

Results from the MERAMED project - a modelling tool to assess environmental effects from Mediterranean aquaculture: MERAMOD



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SCOTTISH
ASSOCIATION
for MARINE
SCIENCE

MERAMED partners (www.meramed.com)

EU FP5 MERAMED project (Contract Q5RS-2000-31779)

Carroll M., Kogeler J., White P.
Akvaplan-niva, Tromso, Norway

Black K.D., Cromey C.J., Provost P.
Scottish Association for Marine Science

Karakassis I., Lampadariou N. + many others
HCMR, Crete, Greece

Thetmeyer H.
IfM-GEOMAR, Kiel, Germany

Blackstock J., Pearson T.
SEAS, Oban, Scotland



MERAMED



- Starting point – DEPOMOD
- MERAMOD structure
- Key measurements and settings
 - currents
 - dispersion
 - faecal sinking velocity
- Results – carbon deposition and benthic macrofaunal indices

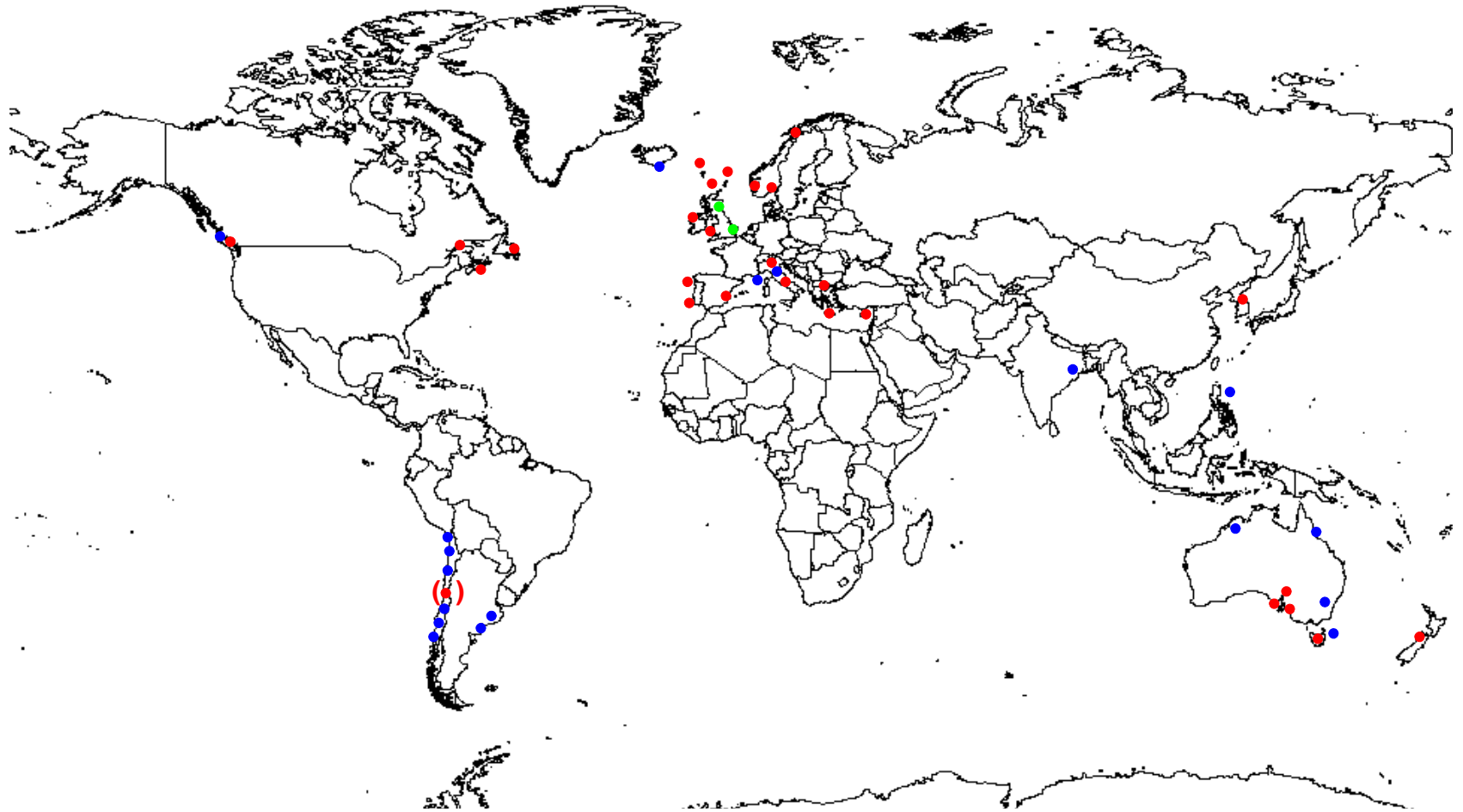
Starting point - DEPOMOD

- Cromey, C. J., Nickell, T. D. and Black, K. D. (2002) DEPOMOD - modelling the deposition and biological effects of waste solids from marine cage farms. *Aquaculture* 214, 211-239.
- Cromey, C. J., Nickell, T. D., Black, K. D., Provost, P. G. and Griffiths, C. R. (2002) Validation of a fish farm waste resuspension model by use of a particulate tracer discharged from a point source in a coastal environment. *Estuaries* 25, 916-929.
- www.sams.ac.uk

DEPOMOD is an Operational Regulatory Model

- Used for:
 - Regulating discharges of medicines (emamectin)
 - Determining the maximum biomass for a site
 - Assisting selection of sites
 - Preparation of EIA
- Used by:
 - Regulators e.g. SEPA
 - Fish farmers (SAMS provides training and helpdesk)
 - Consultants
 - Researchers

