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Daily Digest

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TODAY'S OVERVIEW

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NEWS SUMMARY

1. **Current catch figures underestimate numbers of fishes taken from reefs; new data sources provide a more accurate view of fish population health and food security issues**

A new study reveals that fisheries catches from tropical island nations are vastly underreported. The investigation of actual catches from 1950-2004 for 20 small island countries in the tropical Pacific shows that unreported catches were as great as reported catches. In most cases unreported catches were twice that of reported catches. The scientists have delved deeper into the investigation in some cases, such as American Samoa, where they found that uncounted catches were nearly 17 times higher than reported catches.

“In FAO data, the only fish being reported are the ones that are being traded,” said Dr. Daniel Pauly, University of British Columbia (UBC), who first recognized this underreporting problem when observing uncounted catches of fish and shellfish by women and children in many countries. Pauly continued, “In many cases, these small scale fisheries generate the most catch.”

The underreporting of fisheries data – particularly by subsistence fisheries – means official statistics have incorrectly informed national and international policy and management. The reconstructions of the catch figures, led by Dr. Dirk Zeller of UBC with help from researcher Jennifer Jacquet, shows the trend for domestic catches in some Pacific island nations has been declining by between 54 to 86 percent since 1950.

Jacquet said, “When you underestimate fish catches what results is an underestimation of a community’s reliance on seafood.” She added that government officials considering whether to sell fishing rights to other nations, may do so under the impression that they have plenty of fish and that their people are not very dependent on seafood. “We are stealing from the poor and giving to the rich,” she stated. Zeller said, “Countries must do a better job estimating catch. It is vital to ensuring better management, food security and stronger economies.” Pauly added that international bodies such as the World Bank and FAO must take small-scale fisheries into consideration as a major policy management issue and not relegate it to the sidelines because these are the fisheries that are likely to be sustained into the future, unlike heavily subsidized fishing fleets that essentially will go out of business because of rising costs.

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2. Reef fish populations in Main Hawaiian Islands are more overfished than previously thought

A new study by NOAA Biogeography and The Oceanic Institute of Waimanalo, Hawaii, shows that fish populations in the Main Hawaiian Islands are in a dire state, with 75 percent of reef fishes in depleted or critical condition. “Many of the reef fishes in the Main Hawaiian Islands, especially sharks, jacks and parrotfish, are much more overfished than we thought,” said study lead Dr. Alan Friedlander, fisheries ecologist for NOAA’s Biogeography Branch and The Oceanic Institute. The study is the most comprehensive analysis of fish populations in the Main Hawaiian Islands and uses the protected, unfished Northwestern Hawaiian Islands (NWHI) near-shore reefs as the baseline, or reference area. Scientists used underwater surveys to estimate biomass of 55 reef fish species that exist in both locations. Friedlander says the study is a more accurate reflection of the state of fish resources in Hawaii because commercial catch data, the only

indicator available previously, “is often poor, inconsistent or spotty.” Friedlander also discovered that most of the main islands’ marine protected areas are “too small to be effective.” He said more and larger marine protected areas are needed to ensure sustainability of fisheries. Better management and stronger fisheries regulations are needed outside marine protected areas, specifically restrictions on the use of harmful fishing methods such as gill nets and fishing on SCUBA. Friedlander added that large protected areas such as the NWHI are important for conserving biodiversity, ensuring food security, and for informing scientists and managers of what a natural, healthy reef ecosystem is. “There are areas in the Main Hawaiian Islands where the reefs are still healthy, so everything hasn’t collapsed yet,” Friedlander said. “But we need to protect the healthy reefs, because it’s so much easier and safer to conserve now than it is to try to rebuild later.”

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3. Where Are Coral Reef Fish Going?

The behavior and habits of young reef fishes offer answers to important questions scientists and managers have about issues ranging from marine protected areas to climate change. Dr. Bob Warner, University of California at Santa Barbara, said the connectivity of reef habitats at critical life stages for reef fishes is essential for management, yet remains largely unsolved. Dr. Geoffrey Jones said a vital piece of information needed to design and evaluate marine protected areas is the traveling patterns of baby fish: “If we don’t know where the larvae go after they are born, then we don’t know how well placed these no-take marine reserves are.” Scientists are beginning to find the answers, for instance, clownfish larvae migrate long distances yet many return to their home reef. How do they get back? A study led by Jones and Danielle Dixson indicates that the smell of leaves helps clownfish find their island homes. Jones said the body of knowledge so far shows that between 30 and 60 percent of larvae return as juvenile fish to the protected area in which they were born. “This indicates that protected areas can be self sustaining for generations,” Jones said at a press briefing today. Scientists are also finding evidence of “spillover,” with studies showing that up to 10 percent of juvenile fish on adjacent reefs where people were fishing came from an MPA. Science is showing that reef fish larvae are going from one protected area to another, with evidence of some larvae traveling more than 30 kilometers.

