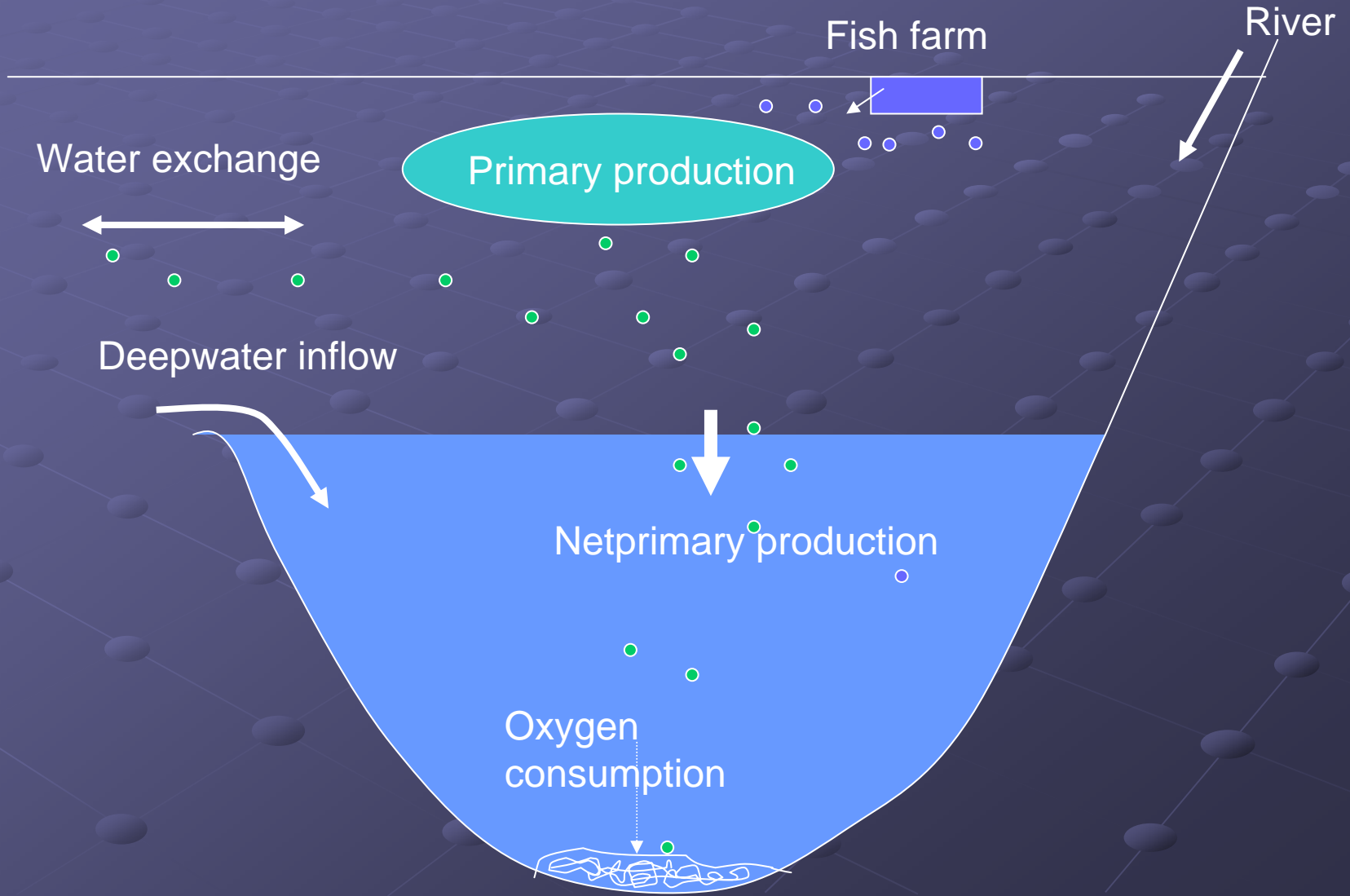


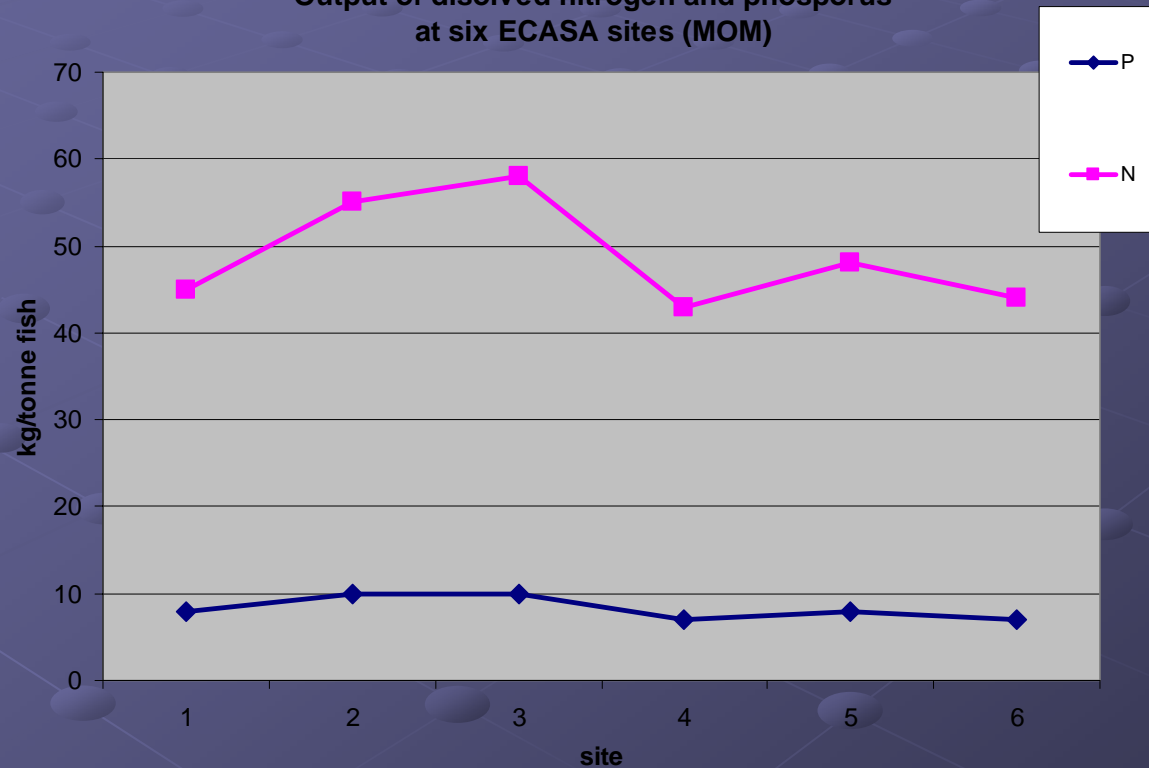


# Water quality indicators





Output of dissolved nitrogen and phosphorus at six ECASA sites (MOM)



