



# Estimating food resources for shellfish

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## Introduction

**Carrying capacity for shellfish:**

**The amount of shellfish that can be supported by the available food in an ecosystem**

- **commercial shellfish**
- **competing natural populations**

**Two questions:**

- **How much food is there available?**
- **How much shellfish can grow on that food?**



## Relevance

### Carrying capacity of ecosystems:

- **Site assessment**
- **Planning of aquaculture operations**
- **Water Framework Directive**
- **EC Habitats and Wild Birds Directives**
- **Understanding of trends observed**
- **Support discussions on sustainable aquaculture**



## Keyzones project

- **Develop carrying capacity models for:**
  - **Clew Bay (Ireland)**
  - **Loch Creran (Scotland)**
  - **Eastern Scheldt (Netherlands)**
- **Measure shellfish growth and environmental parameters**
- **Check if models correspond to measurements**



## Food sources

### Food for shellfish:

- live algae
- dead organic matter

*1: river*



*2: tide*



shellfish



*3: local algae growth*

land

sea



## How much food per source?

- **River input:**  
river discharge \* food concentration in river
- **Tidal input:**  
tidal amplitude \* bay surface \* food concentration at sea
- **Local production depends mainly on:**
  - concentration nitrogen and phosphorus
  - water transparency
  - sunshine
  - water depth or mixing layer depth



## Variability in time

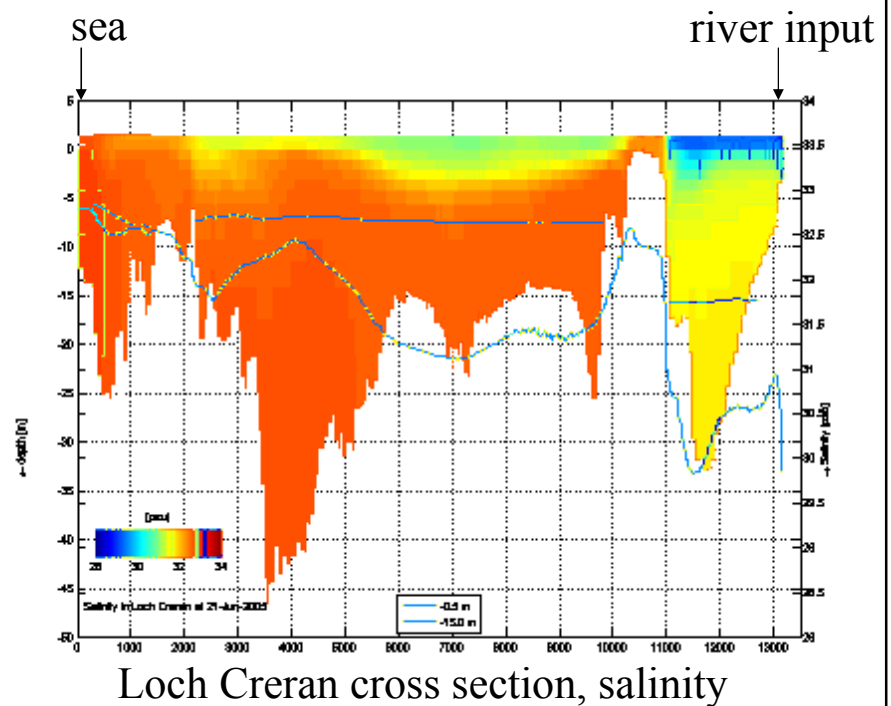
### Seasonal variations of:

- river discharge
- spring and neap tides
- algae and dead organic matter concentrations
- nitrogen and phosphorus concentrations
- sunshine



