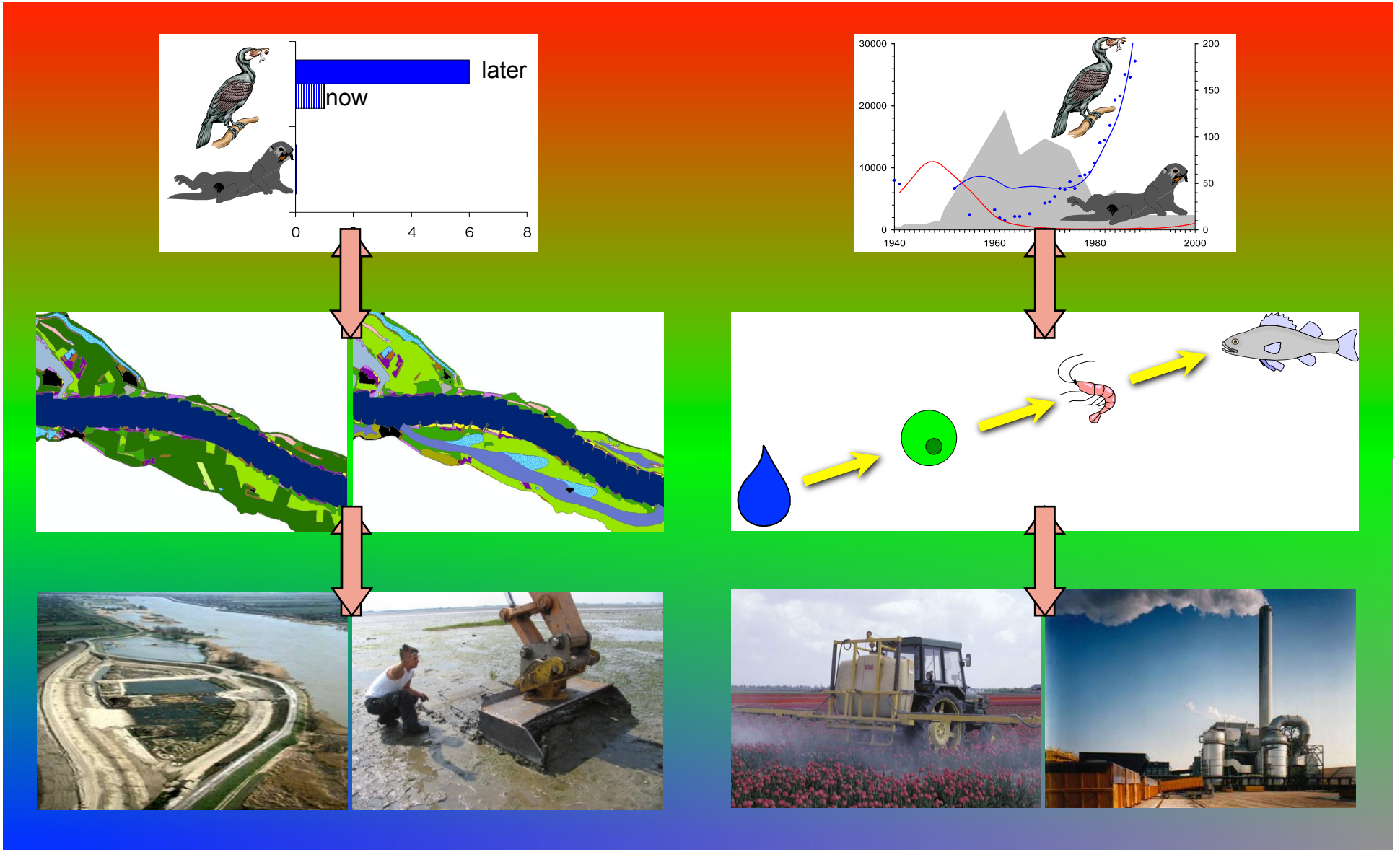
DEPARTMENT OF ENVIRONMENTAL SCIENCE
FACULTY OF SCIENCE

Multistress

Radboud University Nijmegen

