Rosenfeld et al. 2016: HSI Coho Juvenile Velocity (12 cm FL)

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Species Information

Common Name: Coho Salmon
Genus: Oncorhynchus kisutch

Stressor Details

Stressor Name: Velocity
Units: m/s
Metric: Water Velocity (focal velocity; 12-cm FL juvenile)
Scale: linear
Function Type: continuous
Vital Rate/Process: Habitat Suitability Index

Life Stage & Context

Life Stages: Parr
Geography: Washington/BC.
Activity: rearing
Season: Late summer–early fall (low flow)

Descriptions

Overview

> Bioenergetic-based velocity habitat suitability curve for 12-cm fork length (~21.2 g) juvenile Coho Salmon. Suitability is net energy intake (gross energy intake from drifting prey minus swimming and metabolic costs) predicted by a drift-foraging model, standardized to a maximum of 1 (rescaled here to 100). Unlike frequency-based curves, suitability is 0 at zero velocity (no prey flux), peaks at intermediate velocity, and falls to 0 where swimming costs exceed intake; larger fish have higher optimal and maximum velocities. Bioenergetic curves better matched observed flow-related changes in Bingham Creek smolt production than frequency-based curves.
>
> Stressor-response relationship data sourced from: Appendix, TABLE A.1. Velocity habitat suitability values for 6-, 8-, 10-, and 12-cm-FL juvenile Coho Salmon based on bioenergetics — 12 cm FL column (p. 1219); see also Figure 3a.
>
> See curve for 6cm FL. See source publication for remaining curves.

Function Derivation

> Mechanistic drift-foraging bioenergetic (net energy intake) model, standardized to a maximum of 1.

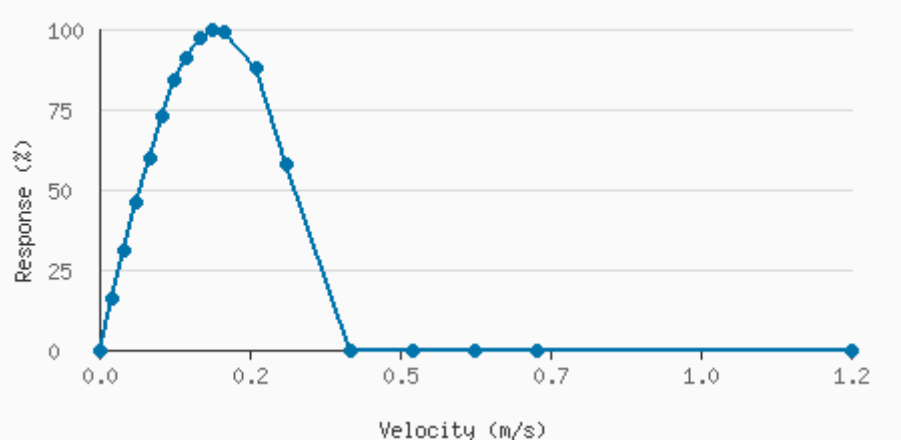
Transferability of Function

> Sensitive to drift concentration, temperature (fixed at 12°C) and fish size; best suited to drift-feeding juvenile salmonids.

Source of Stressor Data

> Drift-foraging bioenergetic model (Hughes & Dill 1990 framework) run over homogeneous depth-velocity fields; drift concentrations from Husdon Creek, BC; fixed 12°C.

Stressor Response Data



Raw Stressor Values	Scaled Response Values 0 to 100	SD	low.limit	up.limit
0	0	0	0	100
0.02	16	0	0	100
0.04	31	0	0	100
0.06	46	0	0	100
0.08	60	0	0	100
0.1	73	0	0	100
0.12	84	0	0	100
0.14	91	0	0	100
0.16	97	0	0	100
0.18	100	0	0	100
0.2	99	0	0	100
0.25	88	0	0	100
0.3	58	0	0	100
0.4	0	0	0	100
0.5	0	0	0	100
0.6	0	0	0	100
0.7	0	0	0	100
1.2	0	0	0	100

Citations

Rosenfeld, J., Beecher, H., & Ptolemy, R. (2016). Developing bioenergetic-based habitat suitability curves for instream flow models. North American Journal of Fisheries Management, 36(5), 1205–1219.

References

Rosenfeld et al., 2016 - https://doi.org/10.1080/02755947.2016.1198285