## Fish model (MOM):

- Requirements of the fish
- Amount of protein in the food



# Water quality indicators



ECASA

Göteborg University



● Regional

● Local

● In farm



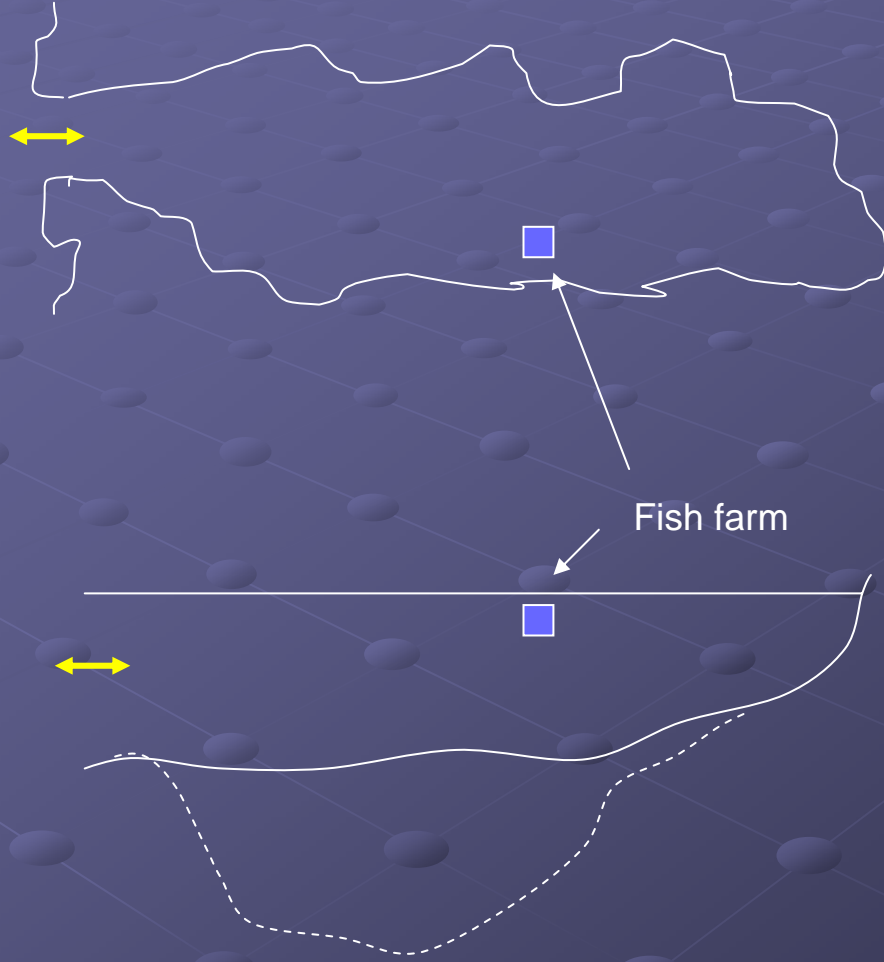
# Water quality indicators



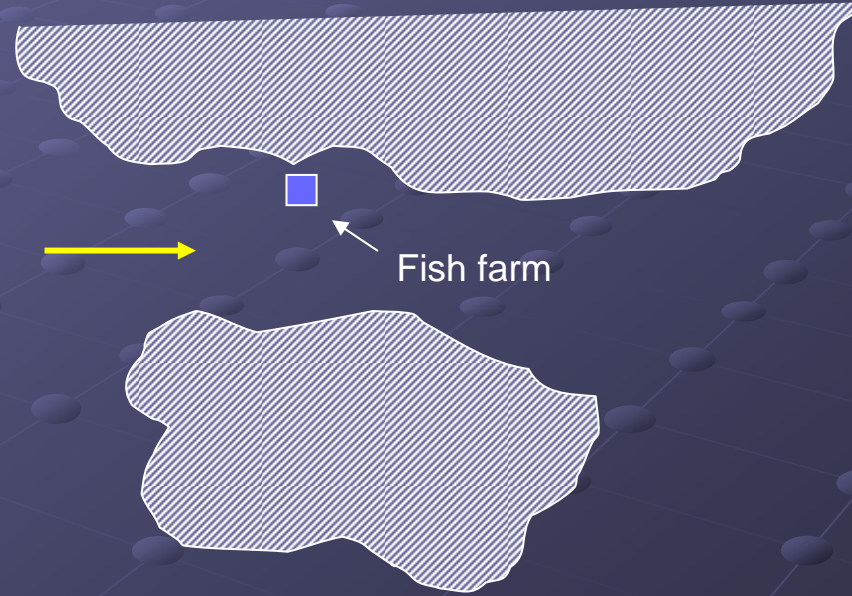
ECASA

Göteborg University

