Epidemiology: An Emerging Tool for Coral Research and Conservation

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SCAN ME!

BACKGROUND

Epidemiology is the study of the occurrence of disease and health-related conditions and their risk factors in populations of individuals relative to their environment and demographics.

Historically, marine epidemiology has focused on infectious diseases and outbreaks; however, with the greater availability of environmental data sets and improved understanding of impacts to the animals, the same tools can be used to assess and measure subclinical effects of acute and chronic environmental and anthropogenic stressors on coral reef health.
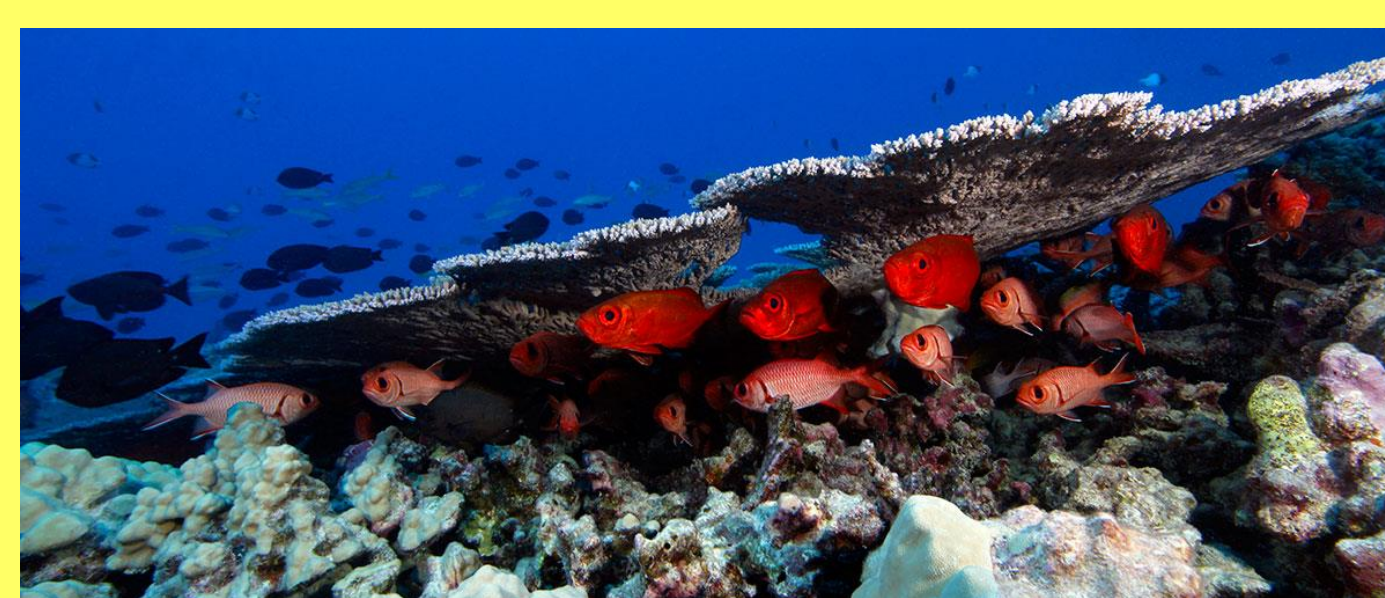
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Host