Theoretical concepts: models



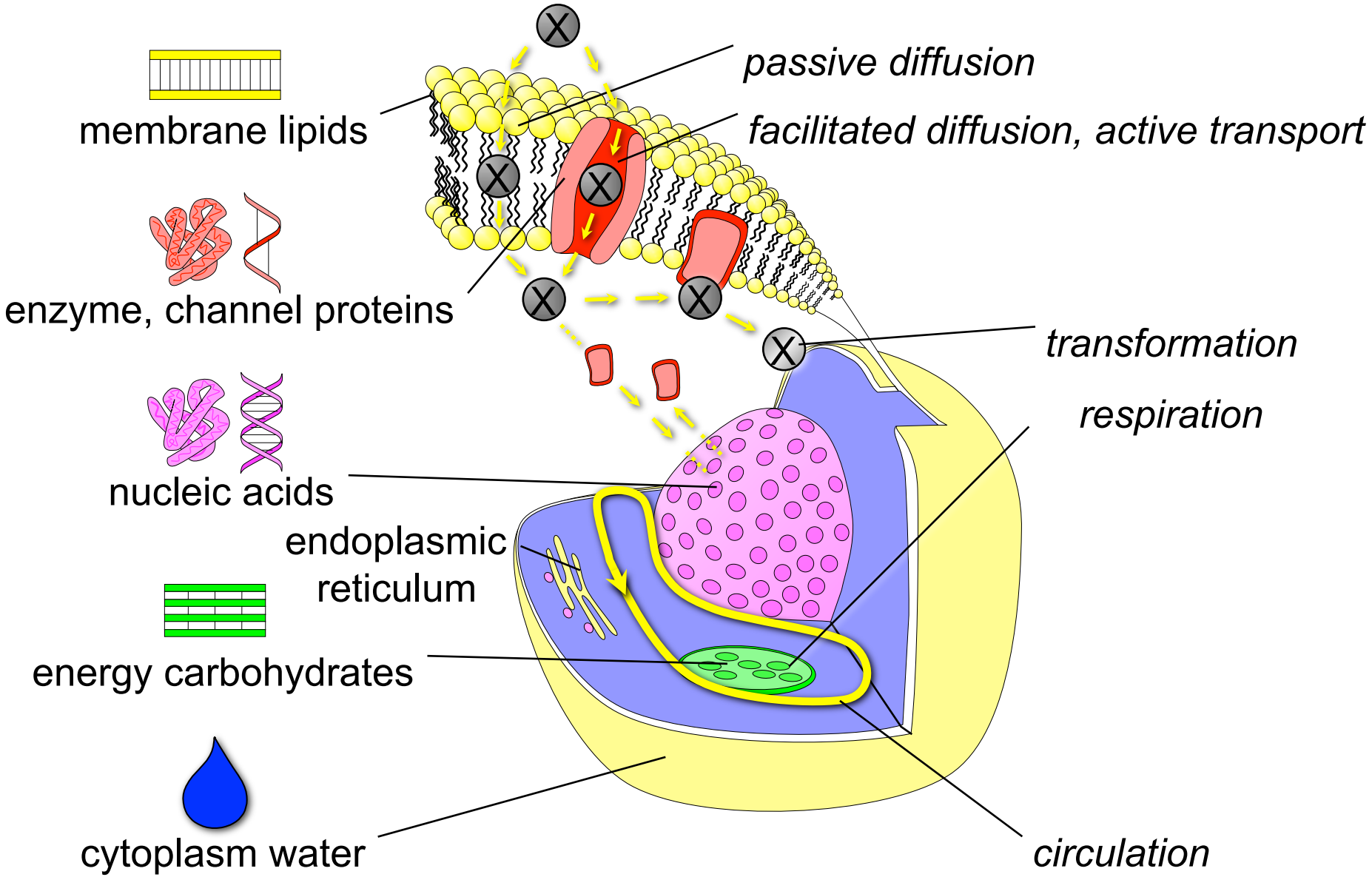
Scope

1000^{+} physical-chemical stressors → 1000^{+} ecological responses

