

Deep Sea Corals in the U.S.

- Locations, Threats, and Protections -



Introduction

Deep sea corals support high levels of marine biodiversity by providing habitat for numerous benthic species. As structure-forming animals, deep sea corals enhance habitat complexity by growing in the form of "reefs," fans, stalks, and "bushes." Unlike the tropical corals that most people are familiar with, deep sea corals typically live in waters that are too deep for the sun to penetrate or too cold for shallow-water corals to survive. In the U.S. there is not yet a coordinated policy for studying or protecting deep sea corals. The President's Ocean Action Plan, released in 2005, emphasized protection of deep sea corals, and included management recommendations for Regional Fishery Management Councils (Councils) to identify and protect deep sea coral habitats, but it is unclear how NOAA Fisheries will implement these recommendations.

Currently, most legal protections for deep sea corals in U.S. waters have been adopted in accordance with the Magnuson-Stevens Act (MSA). Under the MSA, NOAA Fisheries and the Councils are required to identify and minimize impacts on the essential fish habitat (EFH) of all species managed by federal fishery management plans. The extent to which the eight Councils have considered and recommended protecting deep sea corals under the EFH provisions is highly inconsistent. Some Councils identify corals as a type of EFH for managed fish species, while others consider the corals themselves to be managed species and therefore designate EFH specifically for them. Often corals are not considered in EFH designations because Councils have insufficient information to identify deep sea coral habitats in their management zones or have not investigated possible negative impacts of benthic fisheries on deep sea corals. Finally, even if a deep sea coral habitat is given an EFH designation, this does not guarantee any specific protections from destructive fishing practices. NOAA Fisheries was sued in 2000 by Oceana and eight other environmental and fishing organizations, who argued that the agency was taking insufficient action to protect EFH from adverse fishing impacts. The case was settled and led to the current Council attempts at comprehensive EFH analyses and protections.

Finally, NOAA Fisheries does not have a systematic approach for collecting data on coral locations or impacts by fishing gear. Therefore, knowledge of deep sea coral locations and the degree to which they are exposed to fishing activity varies widely from one region to the next. NOAA research programs, such as the Ocean Exploration Initiative, use submersibles to record the locations of deep sea corals and document the type and extent of damage to deep sea corals. Fisheries observer programs record information on bycatch in commercial fisheries. Observers can therefore provide crucial information identifying which target species, fishing gear types, and fishery locations are most commonly associated with deep sea coral damage. However, the adequacy of this data varies among fisheries and regions. For example, some fisheries observer programs do not collect complete and detailed data on species that are not commercial target species, making it very difficult to learn anything about fishery impacts on deep sea corals or other habitats. Furthermore, observers are often unable to classify the broken remains of corals and sponges that are captured in fishing gear.

The information below identifies where deep sea corals are known or likely to exist, the fisheries that damage deep sea corals, and the coral management strategies in place in each fishery management region. It should be noted that the information on coral habitats is as complete as possible given the data that is currently available, but it is not all-inclusive.

New England and Mid Atlantic Regions

Deep Sea Coral Habitats (known and probable)

- Submarine canyons: Heezen, Corsair, Oceanographer, Veatch, Lydonia, Hydrographer Norfolk, Baltimore, Hudson, Wilmington, Washington
- Seamounts: Bear, Physalia, Mytilus, Retriever
- Eastern Gulf of Maine, Jordan Basin
- George's Bank, especially the northeast peak
- The outer continental shelf and slope
- Northeast Channel
- Hard-substrate areas near Cape Hatteras,
- *Lophelia* banks on the mid-continental slope off North Carolina

No systematic assessment of the distribution and population dynamics of coral taxa is available for these two regions. Based on a review of mapping data from the 1980's, and limited ongoing mapping efforts, scientists have identified deep sea coral off New England, on Georges Bank in the Gulf of Maine, and in deep sea canyons on the continental slope. Scientists monitoring deep sea corals believe that their range in New England has been significantly reduced since mapping efforts were first undertaken in the 1980s. Over the past 20 years, submersible dives into complex benthic habitats in the northeastern U.S. have rarely encountered deep sea corals on the continental shelf and upper slope even though the presence of corals was recorded prior to then.