DEPOMOD/MERAMOD Licences

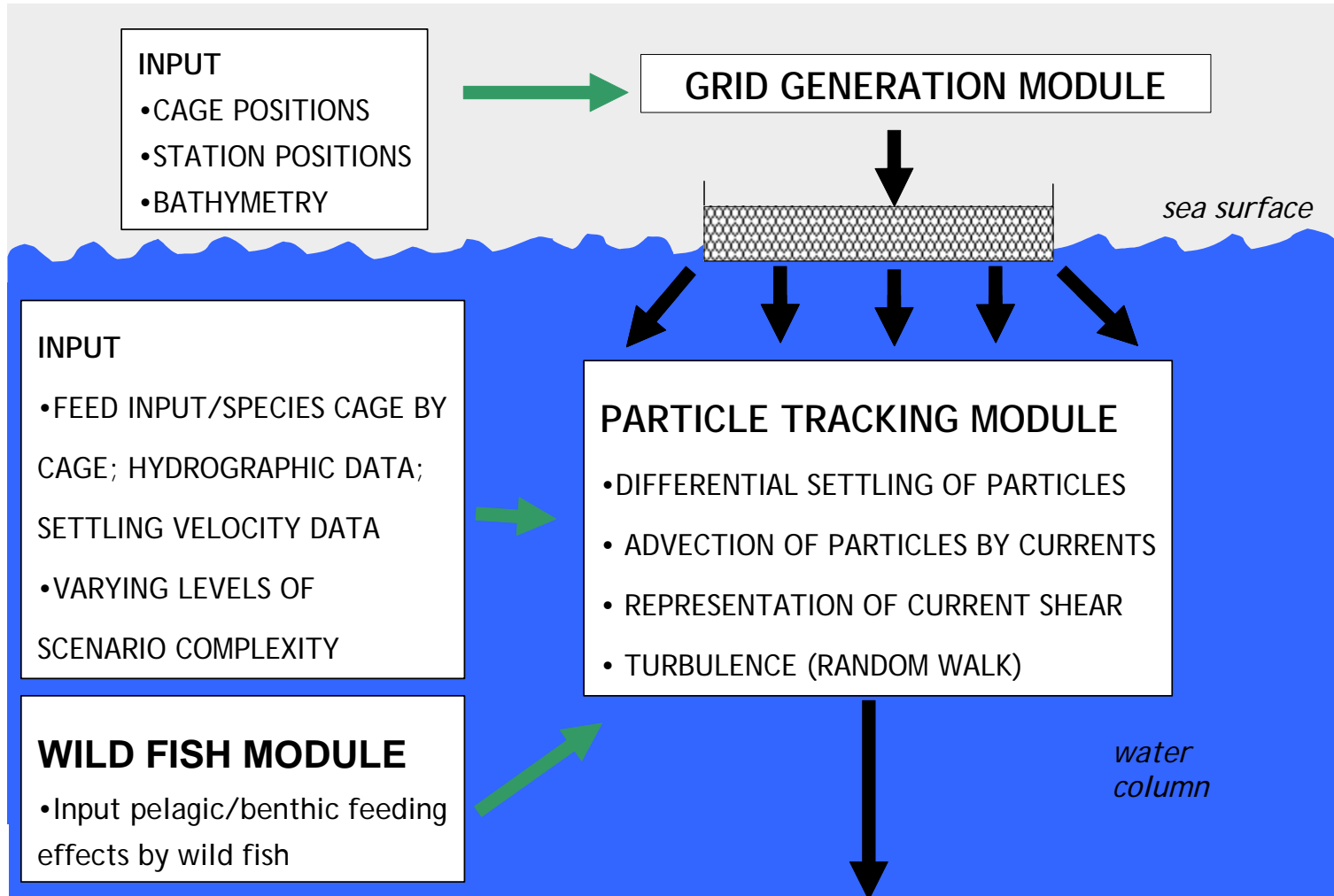


- 3+ licences
- 1-3 licences
- enquiries only

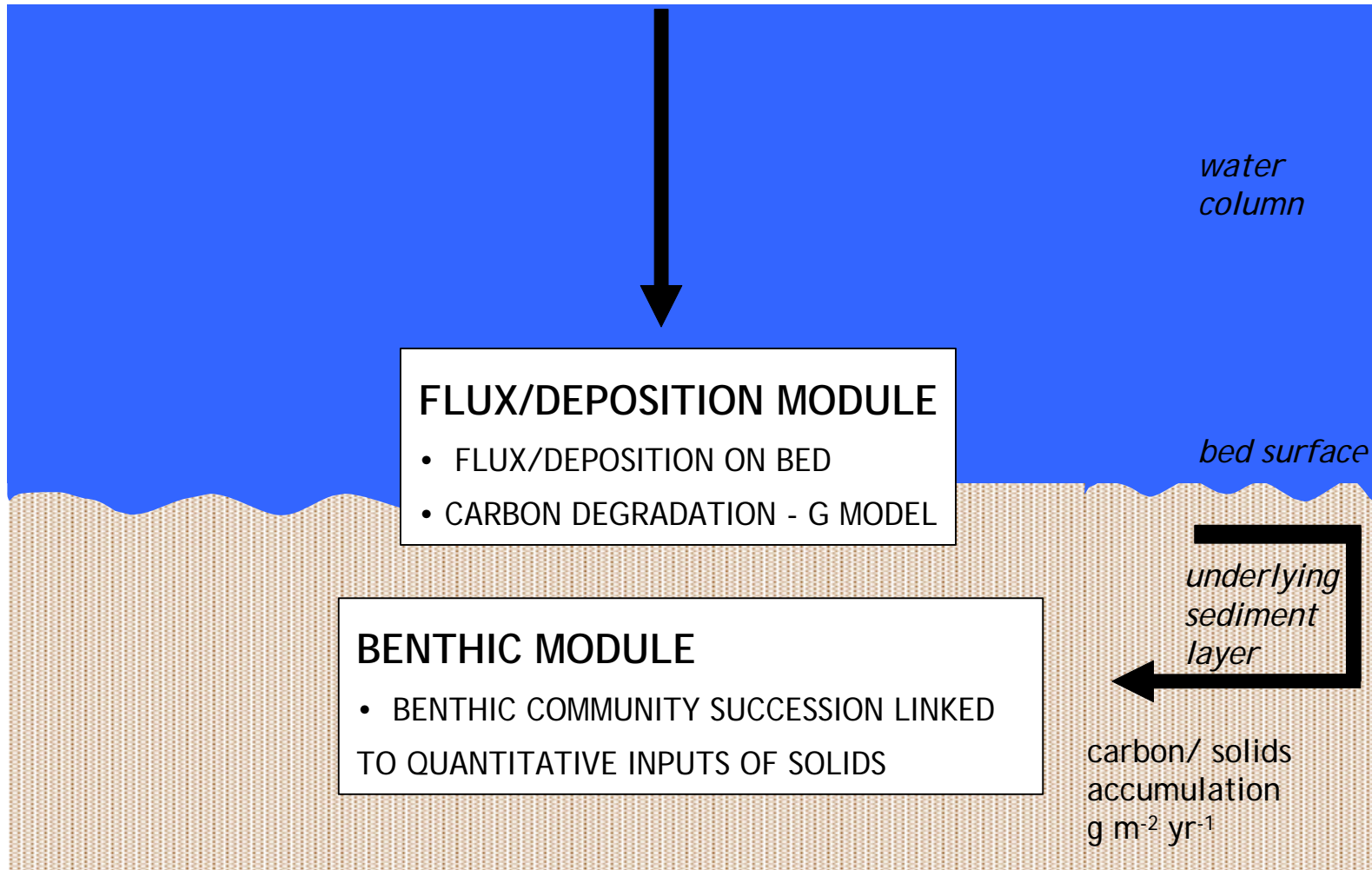
96 licences - 14 countries (65% commercial)
80-100 enquiries p.a. (75% e-mail, 25% phone)
10+ tuition workshops

