Food and Agriculture Organization of the United Nations

Microbial management protocols to reduce antimicrobial resistance and as part of good aquaculture practices

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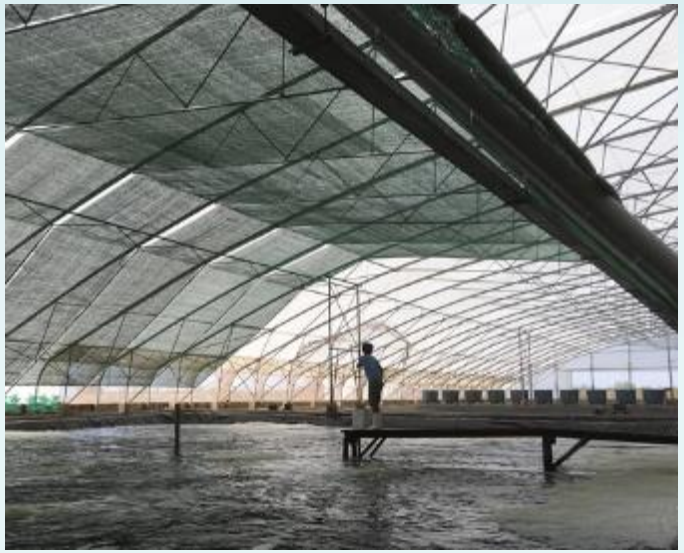

FAO COFI Webinar **"Innovative biosecurity approaches for a healthier aquaculture industry"**
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Current perception of microbial management

disinfection followed by **probiotics**

Essential in biosecurity protocols and in disease prevention

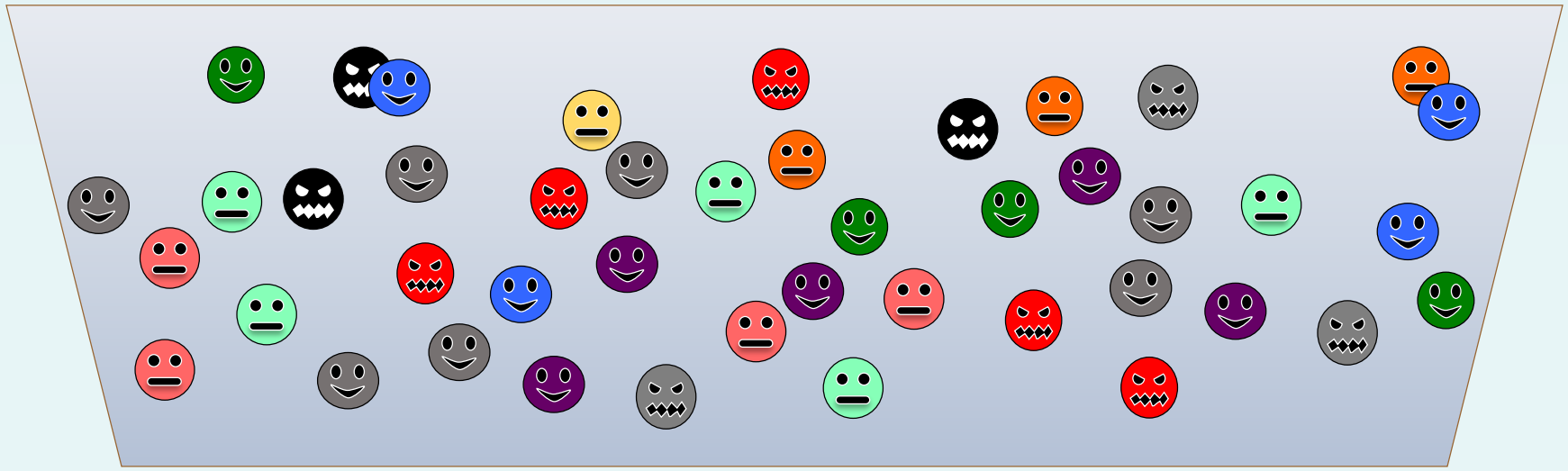
Considered the main way to install good bacteria in the system

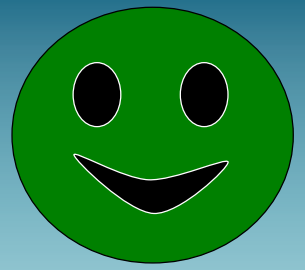
it is a good start, but we can do better…

… but then we have to understand what happens in the water

Efficient disinfection leads to very low microbial load (eliminates both good and bad bacteria), but also

high $\frac{\text{amount of substrate}}{\text{number of bacteria}}$ ratio at first period after stocking



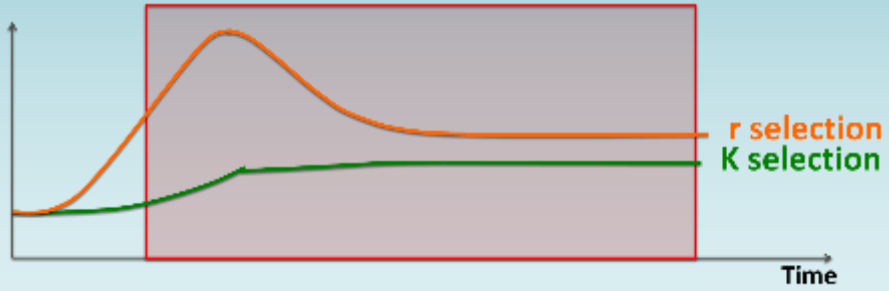


	r-strategist bacteria	K-strategist bacteria
Importance for shrimp & fish	Dangerous; often opportunistic pathogens (typical example: **Vibrios**)	Generally harmless
When can they dominate?	Low competition = high substrate/bacteria ratio Unstable environmental conditions	High competition = low substrate/bacteria ratio Stable environmental conditions

