

Finding solutions to global fisheries woes in the Galapagos

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Of all the marine ecosystems of the world, no two are exactly alike. Indeed marine ecosystems and their characteristics can vary considerably from place to place. This is also true of fisheries within these ecosystems. Perhaps no setting illustrates these differences so profoundly as the Galapagos Islands, approximately 1000 km west of the mainland coast of Ecuador.

The Galapagos are geologically-recent volcanic islands, and the prevailing oceanic currents and wind patterns allowed precious few groups of terrestrial organisms to colonise the islands. For example, large terrestrial predators never arrived, thus enabling the persistence and evolution of a unique fauna and flora including terrestrial and marine iguanas, giant tortoises, and prickly-pear cacti that grow very tall – out of reach of the hungry tortoises. It was a unique assemblage of finches that made the Galapagos world-famous by catching the eye of the young naturalist Charles Darwin, and helping him to

develop the theory of evolution by natural selection.

The marine environment of the Galapagos Islands, on the other hand, is characterised by a high level of mixing from diverse ecosystems. One can find components of coral reef ecosystems right next to more temperate water species. Where else in the world can you dive and look at coral reef fish while sea lions and even penguins swim by? This uniqueness is driven by the fortunate circumstances of the location of the islands at the intersection of several water currents, which permit marine organisms from the South American coast, the tropical Central American coast as well the Central Pacific equatorial environments to disperse and settle in this island group. The Galapagos Islands are truly a special place, below as well as above the water surface.

The Charles Darwin Research Station on the Galapagos Islands was an ideal venue at which a group of marine and fisheries scientists from the

Americas, Europe, Asia and Africa recently met for an international conference organised by Dr Villy Christensen (UBC Fisheries Centre) and supported by the European Commission and the North Sea Centre, to try and find solutions to fisheries and marine ecosystem problems in the different areas in which these scientists work. Most of the participants presented the results of ecosystem-based research using the food web and fisheries modelling approach Ecopath with Ecosim (EwE). Four representatives of the Fisheries Centre attended the conference (Daniel Pauly, Villy Christensen, Tom Okey, and Dirk Zeller). Among other presentations and an exciting pre-launch of Daniel Pauly's book on 'Darwin's fishes', significant findings from the 'Sea Around Us' project were presented. For example, Dirk Zeller presented the results of spatial ecosystem modelling of the use of closed areas as a fisheries management tool in the Faroe Islands in the north-east Atlantic; Tom Okey presented a framework for

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investigating the shading effects of coastal nutrient enrichment on continental shelf ecosystem structure, with special reference to the West Florida Shelf; and Villy Christensen provided an excellent comparison between EwE results and Multi-species Virtual Population Analysis for the North Sea.

Like most of the world's ecosystems, the Galapagos Islands are ecologically degraded to some extent, as the result of large populations of humans finding food, and otherwise making a living. Although the Galapagos Islands are globally unique, many of the pathologies of human activities that affect them are generally similar to those affecting other areas in the world. For example, continuous introductions of alien species

and historical removals and extinctions of native species (e.g., giant tortoise) have wreaked havoc on the terrestrial ecology of the islands. Another immediate and dramatic example of the similarities of Galapagos degradation to other settings is the recent violence perpetrated by the lobster fishermen on the islands.

The Galapagos is in the midst of a virtually uncontrolled human migration from mainland Ecuador, as the natural resources along Ecuador's coasts continue to degrade. One effect of this migration has been a considerable increase in the number of fishers trying to make a living on the islands. Like elsewhere, local stocks such as the highly-priced lobster have limits to the amount of fishing pressure they can sustain, and like most places scientists attempt to estimate the amount of removals the individual stocks can maintain before severe depletion or catastrophic collapse of the population occurs. Unfortunately, like in many other cases before, fishing interests succeed in pressuring decision makers to increase allowable catches beyond those recommended by scientists. In the case of the Galapagos, the lobster fishers physically assaulted employees

and ransacked facilities of the Ecuadorian National Park Agency and the Charles Darwin Research Centre. For many of the scientists attending the meeting, this local conflict in the Galapagos exemplified similar resource conflicts happening around the world.

Consensus was reached at this international meeting that the ecosystem-based focus of the EwE approach can help to identify and hopefully alleviate the types of conflicts exemplified by the violence that greeted us in the Galapagos. This approach not only enables us to gain insights into the indirect ecological and economic effects of a particular fishery, but it also allows us to analyse the optimisation of different combinations of objectives, be they economic, social, ecological, or legal. Before such grand plans come to fruition, however, a considerable amount of work must be done to refine our knowledge of the systems being analysed. This meeting helped to clarify the work that needs to be done in order to accomplish the goal of ensuring the integrity of ecosystems while allowing for utilisation of marine ecosystems in a long-term sustainable manner.

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The Sea Around Us website may be found at www.fisheries.ubc.ca/projects/saup/index.htm, and contains up-to-date information on the project.

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