



## Fish Health and Food Security

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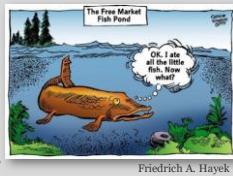
## Fish as Food

- Fish is a vital source of food for people
- Important source of high-quality protein (FAO, 2014)
- 20% of the animal protein consumed by the world's population



## Role of Fish in Aquatic Ecosystem

- Competition
- Predation
- Regulation of other aquatic organisms populations
- provide balance to ecosystems



## Role of Fish in Aquatic Ecosystem

- Contribute essential nutrients to their ecosystems.
- Role in nutrient cycling
- Help regulate the ecosystem's food web
- Transfer of energy up and down the food chain



Kolovich (2013)

## Role of Fish in Aquatic Ecosystem

- Increase primary productivity.
- Fish Migration from lakes to streams can introduce significant nutrients to stream
- The physical disturbance of sediments can influence the availability of food resources for other animals.
- Through excretion, they recycle the nutrients they take in, providing the fertilizer for sea grass and algae

(Wheeler, CC., "The Ecosystem Role of Fishes in Lotic Environments" (2014).

## Role of Fish in Aquatic Ecosystem

**ECOLOGY**  
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Note:

**Thresholds of ecosystem response to nutrient enrichment from fish aggregations**

Craig A. Layman ET, Jacob E. Allgeier, Lauren A. Yeager, Elizabeth W. Stoner

Article


**Consumers regulate nutrient limitation regimes and primary production in seagrass ecosystems**

Jacob E. Allgeier ET, Lauren A. Yeager, Craig A. Layman


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### Threats to Fish Health




Pollution




Habitat Alteration




Climate Change



Loss of Biodiversity



Introduced Species






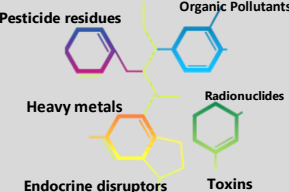
Source: Google Image

### Pollution

- Biological agents


- Chemical substances

 Bacteria  
 Virus  
 Parasite




### Pollution

- Human/domestic wastes
  - saturates the water and stops the normal functioning of the ecosystems
  - associated pathogenic microorganisms and parasites
  - heavy metal
- Agricultural runoffs - pesticides and fertilizers (Nitrates and Phosphates)
- Endocrine disruptors
- Eutrophication
  - excessive algal
  - depletion of dissolved oxygen
  - death of living organisms




### Habitat alteration

- Creation of dams
- Recreation
- Draining and conversion of wetlands
- Quarrying
- Aquaculture



### Introduction of exotic species

- Habitat modification
- Compete with native species for resources
- Predation of native species
- Herbivory on native plants
- Bring in pathogens
- Hybridize with natives, leading to loss of genetic diversity




*Chitala sp.*

### Loss of Biodiversity

**Biodiversity** boosts ecosystem productivity where each species, no matter how small, all have an **important role** to play.

Greater species diversity ensures natural sustainability for all life forms

- Removal of lobster - Urchin bacterial disease outbreak
- Removal of sea otters - Rickettsial disease outbreak in black abalones



### FISH ARK PROJECT (DOST)

Fish Ark Philippines: Direction for the Conservation to Native and Endemic Philippine Freshwater Fishes (PP Ocampo and VGV Paller)

### Climate Change

- projected increases in temperature, sea level and precipitation variability
- semi-arid and arid areas
- exacerbates many forms of water pollution
- affects the function and operation of existing water infrastructure as well as water management practices



IPCC: Freshwater resources and their management. 2007

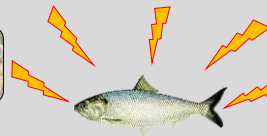
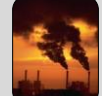
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### Environmental disturbances

- Affect development and life cycles
- Immunosuppression
- Reduce reproductive capacity – gonad development, feminization of fish
- Poor metabolic activity
- Imbalance physiological homeostasis
- Morpho-anatomical abnormalities



### Threats to Fish Health



Source: Google Image

### Fish Life Stages

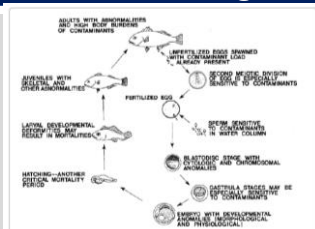


Figure 10: Points in the life cycle when fish are especially sensitive to pollutants [26]