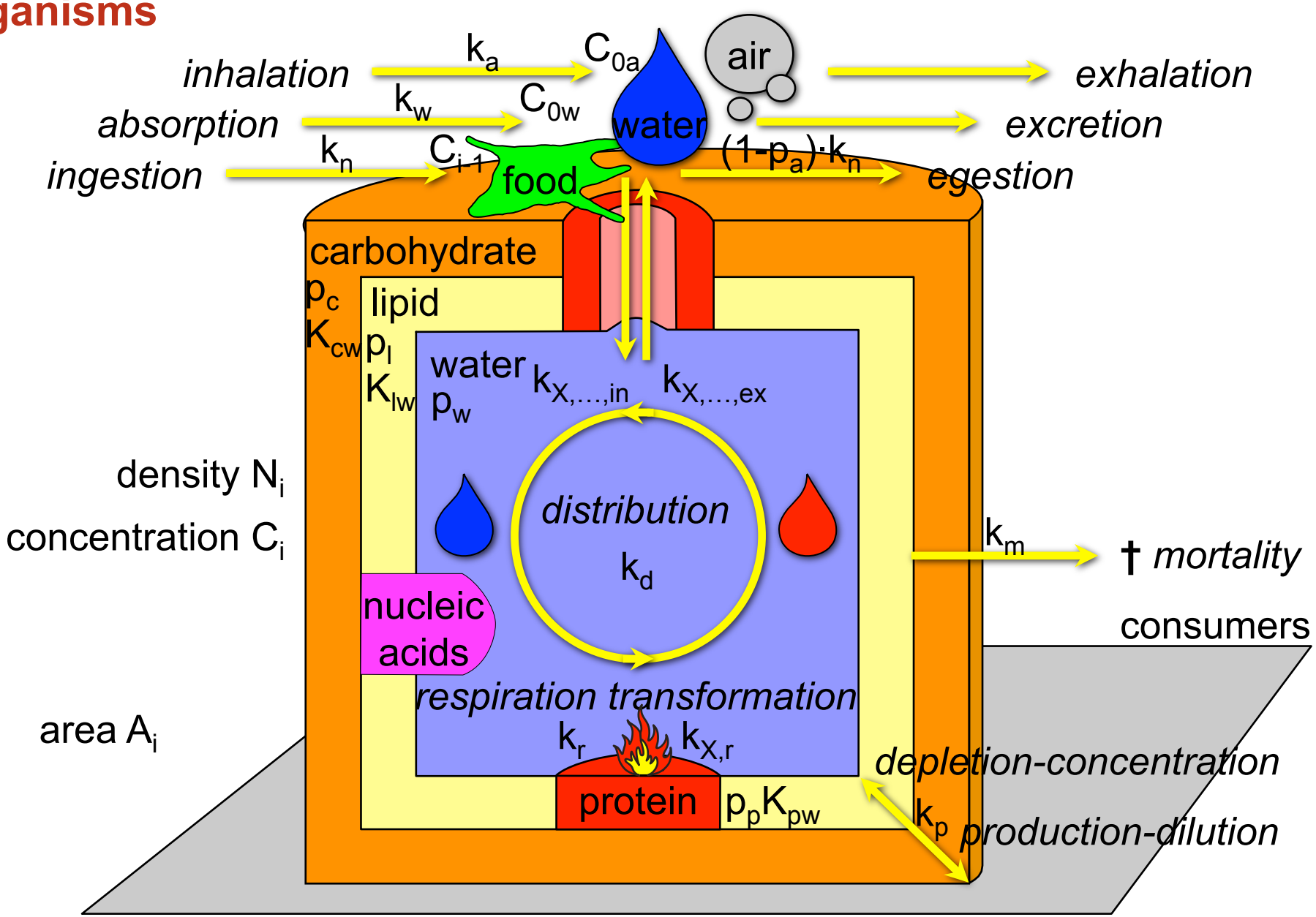
theoretical concepts (models) ↔ empirical cases (lab-field, river-estuary)

