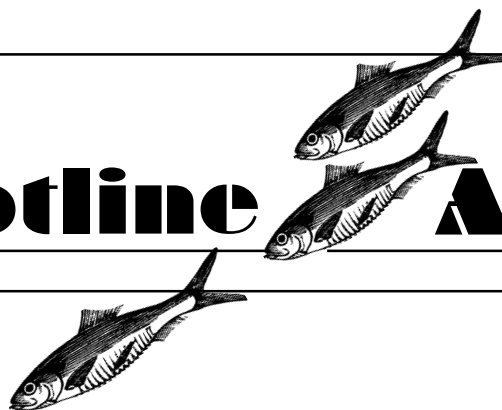

Habitat Hotline Atlantic

Issues of Concern for Atlantic Marine Fish Habitat

June 2005, Volume XII, Number 2



Second National Coast Condition Report Published U.S. Coastal Areas Assessed

Estuaries, coastal wetlands, seagrass meadows, coral reefs, mangrove and kelp forests, and upwelling areas are some of the habitats found in coastal areas of the United States. These habitats are important because they provide spawning and nursery grounds, shelter, and food for aquatic and riparian organisms. Humans are also an important component of coastal habitats. More than 53% of the U.S. population lives in coastal areas that make up only 17% of the total contiguous U.S. land area. Recreational activities such as fishing, swimming, boating, and diving; and many commercial activities such as fishing, shipping, energy production, and wastewater treatment rely on coastal resources. Although we know that human uses affect coastal habitats via nutrient enrichment, habitat loss from encroaching development, and degraded water or sediment quality, we often do not have an overall picture of the condition of our coastal areas.

To evaluate the present condition of the nation's coastal areas, the U.S. Environmental Protection Agency (EPA) in conjunction with the National Oceanic and Atmospheric Administration (NOAA), the U.S. Department of the Interior (DOI), and the U.S. Department of Agriculture (DOA) produced the National Coastal Condition Report (NCCR), which is a comprehensive report on the condition of the nation's estuarine areas and coastal fisheries. The first report (NCCR I), published in 2001, used data from 1990 to 1996 to characterize about 70% of the nation's estuarine resources. The second report (NCCR II), published in December 2004, used data from 1997 to 2000, and analyzed data representing 100% of the estuarine acreage in the 48 continental states and Puerto Rico. The collaborative effort will provide a benchmark of coastal conditions so that regulatory agencies can measure the success of coastal programs over time.

NCCR II

The NCCR II covers all coastal areas of the U.S., however this article summarizes information for the Atlantic Coast, specifically the Northeast (Maine to Virginia) and Southeast (North Carolina to Florida) regions. The agencies designed ratings of coastal

conditions that are based on coastal monitoring data, fisheries data, and other assessment data provided by various state and federal agencies. The data are used to generate five indices of ecological conditions for each region of the country. To determine the overall condition for each region, the indicator scores were added together (where good = 5; fair = 4, 3, or 2 depending on percent range; and poor = 1) and then divided by the number of available indicators (Table 1). Definitions for good, fair, and poor ratings for each index are provided in Table 2.

Water Quality Index

The water quality index is based on five water quality measurements: dissolved oxygen (DO), chlorophyll *a*, dissolved inorganic nitrogen (DIN), dissolved inorganic phosphorus (DIP), and water clarity. Water quality in Northeast estuaries is the poorest in the nation with 19% of estuarine waters in poor condition and 42% in fair condition. Poor water quality conditions are concentrated in a few estuarine systems (New York Harbor, Delaware River, tributaries of Delaware Bay, coastal bays of Maryland and Delaware, and western and northern tributaries of Chesapeake Bay). Southeast estuaries rate better with only 5% rated poor and 45% rated fair.