Fisheries with Deep Sea Coral Bycatch

- Bottom impacting mobile gear:
 - Bottom trawls: monkfish, northeast multispecies, Atlantic sea scallops, tilefish (trawling accounts for 5% of the fishery)
- Fixed gear
 - Hook-and-line: groundfish, halibut, flounder, tilefish
 - Pots and traps: offshore American lobster and red crab
 - Longline: tilefish, gag-grouper, tilefish
 - Gillnets: groundfish

Coral bycatch in New England waters has been observed on trawl research surveys conducted by the Northeast Fisheries Science Center (NEFSC), but have not been quantified; the NEFSC does not routinely count or identify corals during research surveys. Before 2000, observer coverage was mainly in gillnet fisheries, was at near-zero levels, and only reported marine mammal takes, not invertebrate bycatch. Coverage in the current observer program is now 1-5%.

Research and Management

- Amendment 2 of the Monkfish FMP, which applies in both the New England and Mid Atlantic regions: sets a 6-inch diameter limit on roller and rockhopper for trawl vessels fishing in the Southern Fishery Management Area (SFMA), which includes the region's nine submarine canyons (Lydonia, Oceanographer, Hydrographer, Veatch, Hudson, Wilmington, Baltimore, Washington, and Norfolk); and proposes expansion of the monkfish trawl fishery into deep sea canyons while indefinitely banning monkfish bottom trawling and gillnetting in Oceanographer and Lydonia canyons to protect deep sea corals that may live there.
- A tilefish habitat area of particular concern (HAPC), a subset of EFH, extends from Cape May to Cape Cod (80 m to 400 m deep), including Hudson Canyon.

South Atlantic Region

Deep Sea Coral Habitats (known and probable)

- Onslow Bay rock reef, North Carolina
- *Enallopsamia* reefs, South Carolina
- Blake Plateau, Georgia and South Carolina
- *Oculina* Habitat Area of Particular Concern (HAPC), Florida
- East Florida Reefs from Cape Canaveral to Cocoa Beach/Daytona, Florida
- *Lophelia* reefs from North Carolina to Florida
- Continental shelf edge, from northern Florida to Cape Hatteras

In December 2004 ten additional deepwater coral HAPCs were proposed. These proposed areas will be included in the South Atlantic Council's Comprehensive Fishery Ecosystem Plan Amendment which will be made available for public comment by the end of 2005. The areas include: *Lophelia* banks off Cape Lookout and Cape Fear, Stetson Reef, Savannah and Southwest Florida Lithoherms, and Miami and Portuales Terrace

Fisheries with Deep Sea Coral Bycatch

- Bottom impacting mobile gear
 - Trawl: rock shrimp, royal red shrimp, calico scallops
 - Dredge: calico scallops
- Fixed gear
 - Handlines, pots and traps: snapper-grouper
 - Bottom longline: wreckfish, gag grouper

Research and Management

- The Coral, Coral Reefs, and Live/Hard Bottom Habitat FMP allows direct take of most octocorals anywhere south of Cape Canaveral; no other coral species may be taken.
- Deep sea corals are considered managed species and EFH for the corals has been designated and defined as "hard substrate in subtidal to outer shelf depths throughout the management area." EFH for deep sea corals was defined as follows:
 - **Ahermatypic stony corals**: defined, hard substrate from subtidal to outer shelf depths
 - **Octocorals** (except sea pens and sea pansies): rough, hard, exposed, stable substrate from subtidal to outer shelf depths; includes wide range of salinity and light penetration
 - **Black corals** (*Antipatharia*): rough, hard, exposed, stable substrate, offshore in high (30-35%) salinity waters in depths exceeding 18 meters (54 feet)
- The *Oculina* HAPC encompasses 300 nm² from Cape Canaveral to Sebastian Inlet.
 - Bottom impacting fishing gears (longlining, trawls, dredges, and fish traps) are prohibited in the HAPC.
 - Experimental *Oculina* Research Reserve (EORR) (within the *Oculina* HAPC):
 - Fishing for or retention of snapper/grouper species in the area is prohibited
 - Anchoring is prohibited
 - A 2001 survey of the EORR indicated that 90% of the reserve's *Oculina* reefs have been reduced to rubble, in part by shrimp trawls
 - Trawlers have poached shrimp within the *Oculina* HAPC as recently as October 2002, causing significant damage to the corals.
- Cape Canaveral Pinnacle reef, intact 25 years ago, has been destroyed by bottom trawls
- *Oculina* HAPC is the only area where specific gear restrictions have been implemented.