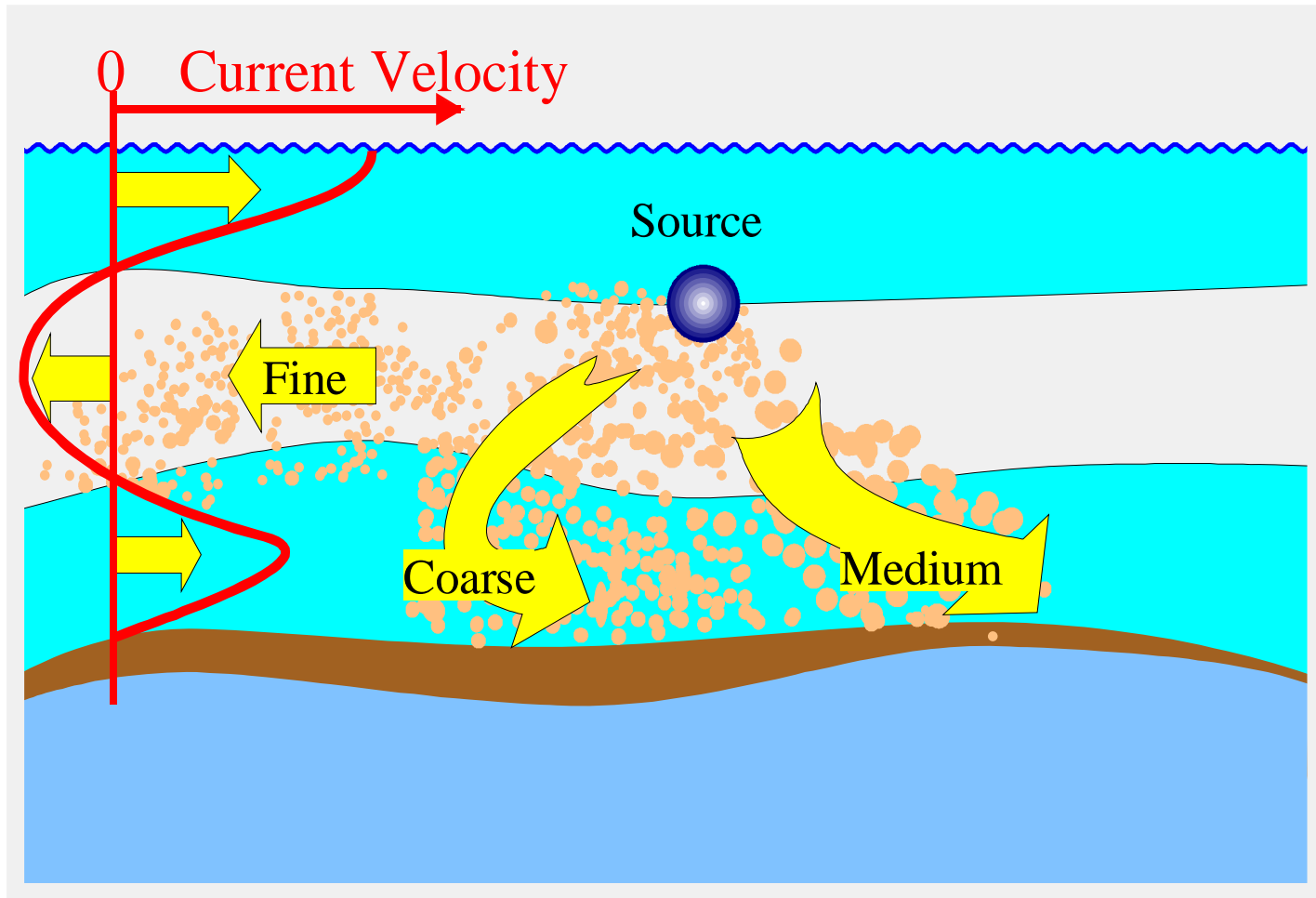
FLOW OF INFORMATION THROUGH MERAMOD

MERAMOD MODULES (I)



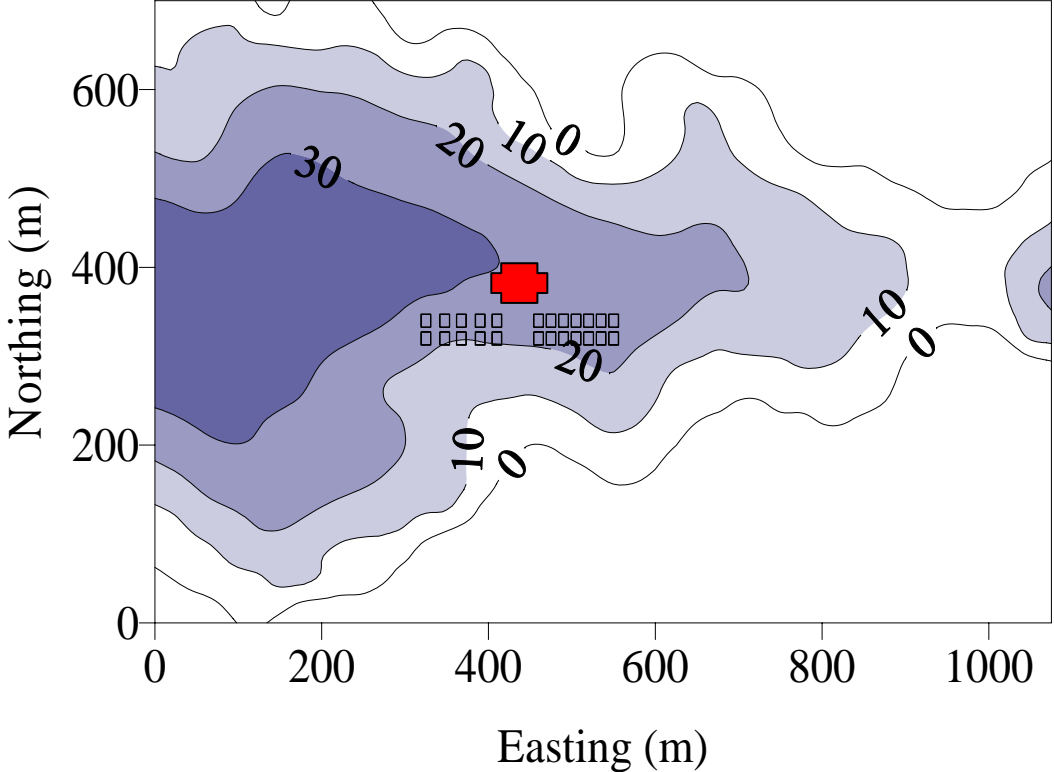
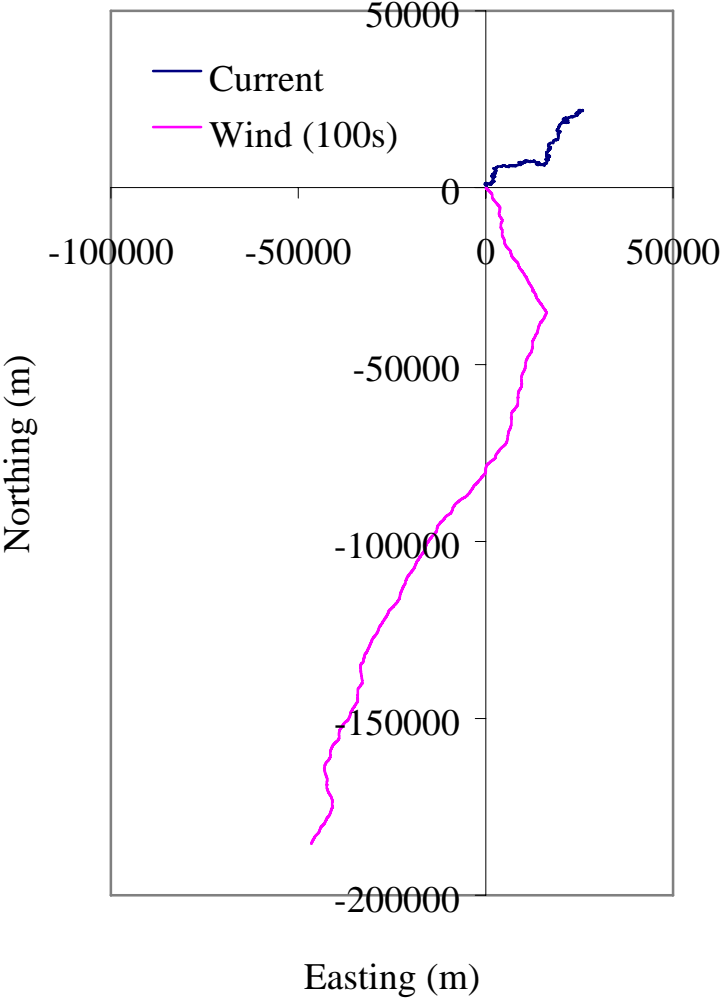
MERAMOD MODULES (II)