High DIN and DIP concentrations in surface waters are often used as indicators of potential nutrient enrichment. The overall rating of the Northeast region is fair with several estuaries (New York Harbor, Maryland coastal bays, Narragansett Bay, and several tributaries in Chesapeake and Delaware estuaries) exceeding reference conditions for total DIN concentrations and bringing down the rating for the region as a whole. Southeast estuaries rate good for DIN (0% = poor) but rate poor for DIP because 12% of the DIP concentrations measured exceeded the reference point (0.05 mg/L). Chlorophyll *a* measurements are used to estimate the amount of algae suspended in the water. Concentrations of DIN and DIP in Northeast estuaries generally correspond to areas of elevated chlorophyll *a* concentrations. Approximately 15% of estuarine areas are rated poor for chlorophyll *a* in the Northeast,

(continued on page 2)



(continued from page 1)

Table 1. Coastal Condition Rating Scores by Indicator and Region. Rating scores are based on a 5-point system, where 1 is poor and 5 is good. (Adapted from Table ES-1 in NCCR II).

Indicator	Northeast Coast	Southeast Coast	Gulf Coast	West Coast	Great Lakes	Puerto Rico	United States ^a
Water Quality Index	2	4	3 ^b	3	3	3	3.0
Sediment Quality Index	1	4	3	2	1	1	2.1
Benthic Index	1	3	2	3	2	1	2.0
Coastal Habitat Index	4	3	1	1	2	— ^c	1.7
Fish Tissue Contaminants Index	1	5	3	1	3	— ^c	2.7
Overall Condition	1.8	3.8	2.4	2.0	2.2	1.7	2.3

^a The U.S. score is based on an aerially weighted mean of regional scores.
^b This rating score does not include the impact of the hypoxic zone in offshore Gulf Coast waters.
^c No coastal habitat index or fish tissue contaminants index results were available for Puerto Rico.

Table 2. Definitions of Good, Fair and Poor conditions for the five indicators used to assess regional coastal condition. Adapted from Table 1-24 in NCCA II.

Indicator	Good	Fair	Poor
Water Quality (% of coastal waters in each condition)	<10%=poor & <50%= fair & poor combined	10-20%=poor or >50% = fair & poor combined	>20%=poor
Sediment Quality (% of coastal waters in each condition)	<5%=poor & <50%= fair & poor combined	5-15%=poor or >50%=fair & poor combined	>15%=poor
Benthic Index (% of coastal sediments with benthic index in each condition)	<10%=poor & <50%=fair & poor combined	10-20%=poor or >50%=fair & poor combined	>20%=poor
Coastal Habitat Index (Value of calculated index score)	< 1.0	1.0 - 1.25	> 1.25
Fish Tissue Contaminants Index (% of sites in each condition)	<10%=poor & <50%=fair & poor combined	10-20%=poor or >50%=fair & poor combined	>20%=poor

but the overall rating for the region is fair. Southeast estuarine areas received a fair rating because 83% received a fair or poor rating.

Water clarity is measured by estimating light penetration through the water column. All estuaries were placed in one of three categories depending on the amount of normal turbidity expected to account for natural differences between estuaries. In the Northeast, poor ratings in 23% of the estuaries contributed to an overall fair rating. Southeast estuaries rated fair, with 80% rated good and only 12% rated poor. Dissolved oxygen (DO) is important because low levels can limit the distribution and survival of many estuarine organisms. DO samples were taken during the summer when DO levels are usually at their lowest. Northeast estuaries had the greatest number of locations with low dissolved oxygen levels. Hypoxia or periods of very low DO (< 2 mg/L) was evident in 10% of the Northeast estuarine areas, and almost exclusively in the deep, isolated trenches of Chesapeake main stem. Dissolved oxygen

levels in Southeast estuaries are rated good: 74% of bottom waters had DO levels greater than 5 mg/L, 24% had levels between 2 to 5 mg/L, and only 2% had levels less than 2 mg/L.

