UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NOAA FISHERIES Glossary

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http://www.st.nmfs.gov/st4/documents/F_Glossary.pdf

Cover Photo of Yellowfin Tuna by William L. High, NMFS

This revised and updated edition has a correction to the B_{msy} determination of Minimum Stock Size Threshold on page 29.

Contents

NOAA's National Marine Fisheries Service (NOAA Fisheries Service) is dedicated to the stewardship of the Nation's living marine resources and their habitat. As a leading voice for the economic benefits that can be derived from sustainable use and conservation of our Nation's living marine resources, NOAA scientists and resource managers work to ensure the continued productivity and abundance of these resources and a bright future for the people dependent upon them.

To meet these goals and better serve its constituents and the general public, NOAA strives to develop and maintain effective communications and educational resources. Efforts include the development of outreach, educational, and reference materials such as this fisheries glossary.

NOAA Fisheries Service engages in a wide range of scientific research, fisheries management, protected species, and enforcement and habitat conservation programs. Each of these areas have a language uniquely their own, complete with terminology that may be unfamiliar to the general public or professionals working in other disciplines.

To facilitate communication and encourage public participation in NOAA's stewardship activities, this fisheries glossary seeks to provide clear and understandable definitions for the technical terms likely to be encountered by our constituents and for interested citizens. Included are the most commonly occurring terms, with definitions derived from a variety of sources.

From the Assisstant Administrator for Fisheries

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GLOSSARY

A

Abiotic
A nonliving (physical or chemical) component of the environment.[12]

(Absolute) Abundance
The total number of a kind of fish in a population; this is rarely known, and usually estimated from the relative abundance.[10] (see *Abundance Index*)

Abundance Index
A relative measure of the weight or number of fish in a stock, a segment of the stock (e.g. the spawners), or an area. Often available in time series, the information is collected through scientific surveys or inferred from fishery data.[5]

Abyssal Plain
The ocean floor offshore from the continental margin, usually very flat with a slight slope.[12]

Abyssalpelagic Zone
The pelagic environment from a depth of approximately 4,000 meters to 7,000 meters.[12]

Abyssal Zone
The bottom from a depth of approximately 4,000 meters to 7,000 meters.[12]

Acceptable Biological Catch (ABC)
A scientific calculation of the sustainable harvest level for a species or species group, and is used to set the upper limit on the range of potential annual total allowable catch (TAC).[1,4] (see *Allowable Biological Catch*)

Accuracy
Of an estimate: an indicator of the closeness of an estimated value (e.g. population parameter) to the actual value. It should not be confused with precision, which relates to the confidence limits (variability) of the estimate and can always be computed from the samples.[5] (see *Precision*)

Acoustic Survey
A systematic method of gathering information on fish availability and abundance in a water body with the help of sophisticated acoustic instruments, such as echo sounders and sonar, that generate ultrasonic sound for the detection of fish.[5]

Adaptive Management
1. A management process involving step-wise evolution of a flexible management system in response to feedback information actively collected to check or test its performance (in biological, social, and economic terms). It may involve deliberate intervention to test the fishery system's response; 2. The process of improving management effectiveness by learning from the results of carefully designed decisions or experiments.[5]

Advisory Panel (AP)
Provides additional review and stakeholder perspective to a regional fishery management council (FMC) for proposed actions and draft amendments to fishery management plans (FMPs). The advisory panel usually represents a variety of interests from commercial, recreational, environmental, and consumer areas. However, panel members do not have seats on the council and do not vote.[2] (see *Scientific and Statistical Committee*)

Age
The number of years of life completed, here indicated by an Arabic numeral, followed by a plus sign if there is any possibility of ambiguity (age 1, age 1+).[5]

Age Class
A group of individuals of the same age range in a population. The age 0 group are the fish in their first year of life. A fish born in April of a given year remains in the age 0 group until April of the following year. The term usually refers to a year class in long-lived annually breeding species, but shorter units of time are also used, particularly in the tropics.[5]

Age Frequency or Age Structure
A breakdown of the different age groups of a kind of fish in a population or sample.[2]

Age-Length Key
One approach used to assign ages to fish, given length measurements. Used to convert catch-at-size data into catch-at-age data. The keys specify the probability that fish of a given size belong to one of several age groups.[5] (see *Length-Weight Relationship*)

