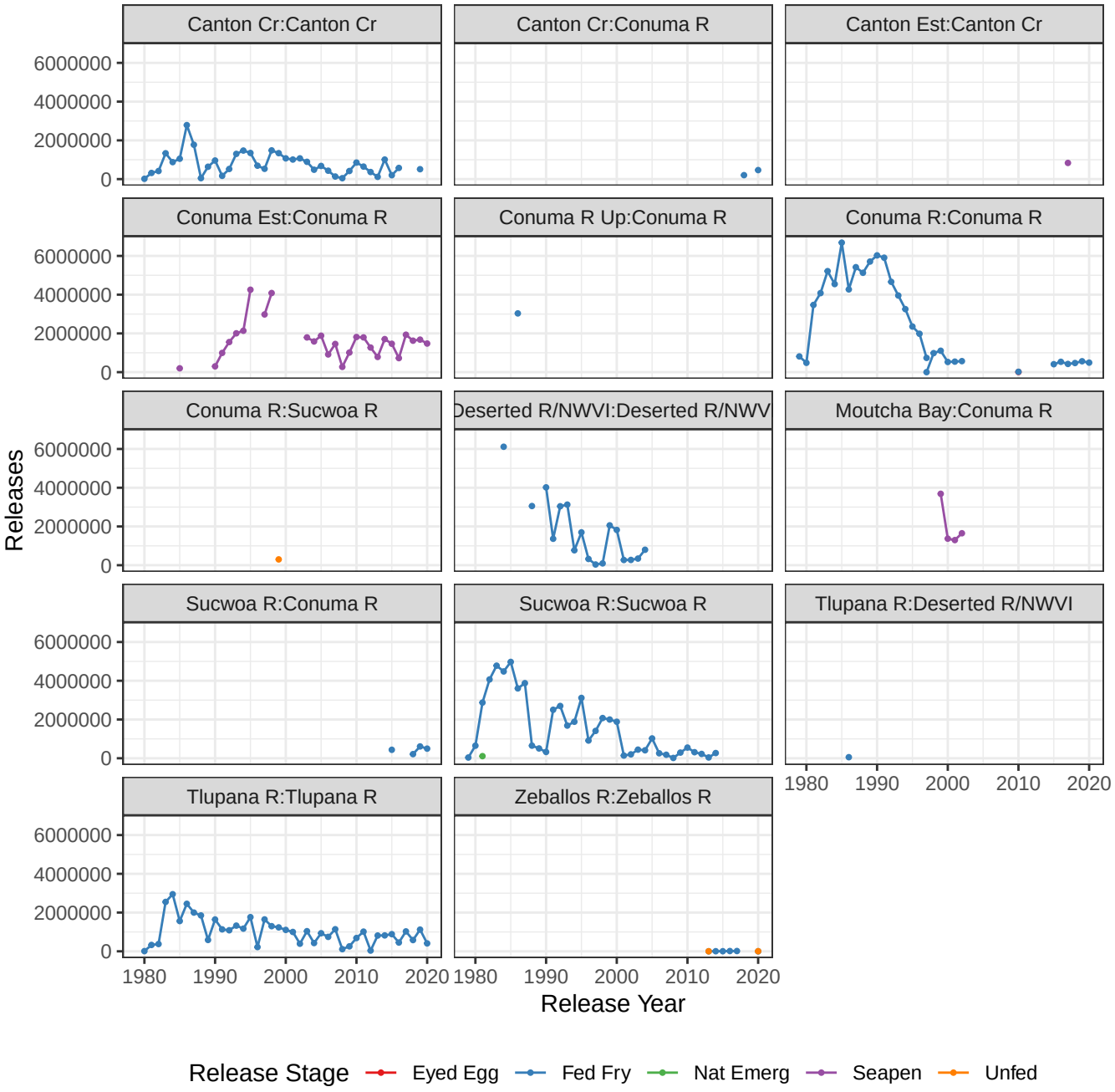


Figure 4: Chum releases to Area 25 by release site and release stage.

Metrics

Escapement, logged escapement, Z-scores, Pavg, and moving average

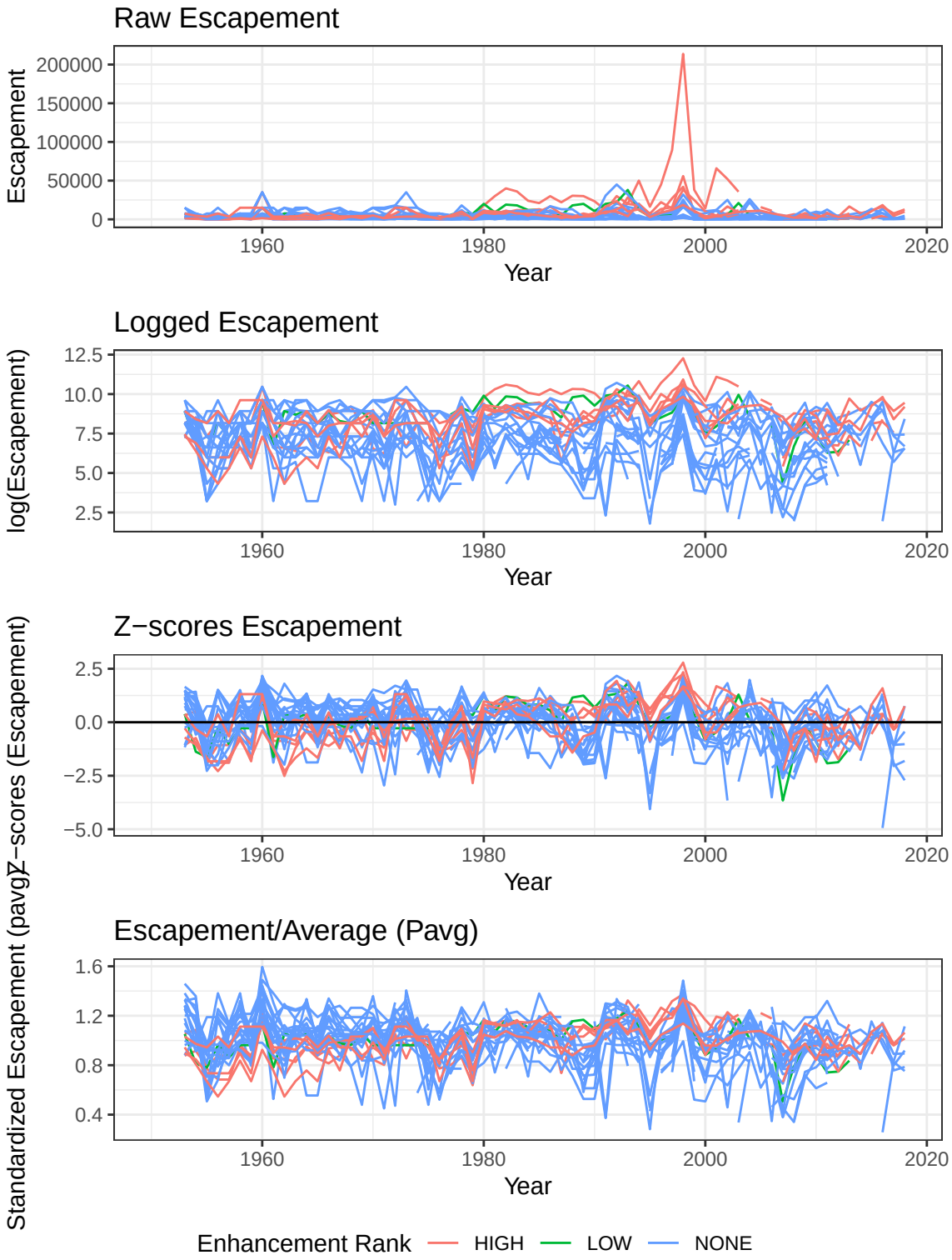


Figure 5: Various plots for escapement and transformations.

Moving average and LOESSS fits

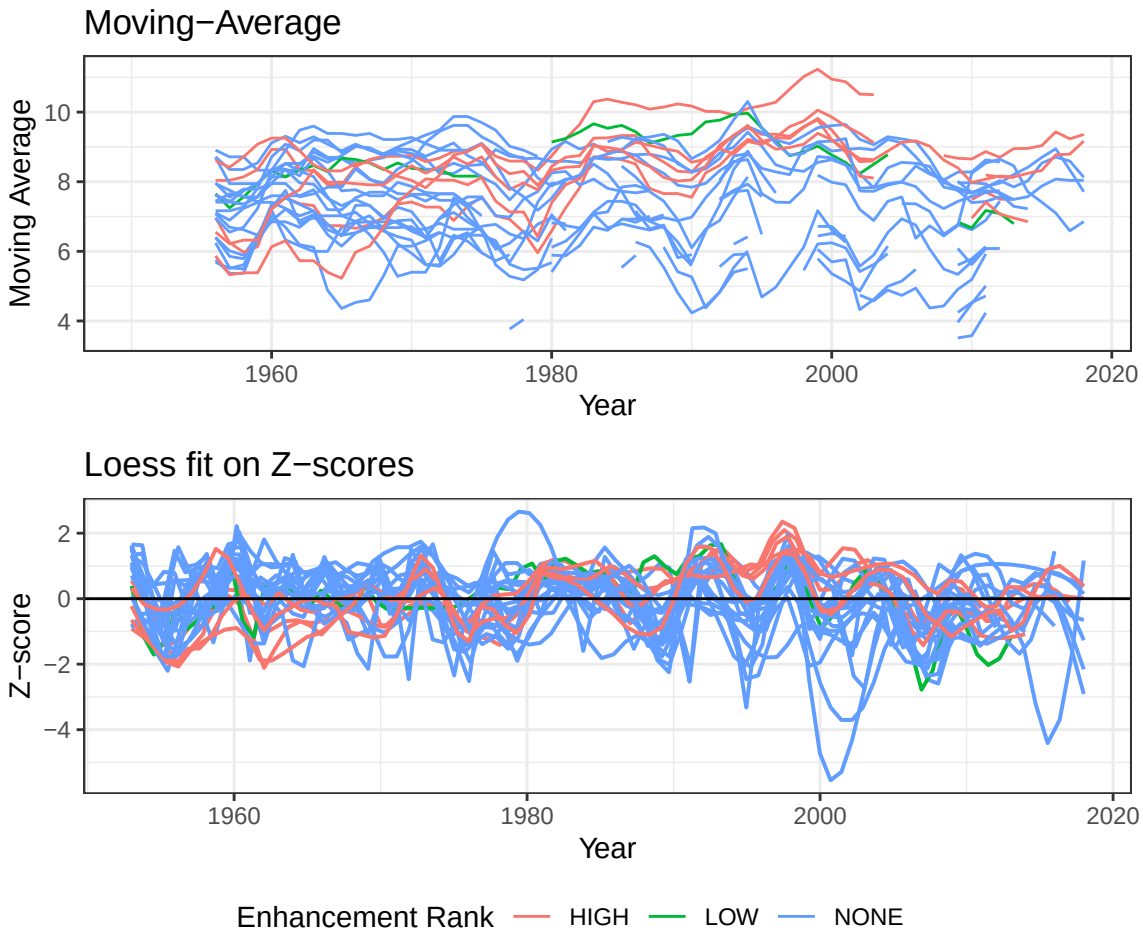


Figure 6: Moving average and LOESS fits on logged escapement by enhancement ranking.