Gulf of Mexico Region

Deep Sea Coral Habitats (known and probable)

- Madison-Swanson Marine Reserve
- Steamboat Lumps
- Desoto Canyon
- Pulley Ridge / Southwest Florida Shelf
- Northeastern Gulf hydrocarbon seeps
- Florida Middle Grounds HAPC
- North-central *Lophelia* banks
- Southwest Florida shelf, north of Tortugas

The U.S. Geological Survey and Mineral Management Service are studying and mapping deep sea corals in the Gulf in addition to research being done by NOAA Fisheries.

Fisheries with Deep Sea Coral Bycatch

- Bottom impacting mobile gear
 - Trawl: reef fish, shrimp
- Fixed gear
 - Longline: snapper-grouper, shark, tuna

Data on bycatch of non-commercial species is not regularly collected in the Gulf of Mexico, however the data that do exist indicate that shrimp trawls take corals as bycatch. Commercial bottom longliners and sport fishermen pursuing reef fish such as red snapper and grouper are believed to have the greatest negative impact on coral habitat. While hauling lines up to the surface, hooks may snag and break coral, sponges, and gorgonians. Most other commonly used gear types (power hook and line, regular hook and line, and pelagic longlines) are associated with less coral bycatch. While damage caused by anchors from commercial and recreational fishing vessels is a problem in all regions, the Gulf of Mexico has taken action by recommending (pending NOAA approval) that anchoring on corals be prohibited.

Research and Management

- Bottom impacting gear is prohibited in all areas with known coral reefs.
- EFH in the Coral FMP includes hard bottom offshore of Florida from Crystal River to the Florida Keys and areas among pinnacles and banks from Texas to Mississippi.
- Generic Amendment for Essential Fish Habitat (EFH) was approved for submission to the Secretary of Commerce at the beginning of 2005.
 - Pulley's Ridge (2300 nm²) is designated a HAPC; bottom impacting gear is prohibited in 104nm² within the HAPC
 - 13 HAPCs were designated off Texas and Louisiana
 - HAPCs with coral communities: McGrail, East and West Flower Garden Banks, Stetson, Bright, Geyer, Sonnier, and Claypile Banks
 - In January 2005, the Gulf of Mexico Fishery Management Council approved and submitted to NMFS an amendment to its Coral FMP that restricts fishing activities in the above identified HAPCs with coral habitats. NMFS expects to implement this Amendment by December 2005. Regulations will include:
 - A ban on anchoring
 - A ban on bottom impacting fishing gear including trawls and longlines
 - Required weak links in tickler chains used by shrimp trawls

North Pacific Region

Deep Sea Coral Habitats (known and probable)

- Aleutian Islands (hydrocoral, black coral, seafans)
 - Adak Canyon, Semisopchnoi, Ulak, and other Coral Gardens
 - Bower's Ridge
- Bering Sea (soft corals throughout the shelf, hard corals along the lower Bering Sea slope)
- Gulf of Alaska (red tree coral, hydrocorals, bamboo coral, black coral, sea fans, cup coral)
 - Seamounts, Fareweather Grounds, Cape Ommaney, Dixon Entrance
- Prince William Sound