Allowable Biological Catch (ABC)
A term that refers to the range of estimated allowable catch for a species of species group. It is set each year by a scientific group. The ABC estimates are used to set the annual total allowable catch (TAC).[4] (see *Acceptable Biological Catch*)

Allocation
1. Distribution of the opportunity to fish among user groups or individuals. The share a user group gets is sometimes based on historic harvest amounts; 2. A quantity of catch, effort, or biomass attributed to a person, a vessel, and a fishing company. The allocation can be absolute (e.g. a number of tons) or relative (e.g. a percentage of the annual allowable catch).[5]

Alternatives
In the context of an environmental impact statement for annual fisheries management measures, alternatives are different suites of optimum yields and management actions that could be used to manage fisheries.[1]

Anadromous
Fishes that migrate as juveniles from freshwater to saltwater and then return as adults to spawn in freshwater; most Pacific salmon are anadromous.[4]

Angler
A person catching fish or shellfish with no intent to sell, including people releasing the catch.[10] (see *Recreational Fishery*)

Annual (Total) Mortality (Rate)
1. The rate of death, usually in terms of a percentage of fish dying from a population in one year, due to both fishing and natural causes[2]; 2. The ratio of the number of fish which die during a year divided by the number alive at the beginning of that year.[5]

Anoxic
The condition of oxygen deficiency or absence of oxygen. Anoxic sediments and anoxic bottom waters are commonly produced where there is a deficiency of oxygen due to very high organic productivity and a lack of oxygen replenishment to the water or sediment, as in the case of stagnation or stratification of the water body.[12]

Aphotic
Light level modifier of the deep epipelagic ocean ecosystem, and turbid regions of all other waters; areas never reached by natural light.[12]

Aquaculture
The farming of aquatic organisms including fish, mollusks, crustaceans, and aquatic plants with some sort of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. Farming also implies individual or corporate ownership of the stock being cultivated.[5]

Archipelago
A group of islands; an expanse of water with scattered islands.[12]

Area Closure
The closure to fishing by particular gear(s) of an entire fishing ground, or a part of it, for the protection of a section of the population (e.g. spawners, juveniles), the whole population, or several populations. The closure is usually seasonal but it could be permanent.[5]

Artisanal Fishery
A fishery based on traditional or small-scale gear and boats.[10]

Assemblage
1. An association of coexisting species, in space and time, with similar environmental tolerance, possibly trophic relationships, but not totally interdependent; 2. A collection of species inhabiting a given area, the interactions between the species, if any, being unspecified.[5]

Assessment
A judgment made by a scientist or scientific body on the state of a resource, such as a fish stock (e.g. size of the stock, potential yield, on whether it is over- or underexploited), usually for the purpose of passing advice to a management authority.[5]

Assessment Level
Categories of the level of complexity of, and data available for each assessment: index of abundance (Index), yield-per-recruit analysis (Yield), analysis of the age structure of the catch (Age Structure), analysis including the relationship between recruitment and spawning stock size (Spawning Stock), and assessment that allows prediction of future (1or 2 years ahead) stock sizes and catches (predictive).[6]

Associated Species
Those species that (a) prey upon the target species, (b)

are preyed on by it, (c) compete with it for food, living space, etc., or (d) co-occur in the same fishing area and are exploited (or accidentally taken) in the same fishery or fisheries. These interactions can occur at any stage of the life cycle of one or other species and the range of species concerned can therefore be very large.[5]

Atoll
Earthform consisting of a ringlike perimeter reef area, often with a reef islet, enclosing a lagoon area.[12] (see *Lagoon*, *Reef*)

Availability
1. The fraction of a fish population which lives in regions where it is susceptible to fishing during a given fishing season. This fraction receives recruits from or becomes mingled with the non-available part of the stock at other seasons, or in other years (any more or less completely isolated segment of the population is best treated as a separate stock); 2. The proportion of a stock which is susceptible to fishing. Fish become "available" to fisheries through migration, growth and /or change of behavior (from pelagic to demersal). If an available section of a stock is sufficiently isolated from the rest of the stock, it could be considered a management unit and be managed as such; 3. Describes whether a certain kind of fish of a certain size can be caught by a type of gear in an area.[5]

