Foraging

Definitions:

Foraging- The behavior of searching for, selecting, and consuming food to meet energy needs.

Optimal Foraging Theory- A concept in ecology that predicts animals will maximize energy gained per unit of effort, balancing food quality, risk, and search or handling time.

Benthic- Associated with the bottom of a body of water; benthic foragers feed along or within sediments.

Pelagic- Associated with the open water column; pelagic foragers feed in midwater or near the surface.

Filter Feeding- A feeding strategy where organisms strain suspended particles or plankton from the water.

Bottom Feeding- Feeding on or near the substrate, often on invertebrates, detritus, or organic-rich sediment.

Intraspecific Competition- Competition for food or space among individuals of the same species.

Interspecific Competition- Competition between individuals of different species for similar food resources or habitat.

Description of Process:

Foraging is a vital behavior that allows fish to acquire energy needed for growth, movement, reproduction, and recovery. Fish use a variety of feeding strategies, such as; benthic, pelagic, filter, or bottom feeding, depending on their species, life stage, and local habitat conditions.

Optimal Foraging Theory suggests that fish will select feeding strategies and locations that maximize their net energy gain, considering not just food abundance but also the effort, risk, and time required to locate, capture, and consume prey. For example, a fish may choose a lower-quality but safer or easier-to-access food source if predation risk is high.

Foraging behavior is influenced by turbidity, current speed, prey visibility, and salinity. Fish must also avoid contaminated food sources. Bottom feeders may ingest mercuryladen sediment, and filter feeders may take in contaminated particles from the water column.

Intraspecific and interspecific competition emerge when multiple individuals or species rely on overlapping food sources. This can drive habitat partitioning, shifts in foraging depth, or even changes in diet, especially during migration or high-density periods.

In modeling, foraging should reflect species-specific strategies, energy optimization, spatial variability in food resources, and trade-offs with risk or energy cost. This behavior directly influences bioaccumulation risk, growth, and survival.

Little Facts:

- Optimal foraging does not always mean "eating the most", it balances risk, energy cost, and food value.
- Filter feeders are more likely to take in suspended contaminants along with plankton.
- Benthic foragers face higher risk of mercury exposure from contaminated bottom sediment.
- Schooling fish may reduce predation risk while foraging, but face more intraspecific competition.
- Foraging activity can increase during specific tides or times of day depending on prey availability.
- Fish may switch strategies as they grow, change habitats, or encounter competition.
- Poor foraging success can lead to energy deficits that reduce growth, delay migration, or increase mortality.

Discussion Objectives:

- Is this function accurate and realistic to your knowledge?
- What foraging strategies do different species in the model use, and how can we account for the difference in contamination exposure associated with these feeding strategies?
- What are the consequences of intraspecific or interspecific competition when it comes to foraging?
- What kind of model outputs should reflect foraging processes?
    - Are there zones or periods of high foraging activity or resource depletion?
    - Are fish able to meet their energetic needs, or falling into deficit?
    - Do foraging strategies increase exposure to mercury or other stressors in certain areas or conditions?