Environment

Agent/Risk factor

Epidemiological studies focus on the classic triad of host, environment, and agent/risk factor. Risk factors may be environmental or anthropogenic.
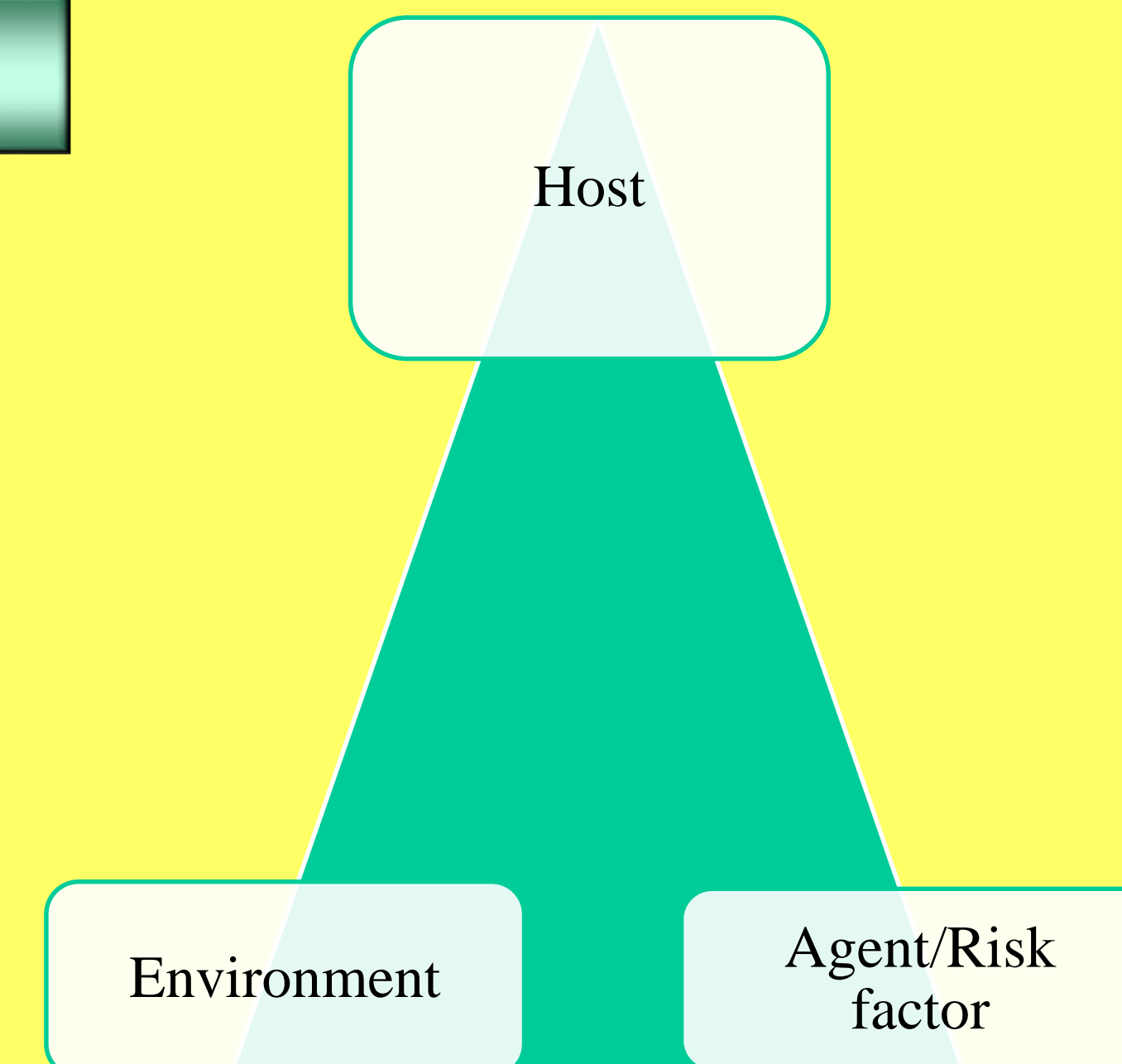
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EXPANSION OF APPLICATIONS

These methodologies may be useful to coral scientists and resource managers through:

- Relating impacts from climate, humans, and other processes to their consequences for the health and survival of marine species or their environment.

- Offering a metric for comparison between populations in order to quantify the effects of various stressors on life history metrics such as fecundity and survival.

- Analyzing a number of disparate data sets of varying quality to quantify effects and test hypotheses.