B

B_0 ($B_{"zero"}$)
Unfished or virgin biomass. Rarely known. Using mathematical models, it is generally calculated as the long-term average biomass value expected in the absence of fishing mortality. In production models, B_0 is also known as carrying capacity. It is often used as a biological reference point in fisheries management.[5]

B_{MSY}
1. Long-term average biomass that would be achieved if fishing at a constant fishing mortality rate equal to F_{MSY}[2,3]; 2. The weight (biomass) of a group of fish necessary to produce maximum sustainable yield (MSY).[4]

Bag Limit
The number and/or size of a species that a person can legally take in a day or trip. This may or may not be the same as a possession limit.[2]

Bank
Submerged earthform with a crest at a depth of 20–200 meters in oceanic waters and of 0–5 meters in nearshore and neritic waters.[12] (see *Nearshore*, *Neritic Zone*)

Barrier Island
A sedimentary island, generally elongate and low, that is built by longshore transport or wave action parallel to the coast.[12]

Barrier Reef
A reef growing offshore from a land mass and separated from the shoreline, often by a lagoon or estuary.[12] (see *Estuary*, *Lagoon*)

Baseline
A set of reference data sets or analyses used for comparative purposes; it can be based on a reference year or a reference set of (standard) conditions.[5]

Basin
Any large depression in which sediments are deposited.[12]

Bathyl Zone
The seafloor between depths of 1,000 meters and approximately 4,000 meters.[12]

Bathymetry
Pertaining to the depth and relief of water basins.[12]

Bathypelagic Zone
The pelagic environment between depths of 1,000 meters and 4,000 meters.[12]

Bayesian
A formal statistical approach in which expert knowledge or beliefs are analyzed together with data. Bayesian methods make explicit use of probability for quantifying uncertainty. Bayesian methods are particularly useful for making decision analyses.[5] (see *Monte Carlo*)

Beach
A sloped sediment shoreline composed of sand, gravel, cobble, mud, or boulder-sized sediments, sometimes with beach rock.[12]

Benthic
1. Defining a habitat or organism found on the sea bottom[10]; 2. Of or pertaining to the seafloor (or bottom) of a water body.[12] (see *Demersal*, *Pelagic*)

Benthos
Organisms that live on or in the seabottom.[12]

Best Available Science
The term "best available science" comes from National Standard 2 listed in the Magnuson-Stevens Act, and is the informational standard mandated for decision making.[1]

Bias
A systematic difference between the expected value of a statistical estimate, and the quantity it estimates.[5]

Billfish
A group of tuna-like fish species comprising marlins, sailfish, and spearfish, and which are characterized by a snout which extends into a bill or spear.[5]

Bioaccumulation
The buildup over time, within animal tissues, of substance (e.g. heavy metals) that cannot be excreted by an organism.[1]

Bioeconomic Modeling
Mathematical formulae that simulate the interaction between biological behavior of fish stocks and human behavior of users of the resource as it is shaped by economic factors.[9]

Biogeography
The distribution of one or more species that is defined by abiotic factors (temperature, salinity, surface currents, etc.).[12]

Biological Assessment
An assessment conducted as part of the Endangered Species Act (ESA).[1]

Biological Diversity (Biodiversity)
1. The variety and variability among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems. Diversity indices are measures of richness (the number of species in a system) and may reflect ecosystem stresses (such as those due to high fishing intensity); 2. Includes genetic diversity (within species), species diversity (within ecosystems), and ecosystem diversity.[5] (see *Species Diversity*)

Biological Opinion
A scientific assessment issued by the National Marine Fisheries Service (NMFS) or U.S. Fish and Wildlife Service (USFWS), as required by the Endangered Species Act (ESA) for listed species. Determines the likelihood of an action to jeopardize the existence of a species listed under the ESA.[1]

Biological Reference Points
1. A biological benchmark against which the abundance of the stock or the fishing mortality rate can be measured in order to determine its status. These reference points can be used as limits or targets, depending on their intended usage[5]; 2. Specific values for the variables that describe the state of a fishery system which are used to evaluate its status. Reference points are most often specified in terms of fishing mortality rate and/or spawning stock biomass. These may indicate (a) a desired state of the fishery, such as a fishing mortality rate that will achieve a high level of sustainable yield, or (b) a state of the fishery that should be avoided, such as a high fishing mortality rate which risks a stock collapse and long-term loss of potential yield. The former are referred to as "target reference points," and the latter are referred to as "limit reference points" or "thresholds." Some common examples are $F_{0.1}$, F_{MAX}, and F_{MSY}.[3]

