

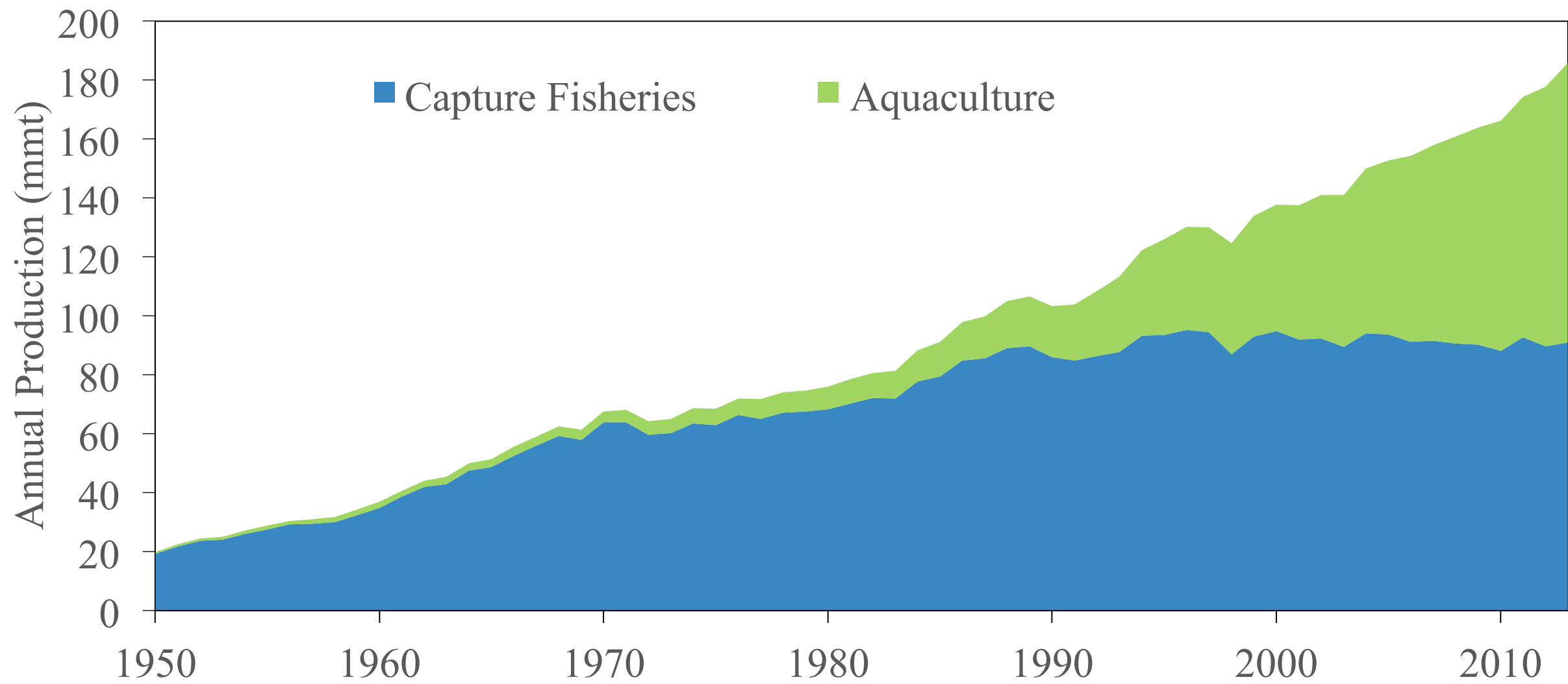
Global view of climate change and
predicted pest/pathogens pressures