## Variability in space

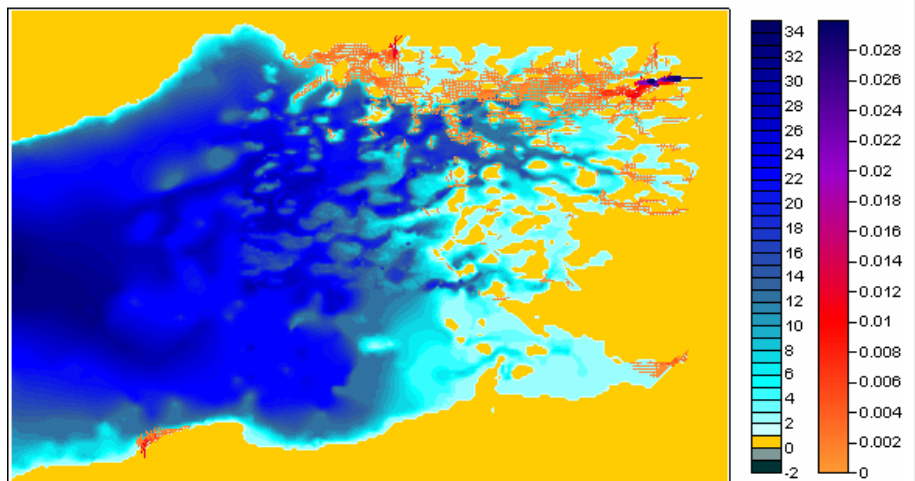
- water depth
- river influence
- tidal flushing





## Variability in space in Clew Bay

- water depth
- river influence
- tidal flushing



salinity Clew Bay



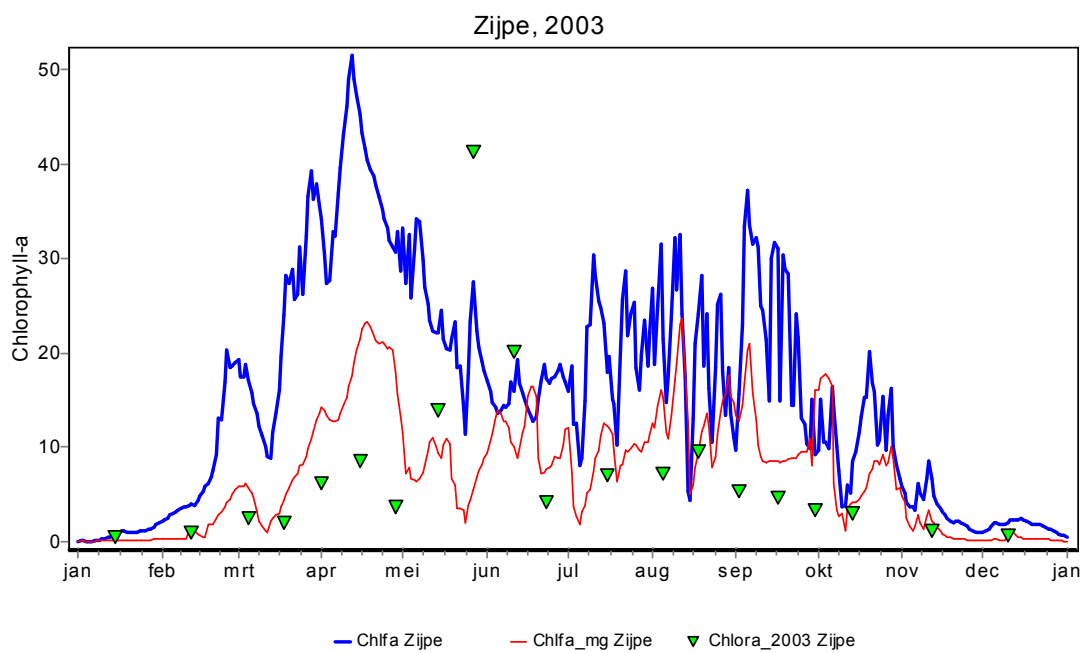
## **Carrying capacity modelling:**

**For every segment and every hour of the year:**

- 1. calculate food availability**
- 2. calculate food uptake and biomass of shellfish**
  - reduces food availability!**



## Algae and organic matter in Eastern Scheldt





## Summary

**Spatial deterministic models can take into account:**

- **Variability in space and time in shellfish food**
- **Interactions between shellfish and algae**

**while estimating the amount of shellfish that can be sustained by an ecosystem.**

**Find optimum exploitation strategy by simulation of different scenarios**