Sediment Quality Index

The sediment quality index is based on three sediment quality measurements: sediment toxicity, sediment contaminants, and sediment total organic carbon (TOC). The concentrations of 91 chemical constituents in sediments were evaluated for toxicity by measuring the survival of the marine amphipod *Ampelisca abdita* following exposure to the sediments for 10 days under laboratory conditions. Sediment toxicity for Northeast estuarine sediments was rated as poor. About 8% of Northeast estuarine sediments were toxic. Northeast regions identified as impaired include parts of Cape Cod Bay, western Long Island Sound, New York Harbor, and tidal-fresh parts of tributaries in lower New Jersey and

Delaware rivers. Contaminants include heavy metals, primarily nickel and mercury, but also silver and zinc, and organics including polychlorinated biphenyl congeners (PCBs) and DDT. The sediment quality index for Southeast estuarine areas is fair to good with 92% rated good and only 8% rated poor. The sediment toxicity indicator is rated good with 86% of sediments supporting survival of the marine test organism.

Toxicity from organic matter is assessed by measuring TOC. Although TOC exists naturally in estuarine sediments and is the result of the degradation of organic materials, anthropogenic sources (organic industrial wastes, untreated or only primary-treated sewage) can significantly elevate the level of TOC in sediments. High levels of TOC in estuarine sediments can result in significant changes in benthic community structure. Nationally, the level of TOC in estuarine sediments was rated good, with only 3% of estuarine sediments being rated poor. Only 2% of Northeast area sediments had a high TOC content. Sixty-five percent of Southeast estuaries are rated good for TOC and only 7% are rated poor.

Benthic Index

The benthic index is an indicator of the condition of the benthic community (organisms such as worms, clams, and crustaceans that live in estuarine sediments). The benthic index includes measures of benthic community diversity, presence and abundance of pollution-tolerant species, and the presence and abundance of pollution-sensitive species. Benthic communities are sensitive to contaminants, low dissolved oxygen, salinity fluctuations, and sediment disturbance, and thus serve as reliable indicators of estuarine environmental quality. Regional benthic indices were developed that reflect changes in diversity and population size of indicator species to distinguish degraded benthic habitats from undegraded benthic habitats. Poor conditions result when benthic communities have lower than expected diversity, are populated by more than the expected amount of pollution-tolerant species, or contain fewer than the expected amount of pollution-sensitive species. Estuaries in the Northeast were rated poor with 22% of sediments having poor benthic communities (the head of Chesapeake Bay and most of its major western tributaries, Maryland coastal bays, portions of Delaware Bay, New York/New Jersey Harbor, western Long Island Sound and Upper Narragansett Bay). Southeast estuarine areas are in good condition (79%), 10% are in fair condition, and 11% are in poor condition (has degraded resources).

Coastal Habitat Index

The coastal habitat index is an estimate of the change in the amount of coastal wetlands on a regional scale over the 10-year time period from 1990 to 2000 compared to the long-time decadal loss rate for 1780 to 1990. The coastal habitat index is calculated by taking the average of the 10-year loss rate and the decadal loss rate and multiplying by 100. Loss of wetland habitats in the U.S. has been significant over the past 200 years, but losses have slowed more recently. From 1990 to 2000, 13,210 acres of coastal wetlands were lost compared to 2,083,620 acres lost from 1780 to 1990. The coastal habitat index for the Northeast Coast is rated

fair to good with an estimated loss of 650 acres between 1990 and 2000 representing a loss of 0.14% over 10 years. The coastal habitat index for the Southeast Coast region is rated fair with a loss of 2,200 acres or 0.2% from 1990 to 2000.

Fish Contaminants Index

The fish contaminants index is used to indicate the level of chemical contamination in target finfish and shellfish species. Whole-body contaminant concentrations in target fish and shellfish were determined and compared with EPA Advisory Guidelines for risk-based thresholds (range of concentrations associated with non-cancer and cancer health endpoint risks for consumption of four 8-ounce meals per month). In the Northeast, 31% of sites evaluated were rated poor. High levels of PCBs (51%), polycyclic aromatic hydrocarbons (PAHs) (14%), DDT (9%), and mercury (3%) found in some species significantly contributed to the overall rating. Southeast estuaries were rated good with only 5% of all sites sampled having fish that exceeded the risk-based criteria guidelines. PAHs and total PCBs were the only contaminants that had high concentrations in fish tissues in the Southeast region.

