

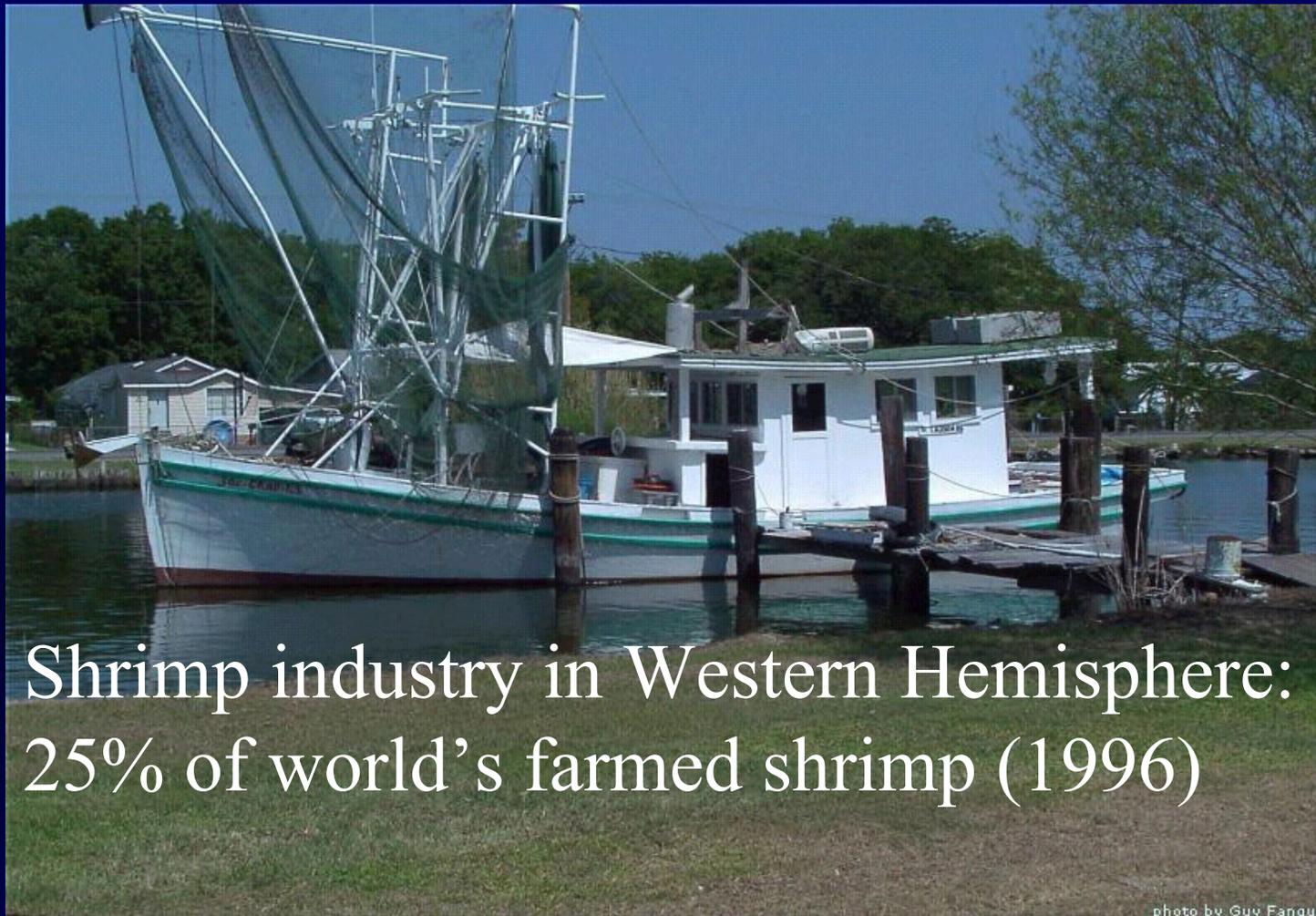
# Stressed Shrimp: Their Enzymes & Cells as Bioindicators