describe → understand → **predict**

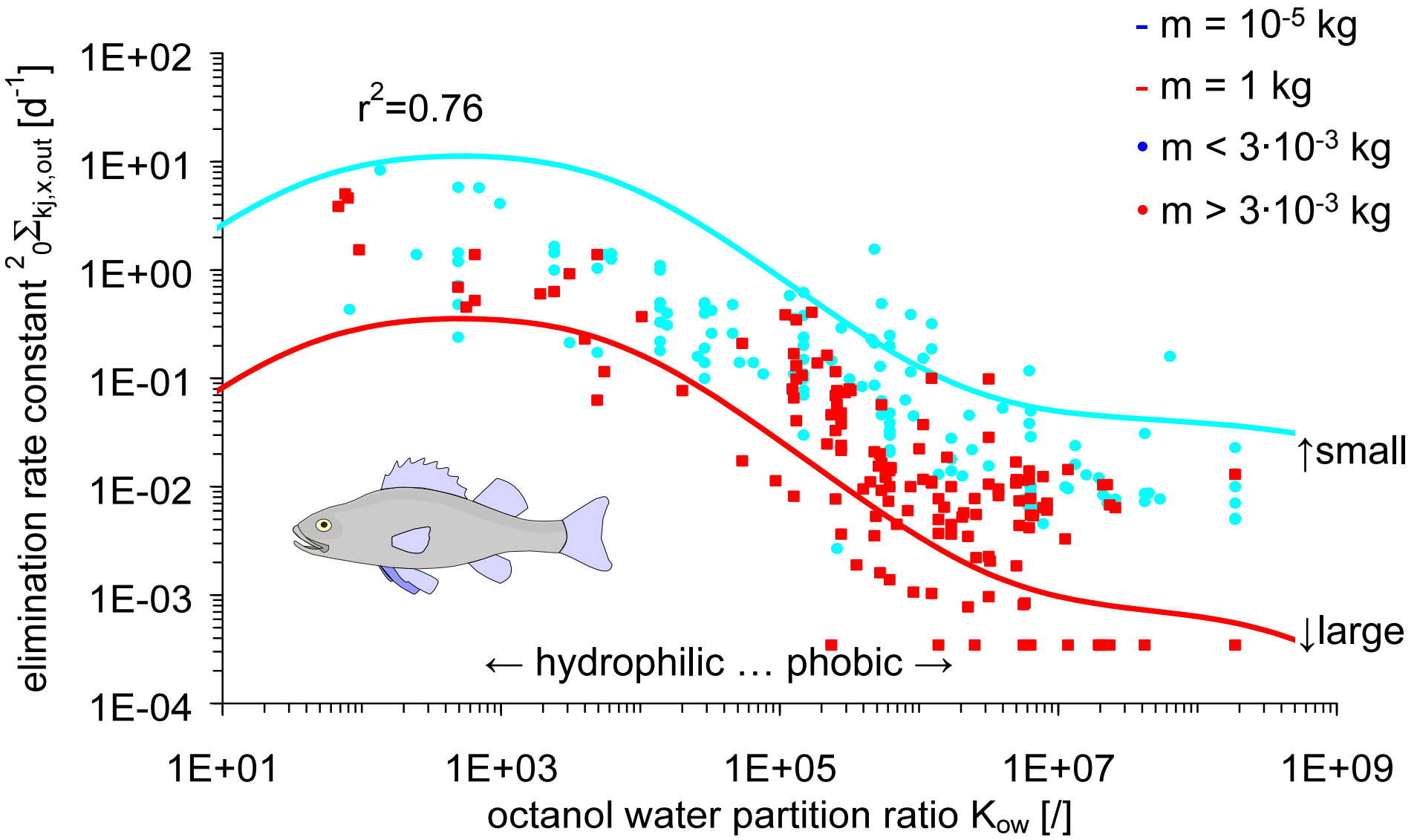
Cells


membrane lipids
enzyme, channel proteins
nucleic acids
endoplasmic reticulum
energy carbohydrates
cytoplasm water
passive diffusion
facilitated diffusion, active transport
transformation
respiration
circulation