For most contaminants, whole-body concentrations overestimate the risk of consuming only the fillet portion of the fish unless the contaminant is concentrated in muscle tissue (mercury). Also, most analyses were conducted on juvenile fish (non-market-size fish) that are known to have accumulated contaminant levels that are lower than those in larger, market-sized fish.

Conclusions & Future Focus

Overall, the NCCR II rated the nation's estuaries as in fair condition. The overall condition of Southeast estuaries is rated fair to good. The overall condition of the Northeast estuaries is poor with 49% percent of the estuarine area threatened for aquatic life use, 31% impaired for human use, and 27% impaired for aquatic life. The Northeast region is the most densely populated coastal area in the United States. Consideration must also be given to the influence that conditions in Chesapeake Bay have on the Northeast condition ratings because the Bay comprises 59% of the total water area in the Northeast region.

Increasing population growth in the Southeast Coast region could lead to water quality degradation so this should be monitored in future assessments. Levels of DO may have been higher in NCCR II due to drought conditions in many parts of the coast. The next NCCR is expected to be completed in 2006 and will include 2002 survey information for parts of Alaska and Hawaii. A framework for a national coastal monitoring program to attain consistent reporting in all U.S. coastal ecosystems is outlined in <http://www.epa.gov/owow/oceans/nccr/H2Ofin.pdf>.

Source

U.S. EPA (Environmental Protection Agency). 2004. *National Coastal Condition Report II*. EPA-620/R-03/002. Office of Research and Development and Office of Water, Washington, DC. 286 pp. (<http://www.epa.gov/owow/oceans/nccr2/>).

Around the Coast: Spotlight on South Carolina's Coastal Assessment Program

South Carolina projects that its coastal population will grow by 73% by the year 2025, placing ever increasing pressures on the state's aquatic resources. In response to growing concern over the quality of estuarine and coastal waters that support important commercial and recreational fisheries as well as provide areas for other recreational activities, the South Carolina Departments of Natural Resources (SCDNR) and Health and Environmental Control (SCDHEC) have launched a collaborative coastal monitoring program called the South Carolina Estuarine and Coastal Assessment Program (SCECAP).

The concept of the SCECAP is similar to the National Coastal Condition Report (see page 1) conducted by the Environmental Protection Agency (EPA) where particular data sets are used to generate scores or ratings in broad categories. The SCECAP program, initiated in 1999, collects information on water quality, sediment quality, and biological conditions at randomly selected sites to assess the overall habitat quality of South Carolina coastal waters. Three categories are used to calculate an overall habitat score: water quality, sediment quality, and biological integrity.

The EPA's National Health and Environmental Effects Research Laboratory (NHEERL), the National Oceanic and Atmospheric Administration (NOAA) Center for Coastal Environmental Health and Biomolecular Research

(CCEHBR), and the NOAA Hollings Marine Laboratory (HML) provide technical support to SCDNR and SCDHEC staff. The EPA's National Coastal Assessment Program provides a substantial portion of the funding. Additional support comes from the U.S. Fish and Wildlife Service (USFWS) Federal Aid in Sport Fish

Figure 2. Sediment quality ratings for open water and tidal creek habitats (2001-2002).