Current profiles in stratified waters are complex. Particles settling through the layers are subject to differential settling, turbulence and current shear

Current (blue line) and wind vector



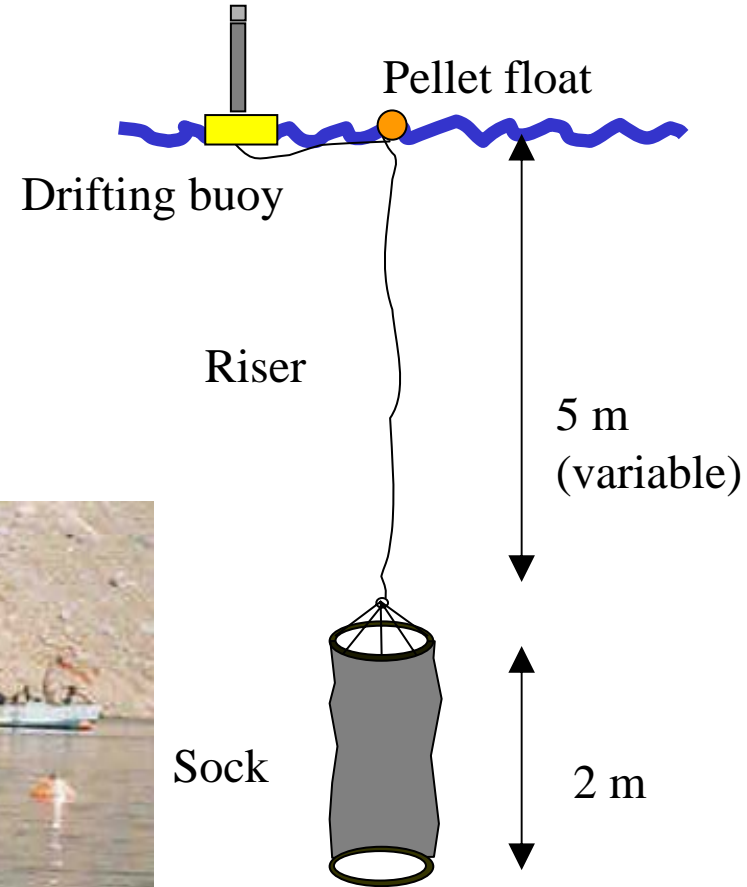
 Current meter location

Drifter experiments - Horizontal Diffusion

17 cm

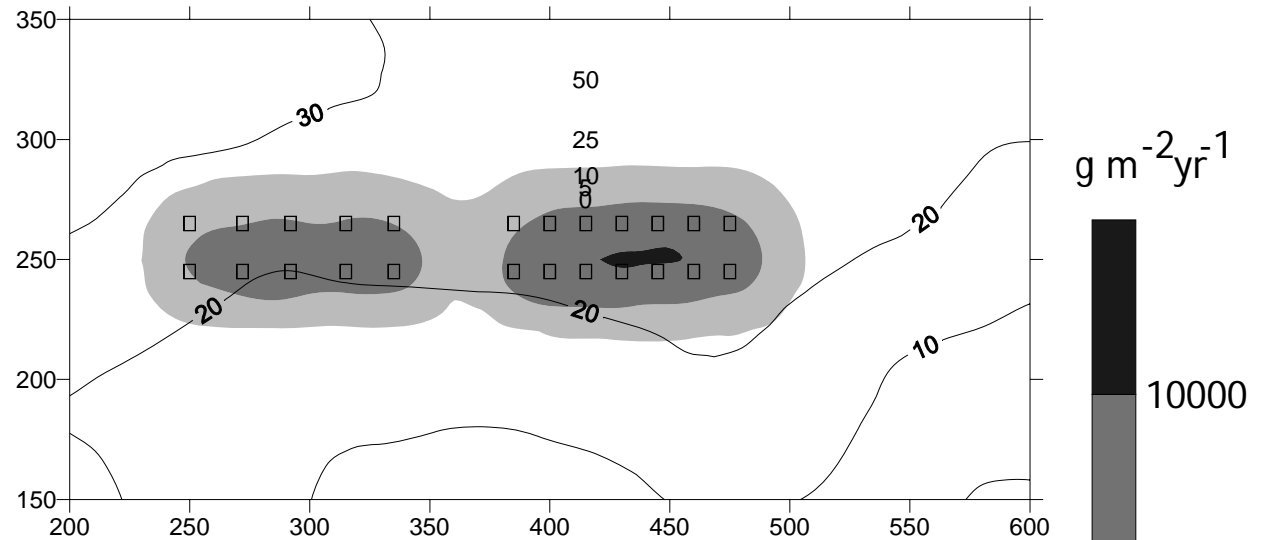


66 cm

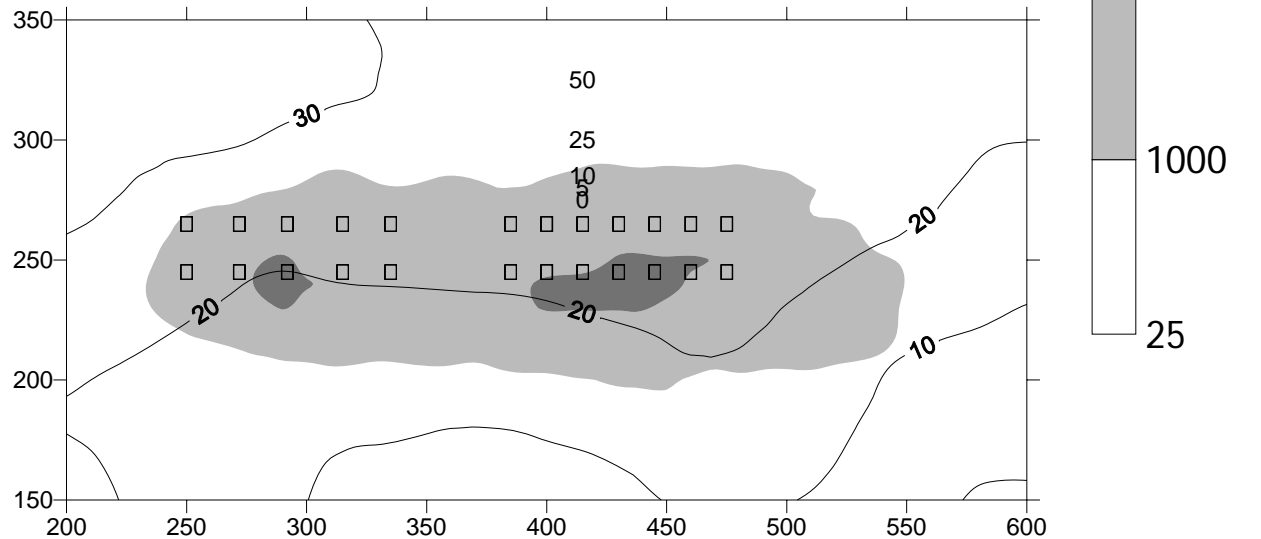


Settling velocity data are important:

Using salmon
faeces in model



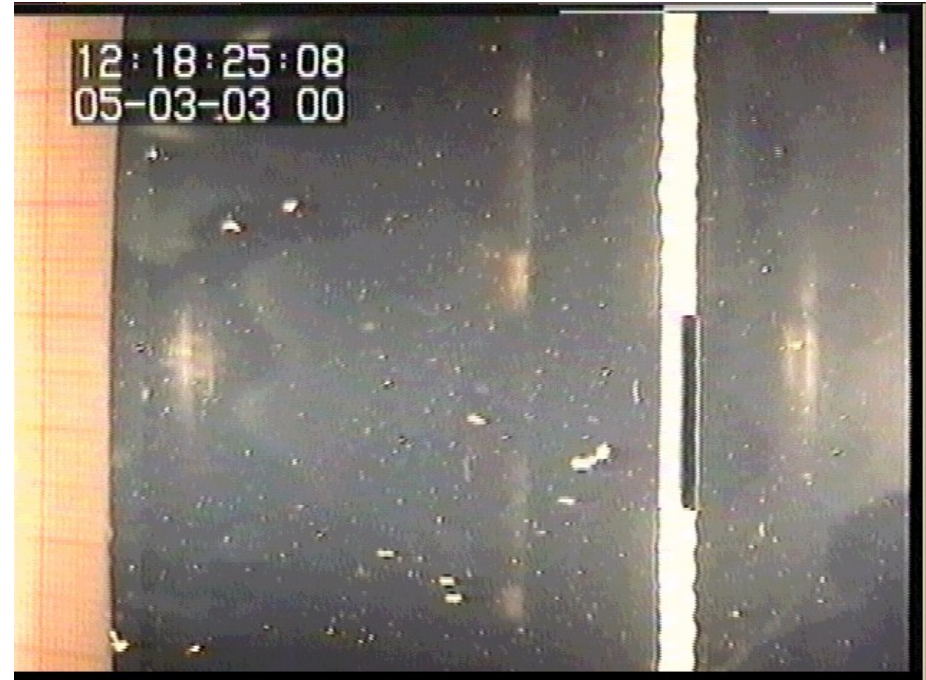
Using sea
bream faeces
in model (fine,
slow settling)