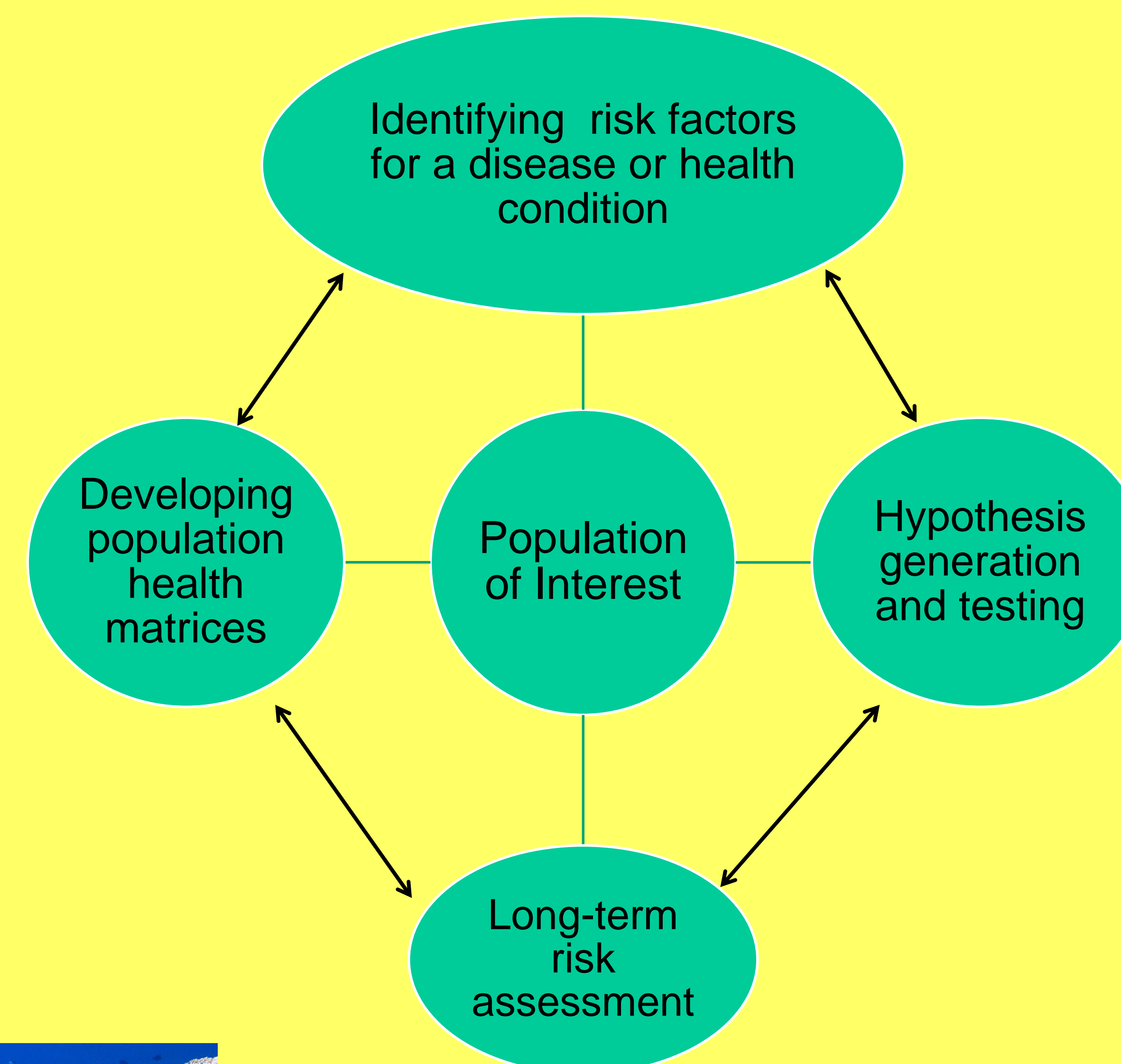- Prioritizing research and coral reef health monitoring needs.

Identifying risk factors for a disease or health condition

Developing population health matrices

Population of Interest

Hypothesis generation and testing

Long-term risk assessment

The integration of multiple tools to monitor the health of a population is a key strength of epidemiology.

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EPIDEMIOLOGY IN CORAL REEF RESEARCH

Monitoring coral reef population health
- Calculate measures of disease occurrence: prevalence (%), incidence (rate), attack rate (frequency of morbidity in at-risk population), mortality rate, survival

Detect disease trends in reef systems
- Determine the origin of a disease whose cause is unknown
- Investigate & control a disease with a poorly or unknown cause
- Four main disease occurrence patterns: epidemic, endemic, pandemic, sporadic

Identify risk factors to coral health and diseases
- Runoff containing pollutants, nutrients, industrial waste, land-source pathogens
- Emerging diseases, alterations in oceanographic features (*e.g.,* temperature, salinity, oxygen)
- Identify predictors for changes in coral ecosystem health such as warm temperatures, increased nutrient load, and risk factors.

Assess effectiveness of disease intervention and prevention programs
- Aid in helping to plan, monitor, and assess coral disease control programs.
- Assess economic impacts of a coral disease and its control (tourism, fishing)

FURTHER APPLICATIONS

- Trend analyses and interpretation of retrospective data collected from surveys and long-term monitoring projects.

- Assess quality of data sets within analyses, identifying data gaps and limitations, and recommendations for refining future data collection efforts.

- Better characterize disease mitigation measures.

- Incorporate multivariate modeling and risk factor analysis.

- Help translate science into policy and management.

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