Means trends by enhancement rank

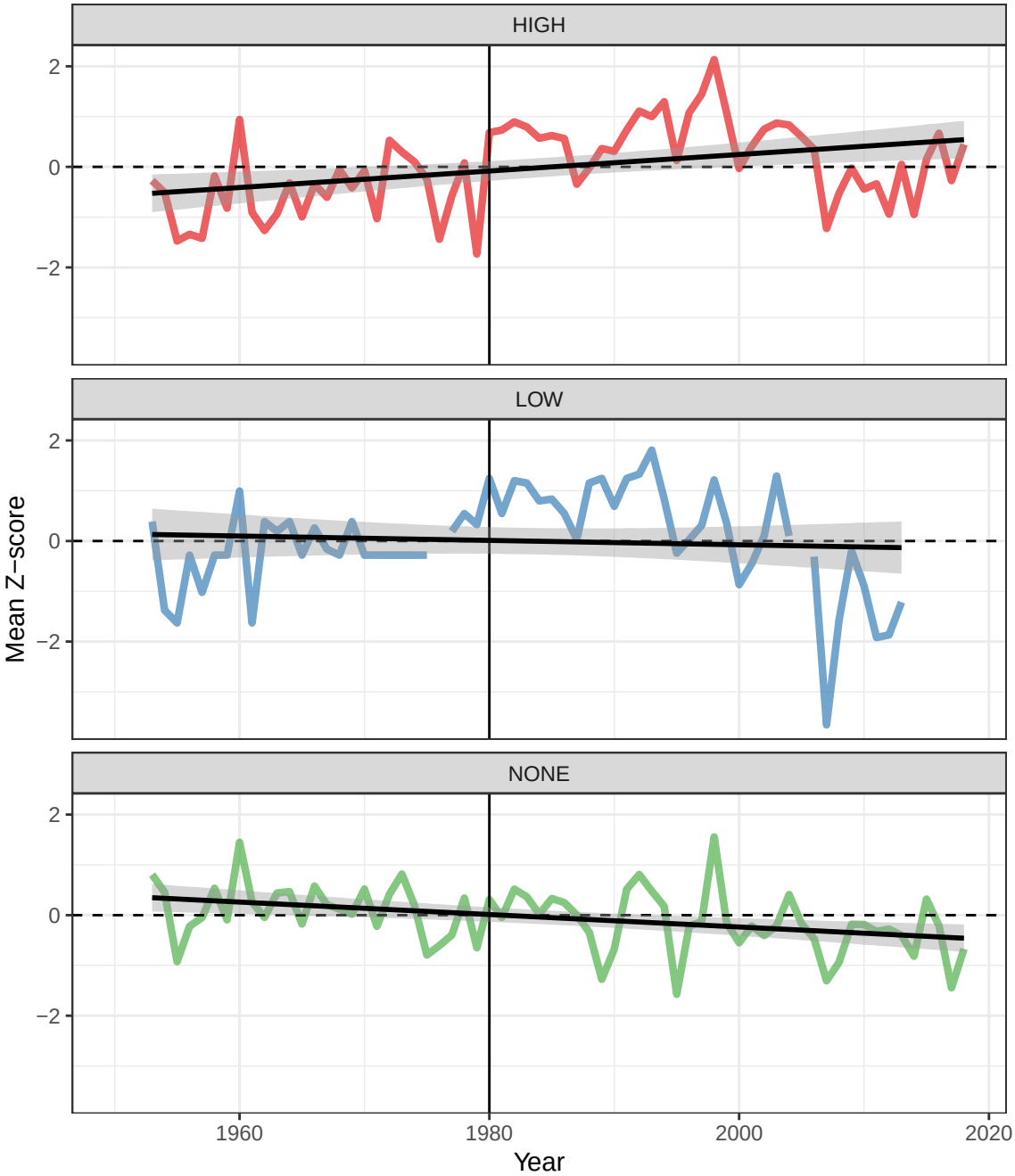


Figure 7: Area 25 chum: Mean Z-score for analysis streams by enhancement rank. Linear regression over all years with SE are shown.

Recruits per spawner by system

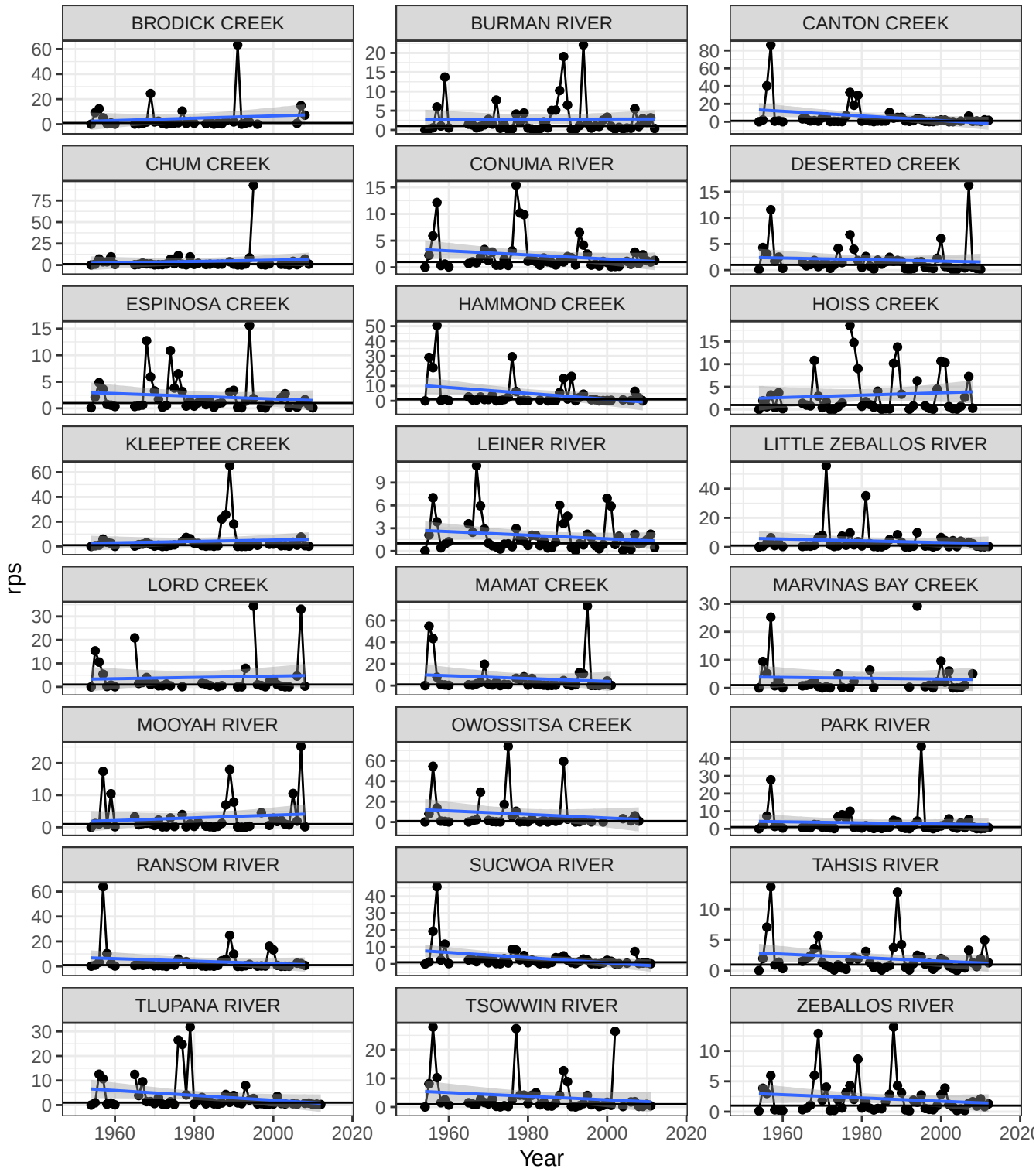


Figure 8: Area 25 chum: recruits per spawner by system.

Log recruits per spawner by system by period

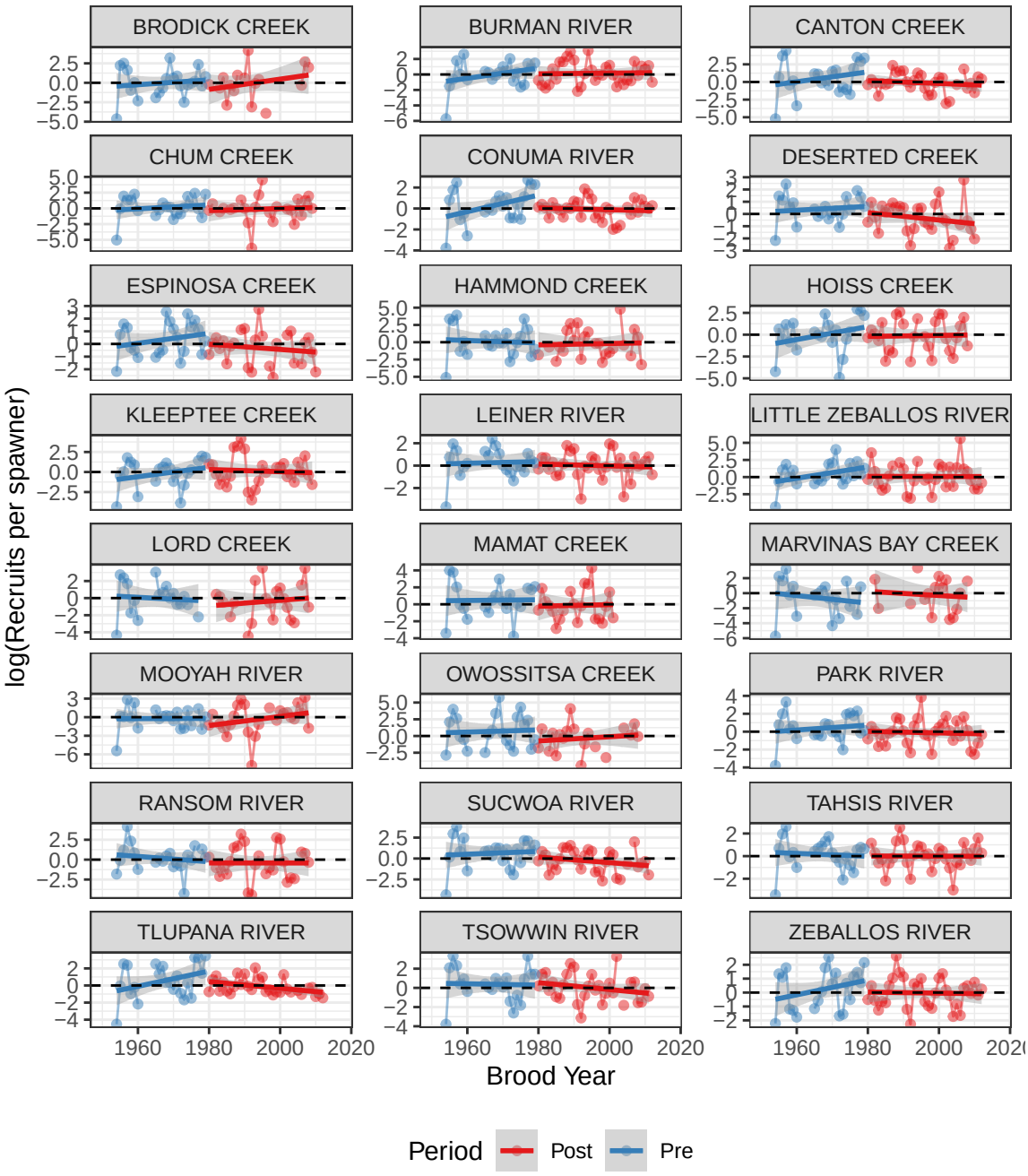


Figure 9: Area 25 chum: log recruits per spawner by system fitted with linear regression for the periods pre- and post-enhancement.