## Restricted water exchange



## Large water exchange





## Surrounding water

### Regional:

Oxygen

Chlorophyll

Nutrients

Secchi depth

### Local:

Oxygen

Chlorophyll

Nutrients

## In farm:

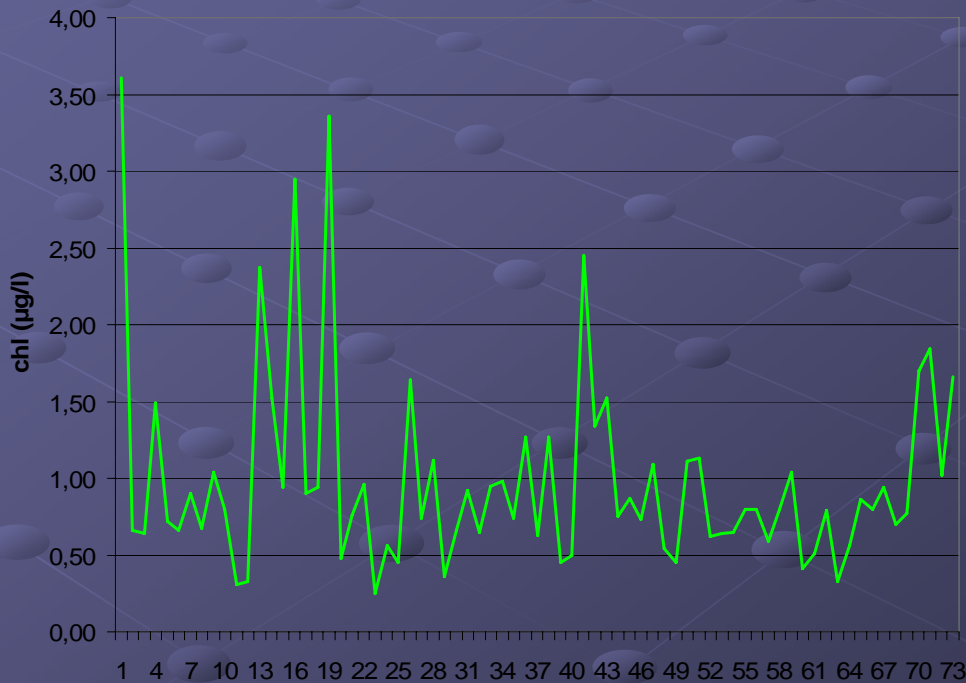
Oxygen/  
Ammonium

Fish growth



## Chlorophyll

### RRE:s and open water sites



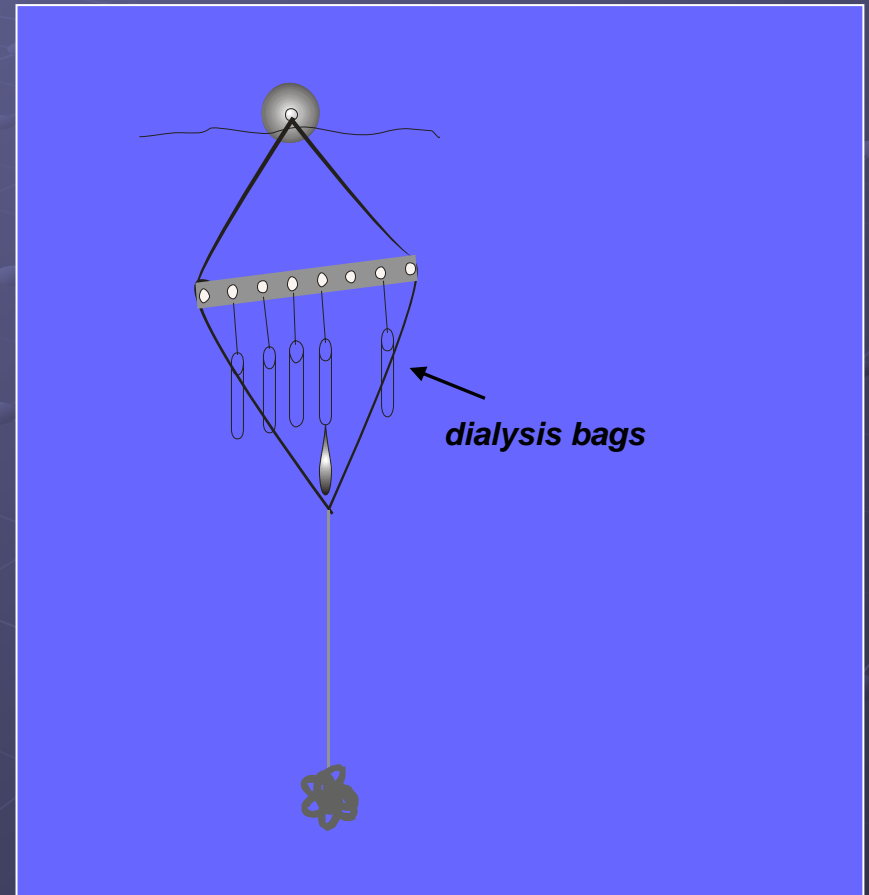
**+**  
known technique  
historical data