Sea Bass faeces



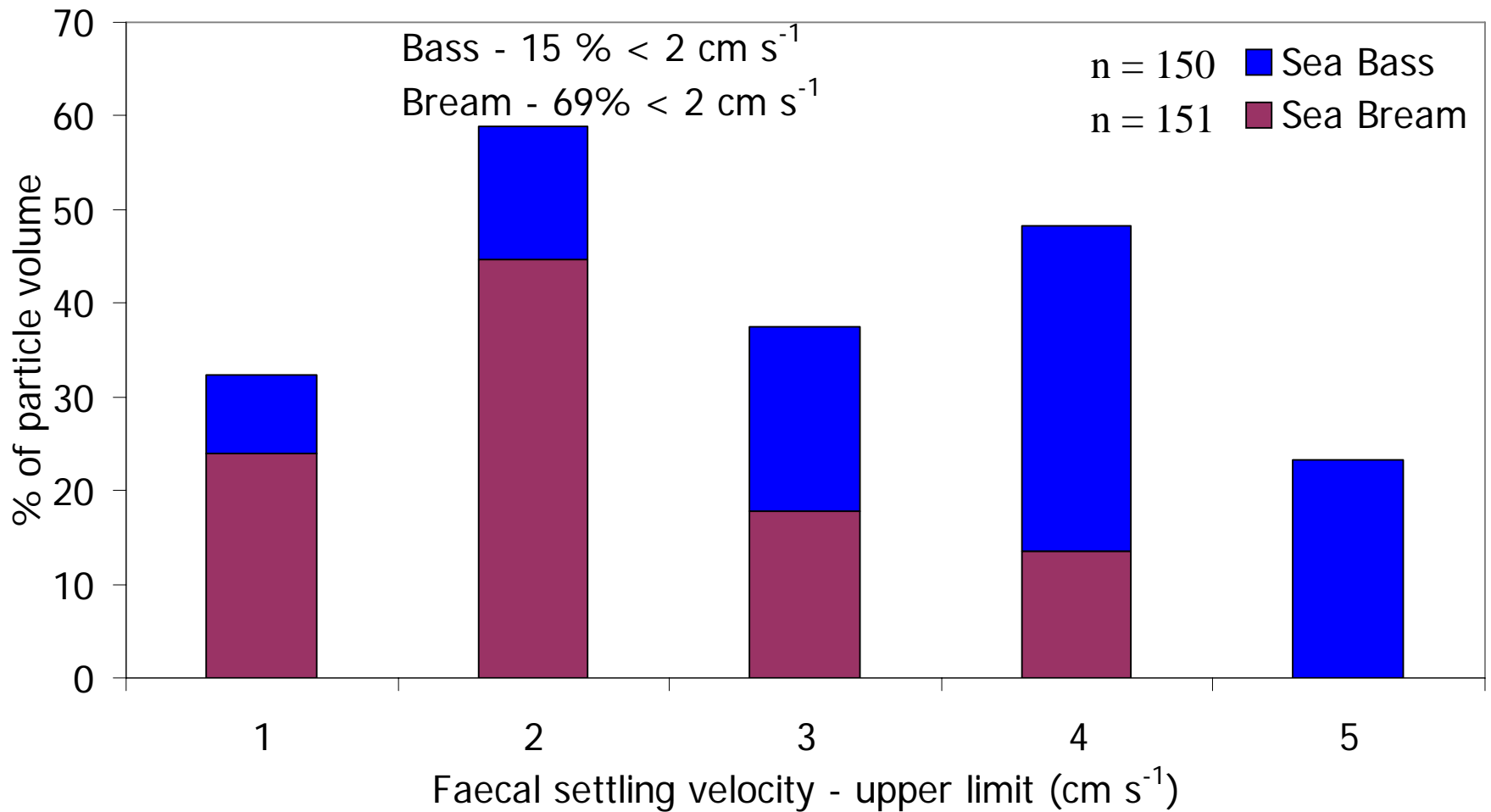
Sea Bream faeces



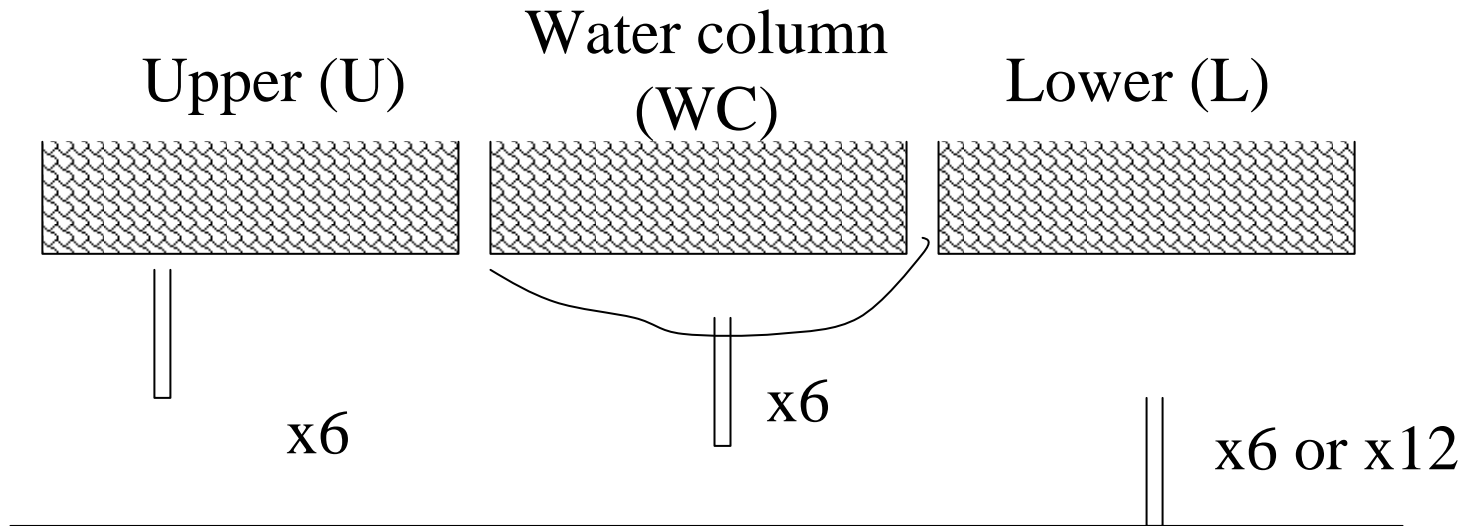
Magill SH, Thetmeyer H and Cromey CJ. 2006. Settling velocity of faecal pellets of gilthead sea bream (*Sparus aurata* L.) and sea bass (*Dicentrarchus labrax* L.) and sensitivity analysis of measured data using a deposition model. *Aquaculture* 251, 295-305

Settling velocity experiments

- Bass and Bream have different distributions



Sediment trap experiments (model validation)