Log RPS comparison before and after enhancement

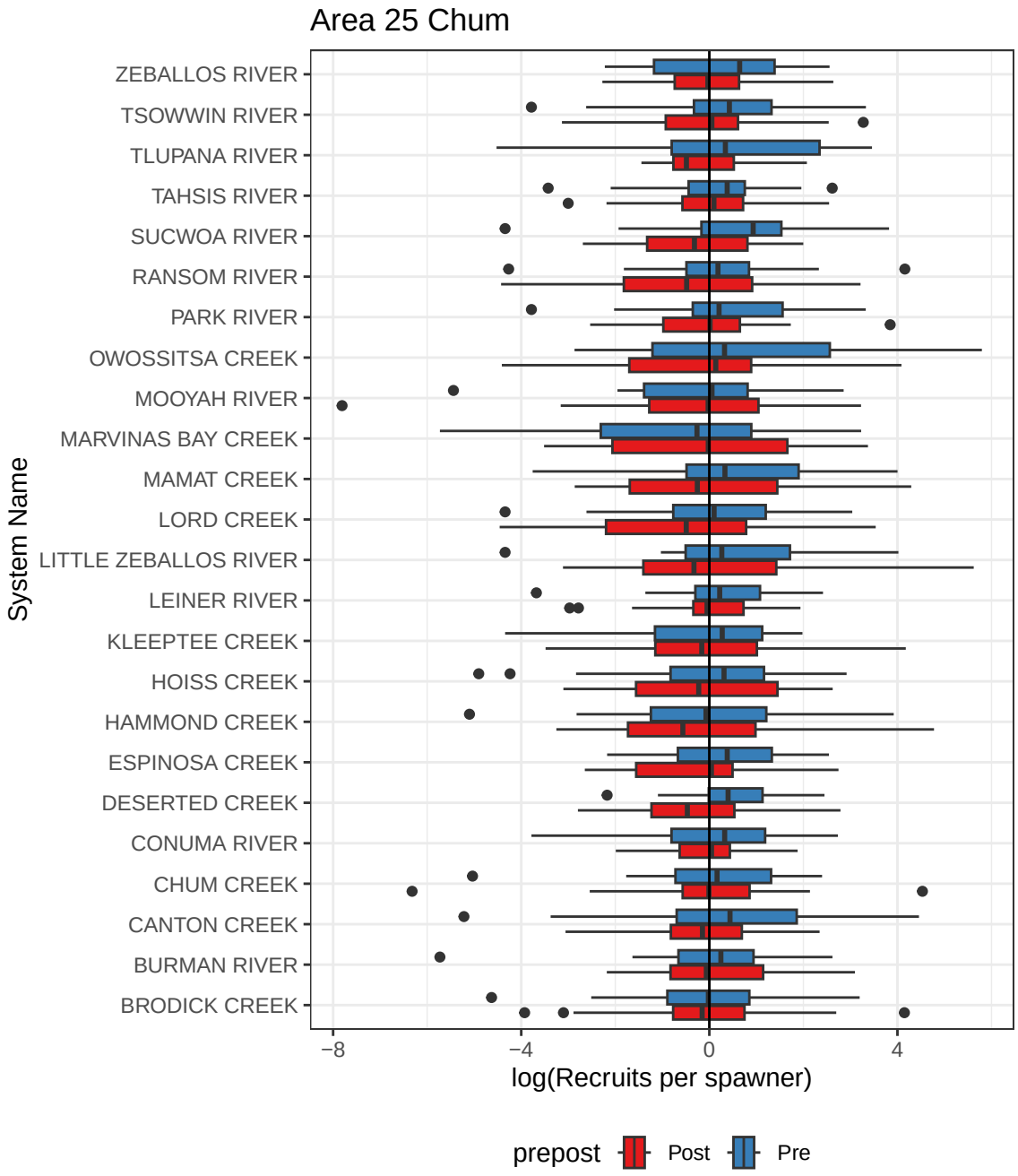


Figure 10: Area 25 chum: Boxplots of log recruits per spawner by system.