**-**  
large variability  
frequent observations  
long data series



## Chlorophyll - bioassay

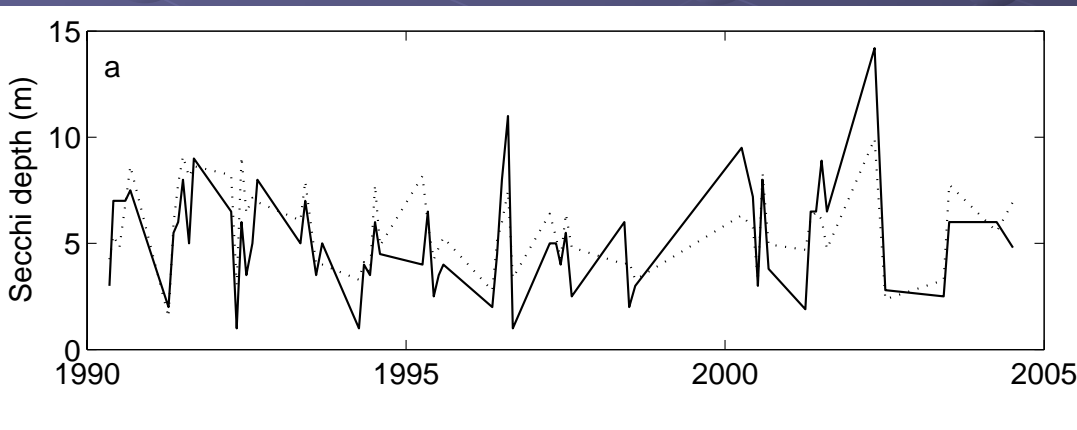
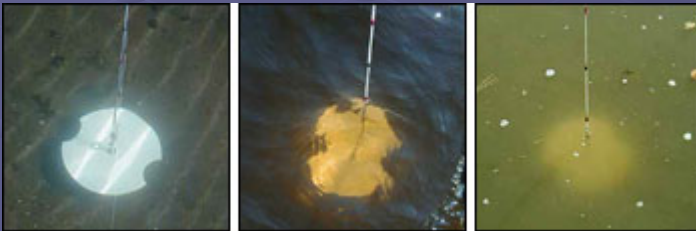
well flushed sites





## Secchi depth - visibility

RRE:s



+

very simple technique

cheap

(historical data)

-

large variability

frequent observations

long data series

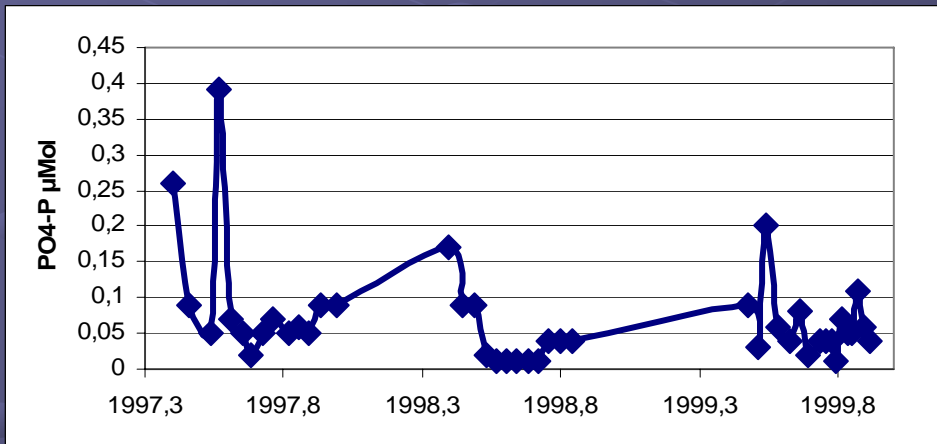
(fresh water influence)



## Nutrients

RRE:s and open water sites

- + known technique
- historical data
- optimize (RRE:s)