Aquaculture



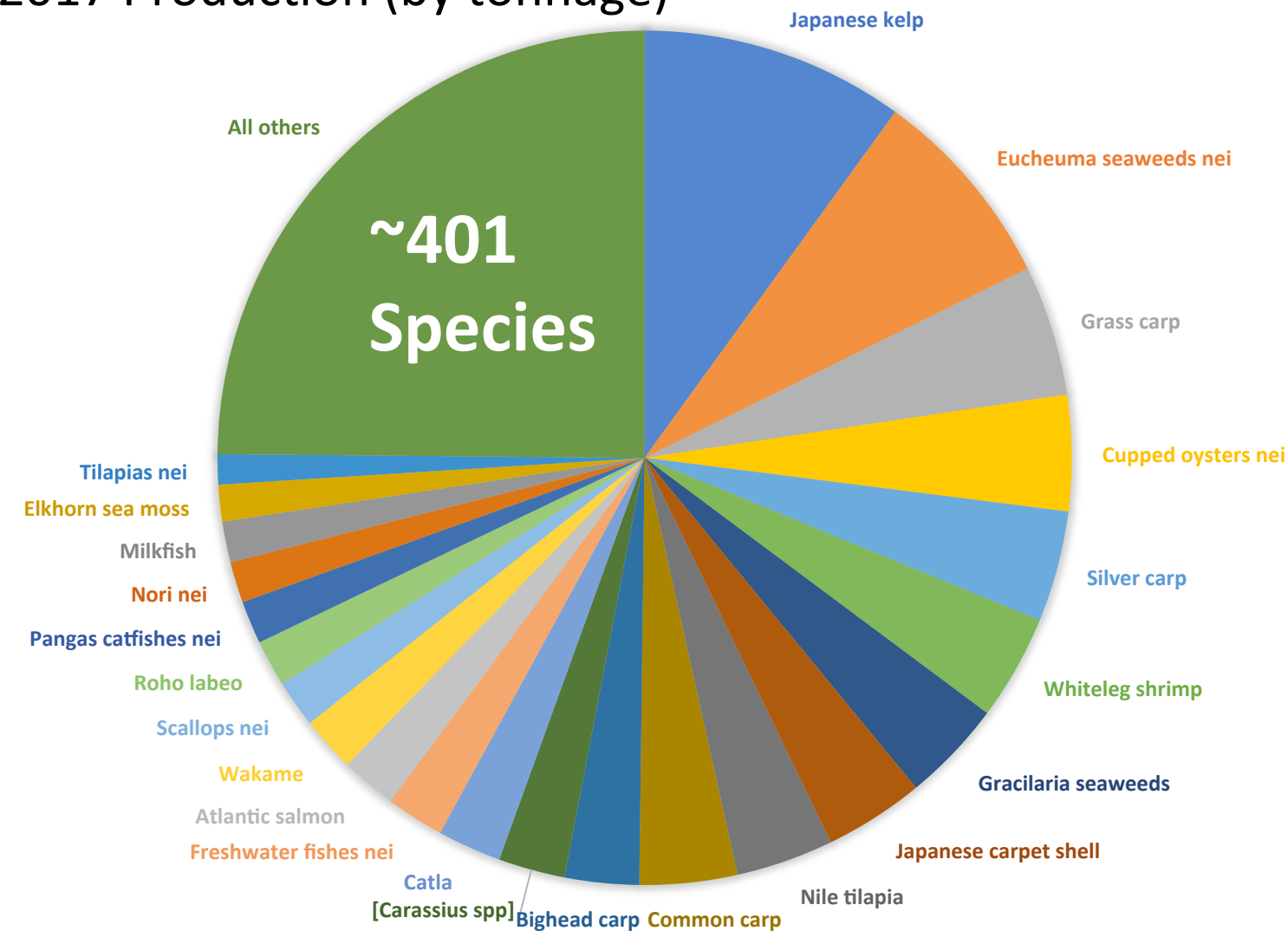
Photo by Binsar Bakkara

Global seafood production (1950 – 2017)