Bubbleplots of metric by inlet

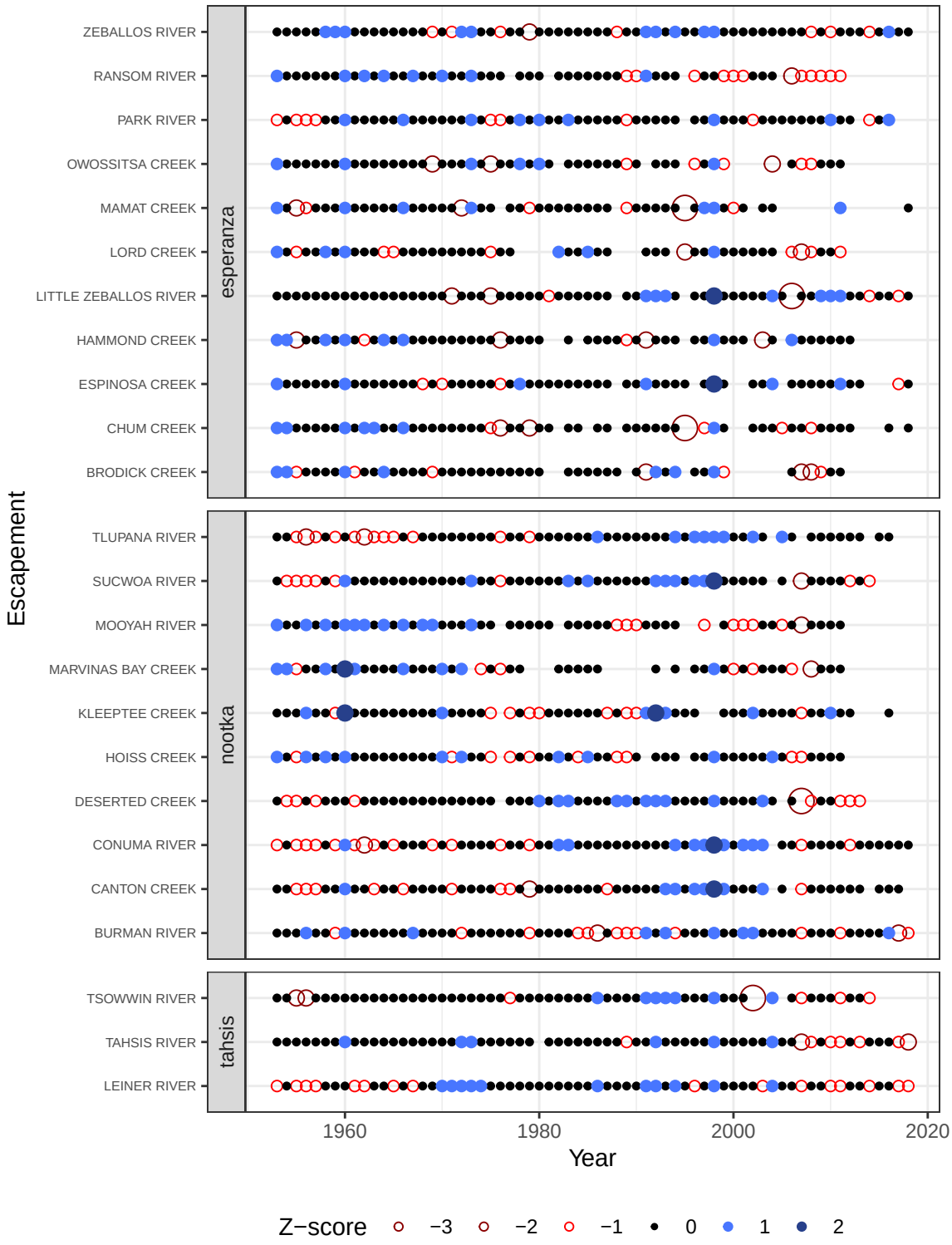


Figure 11: Escapement by inlet and z-score

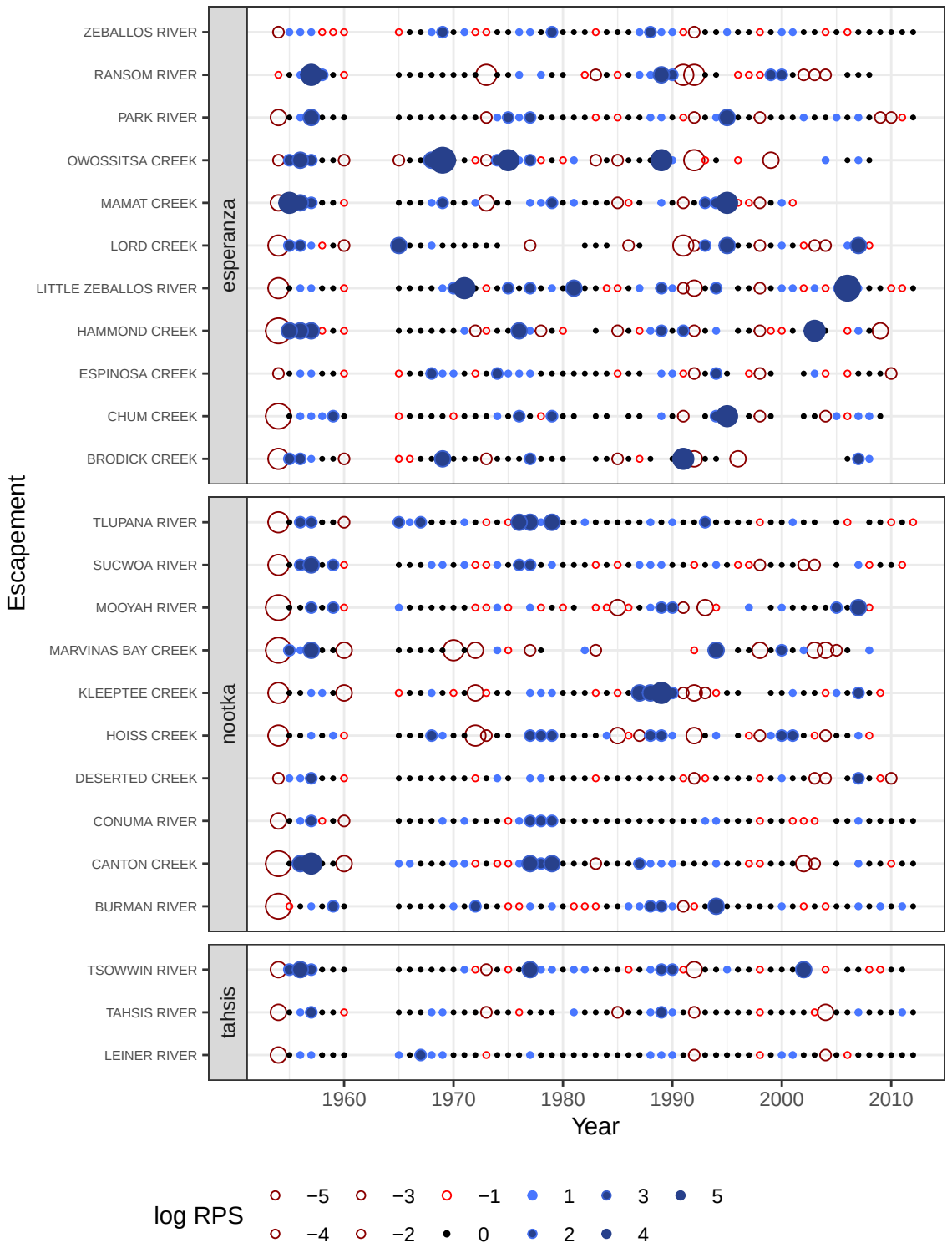


Figure 12: Escapement by inlet and log RPS

Correlation analyses and Dendrograms

Cross correlation plots

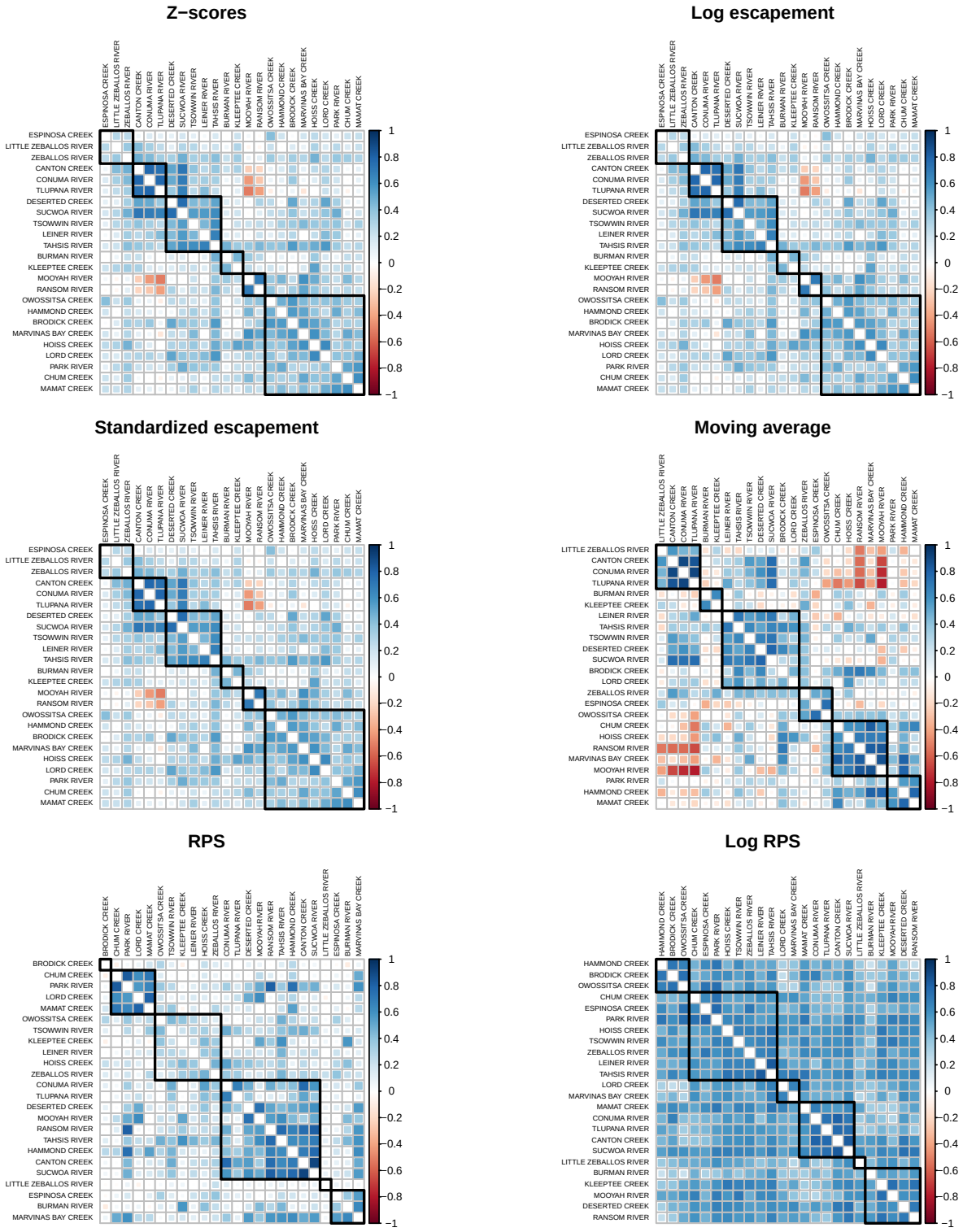


Figure 13: Cross correlation plots to compare metrics.

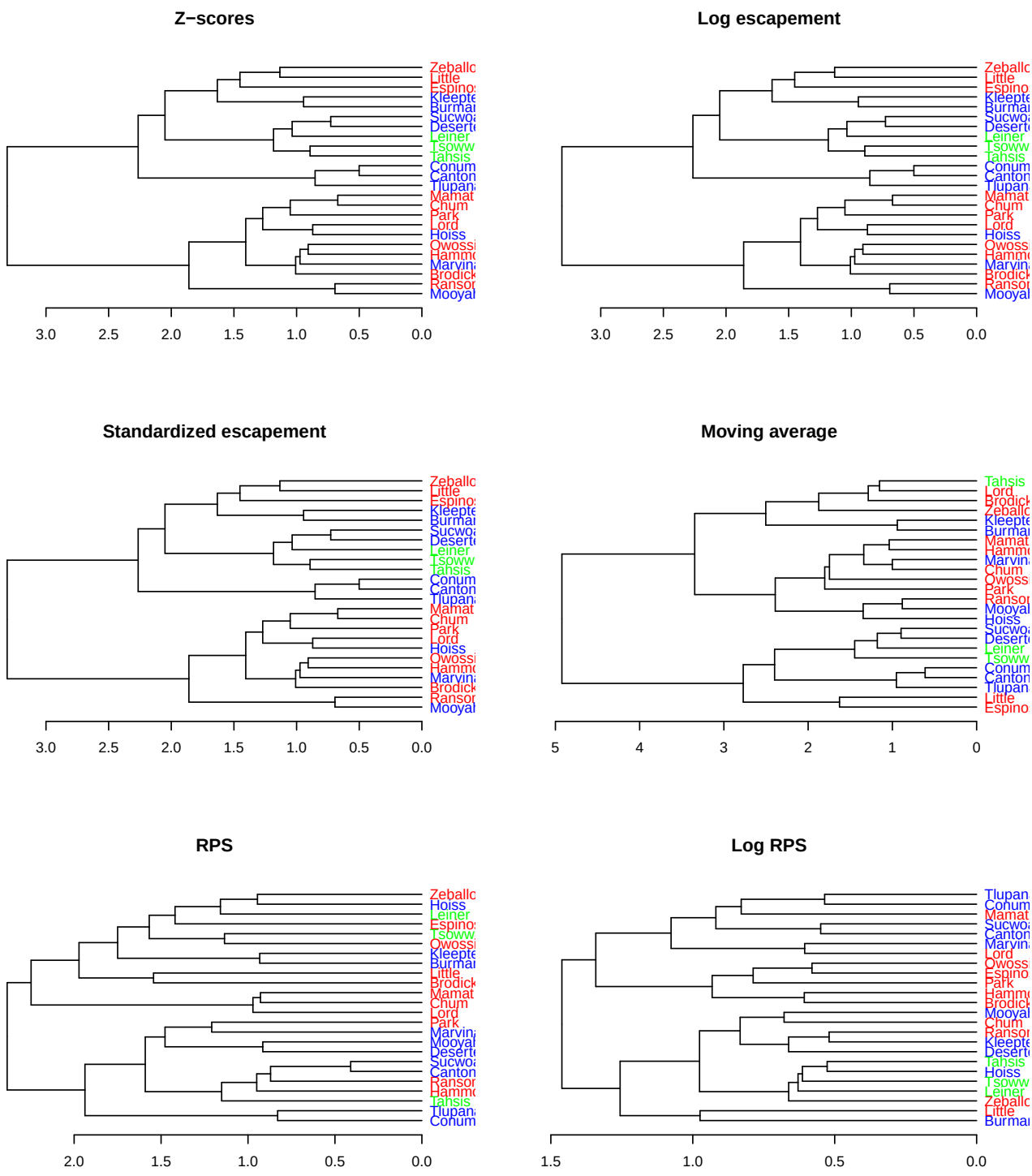


Figure 14: Dendrograms by metric. Red labels are from Esperanza inlet, blue are from Nootka inlet, and green are from Tahsis inlet.

Tanglegrams comparing effect of metric choice on cluster analysis

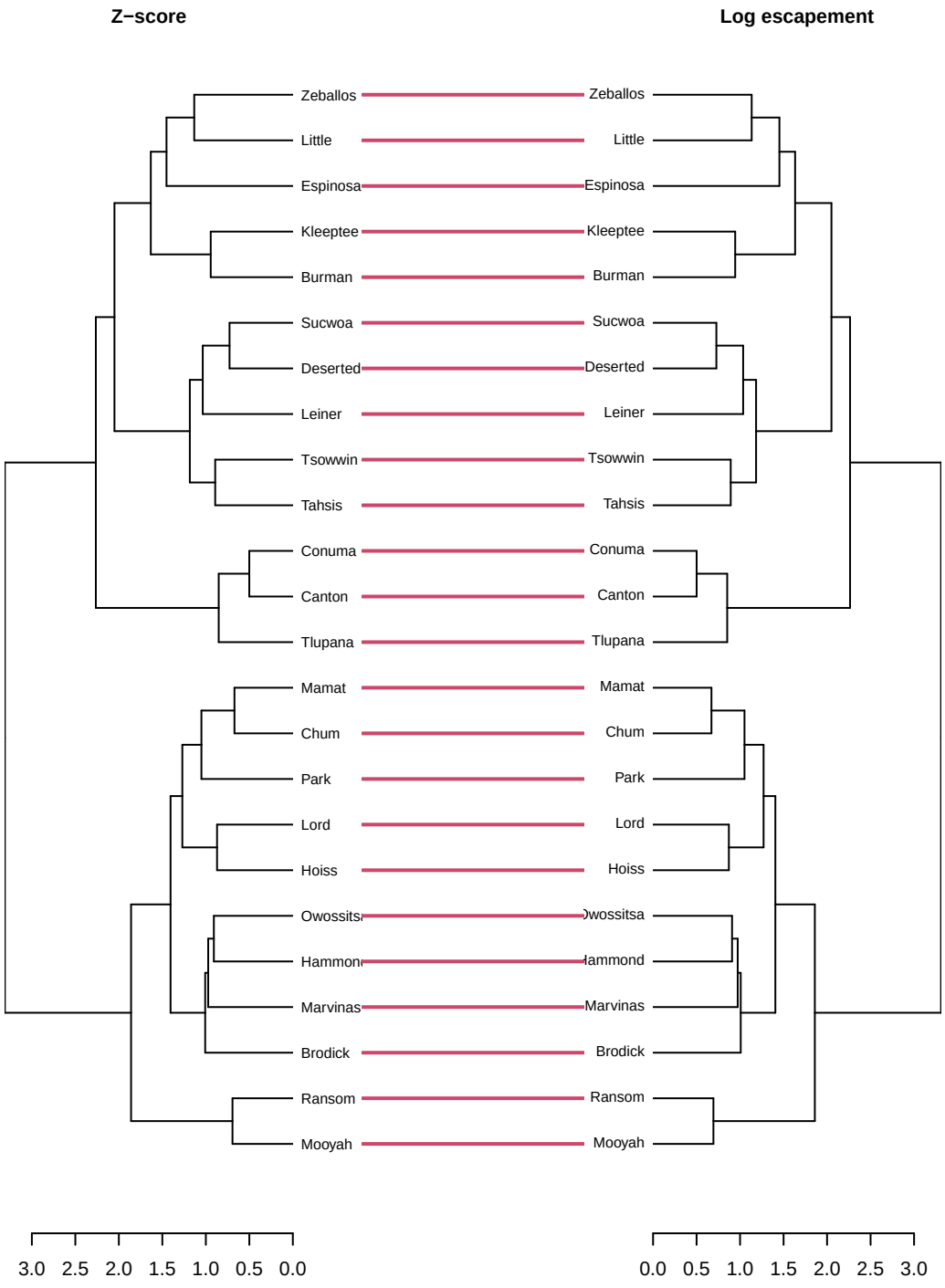


Figure 15: Tanglegram comparing the use of z-score against the use of log escapements on cluster analysis outputs.

