# Description of Data Inputs

I’m writing this as kind of a guide to the [Pinniped-Gauntlet-Model](https://github.com/lizallyn/Pinniped-Gauntlet-Model) generalized version Github repo. More how-to, less academic paper.

This model operates on a daily time step to encompass the foraging decisions that pinnipeds make daily and the time scales on which salmon move through gauntlets. Each day, each individual pinniped is assigned to one of two foraging locations – gauntlet or not gauntlet – according to the weight of their past foraging experiences and the impact of social information sharing. The number of pinniped predators present at the gauntlet on that day is used to calculate the daily number of each salmon run that are consumed and the consumed salmon are assigned to pinniped predators at the gauntlet. After consumption is allotted, the pinniped management scenario is enacted, and harvested individuals are removed from the model. The opinions of surviving pinnipeds are updated according to the new information they gained during that day, informing the foraging decision they make in the following day.

Breadth

This model includes the dynamics between pinnipeds (Harbor seals, California sea lions, Steller sea lions), salmon who have reached the gauntlet area, and human harvesters of both salmon and pinnipeds.

Spatial scope

This model represents the dynamics occurring between the relevant actors only within gauntlet systems. Gauntlets are areas where returning salmon are migrating and they encounter some kind of barrier (physical or physiological) that forces them to slow down, making them vulnerable to predation and harvest. There is no explicit spatial component, i.e. all dynamics either occur in an unnamed staging area outside the gauntlet (pinniped decision making and social copying), in an undescribed alternative foraging area called “not Gauntlet” (pinniped baseline consumption, “forgetting” about hunt exposure or foraging opportunities at the gauntlet), or occur within a single spatial unit that is the gauntlet (predation on salmon, harvest of salmon and pinnipeds, pinniped exposure to hunt activity, salmon migration beyond gauntlet).

Temporal scope

This model explores dynamics between the relevant actors on a daily time step and explores how those dynamics change over the course of a year (for now).

Depth

Dynamics explored in this model include salmon migration through the gauntlet zone, pinniped predation on salmon, human harvest of salmon and pinnipeds, pinniped individual learning about foraging opportunities, pinniped individual learning about hunt risk, and pinniped social copying of foraging decisions. Inter-annual pinniped population dynamics are not represented. All individuals are assumed to have identical bioenergetic demands within each pinniped species group, though each individual accumulates their own learning and decision-making characteristics as described below. Salmon survival and movement outside of the gauntlet is not addressed. The response of interest is the number of salmon that escape beyond the gauntlet under different pinniped harvest conditions. Salmon species are tabulated separately, but age structure within species is not acknowledged.

## Salmon

### Arrival Data

The script “Prep\_Salmon\_Data.R” uses function “createSalmonArrival.R” to create an arrival curve using the inputs provided in “salmon\_run\_info.csv”. The function createSalmonArrival uses the columns “Peak\_Date”, “sd”, and “Run\_Size” to create a normally distributed arrival curve vector for each salmon run described in “salmon\_run\_info.csv”. From this vector the model can extract the number of salmon from each run that arrive at the Gauntlet on a specific day of the year.

### Escape Rate

Comes from residence time estimates. Specific to each run and gauntlet system. Estimated based on tag data, fisheries catch data, or general local knowledge about fish migration speeds and holding times in estuaries. The escape rate is calculated as the inverse of the estimated residence time. This can be included in “salmon\_run\_info.csv” under column “Residence”. Column “Escape\_Rate” is calculated using “Residence” in the “Prep\_Salmon\_Data.R” script. Escape rate is static for each run throughout each model day.

### Fishery Catch Rate

In this generalized version this is simplified somewhat to a single catch rate that is propogated over a single fishing opener. Inputs for this are: the average daily catch rate “Fish\_Rate”, the day of the year that the fishery opens in yday format “Fishery\_Open”, and the day of the year that the fishery closes in yday format “Fishery\_Close”. These inputs are used to create a vector of daily catch rates for each run in the Gauntlet.

### Natural Mortality Rate

The same daily mortality rate is implemented for each run each day. This can be added to the “set\_pars.R” script in the “RunTheModel” folder.

## Pinnipeds

### Consumption

* Cmax for each species combo
* Alpha for each species combo
* W justification and assumptions
* Individual turnover within each day compared to non-ID observational data

### Learning