… so although necessary, disinfection leads to conditions that may initially support dominance of opportunistic pathogens

… and using probiotics helps, but may not always be enough to control the bloom of opportunistic pathogens

The balance between r-strategists and K-strategists determines risk for bacterial interference, but is unpredictable



Even with disinfection and probiotics, *Vibrio* may still be present in such levels to switch on virulence by **quorum sensing**:

- Luminescent vibriosis
- Zoea-2 syndrome
- Bolitas
- AHPND
- …

empirical observations

Systems that are less affected by unpredictable diseases:

- **lower substrate/bacteria ratio**
- **create microbial stability**

Recirculation Systems

role of biofilter

empirical observations

Systems that are less affected by unpredictable diseases:

- **lower substrate/bacteria ratio**
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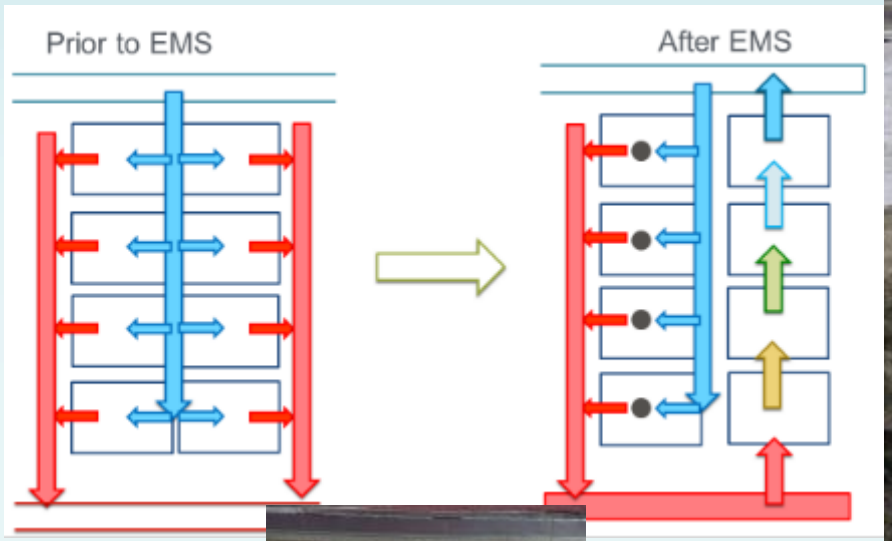
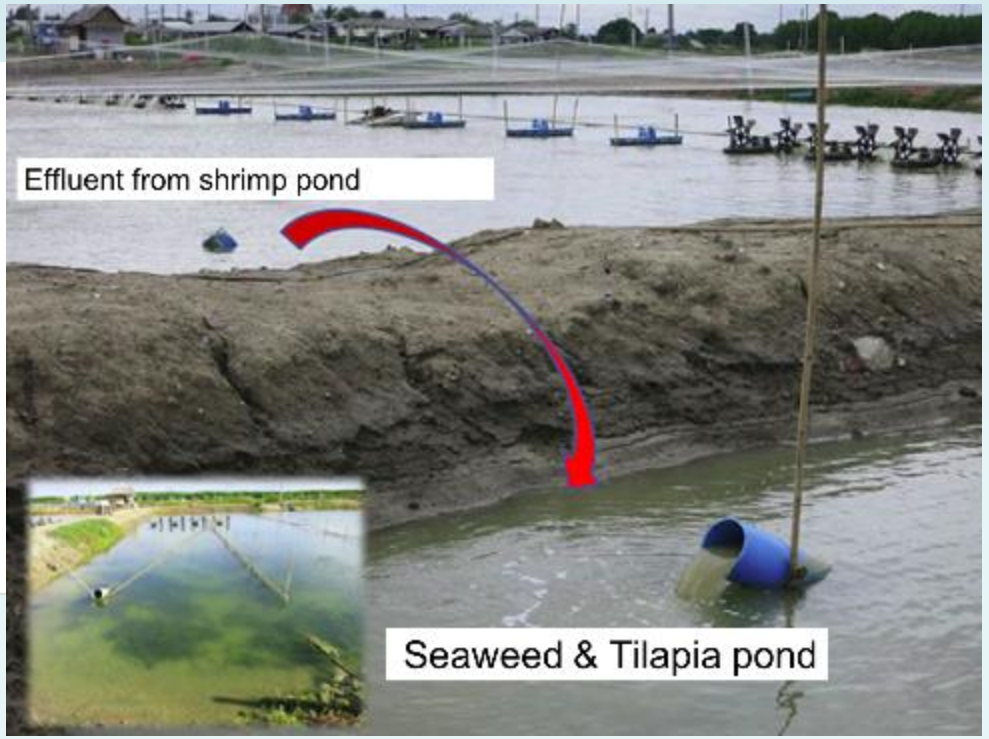
Integrated Farming Systems

role of different biota





Microbial Management as part of Good Aquaculture Practices

Present protocols = elimination (disinfection) & addition of bacteria (probiotics)

can be much improved in **system designs** & in **operations** to **ensure microbial stability**

Current knowledge mainly comes from *ad hoc* observations

Microbiome studies using advanced analysis tools are needed to provide further explanation and direction on **optimal microbial management approaches**

Thank you