### Anatomical Abnormalities

- Split fins
- Scale disorientation (including thickened and deformed scales)
- Hyperplasia of the surface of the mouth,
- Muscle atrophy
- Opercular deformity,
- Gill deformity (including gill raker, gill arch, and gill filament deformities)



Source: Google Image

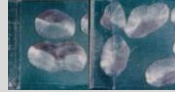
## Anatomical Abnormalities

- Eye deformity (including the subcategories of exophthalmia, concave eye, small eye, blindness, lens deformity, and opaque cornea),
- Skeleton deformity (including vertebral and skull deformities),
- Outward protrusion of the lower lip
- Tumors and other swellings,
- Jaw deformity (including one or two sides of the jaw having



Source: Google Image

## Anatomical Abnormalities



Abnormalities in scales of *Oreochromis* spp.



Gill deformities in *Oreochromis* spp.



Reddened fins and skin due to a bacterial infection



Different Types of Skeletal Deformities in Tilapia

## Prone to Infection/Infestation

The collapse of shrimp industry in SEA associated with bacteria outbreak

AHPND – Acute hepatopancreatic Necrosis Disease  
EMS (Early Mortality Syndrome)

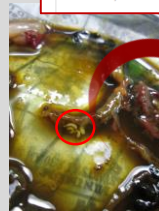
Koi Herpesvirus Disease is a viral disease of common carp, including all its ornamental varieties such as koi

Viral haemorrhagic septicaemia virus (VHSV)

Infectious haematopoietic necrosis virus(IHNV)

## HEMATOLOGY AND HISTOPATHOLOGY OF NILE TILAPIA (*Oreochromis niloticus* L.) INFECTED WITH ACANTHOGYRUS SP. (ACANTHOCEPHALA: QUADRIGYRIDAE)

Vachel Gay V. Paller, Ronald Allan R. Sy and Modesto Z. Bandal Jr.



Bull Environ Contam Toxicol. 2016 Jun;96(6):610-5. doi: 10.1007/s00128-016-1700-y. Epub 2016 Apr 6.  
**Acanthocephalan Parasites (*Acanthogyrus* sp.) of Nile Tilapia (*Oreochromis niloticus*) as Biosink of Lead (Pb) Contamination in a Philippine Freshwater Lake.**

Paller VG<sup>1</sup>, Basamocoron JD<sup>2</sup>, de la Cruz CP<sup>2</sup>, Bandal MC Jr<sup>2</sup>

**DISTRIBUTION PATTERN OF *Acanthogyrus* SP. (ACANTHOCEPHALA: QUADRIGYRIDAE) IN NILE TILAPIA (*Oreochromis niloticus* L.) FROM SAMPALOC LAKE, PHILIPPINES**

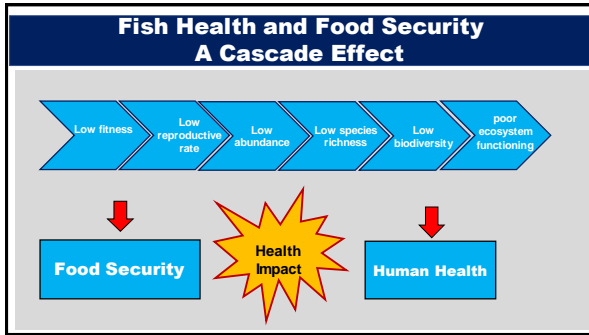
Christian Paul P. de la Cruz<sup>1\*</sup>, Modesto Z. Bandal, Jr.<sup>1</sup>, Angela Rosalina B. Avila<sup>1</sup>, and Vachel Gay V. Paller<sup>1</sup>

<sup>1</sup>Animal Biology Research Laboratory, Institute of Biological Sciences, College of Arts and Sciences,

## Fish Disease

- Stress leads to diseases
- Prone to infection
- Prone to predation
- Poor meat quality
- Poor palatability





### Mitigation

- Habitat restoration
- Responsible ecotourism
- Regulated aquaculture
- Minimize anthropogenic impacts

### Control measures of pollution

- Ensuring the primary treatment of municipal sewage discharged into rivers, creeks, lagoons and the sea.
- Promoting use of environmental impact assessments to help ensure an acceptable level of environment quality.
- Implementation and enforcement of policies and existing acts and regulation of environmental protection.

Source: Bukob et al. 2015



I was hungry and you set up a committee to investigate my hunger.  
 I was homeless and you compiled a report on my homelessness.  
 I was sick and you held seminar on my sickness.

I am still hungry.  
 I am still homeless.  
 I am still sick.

"We have not inherited the earth from our forefathers,  
 we borrowed it from our children" (David Brower)

