LENFEST OCEAN PROGRAM

A scientific summary
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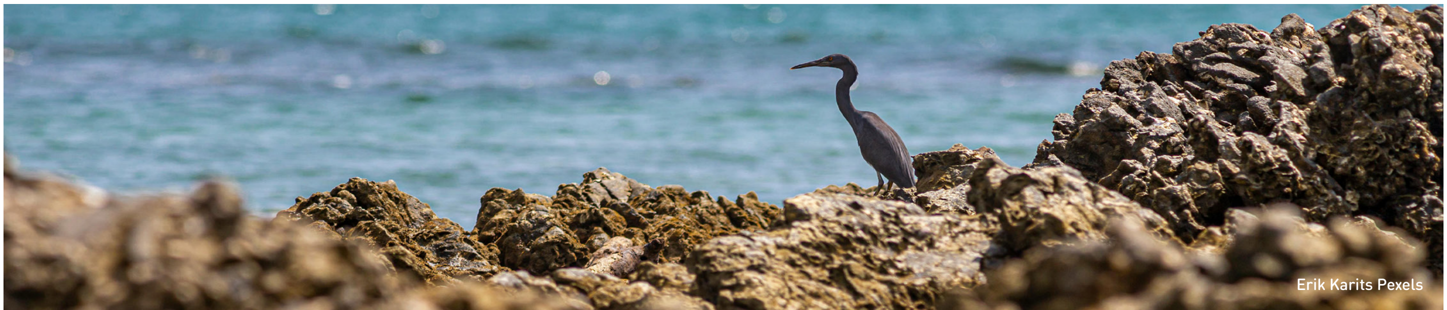


IMPLEMENTING ECOSYSTEM-ORIENTED FISHERIES MANAGEMENT IN THAILAND

Managers, scientists, and fishing communities are eager to move to from current management systems rooted in single-species assessments to ones that integrate more holistic ecosystem approaches. To do this, they must integrate new or additional ecosystem indicators alongside single-species assessments for an ecosystem-oriented approach. In a previous project on Benchmarks for Ecosystem Assessment, an expert Working Group made of scientists, managers, and policymakers from four countries—United States, Chile, Australia, and India—identified three indicators that typify ecosystem structure and function: topology, resiliency, and distortive pressure. These indicators can be collated from existing data and assessed under current management infrastructure. When combined, they produce an Ecosystem Traits Index (ETI) score that signals ecosystem health, allowing managers to more easily identify when an ecosystem is under stress and what actions they should take.

In this project, the Lenfest Ocean Program is supporting a team of researchers and practitioners led by Dr. Pavarot Noranarttragoon and Dr. Nipa Kulanujaree of the Thailand Department of Fisheries (DoF), to implement the ecosystem indicators in the management of commercial and small-scale fisheries in the Gulf of Thailand. The project will demonstrate how indicators can be incorporated into current management strategies to better align with principles of EBFM.

FISHERIES MANAGEMENT IN THE GULF OF THAILAND

Significant fishing efforts in the Gulf of Thailand began in the 1960s, expanding to coastal sites in the Gulf southward along the coast, into the central Gulf, and finally into neighboring countries. Today, both commercial and small-scale fisheries in Thailand are some of the largest in the world with approximately 1 million tons of fisheries per year brought in over the past decade. The highly biodiverse nature of the tropical Thai ecosystem, the many fishing gear types used, and the importance of fishing in livelihoods and economic growth makes the Gulf of Thailand's socio-ecological system highly complex. As such, the DoF recognizes that single species management is not feasible here and is exploring ways to advance ecosystem-based approaches in their fisheries management that better reflect the area's complexity.

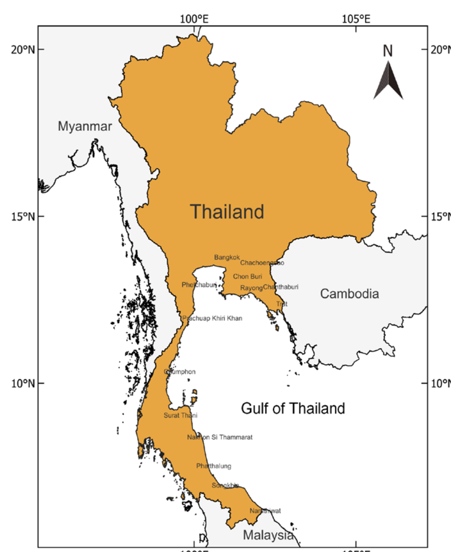


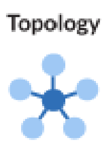
Figure 1

Map of the Gulf of Thailand

APPLYING ECOSYSTEM INDICATORS TO FISHERIES MANAGEMENT

The Benchmarks for Ecosystem Assessment Working Group found that the identified ecosystem indicators can be used alongside current fisheries data and management systems. Here, the research team will employ existing fisheries data from multiple years of surveys to calculate ecosystem indicators and recommend harvest strategies that promote the sustainability of ecosystem health.