75 cm

H:D = 5:1 ratio



1. Deploy

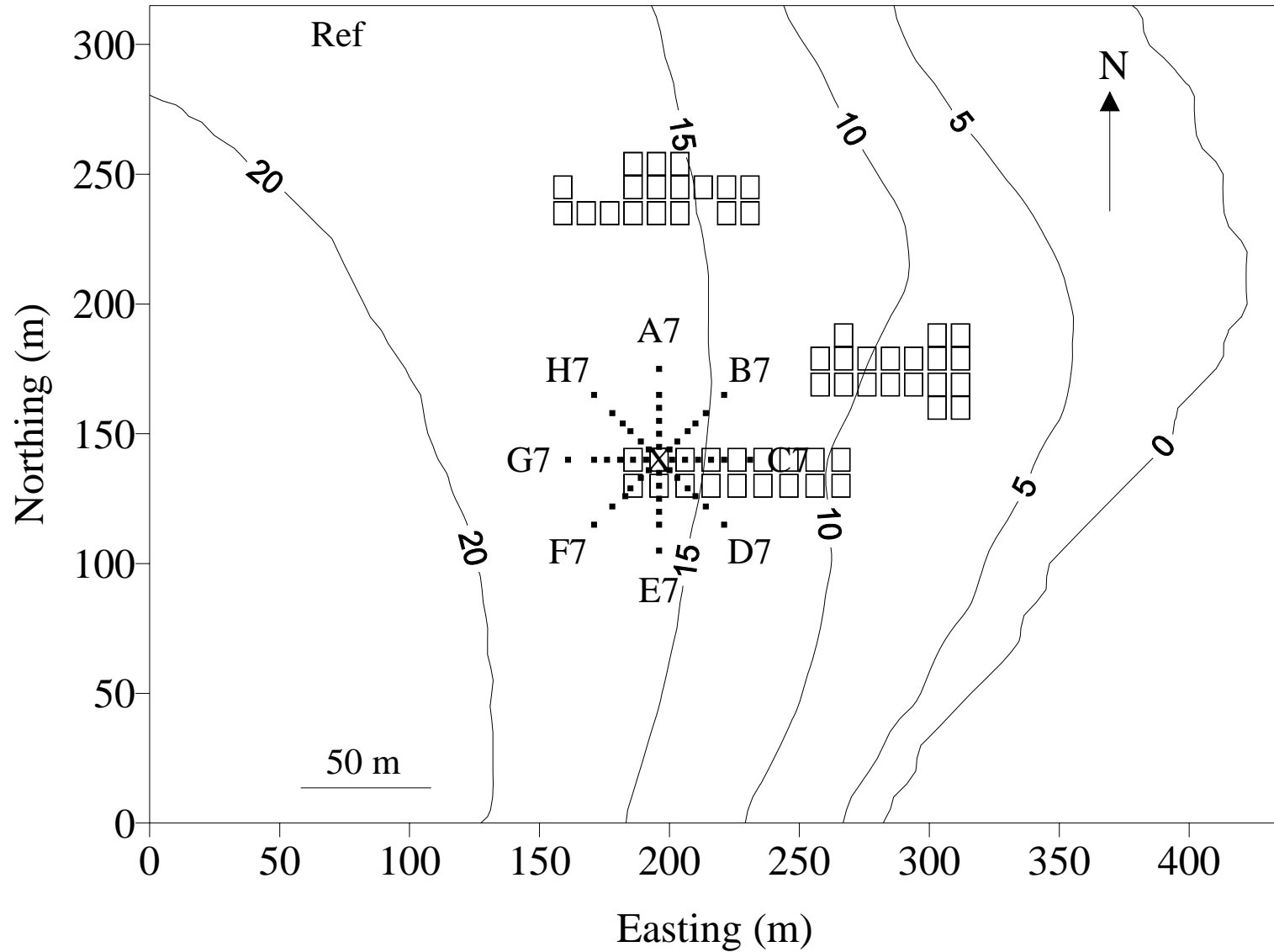
2. Retrieve, filter, dry

3. Calculate observed flux

(total waste particulate material
= $\text{g solids m}^{-2} \text{d}^{-1}$)