Biomass (B)
1. Or standing stock. The total weight of a group (or stock) of living organisms (e.g. fish, plankton) or of some defined fraction of it (e.g. spawners) in an area, at a particular time; 2. Measure of the quantity, usually by weight in pounds or metric tons (2,205 pounds or 1 metric ton), of a stock at a given time.[5]

Biota
The plant and animal life characteristic of a specific region or biosphere, or given time period.[14]

Biotic
Pertaining to the living components of their environment.[12]

Blocked Quota Shares
In Alaska, quota shares in the Alaskan halibut and sablefish individual fishing quota (IFQ) program that are not allowed to be subdivided when transferred. There are limits on the size of the blocked quota and on the number of blocks that an individual may own in a given area. This is intended to ensure the availability of small units of quota for purchase by new entrants.[13] (see *Unblocked Quota Shares*)

Bloom
A sudden increase in the abundance of alga or phytoplankton resulting in a contiguous mass of highly concentrated phytoplankton in the water column.[12]

Bony Fishes
Fishes with a calcified hard skeleton and belonging to Class Osteichthyes; includes most fish species except sharks, rays, skates, hagfish, and lampreys.[10]

Bootstrap
A statistical methodology used to quantify the uncertainty associated with estimates obtained from a model. The bootstrap is often based on Monte Carlo resampling of residuals from the initial model fit.[5] (see *Monte Carlo*)

Boundary Current
Large-scale water stream in the upper ocean that separates water masses; is driven by a combination of wind, temperature, geostrophic, or coriolis effects.[12]

Buffer Zone
The area that separates the core from areas in which human activities that threaten it occur.[14]

Bycatch
Fish other than the primary target species that are caught incidental to the harvest of the primary species. Bycatch may be retained or discarded. Discards may occur for regulatory or economic reasons.[13]

Bycatch Reduction (Excluder) Device
A device inserted in a fishing gear (usually trawl nets, close to the codend) to allow escapement, alive, of unwanted (nontarget and prohibited) species (e.g. jellyfish), smaller fish (juveniles), and threatened or endangered species (e.g. sea turtles, marine mammals).[5]

C

CAGEAN
Catch-at-age analysis. An analysis used to reconstruct the population history of long-lived fish stocks. They provide an estimate of the current "exploitable biomass" (the part of the population that can be fished), upon which the harvest rate is based.[1]

Capability
The ability to do something with the capacity you have; the capacity to be used, treated, or developed for a specific purpose.[8]

Capacity
1. The ability to sustain, harvest, hold, or process; 2. The maximum amount that can be produced per unit of time with existing plant and equipment, provided the availability of variable factors of production is not restricted.[5]

Carrying Capacity
1. The maximum population of a species that an area or specific ecosystem can support indefinitely without deterioration of the character and quality of the resource; 2. The level of use, at a given level of management, at which a natural or man-made resource can sustain itself over a long period of time. For example, the maximum level of recreational use, in terms of numbers of people and types of activity, that can be accommodated before the ecological value of the area declines.[5]

Cash Flow Analysis
A type of financial analysis that compares the timing and amount of cash inflows with the timing and amount of cash outflows. A firm's cash flow position can greatly affect its ability to remain in business. These effects may not be apparent from a cost-benefit analysis.[9]

Catadromous
Fishes that spend most of their life in freshwater and then migrate into saltwater to spawn.[10]

Catch
1. To undertake any activity that results in taking fish out of its environment dead or alive. To bring fish on board a vessel dead or alive; 2. The total number (or weight) of fish caught by fishing operations. Catch should include all fish killed by the act of fishing, not just those landed; 3. The component of fish encounter-ing fishing gear, which is retained by the gear.[5]

Comment: The catch is usually expressed in terms of wet weight. It refers sometimes to the total amount caught, and sometimes only to the amount landed. The fish which are not landed, but returned to the sea, are called discards.[5]

