

Following are summaries of recent scientific studies on fishing pressure.

### **Current and future sustainability of island coral reef fisheries**

*Katie Newton, Isabelle M. Côté, Graham M. Pilling, Simon Jennings, Nicholas K. Dulvy*  
From **Current Biology**, 2007

This report states that overfishing is one of the principal threats to coral reef diversity, structure, function, and resilience. “Although it is generally held that coral reef fisheries are unsustainable, little is known of the overall scale of exploitation or which reefs are overfished. Here, on the basis of ecological footprints and a review of exploitation status, we report widespread unsustainability of island coral reef fisheries.” The study finds that 55% of the 49 island countries examined are exploiting their coral reef fisheries in an unsustainable way. They estimate that total reef fish catches are 64% higher than can be sustained. In order to maintain food security at the current rate of extraction, the report states “an extra 196,000 square kilometers of coral reef would be required by 2050 to support the anticipated growth in human populations.” The authors say that management methods must seek to reduce the social and economic dependence on reef fisheries to prevent the collapse of coral reef ecosystems. They conclude, “The move toward ecological sustainability, whether driven by rights-based management, marine protected areas, or other tools, will only be achieved if reliance on current total catches can be reduced—an essential action but one that lies largely outside the control of conventional fisheries management.” Contact: Nicholas K. Dulvy, [nick.dulvy@cefas.co.uk](mailto:nick.dulvy@cefas.co.uk)

### **High apex predator biomass on remote Pacific islands**

*Charlotte Stevenson, Laure S. Katz, Fiorenza Micheli, Barbara Block, Kimberly W. Heiman, Chris Perle, Kevin Weng, Robert Dunbar, Jan Witting*  
From **Coral Reefs**, 2006

Fish populations were compared among three locations in the Pacific’s Line Islands that experience different levels of fishing pressure yet have similar oceanic conditions. The three, ranging from the most impacted by fisheries to virtually untouched, are Christmas (Kiritimati) Island, Fanning (Tabuaeran) Island, and Palmyra Atoll. The study examined the magnitude of food web alteration from fishing and found that “on coral reefs in Palmyra—a central Pacific atoll with limited fishing pressure—total fish biomass was 428 and 299% greater than on reefs in nearby Christmas and Fanning Islands. Large apex predators, groupers, sharks, snappers, and jacks larger than 50 cm in length, accounted for 56% of total fish biomass in Palmyra on average, but only 7 and 3% on Christmas and Fanning.” On both Christmas and Fanning islands, local fishers use gill nets and hook and line to catch reef fishes, including sharks, and spear fishing and long lining occur throughout the surrounding waters. Palmyra has never experienced heavy fishing pressure. The authors compare their results with studies in Hawaii and Fiji and find similar patterns in the effects of fishing pressure on fish populations. They find further support for earlier studies’ conclusion that fishing pressure greatly alters the coral reef food web, which in more pristine areas is dominated by top level predators but also has high levels of plant-eating fish. The authors state, “In the absence of intense fishing, Palmyra and some of the NWHI have the greatest apex predator biomass among the 28 Pacific reefs surveyed in these studies. Both Palmyra and the NWHI have high herbivore biomass (34% of the total in Palmyra and 33% in the NWHI, on average), supporting the

finding that coral reef ecosystems with high top predator levels can also support high levels of herbivores.” The significance of this, the authors state, is that “coral reefs lacking a history of intense exploitation set new baselines for evaluating human impacts and provide insights into the ecological function of these ecosystems. Understanding the influence of apex predators on the structure and dynamics of healthy coral reefs and devising strategies for protecting and re-building depleted predator populations are critically important research and conservation priorities.” Contact: Fiorenza Micheli, micheli@stanford.edu

### **The importance in fishery management of leaving the big ones**

*Charles Birkeland and Paul K. Dayton*

*From **TRENDS in Ecology and Evolution**, 2005*

Recent research has shown that older fish of some species produce eggs that have substantially better survival potential than do eggs from younger fishes. The authors say this is important because commercial fisheries and especially recreational fishing often target the larger fish, yet should be targeting the smaller fish to ensure a more robust fish population. The paper states, “The protection of larger or older individuals is necessary for the sustainability of species currently exploited by humans. Older fishes can be more experienced and successful at spawning, can provide the population with a longer spawning season and, as larger fishes, have an exponentially greater (reproductive ability).” The authors say the catching of older and larger fish makes it more difficult for some populations to recover from overfishing: “We need to focus on protecting the larger or older individuals of long-lived fish species rather than concentrating on regulating the total numbers harvested from the population.” The authors describe how Hawaiians traditionally used “slot limits” for species that were at risk for overfishing, such as allowing catches of medium-sized moi adults and prohibiting take of juveniles or large females. The authors encourage today’s spearfishers to take medium-sized fishes, but admit that other types of fishing, such as nets and pole and line, do not allow selection. The paper then points to the conclusion of other scientists, stating that “the preservation of old-growth age structure in long-lived fishes can only be achieved by the establishment of networks of marine reserves.” Contact: Charles Birkeland, charlesb@hawaii.edu

### **The impact of United States recreational fisheries on marine fish populations**

*Felicia C. Coleman, Will F. Figueira, Jeffrey S. Ueland, Larry B. Crowder*

*From **Science**, American Association for the Advancement of Science, 2004*

Taking a hard look at the common belief that recreational fishing accounts for only 2-3% of total landings in the U.S., this study reveals that recreational catches account for nearly a quarter of the total take of over-fished populations, including many of the most economically valuable species such as red snapper, red drum, lingcod, and bocaccio. For specific depleted populations in the U.S.—particularly the large charismatic fishes that people care about most—recreational landings outstrip commercial landings. This is true for red snapper (59% recreational) and gag (56%) in the Gulf of Mexico, red drum in the South Atlantic (93%), and bocaccio on the Pacific coast (87%), among others. The study is the first comprehensive analysis of the impact of recreational saltwater fishing in the United States. Using all available federal and state data, the authors formally compare

commercial and recreational landings for the past 22 years. Lead author Felicia Coleman of Florida State University says, “If you remove the fish caught and used for fish sticks and fishmeal (pollock and menhaden) – two strictly commercially caught species that account for over half of all U.S. landings - the recreational take rises to 10% nationally. And if you focus in on the populations identified by the Federal government as species of concern, it rises to 23%.” Recreational fishing targets large, top-level predatory fish in the ocean. Removal of these fish can create dramatic changes in ocean food webs and cause cascading effects that alter the overall productivity and health of marine ecosystems. While the cumulative impact of commercial fishers is constrained by limits on who, where, when and how much fish they can catch, there are no controls on the aggregate impact of recreational fishers. The authors conclude, “Where recreational fishery landings rival those of commercial fisheries for major stocks of concern, sometimes even replacing them, they can have equally serious ecological and economic consequences on fished populations. If the goal of fishery management is to sustain viable populations and ecosystems, then recreational as well as commercial fishing requires effective regulations.” Contact: Felicia C. Coleman, [coleman@bio.fsu.edu](mailto:coleman@bio.fsu.edu)