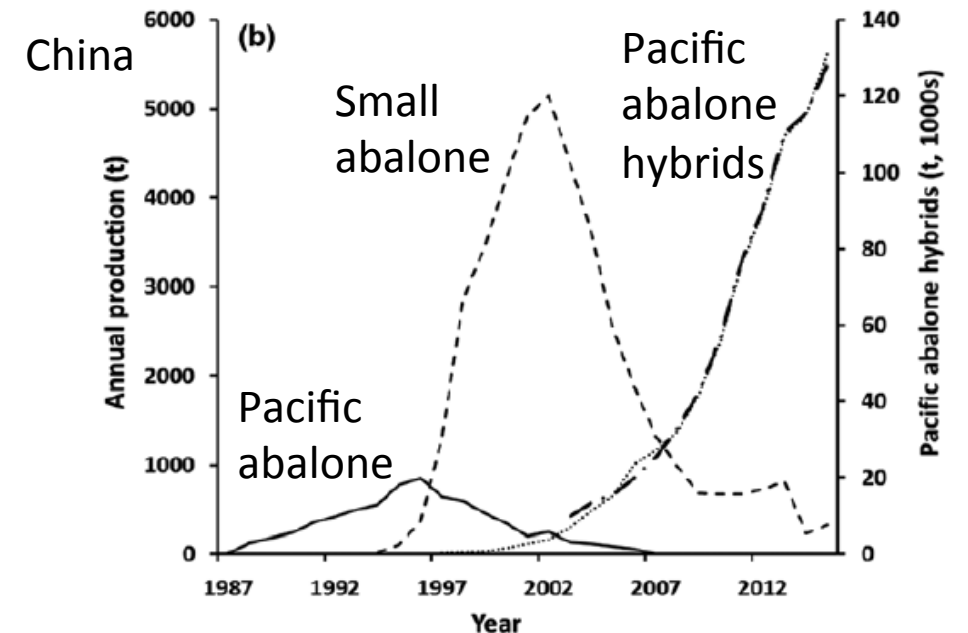
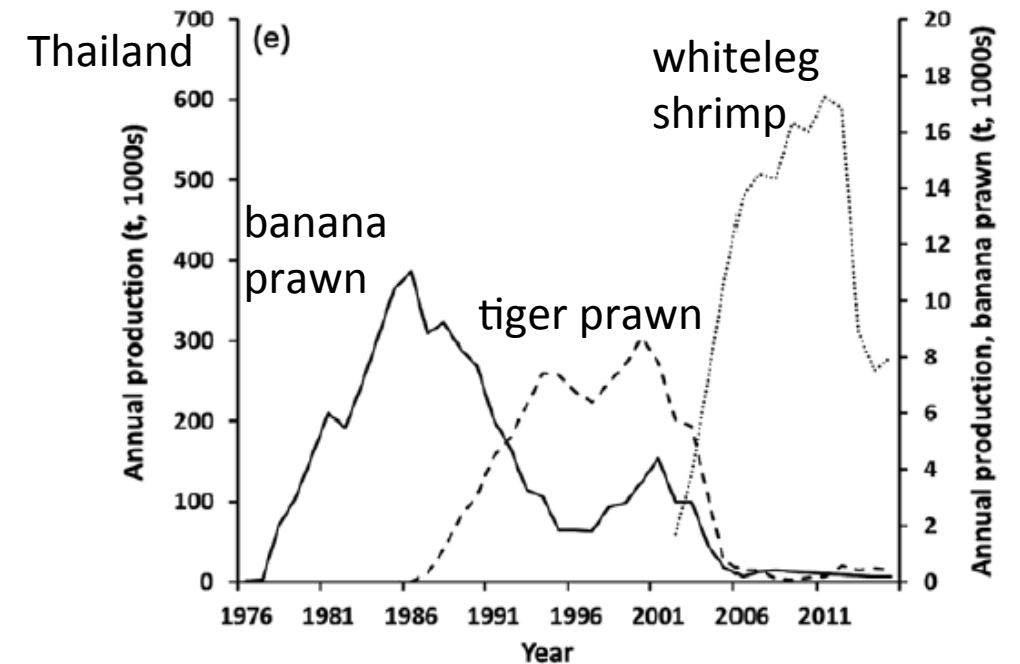