Catchability
1. In general, the extent to which a stock is susceptible to fishing.[5] (see *Vulnerability*)

Comment: Catchability often increases with developments in fishing technology, and so needs to be monitored. It depends on the habits of the fish as well as on the type and deployment of fishing gear. It may also depend on the abundance of the fish (e.g. less abundant fish may be more catchable due to less saturation of gear or to concentration in schools). Specific climatic conditions may result in increased or decreased availability of the fish. This would lead to increased (or decreased) catchability and, thus, increased (or decreased) fishing mortality rate with the same fishing effort.[5]

Catchability Coefficient (q)
1. In fisheries models, the factor (*q*) relates abundance to stock size (x = *q*N) and fishing mortality to fishing effort (F = *q*f). Following the latter, (*q*) is a measure of fishing mortality generated on a stock by one unit of effort; 2. The fraction of a fish stock which is caught by a defined unit of the fishing effort. When the unit is small enough that it catches only a small part of the stock—0.01 or less—it can be used as an instantaneous rate in computing population change.[5]

Catch Curve
A breakdown of different age groups of fish, showing the decrease in numbers of fish caught as the fish become older and less numerous or less available. Catch curves are often used to estimate total mortality.[2]

Catcher Vessel
Vessel that harvests fish but does not have onboard processing capacity.[13]

Catcher-Processor Vessel
Vessel that can both catch and process the catch onboard. Also referred to as factory trawlers or freezer-longliners.[13]

Catch Per Unit (of) Effort (CPUE)
The quantity of fish caught (in number or in weight) with one standard unit of fishing effort; e.g. number of fish taken per 1,000 hooks per day or weight of fish, in tons, taken per hour of trawling. CPUE is often considered an index of fish biomass (or abundance). Sometimes referred to as catch rate. CPUE may be used as a measure of economic efficiency of fishing as well as an index of fish abundance. Also called: catch per effort, fishing success, availability.[5]

Catch Rate
Means sometimes the amount of catch per unit time and sometimes the catch per unit effort.[5]

Ceremonial and Subsistence
A harvest category specific to Native American tribes representing fishing rights granted by treaty.[1]

Cetaceans
Marine mammals of the Order *Cetacea*. Includes whales, dolphins, and porpoises.[5]

Charter Boat
Any vessel-for-hire engaged in recreational fishing and hired for a charter fee by an individual or group of individuals (for the exclusive use of that individual or group of individuals), which results in that vessel being unavailable for hire to any other individual or group of individuals during the period of the charter.[9]

Closed Season
Seasonal closure. The banning of fishing activity (in an area or of an entire fishery) for a few weeks or months, usually to protect juveniles or spawners.[5]

Coastal Pelagic Species
Schooling fish not associated with the ocean bottom that migrate in coastal waters. They usually eat plankton and are the main food source for higher-level predators such as tuna, salmon, most groundfish, and humans. Examples include herring, squid, sardine, and mackerel.[1]

Coastal Zone Management Act (CZMA)
The main objective of the CZMA is to encourage and assist states in developing coastal zone management programs, to coordinate state activities, and to safeguard the regional and national interests in the coastal zone. It requires that any Federal activity (including fishery management regulations) directly affecting the coastal zone of a state be consistent with that state's approved coastal zone management program, since activities that take place beyond the territorial sea may affect the coastal zone.[1]

Code of Federal Regulations (CFR)
A codification of the regulations published in the Federal Register by the executive departments and agencies of the Federal government. The CFR is divided into 50 titles that represent broad areas subject to Federal regulation. Title 50 contains wildlife and fisheries regulations.[1] (see *Proposed Rule*)

Coded-wire Tag
Coded-wire tags are small pieces of stainless steel wire that are injected into the snouts of juvenile salmon and steelhead. Each tag is etched with a binary code that identifies its release group.[1]

Codend
The end of a trawl net that retains the catch and the part of the net where most size-selection takes place. Codend mesh sizes and structure are usually regulated and may be preceded by a sorting grid to reduce bycatch.[5] (see *Bycatch Reduction Device*)

Coefficient of Variation (CV)
The standard error of a statistic, divided by its point estimate. The CV gives an idea of the precision of an estimate, independent of its magnitude.[5]