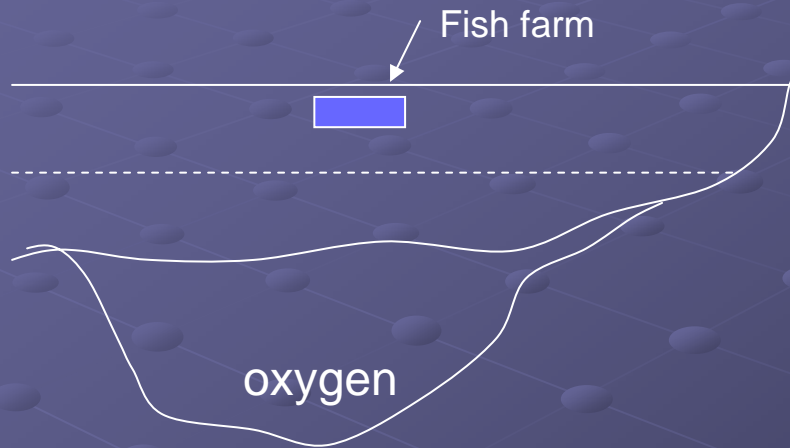


- large variability
- frequent observations
- long data series



## Oxygen minimum

RRE:s



+

known technique

historical data

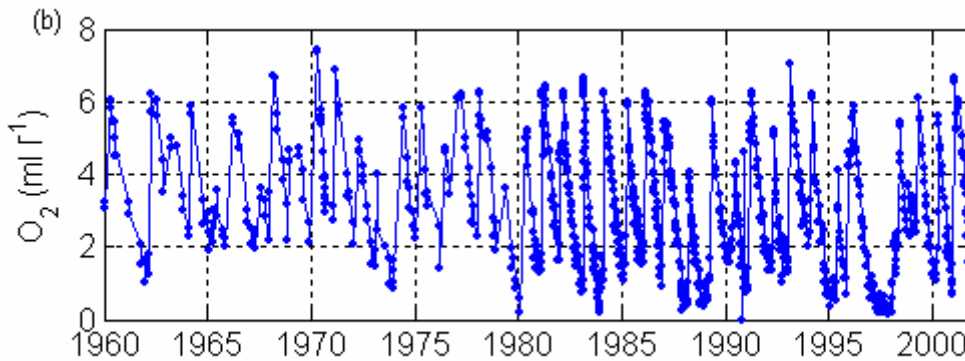
optimize (RRE:s)

-

large variability

frequent observations

long data series





Oxygen/ammonium

(In Farm)



Model: levels in the net pens      Holding capacity

Residence time      oxygen/ammonium conc

- currents
- orientation and configuration of the farm
- trough flow - clean nets

+

known threshold values

automatic probes for oxygen

Model studies of lowest/highest values

-

Ammonium has to be measured by trained personal

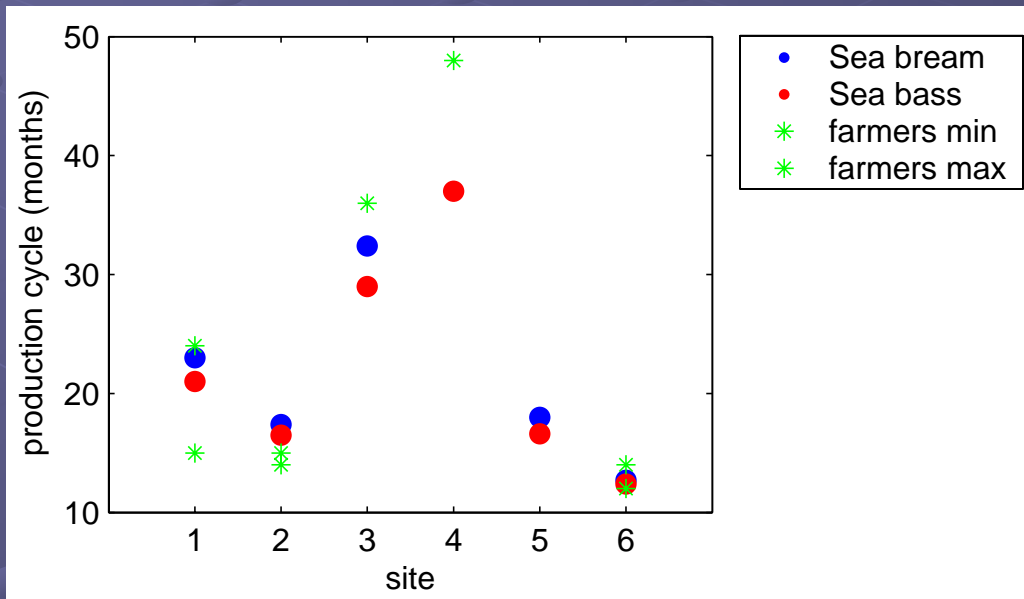
Frequent observations to find critical levels



## Fish growth (In Farm)



Model: maximum fish growth → production cycle



+

obvious significance  
regular weight control

-

lack of historical data ?

Figure: start weight =10 g, end weight= given by farmer