The research team will begin by gaining a better understanding of the current ecosystem state by conducting a principal component analysis (PCA) that describes changes to catch composition over time alongside interviews with key stakeholders from fishing communities about their knowledge of change and threats to fished species and associated habitats. The research team will then produce heatmaps that show how catch composition of species has have shifted over time and what factors drove the shift(s). Next, the research team will define the topology, resiliency, and distortive pressures of the past and current ecosystem states to illuminate overall ecosystem structure- that is, how species are connected, the stability of those connections, as well as the functions each species provides. See the executive summary "Moving from A to B" for more information.



To understand system structure—or topology—researchers will construct a food web model using the Ecopath with Ecoism (EwE) tool and then conduct a criticality analysis to identify "hub species." Unlike "keystone species", hub species are those which have greater connections to others in the food web and are therefore a critical node that should receive special management attention.

Researchers will evaluate the resilience, or strength, of the ecosystem structure by calculating a resilience index (e.g., strong, partial, or no resilience) for the ecosystem in past and recent years. This will allow researchers to better classify current ecosystem resilience in relation to previous years and then, identify a desired ecosystem state which can produce desired harvest rates.

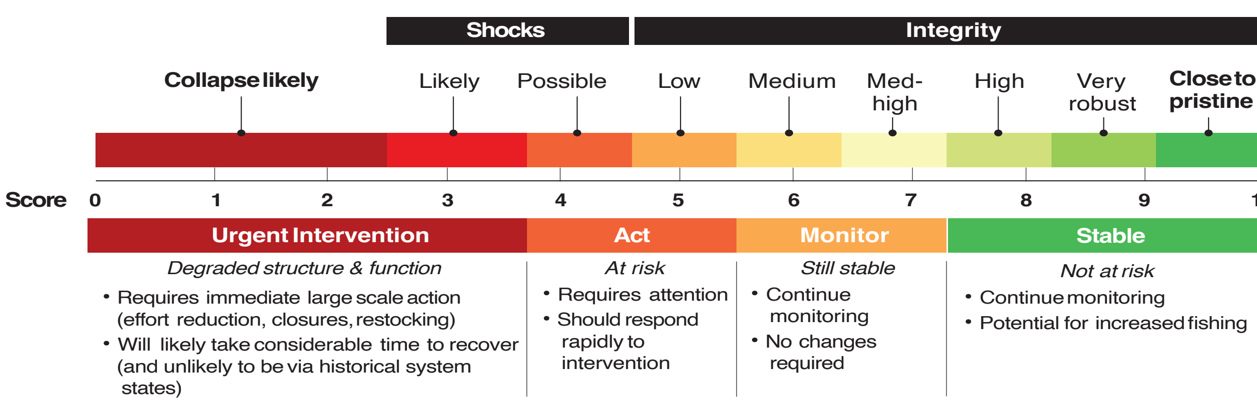
The research team will then identify where fishing pressures (i.e., distortive pressures) are strongest on the current ecosystem structure by calculating a "green band" of fishing pressure that signifies acceptable fishing limits. By plotting current harvest rates on the chart with the 'green band', scientists can identify where fishing pressure is either too high (above the green band), acceptable (within the green band), or low (below the green band), in which case there would be scope for increasing fishing.

Results from all indicators will be combined to produce an Ecosystem Traits Index (ETI) score for the ecosystem. Researchers can do this for ecosystem states through time and plot the ETI score on a chart to demonstrate how the ecosystem state has or has not changed. This will also highlight the current ecosystem state and signal whether management action is needed (Figure 2).

Figure 2

ETI CAN ACT AS A WARNING SYSTEM

Think, a forest fire warning system, but for ecosystems. A high ETI score signals a healthy ecosystem structure and function. A low score indicates one or more indicators are out of balance and this requires further investigation- taking a closer look at each indicator will help managers understand where action is needed and what actions to consider.



A NOTE ON USING ETI

ETI scores are a basis for a broader discussion among scientists, decision-makers, and stakeholders of fishery performance in terms of stock, economic, and social objectives. The scores can be used to signal how an ecosystem is responding to fishing and management decisions over time, as well as predict how an ecosystem might respond to a management decision (e.g., proposing the use of different gear types). ETI can also be paired with other information to inform harvest levels- for example, scientists can calculate Multispecies Maximum Sustainable Yield (MMSY) alongside ETI to estimate the level of sustainable allowable catch for a system or large group of fish species. Throughout the project, the research team will convene trainings and meetings with managers at the provincial and national levels of government as well as key stakeholders in fishing communities to share key findings, receive feedback, and discuss final recommendations.

Research Team

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CONTACT

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