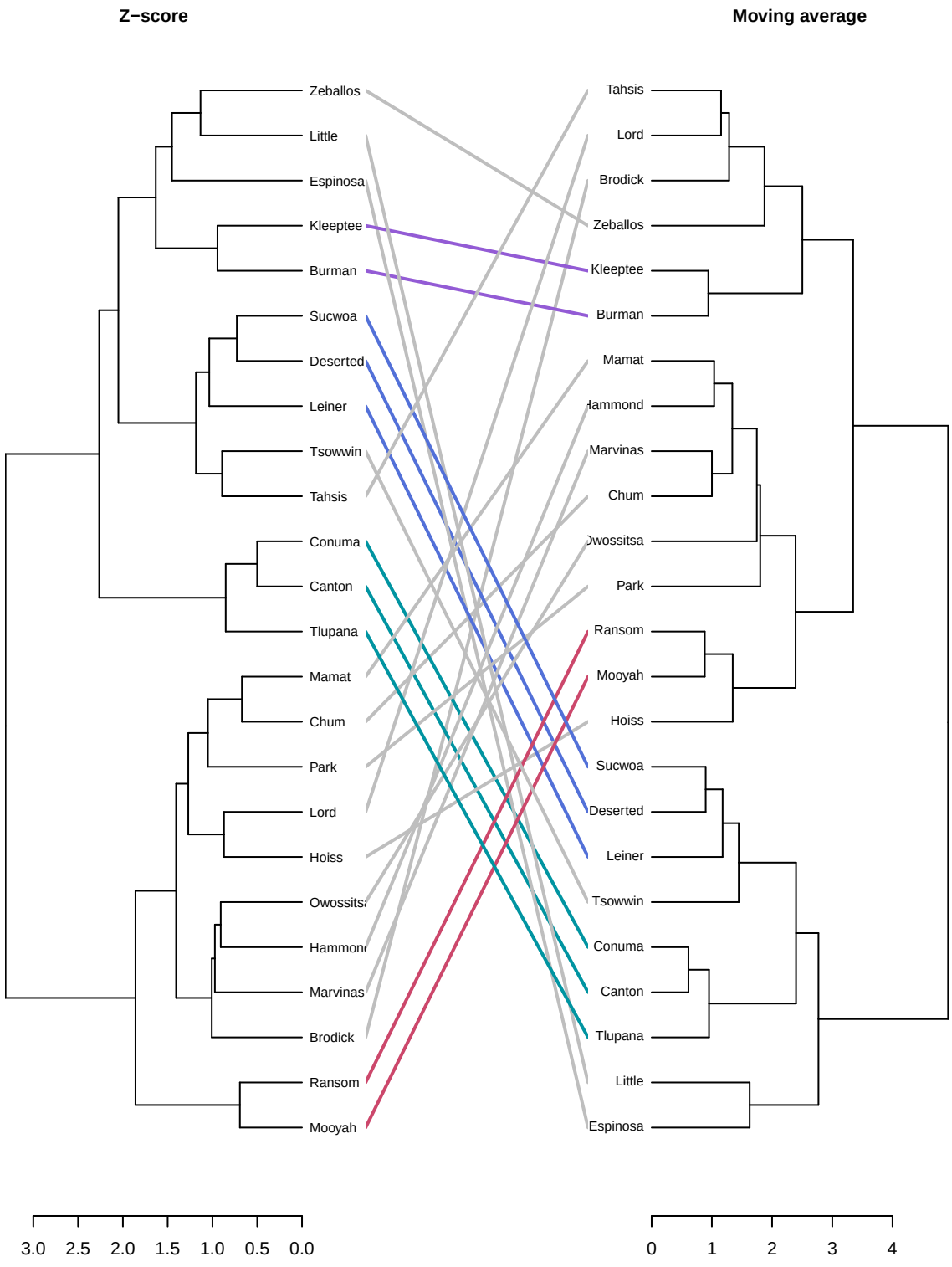


Figure 16: Tanglegram comparing the use of z-score against the use of moving average on cluster analysis outputs.

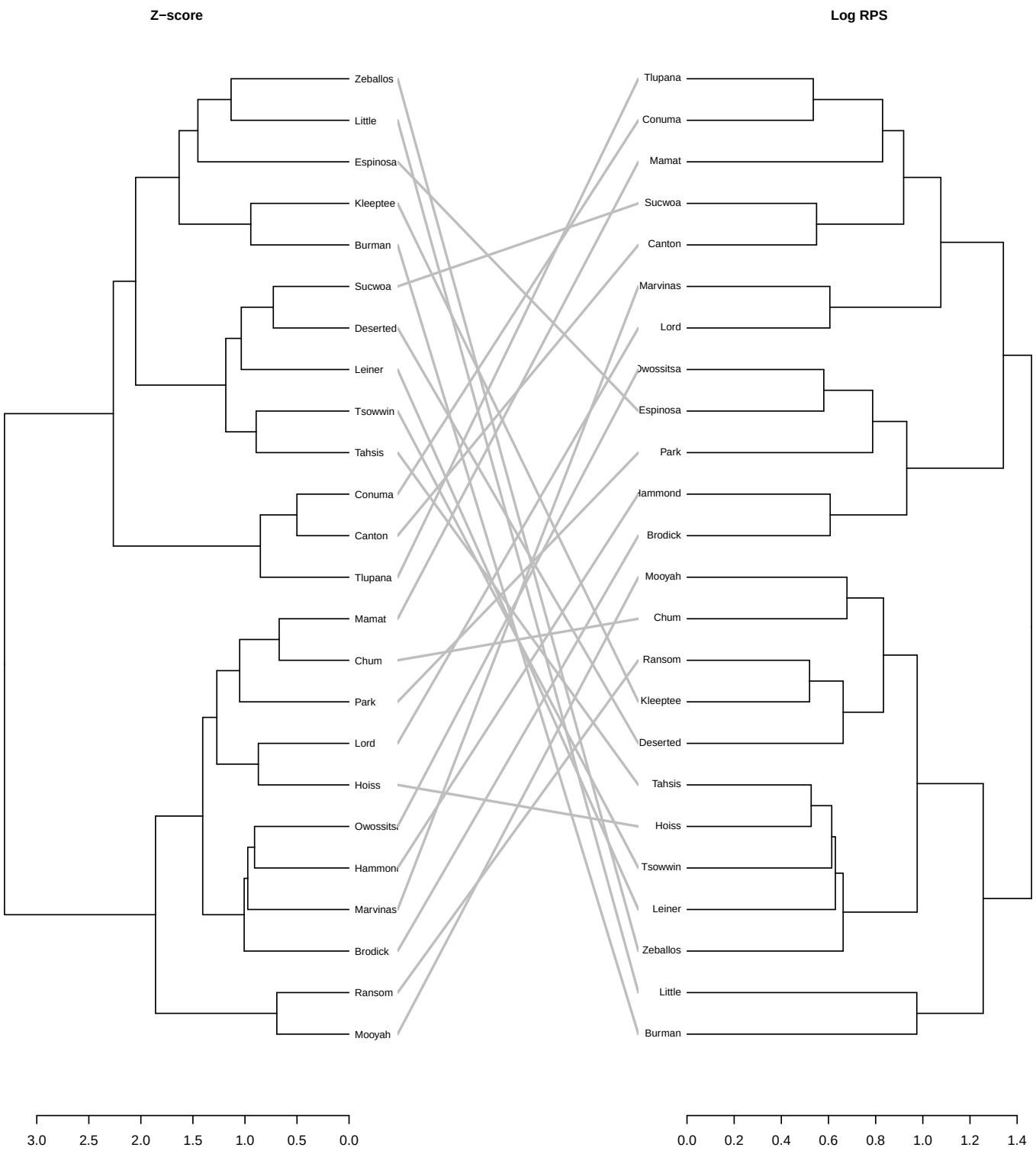


Figure 17: Tanglegram of z-score vs. Log RPS

Pre- and post-enhancement correlation analyses

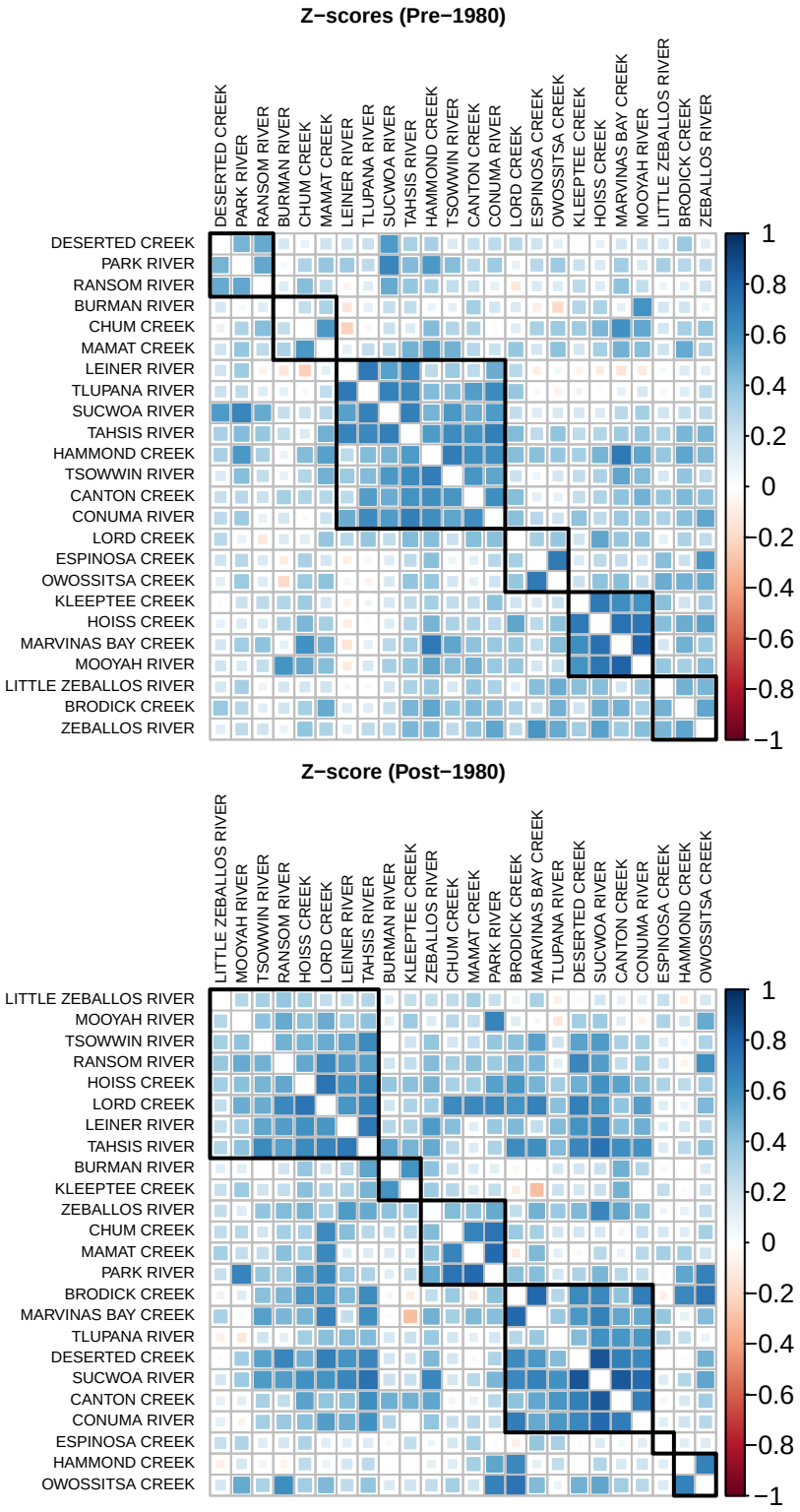


Figure 18: Cross correlation plots of z-scores to compare pre- and post-enhancement.

