Predation

Definitions:

Predation- The ecological interaction where a predator hunts, captures, and consumes a prey organism for energy and survival.

Predator- An organism that hunts and feeds on other organisms.

Prey- An organism that is consumed by a predator and often exhibits behavioral responses to avoid being eaten.

Fleeing Behavior- A reactive movement or evasion tactic by prey in response to predator presence or cues.

Pursuit Behavior- A targeted movement by predators toward potential prey using visual, chemical, or flow cues.

Trophic Transfer- The movement of energy and contaminants through food webs when one organism consumes another.

Description of Process:

Predation is a key driver of fish movement, energy use, and survival in estuarine systems. Both predators and prey use behavioral strategies to maximize fitness. Prey seek to avoid detection or escape encounters, while predators seek to optimize foraging success by locating and capturing vulnerable individuals.

Predators in estuarine systems (e.g., striped bass, larger fish, or birds) may follow prey migrations, patrol high-quality habitats, or use tidal flow to aid pursuit. Prey species respond through fleeing behaviors, habitat shifts, and schooling. These interactions create spatial and temporal “predation pressure” zones that shape fish behavior, habitat use, and exposure risk.

Importantly, predation can increase bioaccumulation risk if predators consume prey that have accumulated contaminants like methylmercury. This process, known as trophic transfer, means predators often exhibit the highest contaminant concentrations in the food web.

In modeling, predation should reflect species roles (predator vs. prey), size-based interactions, behavior rules (fleeing vs. pursuit), and spatial overlap. It may also factor into mortality, bioaccumulation, or altered movement behaviors under high risk.

Little Facts:

- Prey often change depth, speed, or habitat use in response to predators, increasing energy use.
- Schooling behavior can reduce individual predation risk but may also limit foraging opportunities.
- Predators often target slow, injured, or thermally stressed individuals.
- Contaminants like methylmercury bio-magnify through predation.
- Predators accumulate higher levels than prey.
- Estuarine predators may use flow features like eddies or slack tides to trap prey.
- Predation pressure can delay migration, shift habitat use, or reduce reproductive success.

Discussion Objectives:

- Is this function accurate and realistic to your knowledge?
- What species in the model serve as predators and which as prey?
- How does prey detect and respond to predator presence (e.g., fleeing, schooling, shifting depth)?
- What factors influence predator success (e.g., visibility, current speed, prey density)?
- Where and when in the estuary is predation risk likely highest?
- What kind of model outputs should reflect this process?
    - Are there zones where predation strongly influences movement or mortality?
    - Can predation affect contaminant transfer and exposure patterns?
    - Do certain conditions amplify predation pressure (e.g., low turbidity, slow current, low energy reserves)?