Fisheries with Coral Bycatch

- Aleutian Islands:
 - Bottom trawls: Pacific ocean perch, Atka mackerel, Pacific cod
 - Pelagic trawls: walleye pollock (historical bycatch; the fishery is currently closed because of Steller sea lion protections)
- Bering Sea (soft corals):
 - Bottom trawls: flatfish (e.g., yellowfin sole, rock sole)
- Gulf of Alaska:
 - Bottom trawls: rockfish, Pacific cod

Groundfish are known to associate with and depend on deep sea corals and sponges for habitat. *Groundfish bottom trawls have removed nearly one million pounds of deep sea coral and sponge bycatch from Alaskan waters every year since 1991.* Furthermore, coral bycatch measurements underestimate the amount of damage actually done to corals by fishing gear, because they exclude corals that are damaged or destroyed by gear and left to die on the seafloor.

Average Annual Deep Sea Coral and Sponge Bycatch by Bottom Trawls 1997-2001, groundfish fisheries

	Aleutian Islands	Bering Sea	Gulf of Alaska
Sponges	124.3 mt	228.2 mt	5.7 mt
Corals*	28 mt	46.1 mt	7.2 mt

*Coral biomass includes bryozoans, sea whips/pens (octocorals). NMFS 2004.

Research and Management

- Bottomfishing and anchoring have been prohibited in the Sitka Pinnacles Marine Reserve (2.5 nm²) in southeast Alaska since it was created in 1999.
- Coral habitat areas may be indirectly protected by bottom trawling restrictions such as those in part of Bristol Bay (closed to protect red king crab juveniles), the Southeast Alaska Conservation Zone, and other regions.
- Deep sea corals and sponges are considered habitat areas of particular concern (HAPC) in the groundfish fishery management plans.
- Fishing which targets HAPC organisms such as corals and sponges is prohibited.
- The North Pacific Council recently approved EFH that restricts bottom-trawling in the Aleutian Islands to the 25,000 mi² of seas where trawling now occurs, and protects known coral habitats and seamounts. *See box for details.*

North Pacific EFH Final Action Plan

(approved by the North Pacific Fishery Management Council in February 2005 for final adoption in August 2006, pending approval by NOAA Fisheries)

Aleutian Islands:

- Bottom trawling prohibited in over 95% of the area (277,100 nm²) to address concerns about the impacts of bottom trawling on seafloor habitat, particularly deep sea corals
 - 4% (12,423 nm²) of areas that supported high fish catch levels in the past remain open
- Six “coral gardens” (110 nm²) are closed to all bottom-contacting fishing gear (longlines, pots, trawls, etc.)
- Bowers Ridge designated as a HAPC
 - Mobile bottom-contacting fishing gear prohibited (5,286 nm²)
- VMS required for all fishing vessels
- Comprehensive research and monitoring plan will be developed

Gulf of Alaska:

- Bottom trawling for all groundfish prohibited in 10 areas thought to contain high relief bottom and coral communities (2,086 nm²)
- All 16 named seamounts in the Gulf designated as HAPC
 - Bottom impacting fishing gear prohibited (5,329 nm²)
- Three areas of recently discovered large aggregations (“thickets”) of *Primnoa* coral off Southeast Alaska designated as HAPC
 - Bottom-contacting fishing gear prohibited in 20% of the HAPC (13.5 nm²)

Bering Sea:

- Additional analyses will be done to determine the best ways to minimize the impacts of fishing on EFH, including an assessment of possible gear modifications.

Pacific Region

Deep Sea Coral Habitats (known and probable)

- *Lophelia* reefs in the Olympic National Marine Sanctuary
- Monterey deep sea canyon off of Moss Landing, CA (and neighboring canyons)

A comprehensive report on deep sea coral habitat locations has been written by Curt Whitmire and Elizabeth Clarke (Northwest Fisheries Science Center) and is currently undergoing scientific review. The above list of coral habitat areas should be updated when the report is released. The report will use data from the West Coast observer program, NMFS research trawl surveys, and independent submersible studies to map coral locations.