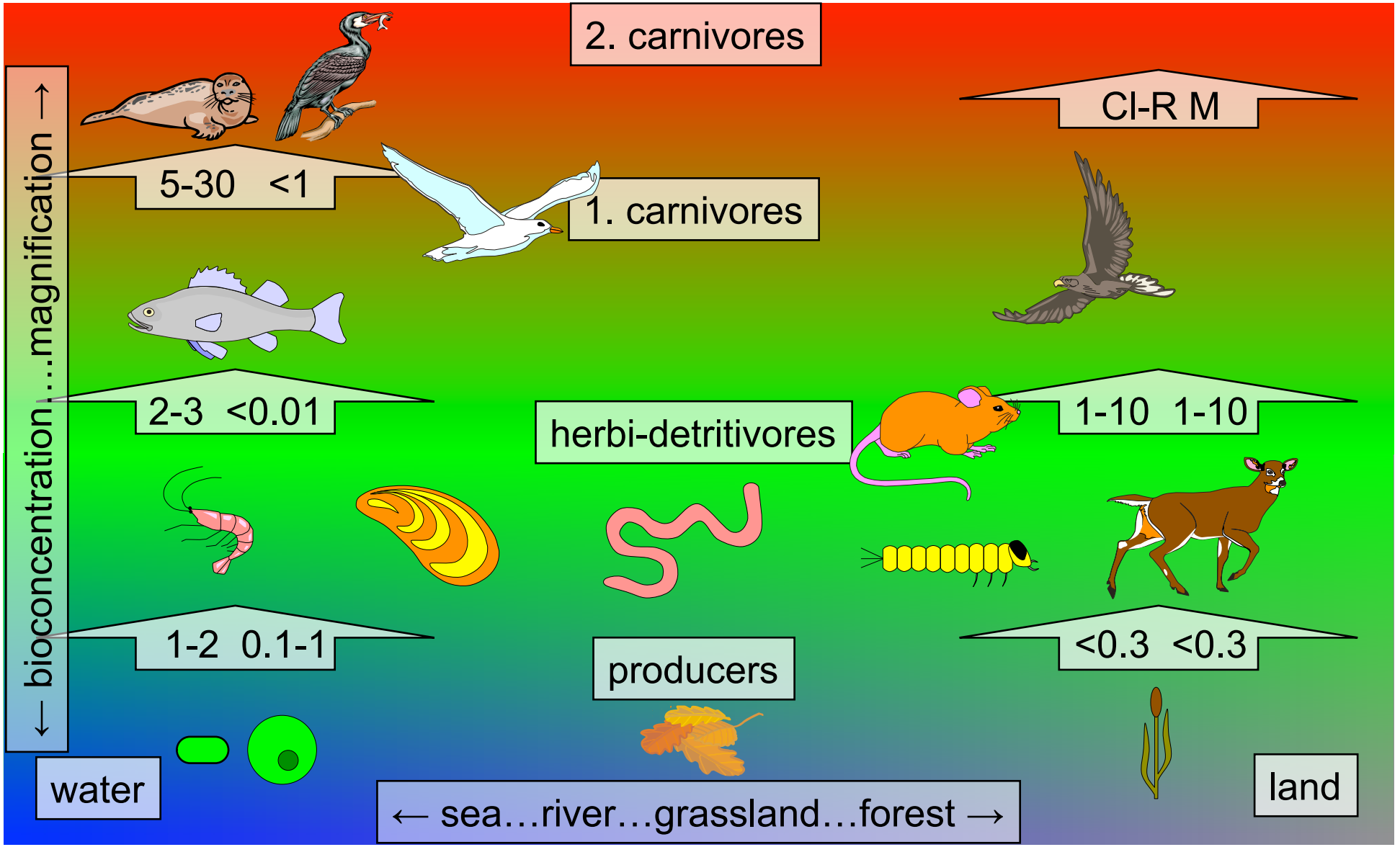
Organisms


inhalation
k_a
C_{0a}
air
exhalation
absorption
k_w
C_{0w}
water
excretion
ingestion
k_n
C_{i-1}
food
$(1-p_a)\cdot k_n$
egestion
carbohydrate
p_c
lipid
K_{cw}
p_l
K_{lw}
water
p_w
$k_{X,...,in}$
$k_{X,...,ex}$
density N_i
concentration C_i
distribution
k_d
k_m
† mortality
consumers
nucleic acids
respiration transformation
k_r
$k_{X,r}$
area A_i
protein
$p_p K_{pw}$
depletion-concentration
k_p
production-dilution