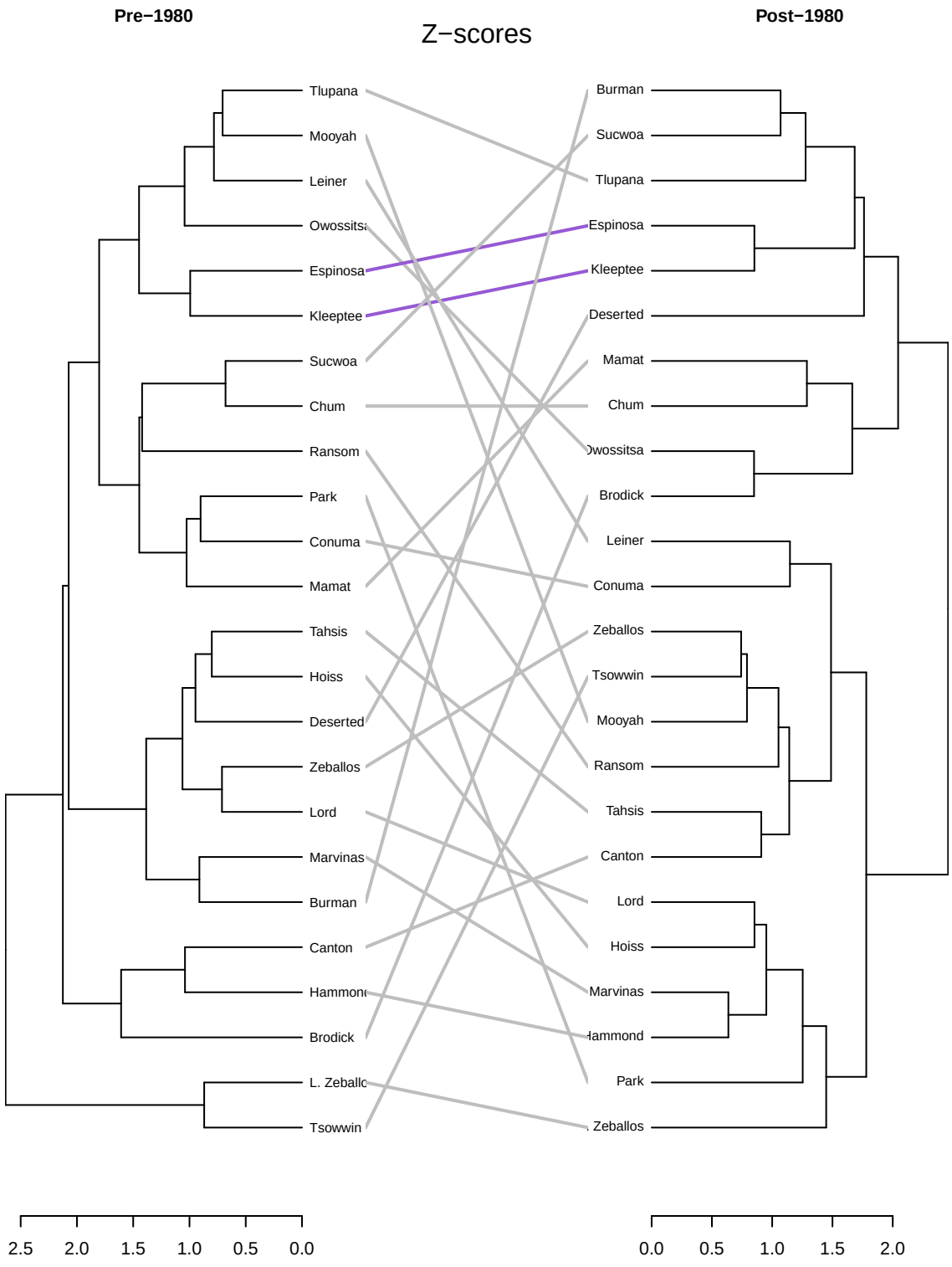


Figure 19: Tanglegram comparing z-scores pre- and post-enhancement (1980)

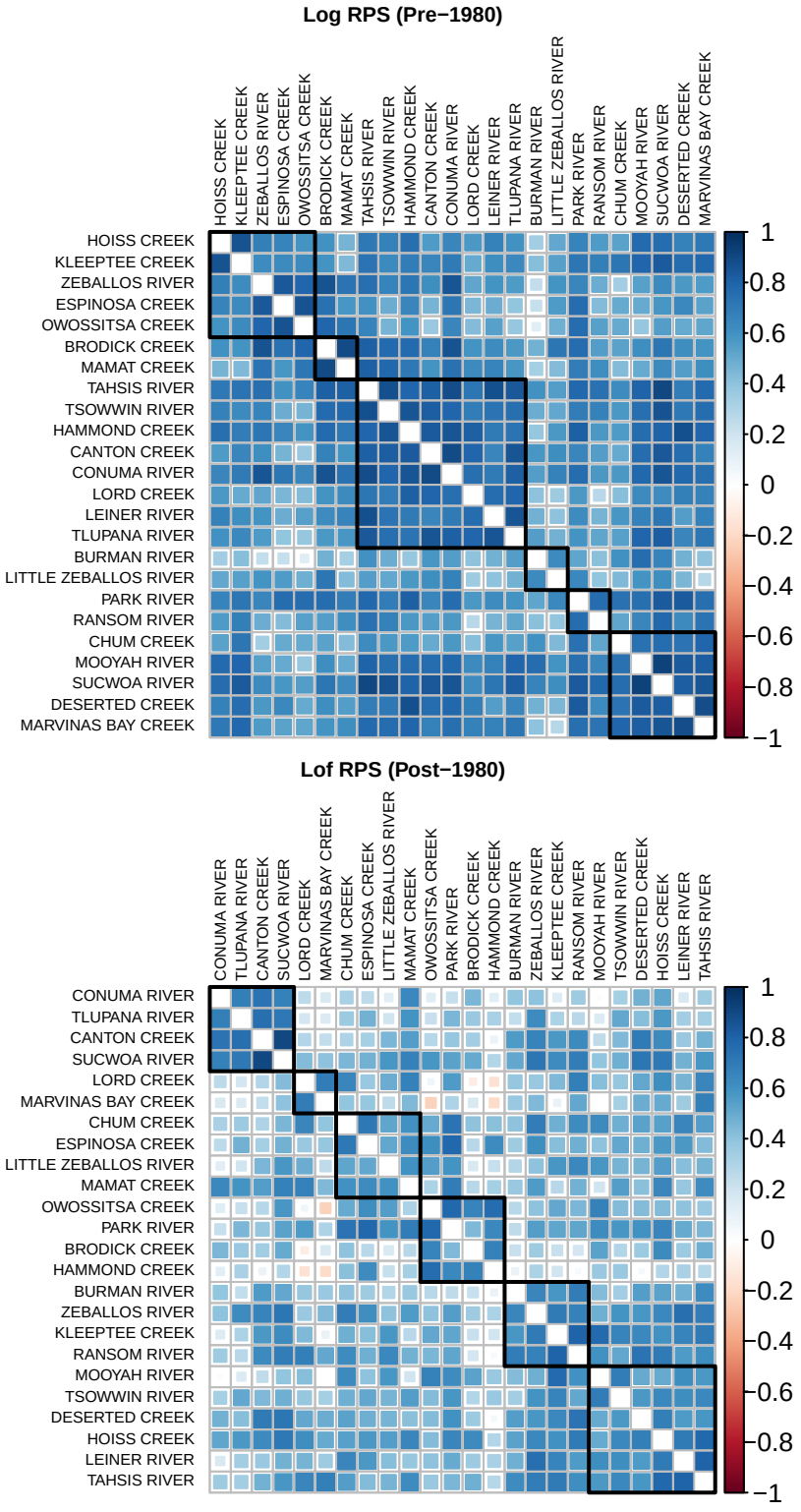


Figure 20: Cross correlation plots of Log RPS to compare pre- and post-enhancement.

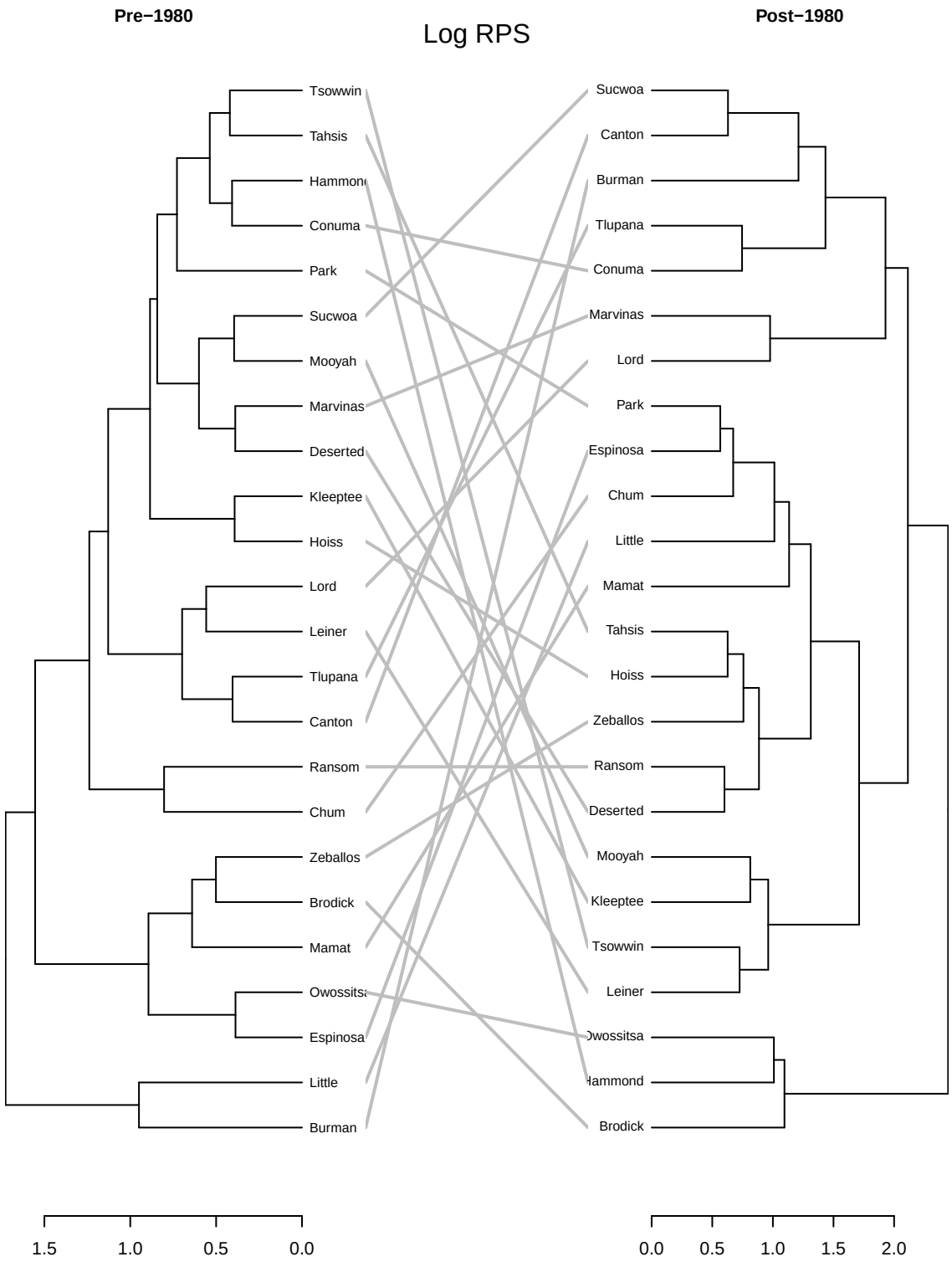


Figure 21: Tanglegram comparing Log RPS pre- and post-enhancement (1980)