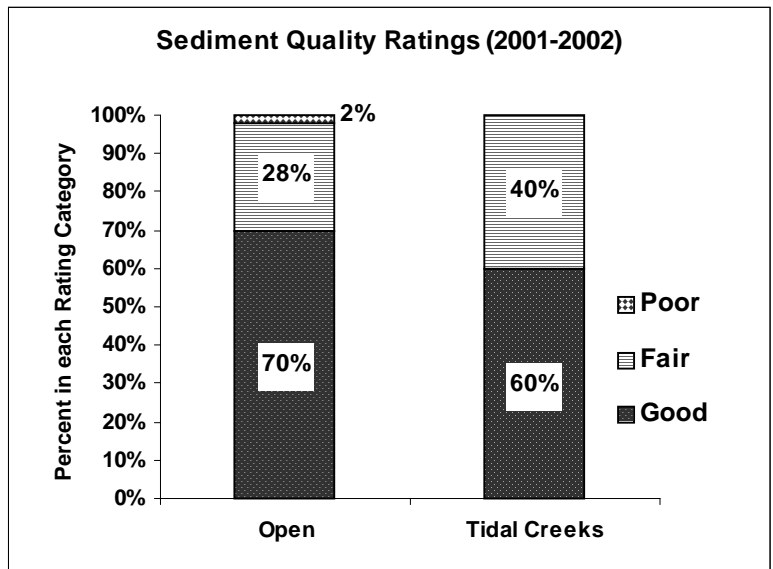
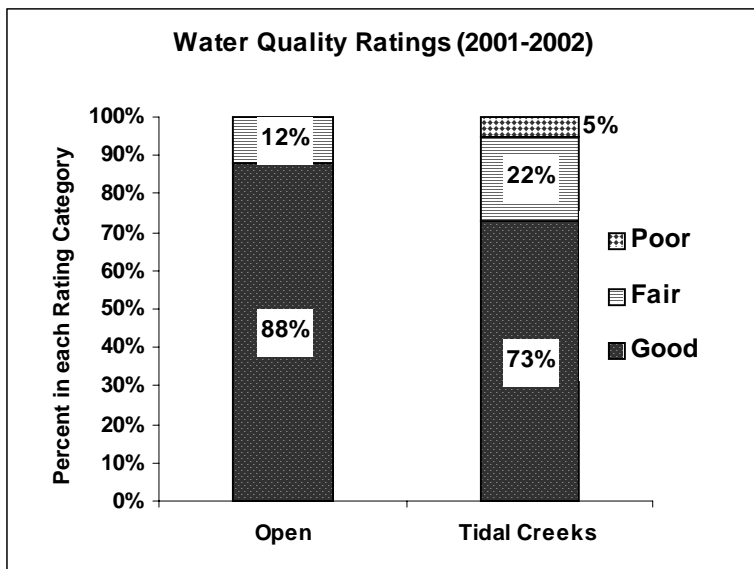


Figure 1. Water quality ratings for open water and tidal creek habitats (2001-2002).



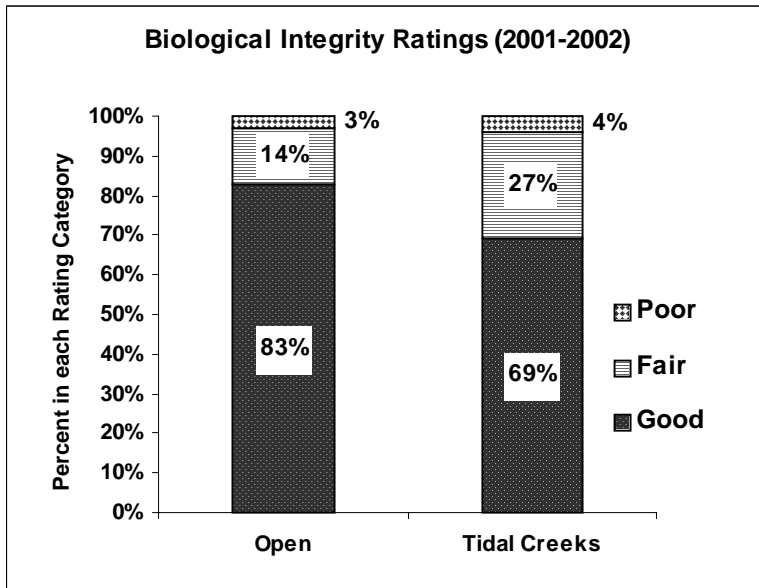
Restoration Program, the SCDHEC Office of Ocean and Coastal Resource Management (OCRM), South Carolina Saltwater Recreational Fisheries License funds, and the counties of Beaufort, Charleston, and Georgetown.