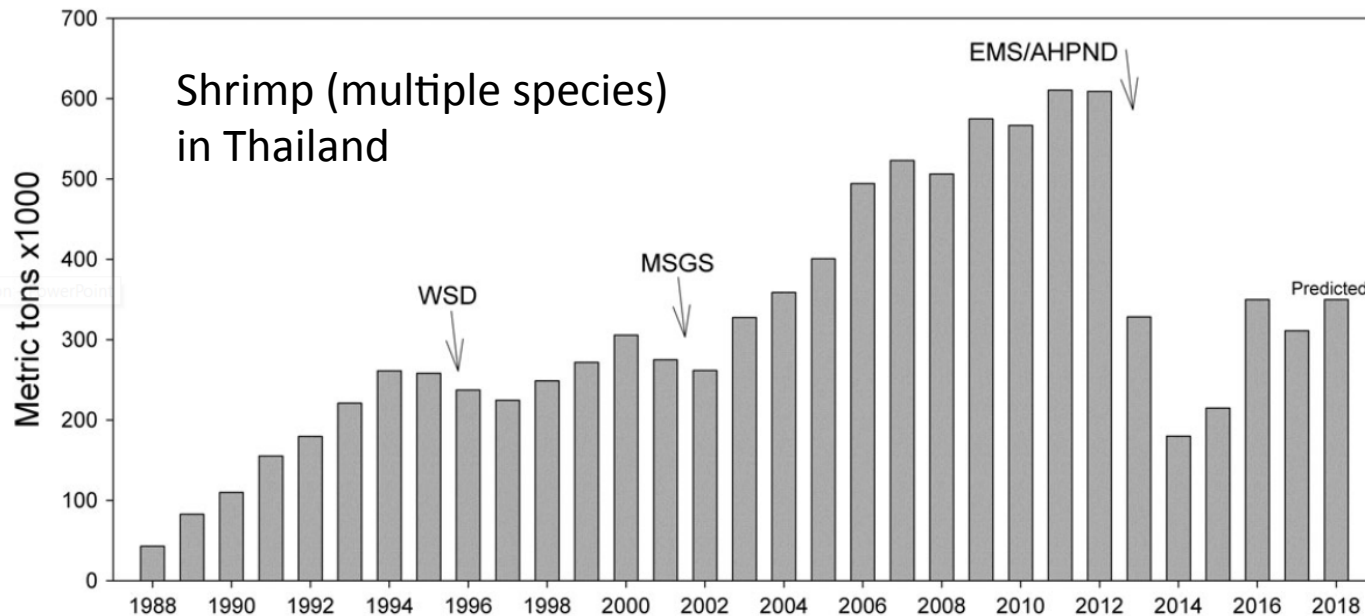
High diversity in the aquaculture sector