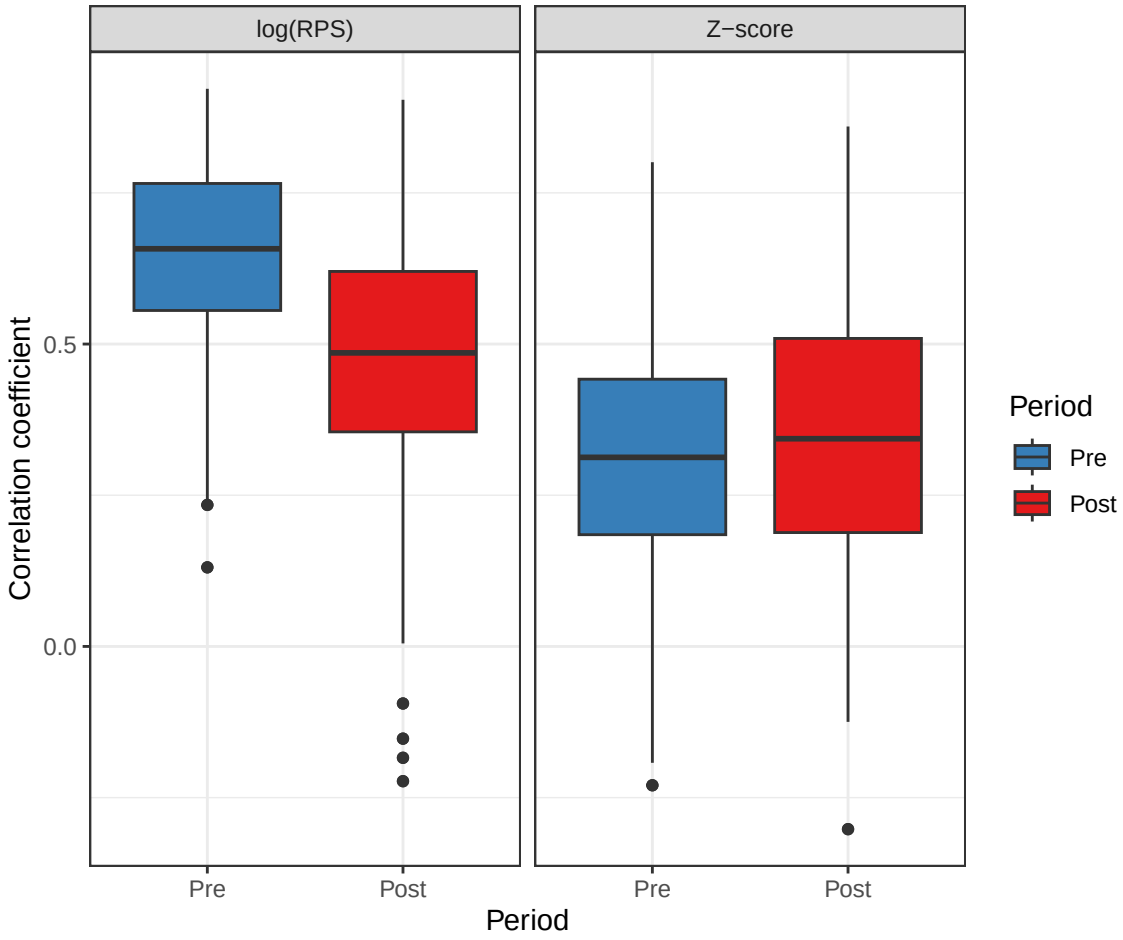


Figure 22: Comparison between correlation coefficients for all pairwise combinations of streams using Z-score and log(RPS) over the pre- and post-1980 periods.

Statistical models

Candidate Models with AIC scores for log RPS and log escapement

Table 2: Candidate models for log RPS and distance from enhancement (dist), total releases (totrel), and year, with AIC scores.

Candidate model	Degrees of freedom	AIC
logrps ~ total releases + factor(year)	33	1360.448
logrps ~ total releases + factor(year) + year	33	1360.448
log rps ~ total releases + year	4	1720.592
logrps ~ correlation coefficient + year + total releases	5	1720.627
log rps ~ distance from enhancement + total releases + year	5	1722.590
logrps ~ correlation coefficient + year	4	1722.756
log rps ~ distance from enhancement + year	4	1724.998
logrps ~ total releases + year + subinlet	12	1730.376
logrps ~ total releases + year + system name	27	1756.327
logrps ~ correlation coefficient + year + system name	26	1758.053

Table 3: Candidate models for log escapement and distance from enhancement (dist), total releases (totrel), and year, with AIC scores.

Candidate models	Degrees of freedom	AIC
log escapement ~ correlation coefficient + distance from enhancement + total releases + year	14	2645.411
log escapement ~ correlation coefficient + total releases + subinlet + year	13	2651.303
log escapement ~ correlation coefficient + total releases + inlet + year	7	2896.195
log escapement ~ correlation coefficient + total releases + year	5	2934.982
log escapement ~ distance from enhancement + total releases + year	5	2982.832
log escapement ~ distance from enhancement + year	4	2991.802