Cohort
1. In a stock, a group of fish generated during the same spawning season and born during the same time period; 2. In cold and temperate areas, where fish are long-lived, a cohort corresponds usually to fish born during the same year (a year class). For instance, the 1987 cohort would refer to fish that are age 0 in 1987, age 1 in 1988, and so on. In the tropics, where fish tend to be short-lived, cohorts may refer to shorter time intervals (e.g. spring cohort, autumn cohort, monthly cohorts).[5] (see *Year Class*)

Cohort Analysis
A retrospective analysis of the catches obtained from a given year class at each age (or length interval) over its life in the fishery. Allows estimation of fishing mortality and abundance at each age as well as recruitment. Involves the use of a simplified algorithm based on an approximation that assumes that, in a given time period, all fishing takes place instantaneously in the middle of the time period.[5] (see *Virtual Population Analysis*)

Cohort Replacement Rate
The rate at which each subsequent cohort or generation replaces the previous one.[1]

Commercial Fishery
A term related to the whole process of catching and marketing fish and shellfish for sale. It refers to and includes fisheries resources, fishermen, and related businesses.[2]

Common Property
Form of resource ownership with a set of well-defined users capable of excluding other potential users and having well-understood rules regarding their rights and obligations with respect to other users and the resource.[13]

Common Property Resource
A term that indicates a resource owned by the public. It can be fish in public waters, trees on public land, or the air. The government regulates the use of a common property resource to ensure its future benefits.[2]

Community
The populations that live and interact physically and temporally in the same area.[12]

Community Development Quota (CDQ)
Program in western Alaska under which a percentage of the total allowable catch (TAC) of Bering Sea commercial fisheries is allocated to specific communities. Communities eligible for this program must be located within 50 miles of the Bering Sea coast, or on an island within the Bering Sea; meet criteria established by the State of Alaska; be a village certified by the Secretary of the Interior pursuant to the Alaska Native Claims Settlement Act; and consist of residents who conduct more than half of their current commercial or subsistence fishing in the Bering Sea or waters surrounding the Aleutian Islands. Currently 7.5% of the TAC in the pollock, halibut, sablefish, crab, and groundfish fisheries is allocated to the CDQ program.[13]

Compensatory Growth
An increase in growth rate shown by fishes when their populations fall below a certain level; possibly caused by decreased competition between individuals for food or space.[10]

Compensatory Survival
A decrease in the rate of natural deaths that some fishes may show when their populations fall below a certain level; possibly caused by decreased competition between individuals for food or space.[10] (see *Natural Mortality*)

Conceptual Model
A depiction or representation of the most current understanding of the major ecosystem features and processes (including biological, physical, chemical, and geopmorphic components) of a particular environment (e.g. estuaries).[12]

Condition Factor (K)
A mathematical measurement of the degree of "plumpness," or the general health of a fish or group of fishes.[10]

Confidence Interval (CI)
The probability, based on statistics, that a number will be between an upper and lower limit.[2]

Connectivity
The movement of organisms from place to place (e.g. among marine reserves) through dispersal or migration.[14] (see *Marine Reserves*)

Consumer Surplus
The welfare (or well-being) consumers derive from a good or service, represented by the difference between the maximum a consumer is willing to pay for a good or service and what the consumer actually pays. "Consumer" also applies to those gaining value from non-consumptive uses (e.g. observing salmon runs) and to nonuse benefits (e.g. protecting marine mammals from exploitation).[9] (see *Producer Surplus*, *Total Welfare*)

Contiguous Fishery Zone (CFZ)
The 9-nautical mile (n.mi.) seaward zone, from 3 to 12 n.mi. offshore, and adjacent to the 3-n.mi. territorial sea.[1]

Continental Margin
The edge of a continent; the zone between a continent and the deep-sea floor of the abyssal plain.[12]

Continental Rise
Part of the continental margin; the ocean floor from the continental slope to the abyssal plain. The continental rise generally has a gentle slope and smooth topography.[12]

Continental Shelf
Underwater portion (shelf) of the continent, with moderate inclination, extending seaward from the shore to the edge of the continental slope where the inclination increases rapidly. Sometimes conventionally considered as the continent margin between 0 and 200 meters depths.[5] (see *Shelf Break*)

Continental Slope
Part of the continental margin; the ocean floor from the continental shelf to the continental rise or oceanic trench. Usually to a depth of about 200 meters. The continental slope typically has a relatively steep grade from 3 to 6 degrees.[12]

Contingent Valuation
A method employing a hypothetical market to elicit people's preferences for a non-market good; typically people are questioned about what they are willing to pay or receive for specific increments or decrements in the provision of the good.