2017 Production (by tonnage)



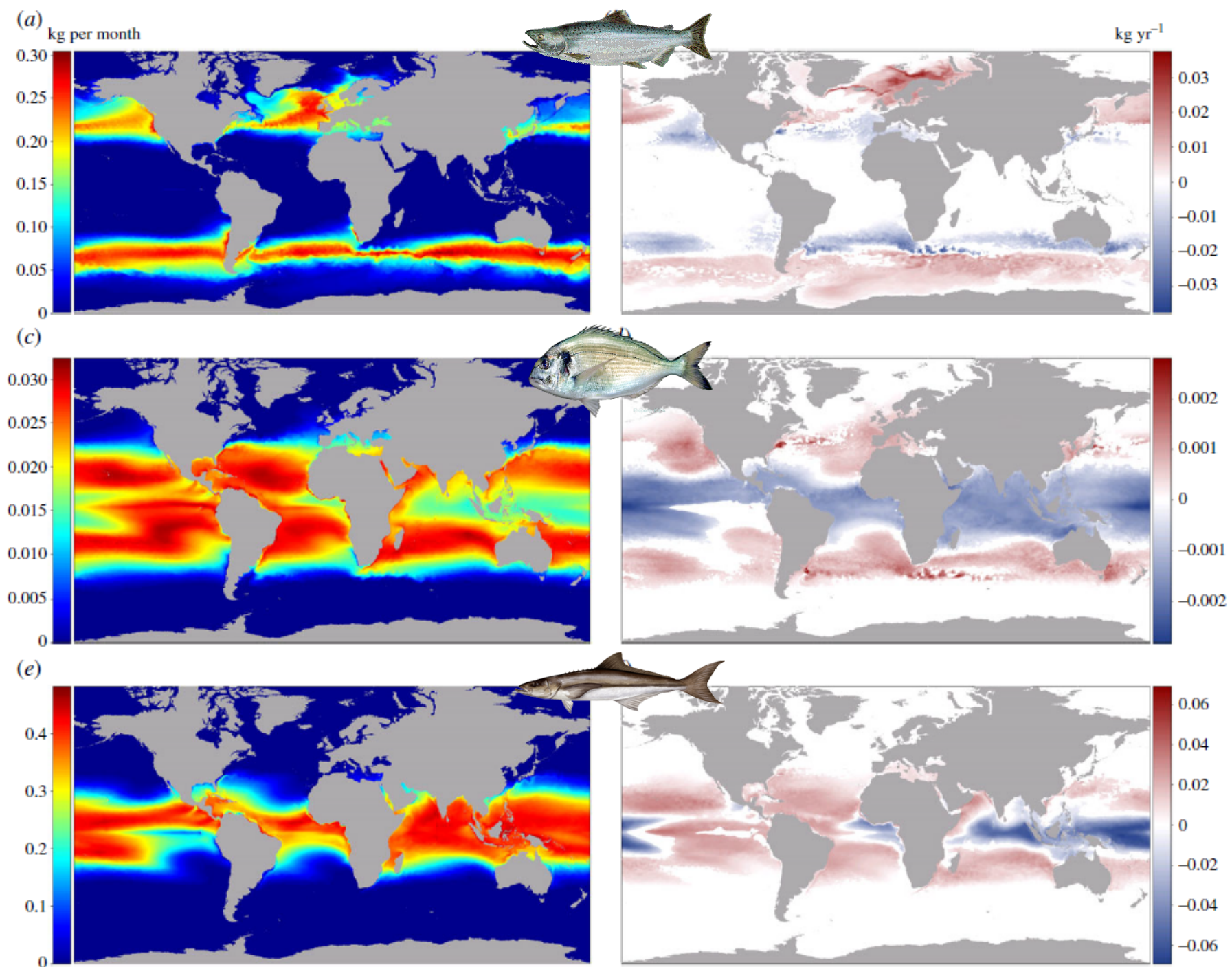
Pathogens in aquaculture

- Estimated \$6 billion in losses per year
- Boom and bust cycles

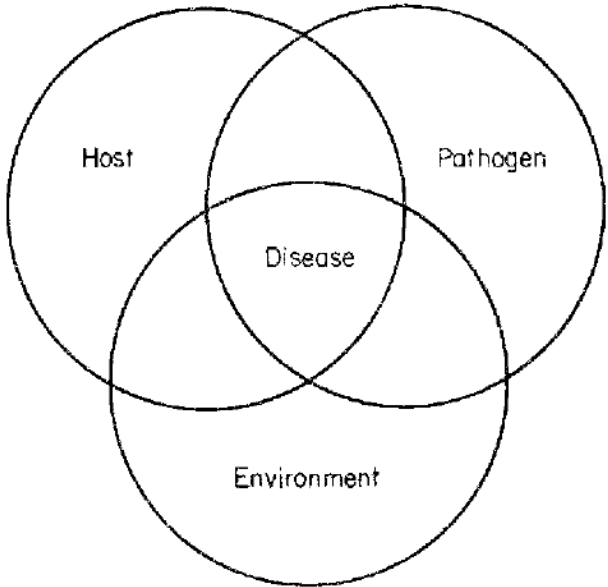


Climate change impacts on aquaculture


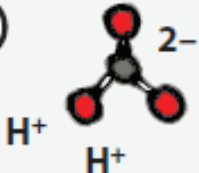


- Temperature
 - Sea level rise
 - Acidification
 - Eutrophication
 - Salinity
-
- Growth
 - Infrastructure
 - Health



Climate change impacts on host-pathogen-environment relationships



Snieszko 1974 *Journal of Fish Biol.*

Changes in host	Climate factor	Changes in pathogen
<ul style="list-style-type: none"> • Increased susceptibility • Change in behavior • Invasions • Range shifts 	① 	<ul style="list-style-type: none"> • Increased activity • Change in virulence • New emergence • Invasions • Range shifts
<ul style="list-style-type: none"> • Increased susceptibility (?) • Change in larval survival/recruitment • Change in behavior • Reductions in diversity (?) 	② 	<ul style="list-style-type: none"> • Change in virulence • Change in abundance
<ul style="list-style-type: none"> • Increased susceptibility • Nutrient stress • Salinity stress • Contaminant stress 	③ 	<ul style="list-style-type: none"> • New emergence • Change in virulence • Invasions • Range shifts • Increased nutrients
<ul style="list-style-type: none"> • Increased susceptibility • Physical injury 	④ 	<ul style="list-style-type: none"> • New emergence • Invasions • Range shifts • Mixing/resuspension of particles

Aquaculture management in the face of pathogens and climate change

- Management unit
 - Farm level
 - Avoidance, detection, anti-pathogen measures
 - Zonal/regional level
 - Communication, reporting, regulation
- Challenges
 - # of species and production systems
 - Small margins
 - Lack of consolidation
- Focus on resiliency

