Mean Annual Discharge and Atlantic Salmon

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Function Updated by leah.egeryhaley on Tue, 06/23/2026 - 18:26.

Species Information

Common Name: Atlantic Salmon
Genus: Salmo salar

Stressor Details

Stressor Name: Flow
Units: %
Metric: Mean Annual Discharge (MAD)
Scale: linear
Function Type: continuous
Vital Rate/Process: Abundance

Life Stage & Context

Life Stages: Smolt
Geography: Catamaran Brook, NB, Canada
Season: Winter

Descriptions

Overview

> Final curve was derived from a linear regression.
>
> System capacity was derived from smolt totals. This data was gathered using a fish-counting fence near the stream mouth to enumerate the smolts emigrating in the spring. Atlantic salmon smolts are typically age 3 when emigrating.
> To normalize and rescale each ecological response, each value was scaled by the maximum ecological response observed in the study such that mean habitat capacity percentage (normalized response) = response / maximum ecological response observed.
> Note that mean density in Cataman brook as estimated by digitizing densities from Fig. 2 pg. 512 of Imre et al. 2005.
> Implicit pathway of effect: Total Atlantic salmon smolt outmigration in Catamaran Brook is positively associated with higher average winter discharge.

Function Derivation

> Observational data. Final curve was derived from linear regression.

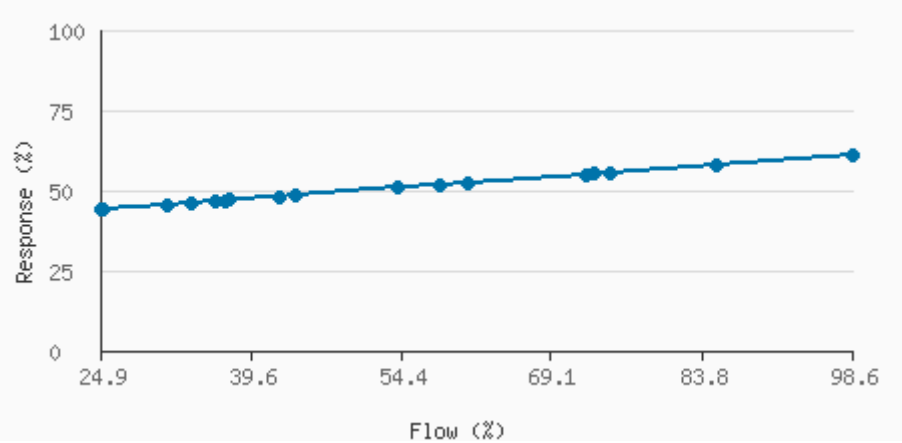
Transferability of Function

> Appropriate for winter stream flow impacts on Atlantic Salmon smolt. General transferability to other salmon stocks in unclear, but likely appropriate for other autumn-spawning salmonids (i.e., regions with similar hydrology to the Catamaran Brook).
> The relationship may be unreliable if extrapolated to a flow range outside the original data (see the Average Salmonid flow-ecology SR function entry based on Rosenfeld and Enright (2025) for a more generalizable function across a wider range of flows).

Source of Stressor Data

The winter streamflow data (discharge) for Catamaran Brook was collected using a streamflow gauging station located in the mid-basin. See methods of Cunjack et al. 2013 for details.
Data was then standardized by dividing absolute flow by MAD to achieve %MAD values (see Rosenfeld & Enright 2024). Such standardization allows for comparison of flow metrics across a wide range of stream sizes (see Rosenfeld et al. 2017).

Stressor Response Data



?PERCENT_MAD	Mean System Capacity (%)	SD	low.limit	up.limit
24.91769231	43.9710692	0	0	100
25.26738462	44.0514985	0	0	100
31.50723077	45.4866631	0	0	100
33.78138462	46.0097185	0	0	100
36.19030769	46.5637708	0	0	100
37.26046154	46.8099062	0	0	100
37.62738462	46.8942985	0	0	100
42.44338462	48.0019785	0	0	100
44.09461538	48.3817615	0	0	100
54.08276923	50.6790369	0	0	100
58.12476923	51.6086969	0	0	100
60.88615385	52.2438154	0	0	100
72.52969231	54.9218292	0	0	100
73.246	55.08658	0	0	100
74.80861538	55.4459815	0	0	100
85.37307692	57.8758077	0	0	100
98.56138462	60.9091185	0	0	100

Citations

Cunjak, R.A., Linnansaari, T., and Caissie, D. 2013. The complex interaction of ecology and hydrology in a small catchment: a salmon's perspective. Hydrol. Process. 27: 741-749.