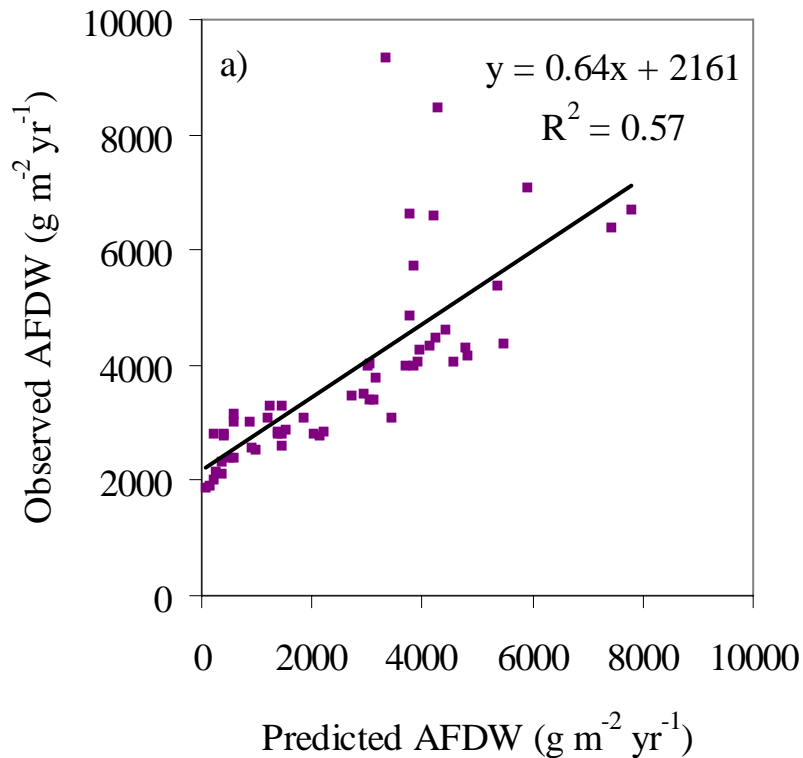
4. Check calculation

Sediment trap validation study - model grid

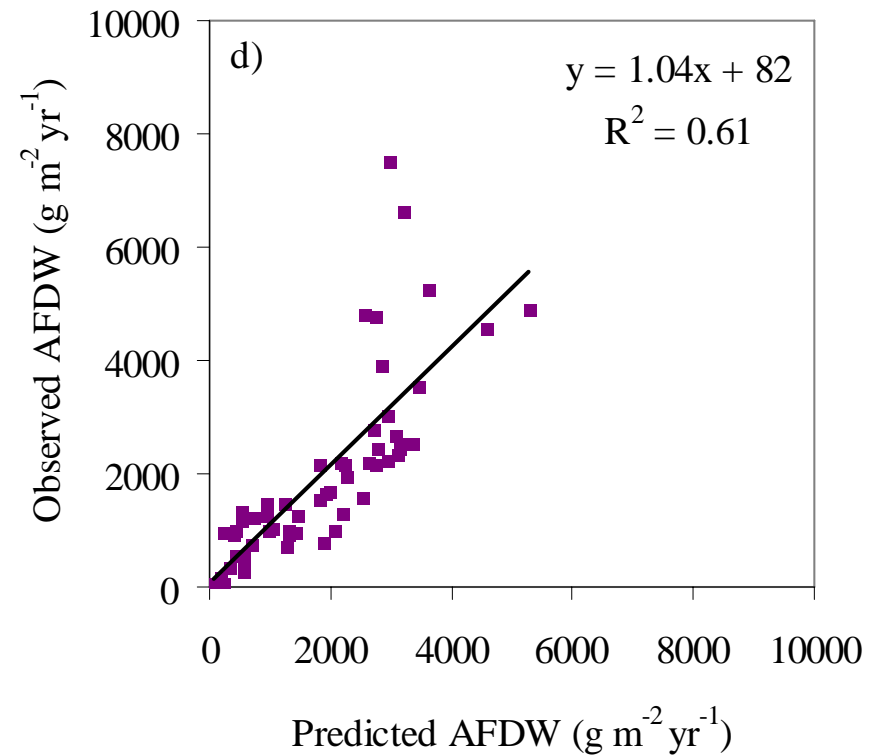


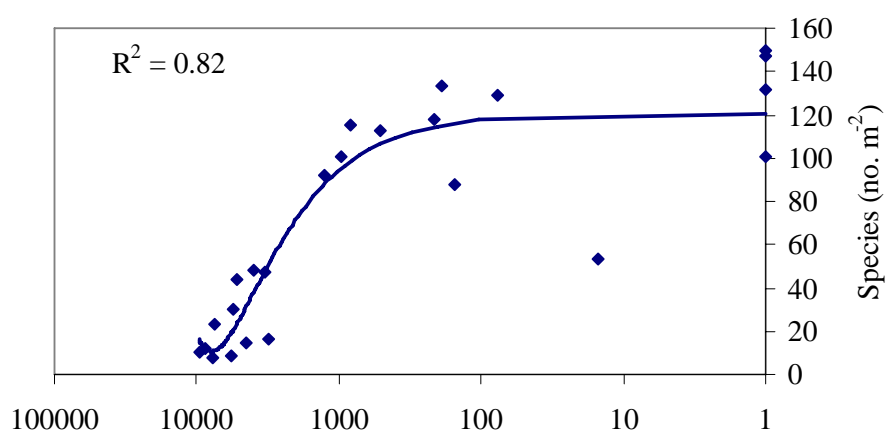
Observed versus predicted flux (n=60)