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4. Climate Change And The Future For Coral Reef Fishes

Scientists from James Cook University in Townsville, Australia, review and predict the likely impacts of climate change on coral reef fishes. Changes to ocean temperature, pH, currents, and extreme weather events will affect reef fishes through impacts on individual

performance, trophic linkages, recruitment dynamics, population connectivity and other ecosystem processes. The most immediate and identifiable impacts will be changes in the composition of reef fish communities and loss of biodiversity as a result of coral bleaching. Coral-dependant fishes suffer the most rapid declines in abundance following coral bleaching. However, they predict that many other species will exhibit longer-term declines due to loss of habitat and erosion of the complexity of reef habitats. Continued degradation of coral reefs from climate change will lead to impoverished reef fish communities. Increased ocean temperature will affect the physiological performance and behavior of reef fishes, especially during the larval phase. Small increases in temperature might tend to favor larval survival, but negative effects on reproduction could counteract this. The scientists predict that already variable recruitment will become more unpredictable, with more good recruitment events and more recruitment failures, especially in locations where food supply is patchy or unreliable. A substantial number of species could exhibit range shifts, with potential implications for extinction risk of small-range species near reef margins. Finally, the potential for adaptation to climate change needs more consideration. Many coral-reef fishes have geographical ranges spanning a wide temperature gradient and many have short generation times. These characteristics are conducive to acclimation and local adaptation to climate change, and provide some hope that resilient species might adapt to climate change if immediate action is taken to stabilize the climate.

Munday said in a press briefing today, “If green house gas emissions are not brought down, the whole range of species in the reef ecosystem is at great risk. Climate change will threaten reef fishes at their most critical life stages,” from surviving the larval state to ensuring the healthy production of eggs as mature adults. “We must keep fish stocks as healthy as possible so they will be better able to withstand these pressures.”

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SCIENCE HIGHLIGHTS

5. Reef Coral – A Symbiosis as Complex Adaptive Systems

This study examines the microbial partners of the coral/algal symbiosis as an ecological community, rather than a single entity- a community whose dynamic environment is the coral organism itself. Here, the changes in symbionts related to coral beaching don't require coral-directed sorting, but are explained by the same types of self-organizing community succession as seen in forest communities following fire or disturbance. Tapping into the tools of more general ecological community studies give a new and promising set of way to understand adaptive responses to climate change, since different symbionts (and combinations of symbionts) have different thermal tolerances. The authors use molecular methods to show that symbiont communities (rather than monocultures) are widespread among coral species, suggesting that dynamic community

shifts may be a widespread, and self-organizing) mechanism for coral persistence in the face of increased temperature.

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6. Solar Insolation Drives Reproductive Schedules of Reef Corals: A Long Road In The Search For Proximate and Ultimate Causes

The mass spawning of coral are a cause for both amazement and curiosity. How do corals of different species know when to spawn, and why is it important for multiple species to spawn at the same time? Van Woesik compared records of seasonal changes in sunlight, and noticed that corals all over the world seem to concentrate their spawning efforts on those times when the rate of change in the amount of sunlight is minimal. Examination of a satellite-derived global wind map shows that these same times are those with minimal wind, and suggests that the function of synchronized spawning may be to ensure that wind-swells do not drive gametes off the reef into the open ocean, but allow the new generation to settle back onto the reef, and the way that corals know when the winds are likely to be low (which would be hard for a coral to know) is to monitor the amount of sunlight (which a photosynthetic organism is likely to do), and gamble that winds will continue to die down when the sunlight periods is most stable.

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7. Coral Response to Ocean Acidification

Fine notes that as atmospheric CO₂ levels increase, the acidity of the ocean increases. Corals show a 10-55% decrease in skeletal calcification rates with a doubling of CO₂, and therefore, in the foreseeable future, corals will no longer be able to build reefs. However, he also notes that ocean conditions have been poor for calcification in the geologic past, and, while during these periods there are no coral reefs in the fossil record, corals still exist. This observation has given rise to the 'naked coral' hypothesis- maybe corals (though not reefs) can survive without their skeleton. Fine presents work here in which he subjects more than 20 coral species to increased acidity conditions, and finds that many lose their skeletons and yet survive. These corals cease being a colony in a matter of weeks, and become independent, anemone-like large polyps, surviving up to a year. When returned to seawaters of natural pH, the corals resume their colonial lifestyle, and rebuild their skeletons within 1-2 months. This suggests that, while the reef ecosystem which is build on the calcium carbonate skeletons of coral may not persist in an acidified ocean, coral organisms themselves may be able to wait out some period of increased oceanic pH.

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The Daily Digest is edited by SeaWeb (www.seaweb.org), the media liaison for the International Coral Reef Symposium.

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