Effects plots for top models

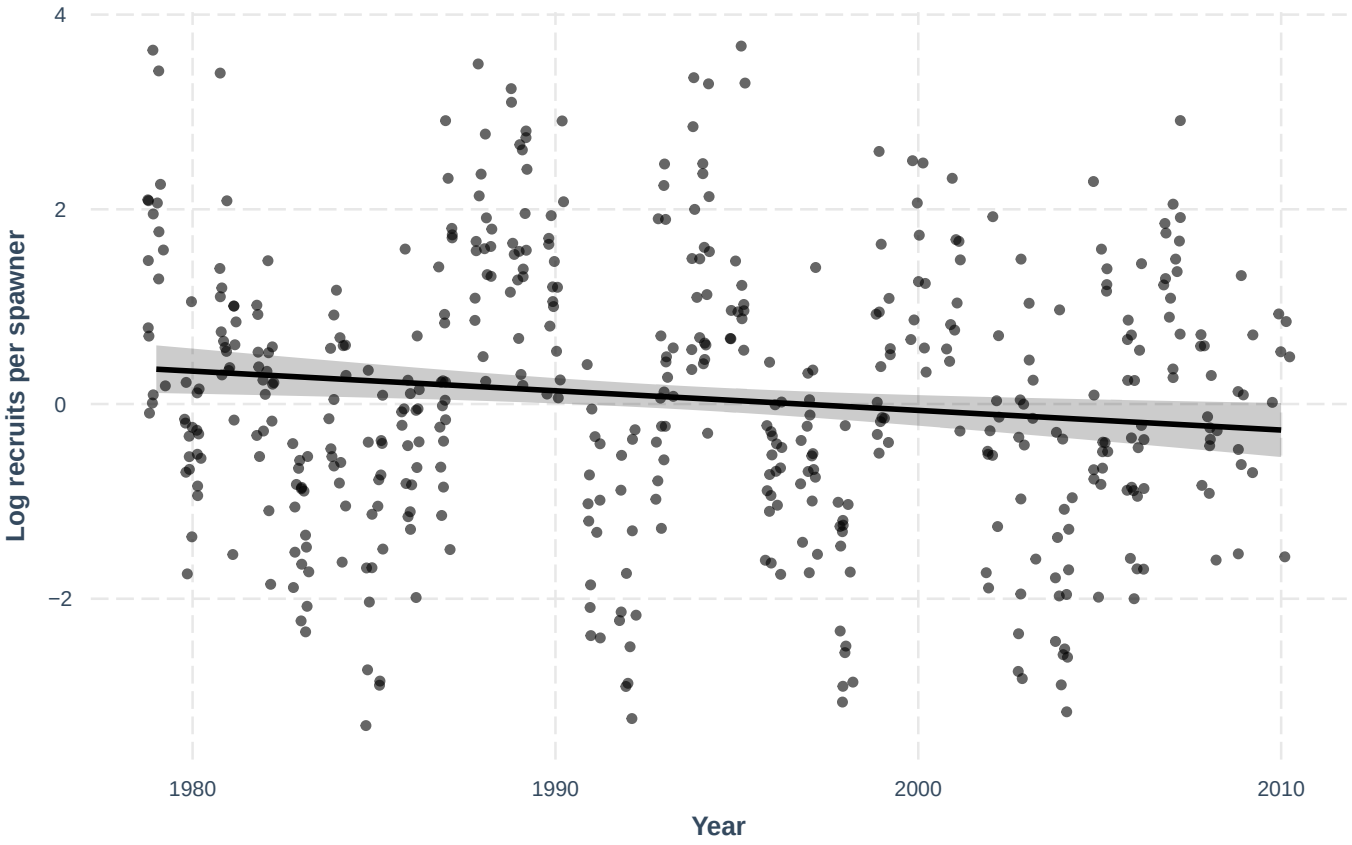


Figure 23: Effects plots of Recruits per spawner by year

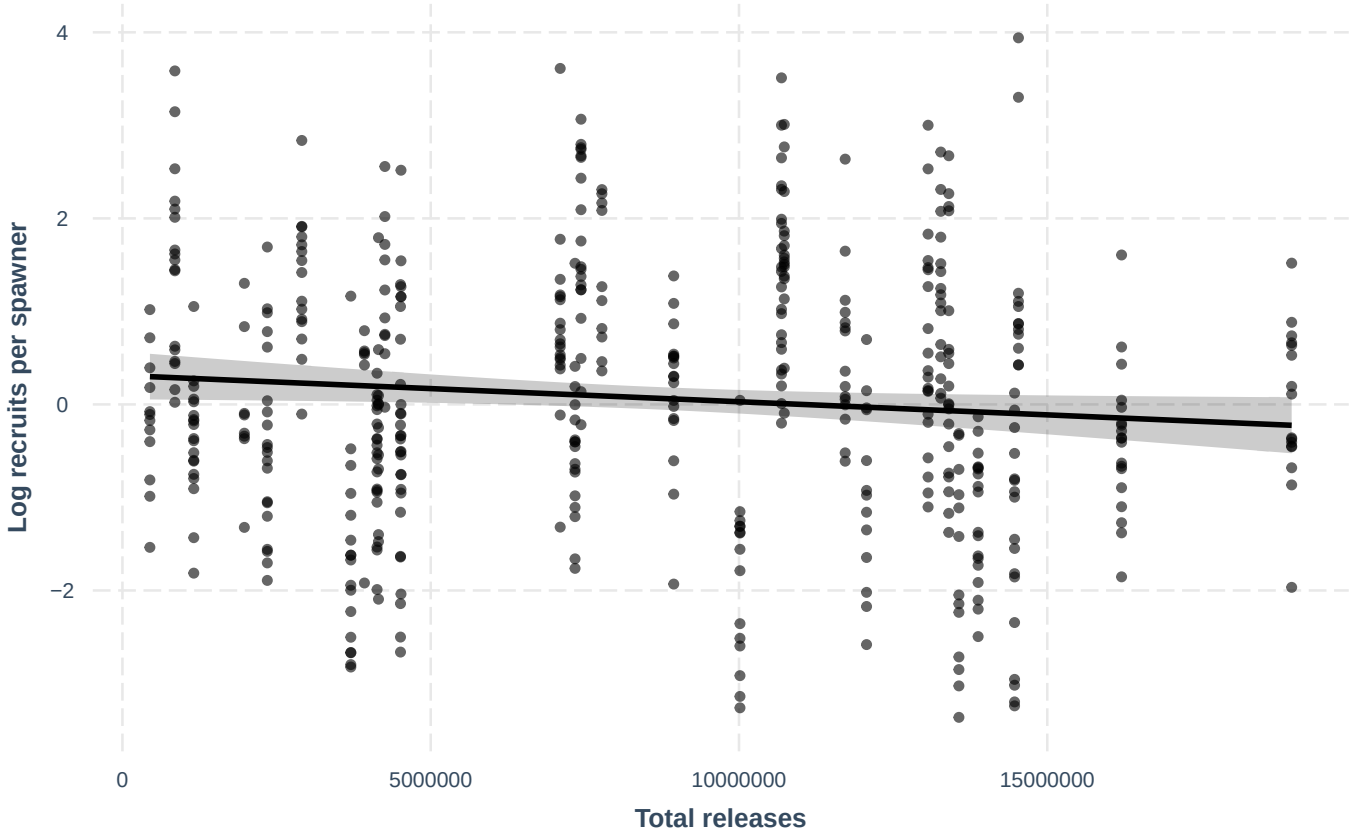


Figure 24: Effects plots of Recruits per spawner by total releases

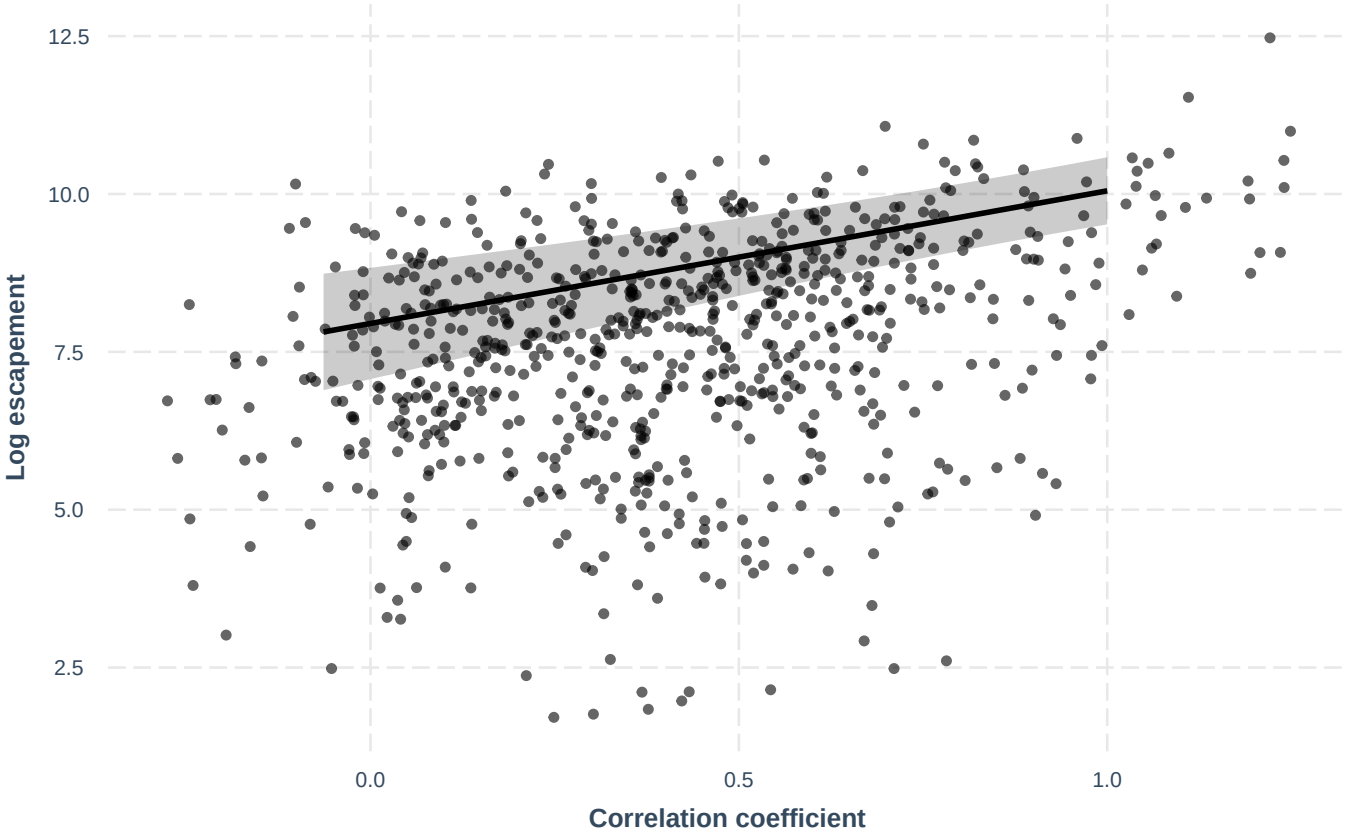


Figure 25: Effects plots of Escapement by correlation coefficient

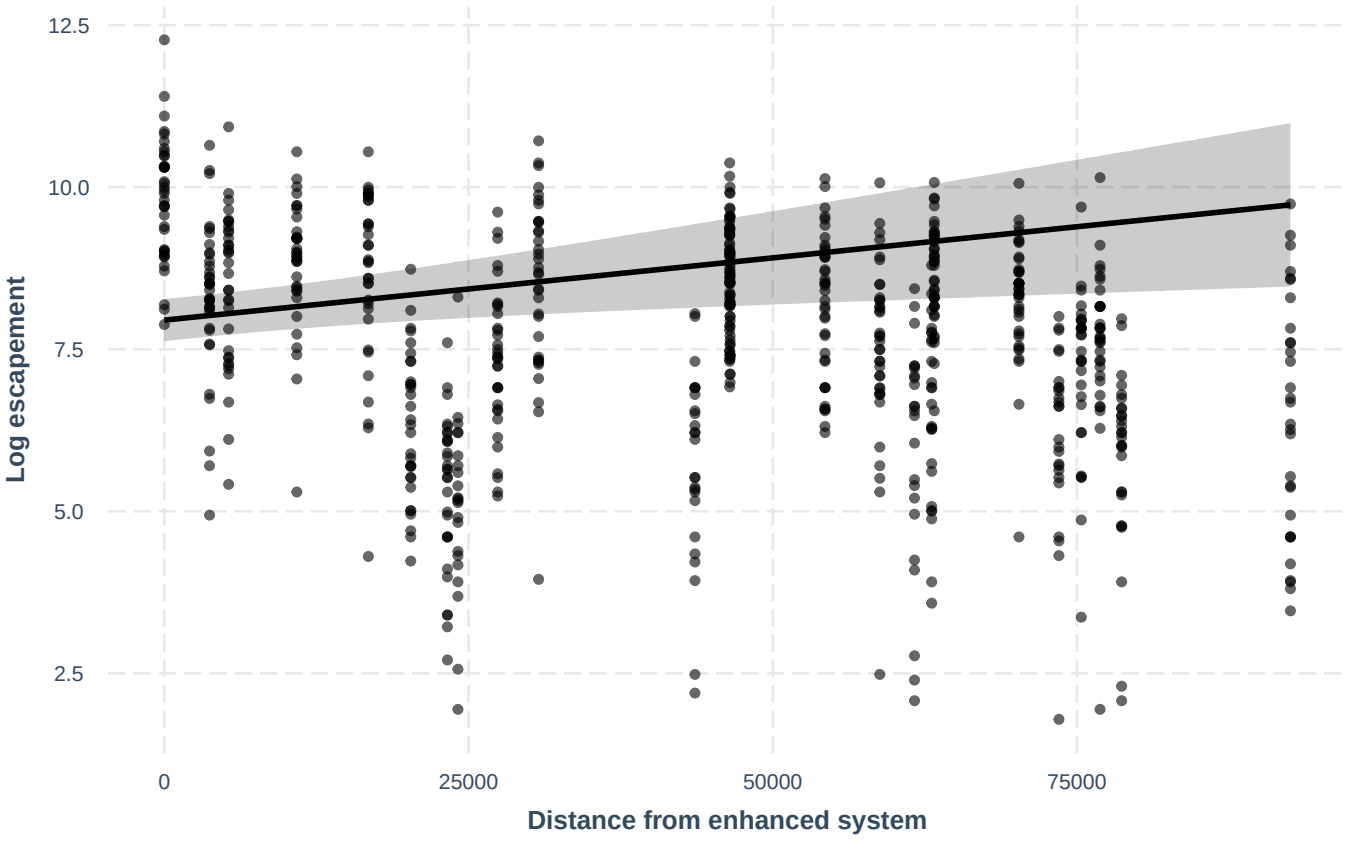


Figure 26: Effects plots of Escapement by distance from enhancement

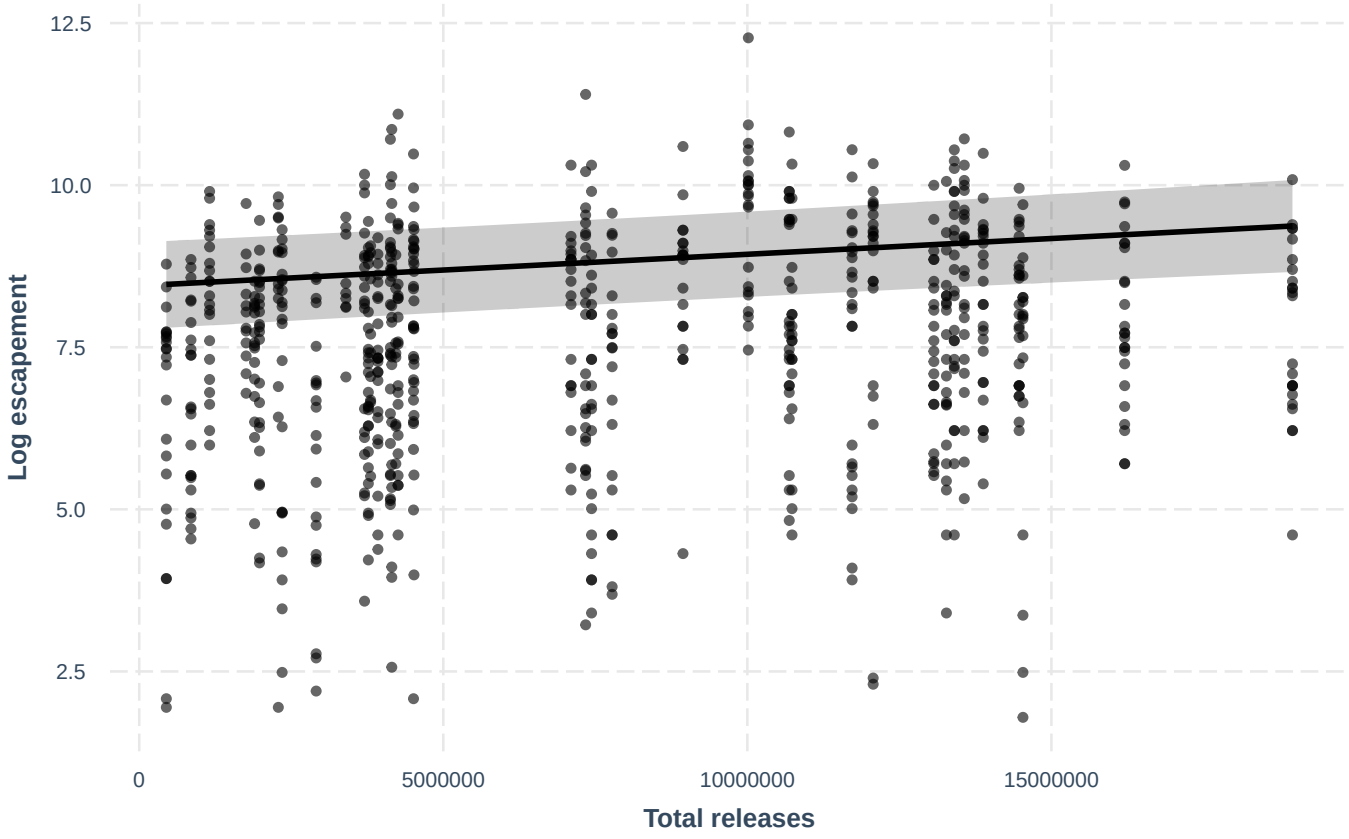


Figure 27: Effects plots of Escapement by correlation coefficient