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Shrimp industry in Western Hemisphere:  
25% of world's farmed shrimp (1996)

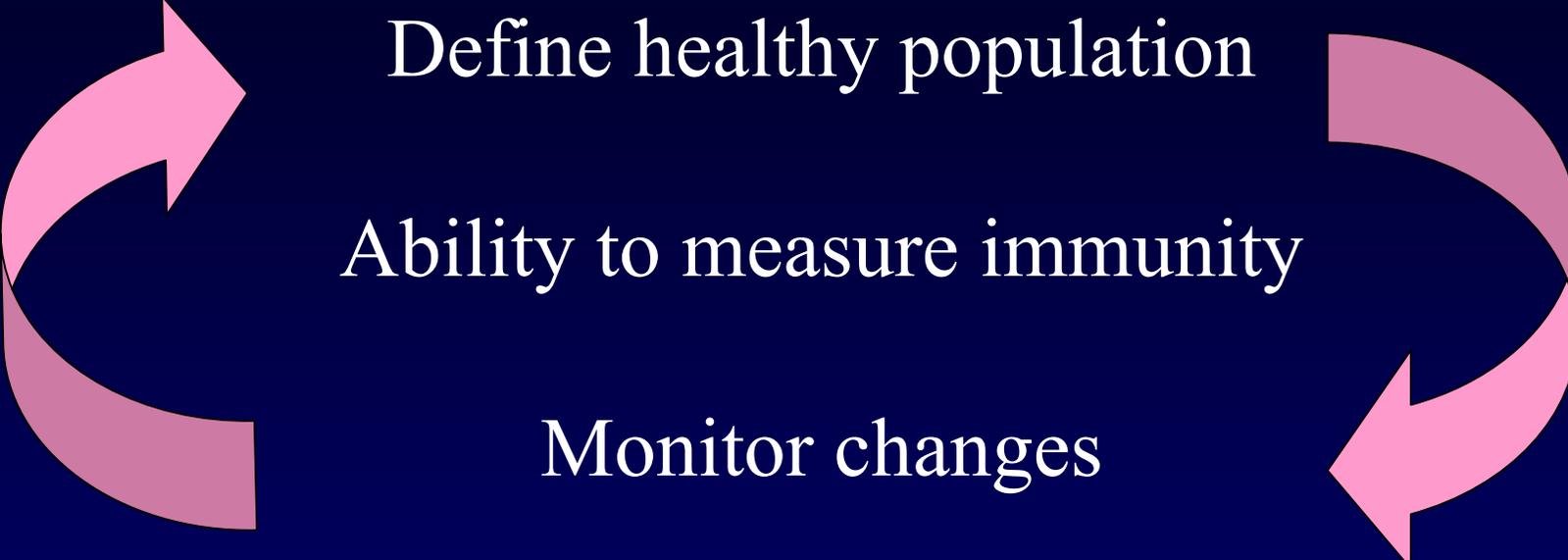
Ecuador > Mexico > Honduras > Peru >  
Nicaragua > Belize > Venezuela > U.S.

## Particular Stressors:

pathogens (viruses, bacteria)

pollutants (pesticides)

water quality (salinity, turbidity, crowding,  
anoxia,  $\text{NH}_3$ ,  $\text{NO}_2$ )



Define healthy population

Ability to measure immunity

Monitor changes

# **Innate Immunity in Arthropods**

## **Prophenoloxidase System**

**enzyme cascade -  
within hemocytes  
activated by stressors**

## **Phagocytosis**

**by hemocytes**

## **Nodules Form**

**aggregates of hemocytes  
and/or proteins**

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# Development of Diagnostic Tools

- **Develop antibody against PO.**
- **Examine cell and molecular response of fluid phase and cells.**
- **Expose animals to levels of stressors - quantify responses.**

## Techniques:

**electrophoresis, fluorometry, flow cytometry,  
and ELISA**

- **Measure responses of animals from different geographic locations.**
- **Generate assay reagents.**
- **Develop applied assay for use on different life stages.**