The goal of the SCECAP is to monitor the condition of the state's estuarine habitats and provide periodic reports to both coastal managers and the public. The program is slated to continue sampling every two years and results will be published in bi-annual State of the Estuary reports. The first four years of data (1999-2002) are now available for review. Data are also provided as electronic files on the SCECAP web site as they become available. To view the data sets and detailed descriptions of the various data measurements, please visit the SCECAP web site at: <http://www.dnr.state.sc.us/marine/scecap/>.

Water Quality

Several measures of water quality are collected to evaluate coastal waters. These measurements include dissolved oxygen, temperature, pH, total nitrogen, total

Figure 3. Biological integrity ratings for open water and tidal creek habitats (2001-2002).



Overall Habitat Quality

The primary goal of the SCECAP program is to assess the overall habitat quality of South Carolina’s coastal areas. The measures of water quality, sediment quality, and biological condition described above are combined to generate an overall rating of habitat. Overall, the majority of South Carolina’s open water habitats are in good condition (Figure 4). While the majority of tidal creek habitats are in good condition, nearly one quarter scored in the fair range (24%). This is most likely because tidal creek habitats are the first areas affected by encroaching development or anthropogenic stresses.

The SCECAP program provides a number of benefits to the citizens of South Carolina. First, the SCECAP program identifies estuarine habitat areas that are impaired or degraded. Second, the program defines a standardized, cost-effective protocol that is consistent with protocols from other coastal states. This will allow South Carolina managers to compare conditions in South Carolina to the southeastern region. It will also help strengthen regional prioritization of threats to habitat.

The SCECAP program will continue to produce State of the Estuary summary reports every two years on South Carolina’s coastal condition to evaluate change over time. Future sampling will also provide an opportunity to statistically evaluate conditions within some of the larger drainage basins or within specific areas of interest such as within designated counties. As more information becomes available to define criteria for good, fair, and poor conditions, the SCECAP scoring process will continue to be re-evaluated and fine-tuned. In the meantime, this unique state program will provide valuable data for the management and protection of South Carolina’ coastal resources.

Source: <http://www.dnr.state.sc.us/marine/scecap/>.

phosphorous, biochemical oxygen demand (oxygen consumed by the decomposition of organic matter), and fecal coliform bacteria. The 2001-2002 survey gave 73% of tidal creek habitats a good rating, 22% fair, and 5% a poor rating. In contrast, 88% of open water habitats were rated good, 12% fair, and 0% poor (Figure 1). Comparisons between the 1999-2000 survey results and the 2001-2002 results showed little change over the time period.