Fisheries with Coral Bycatch

The Pacific groundfish fishery takes deep sea corals as bycatch. Some bycatch data is available from NOAA Fisheries research trawls and aggregate bycatch data is available for larger fisheries. However, the Pacific Council has obtained inadequate data on coral habitat areas. The Council's 2004 groundfish EIS states that "coral, sponges, and other animals may be taken or damaged during fishing operations, but the distributions of these benthic animals are poorly known on the West Coast."

Research and Management

- Monterey Bay National Marine Sanctuary (MBNMS): commercial fishing is allowed
 - Primary gear types: pots and traps, bottom trawl nets, hook-and-line gear, purse seines, and gill nets
 - Over 1000 commercial vessels fish in Monterey Bay, plus many more recreational fishers
- Olympic National Marine Sanctuary
 - Bottom trawling is allowed in the sanctuary
 - Researchers are now comparing areas that have been lightly and heavily trawled in Olympic National Marine Sanctuary to better guide management practices
- In 2003, ten marine reserves and two marine conservation areas were established in California state waters of the Channel Islands National Marine Sanctuary.
- Beginning in 2002, time/area closures, referred to as Groundfish Conservation Areas (GCAs), were created to decrease bycatch of overfished species. GCAs protect depth ranges where incidence of bycatch of overfished species is highest, based on log book and observer data. GCA boundaries vary by season and fishery sector, and can be modified according to new information on geographic and seasonal bycatch distributions.
 - The trawl Rockfish Conservation Area has consisted of a permanently closed area between 100 and 150 fathoms as well as periodically closed areas.
- Fishing for all groundfish is prohibited within the 4,300 square miles encompassed by the two Cowcod Conservation Areas off southern California except in nearshore waters shallower than 20 fathoms (37 meters).
- The Rockfish FMP prohibits the use of trawl net footropes over 12-inches in diameter coastward of the Rockfish Conservation Area. However, larger footropes can be used seaward of the RCA, and therefore the largely untrawled continental slope is not protected by this restriction.
- The Pacific Fishery Management Council chose a preferred alternative for the Essential Fish Habitat Final EIS (to be published in December 2005), in large part to protect deep sea corals, that will close to bottom trawls a total of 259,527 square miles (all waters west of the 700 fathom line and Ecologically Important Areas off CA, OR, and WA). The alternative will also restrict the size of bottom trawl footropes to: 8" in diameter eastward of the 100 fathom line and 19" in diameter between the 100 and 700 fathom lines. Finally, the alternative will prohibit dredges and beam trawls in all waters.

Western Pacific Region

Deep Sea Coral Habitats (known and probable)

- Black Coral:
 - Main Hawaiian Islands: Maui
- Gold Coral:
 - Main Hawaiian Islands: Hawaii, Oahu
 - Northwestern Hawaiian Islands: East French Frigate Shoals, Brooks Bank
 - Seamounts: Cross Seamount
- Pink Coral:
 - Main Hawaiian Islands: Oahu, Kauai, Niihau
 - Northwestern Hawaiian Islands: predominantly around Gardner Pinnacles and Laysan Island, but present in other areas from Nihoa to Midway
- Bamboo Coral:
 - Main Hawaiian Islands: Oahu
 - Hancock Seamount

Fisheries with Coral Bycatch

- Pelagic armorhead is considered severely overfished at Hancock Seamount despite a moratorium on U.S. armorhead fishing since 1986.
- Direct take of deep sea corals (pink, gold, and bamboo coral) is permitted in parts of the Western Pacific. The Western Pacific Council is attempting to expand this "fishery" into the Northwestern Hawaiian Islands.

Research and Management

- In 1986, bottom trawling was prohibited in all US-managed Western Pacific waters to protect all types of coral (shallow and deep).
- Direct take of deep sea corals for use in jewelry is allowed and may expand.
 - Take of gold coral from an area off Oahu has been suspended until its impact on recruitment is better understood
 - A 2000 Executive Order prohibited take of precious (a.k.a. deep sea) corals in the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve. However, the Western Pacific Council seeks to allow directed take of corals when it becomes a national marine sanctuary.