First run

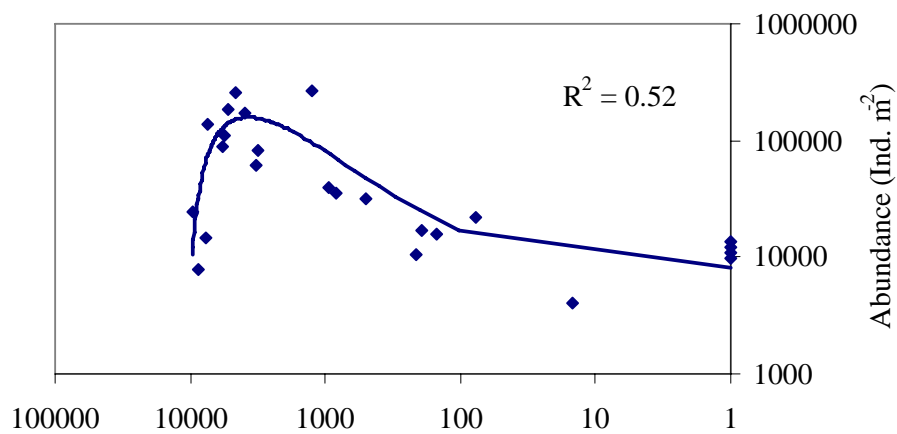


Minus background sedimentation
+ 50 % removal pellets (improvement)

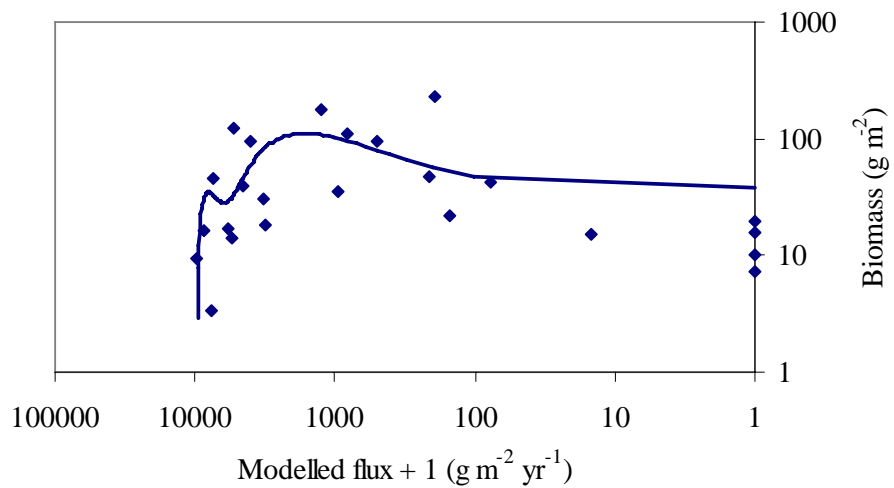




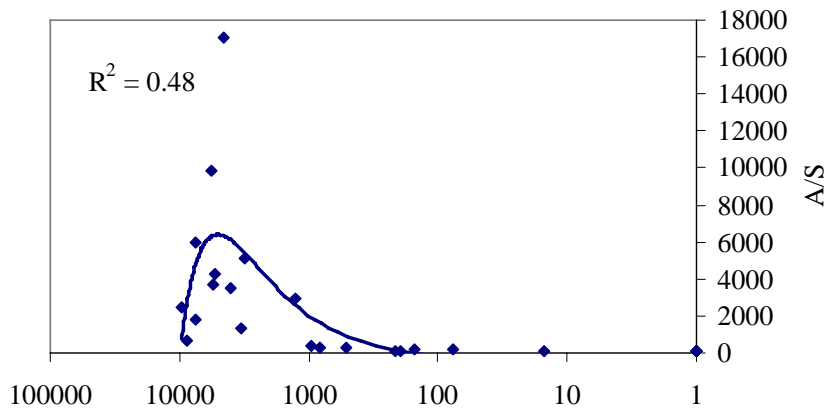
SPECIES



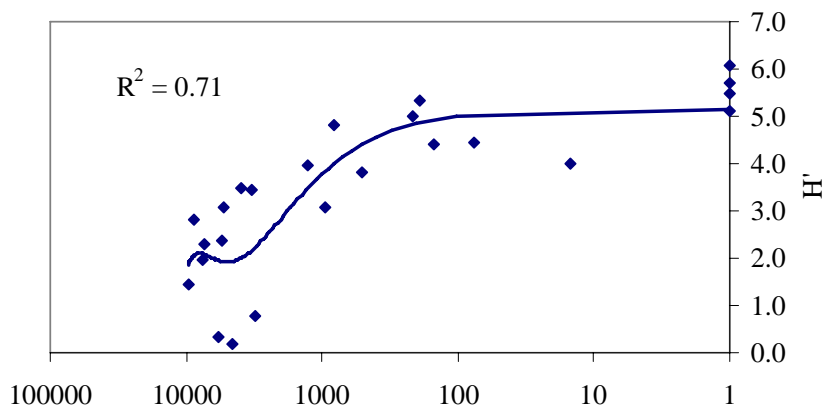
ABUNDANCE



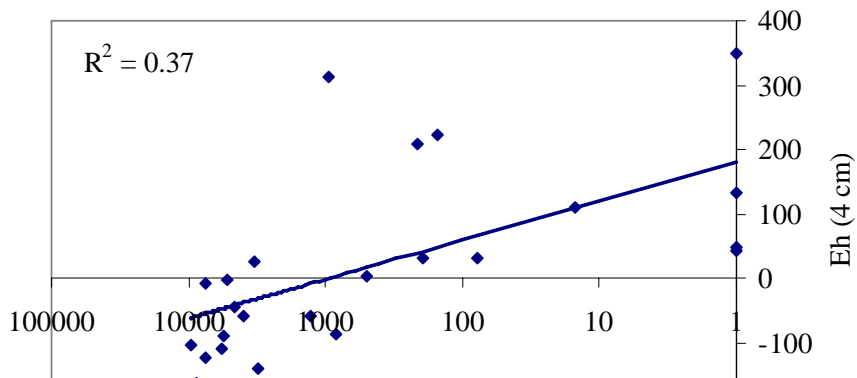
BIOMASS



A/S



SHANNON WEINER



Eh (4cm)

Limitations of model

- Current spatially homogenous. Does exported material redeposit and cause impact? - see Doglioli et al 2004
- Shore line effects, wind-wave resuspension, coarse hard sediments

Finally...what are current gaps and future research needs?

- Biochemical module - e.g. oxygen demand, carbon degradation rates
- Spatially varying grids and processes (e.g. bioturbation, resuspension)
- (ECASA Project - www.ecasa.org.uk)
- Other species (e.g. Cod - talk on Saturday) and environments (e.g. Asia - new project in the Philippines)

For further information

- www.sams.ac.uk
- Email Chris.Cromey@sams.ac.uk
- See posters.



MERAMED