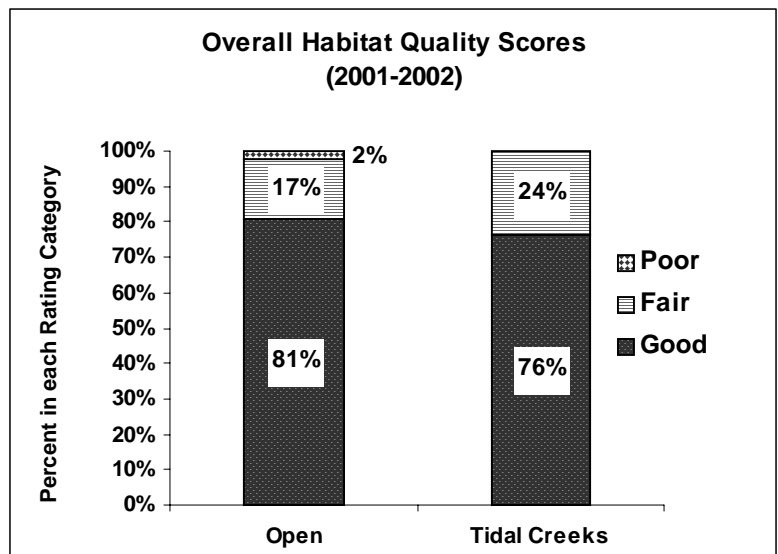
Sediment Quality

The SCECAP assesses pollution exposure by combining concentrations of 24 contaminants that have published standards for biological effects. Lab bioassays test for the potential toxicity of the contaminants. The toxicity and concentrations of sediment contaminants are used to generate an integrated sediment quality score. None of the tidal creek habitats had poor overall sediment quality in 2001-2002, but 40% were scored fair. In open water habitats, 2% were rated poor, and 28% were rated fair for overall sediment quality (Figure 2). There was very little change in ratings from the 1999-2000 survey.

Biological Condition

To characterize the condition of South Carolina’s marine communities, the SCECAP samples benthic communities, finfish, crustaceans, and phytoplankton. The data on benthic communities are used to develop an index of biological integrity that distinguishes areas as degraded or undegraded habitat. At the present time, only the benthic index is used to evaluate or rate coastal habitats. The 2001-2002 survey showed that 83% of the open water habitats were undegraded, 14% were marginally degraded, and 3% were degraded. Sixty-nine percent of tidal creek habitats were undegraded, 27% marginally degraded, and 4% degraded (Figure 3). The 2001-2002 data show an increase in degradation of both open water and tidal creek habitats from the 1999-2000 survey.

Figure 4. Overall habitat ratings for open water and tidal creek habitats (2001-2002)



In the News

First International Symposium on Mangroves as Fish Habitat Announced

The 1st International Symposium on Mangroves as Fish Habitat will be held February 7-9, 2006 in Miami, FL. The symposium will provide a forum for the exchange of ideas, approaches, methods, and data on the links between mangrove forests and fisheries. International experts will be invited to lead discussion on the major issues and questions raised. For registration and abstract submission, visit <http://www.rsmas.miami.edu/conference/mangrove-fish-habitat/> or contact mangrovesasfishhabitat@noaa.gov.

Shark overfishing Linked to Coral Reef Declines

Scientists from the Integrative Ecology Group in Sevilla, Spain and the Scripps Institution of Oceanography have linked targeted fishing (and overfishing) of sharks to overall degradation of coral reef systems. Shark overfishing starts a domino effect that eventually contributes to the decline in the coral reef ecosystem. The scientists developed an intricate model of the Caribbean marine ecosystem and included food web modeling of over 250 species to evaluate the impacts of fishing. The authors concluded that "community-wide impacts of fishing are stronger than expected because fishing preferentially targets species whose removal can destabilize the food web." For more information, please visit <http://scrippsnews.ucsd.edu/>.

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Invasive Snails Spreading Across Florida

Channeled apple snails, originally from South America, are quickly spreading across Florida. The snails, originally introduced to Florida in 1978 by the aquarium trade, produce thousands of gritty pink eggs at a time and deposit finger-size wads all over dock pilings and tree trunks. The snails also eat most aquatic plants, grow to the size of a softball, and are thought to have few predators. The long-term threat posed by the snails is unclear but some biologists fear the snails could reduce the region's wetlands, threaten water quality, and crowd out native species.

World Conservation Union Highlights Major Marine Issues: Recommendations Published

Every four years, the World Conservation Union (IUCN) governing body (Congress) meets to discuss broad, international environmental and conservation issues. The IUCN's Global Marine Program identified four priority issues to discuss with the Congress. IUCN members led discussions on four issues: 1) how to curb ecosystem degradation in the high seas where there is no national jurisdictions; 2) the management and successes of marine protected areas; 3) management and protection of tropical marine ecosystems and impacts of climate change on these ecosystems; and 4) the loss of marine species from extinctions and severe depletions. The complete recommendations and issues summary are available at <http://www.iucn.org/congress/index.cfm>

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