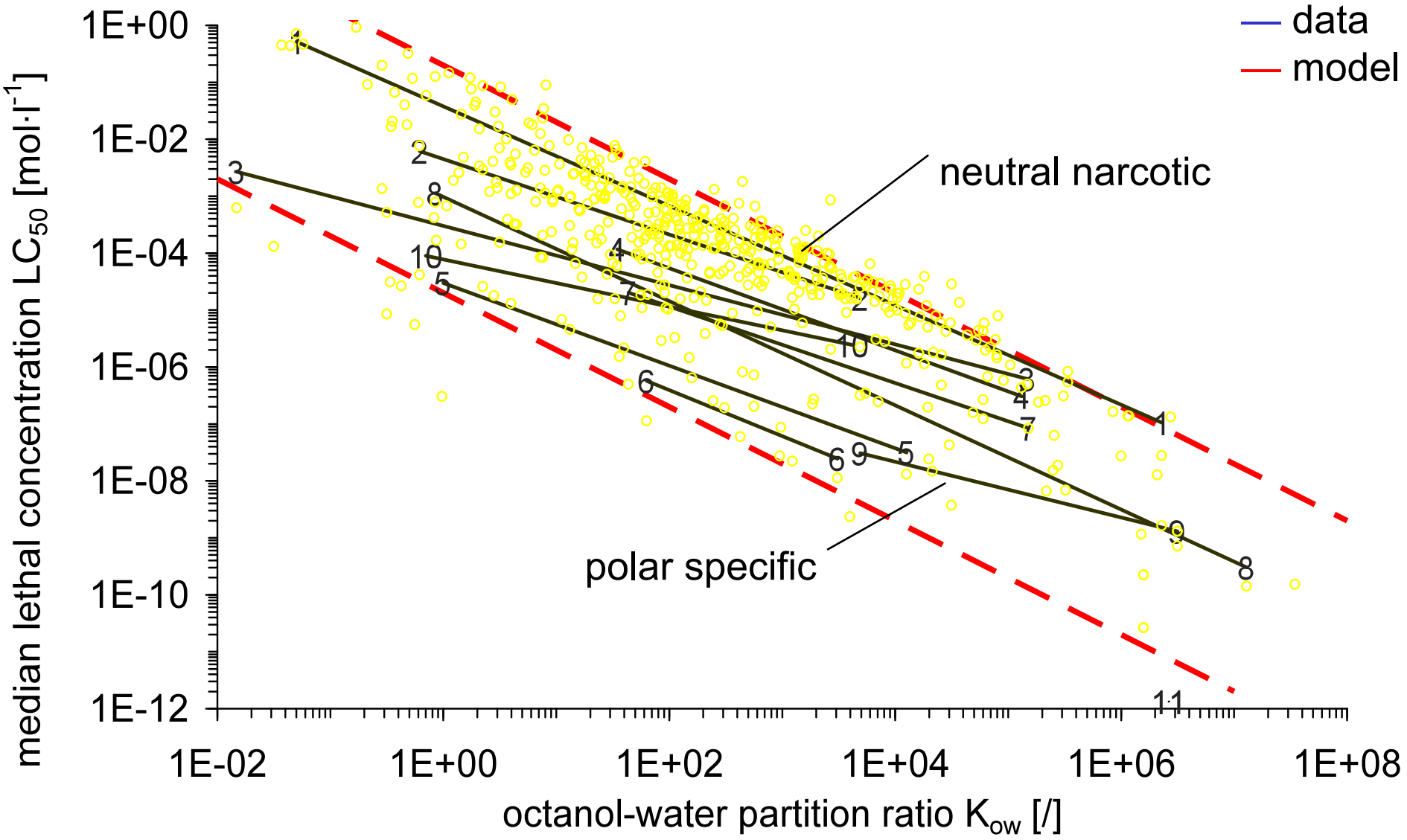
Elimination $k_{X...ex} \propto m^{-\kappa}$, $K_{ow}^{-1..0}$



Organism-food magnification $C_i/C_{i-1} \propto i$

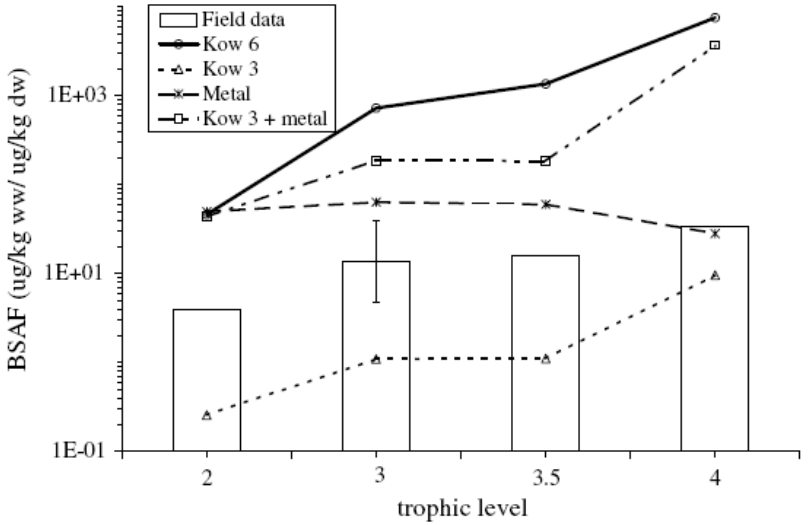


Critical water concentration $LC_{50} \propto K_{ow}^{0...-1}$



Recent and future developments

- away from traditional descriptors (K_{ow})
  - chain length (PFOS)
  - covalent index (metals)
  - Abraham type descriptors? (coatings)
  - size (nanomaterials)



- review of uptake/elimination pathways of biotic compounds that are relevant for xenobiotic compounds
- mechanistic understanding translate to new descriptors
- incorporate in accumulation/toxicity modelling
- RA&LCA: NOMIRACLE, LC-IMPACT, PROSUITE, NANOINTERACT, CADASTER, ...