Control Date
Date established for defining the pool of potential participants in a given management program. Control dates can establish a range of years during which a potential participant must have been active in a fishery in order to qualify for quota share.[13]

Control Rule
Describes a plan for pre-agreed management actions as a function of variables related to the status of stock in question. For example, a control rule can specific how fishing mortality or yield should vary with levels of estimated biomass.[2]

Controlled Access
General term for management schemes that reduce or restrict the number of participants in a fishery. (see *Limited Entry*)

Convention on the International Trade of Endangered Species (CITES)
A voluntary international agreement between governments aimed at ensuring the international trade of specimens of wild animals and plants does not threaten their survival.

Convergence Zone
The line where two oceanic water masses meet, resulting in the sinking of the denser one.[12]

Co-Occurring Stocks
Different stocks of fish that swim or school near one another, and may be caught together.[1]

Coral Reef
The massive deposition of calcium carbonate by coral polyps of colonial stony corals and other organisms producing large living hard structures. Coral reefs can range in size from a few feet to thousands of miles.[12]

Core Area
The central, most highly protected part of a protected area.[14] (see *Marine Reserve*, *Protected Area*)

Cost-Benefit Analysis
1. A comparison of the economic benefits and costs of a project, policy, or regulation; 2. A comparison of the economic benefits of using a resource to the opportunity cost if the resource is used. Projects or regulations are typically evaluated based on how they change the cost-benefit ratio.

Council
A regional fisheries management council (FMC). The Fishery Conservation and Management Act of 1976 as amended created eight regional councils to prepare fishery management plans (FMPs) and FMP amendments for fisheries in the U.S. Exclusive Economic Zone (EEZ).[8]

Critical Areas
Areas within a Marine Protected Area (MPA) that are crucial to achieving the objectives of the MPA; for example, spawning areas in an MPA established for fisheries purposes.[14] (see *Marine Protected Area*)

Critical Size
The average size of a fish in a year class at the time when the instantaneous rate of natural mortality equals the instantaneous rate of growth in weight for the year-class as a whole. At this size, the biomass of the age class is maximized.[5] (see *Optimum Size*)

Crustaceans
A group of freshwater and saltwater invertebrates with jointed legs and a hard shell of chitin. Includes shrimps, crabs, lobsters, and crayfish.[2]

Cultural Landscape
A cluster of beliefs, values, and norms about how places and things on earth are related to human behavor.[14]

Culturally Affiliated
To be connected to a place, region, or resource because it has significant meaning to the culture of the individual and his or her group. In most cases cultural affiliation requires more than one generation to establish, and for some groups the connections have been developed over centuries. The Federal government uses the term in various environmental laws and requlations.[14]

Cumulative (Catch) Limit
The total allowable amount of a species or species group, by weight, that a vessel may take and retain, possess, or land during a period of time. Fishers may take as many landings of a species or species complex as they like as long as they do not exceed the cumulative limit that applies to the vessel or permit during the designated period.[1]

Cumulative (Catch) Limit Stacking
The association of cumulative limits with permits, rather than with vessels, allowing a vessel with multiple limited entry permits to harvest multiple cumulative limits. Also known as permit stacking.[1]

Current
A horizontal movement of water.[12]

Current System
Areas strongly influenced by large, unidirectional, organized, coherent flows of water in horizontal motion. These include freshwater inflows and tidal flows. Geostrophic flows are currents in the deep ocean that flow along lines of constant pressure or baroclinic surfaces. Wind-driven currents along the shore, called longshore currents, flow parallel to the land and play a role in sediment transport and structuring of the habitat. Current systems play an especially important role by governing productivity, providing transport for early-life stages (e.g. eggs and larvae) and adults, and flushing pollutants out to sea.[12] (see *Primary Productivity*, *Pollution*)

D

Decision Analysis
A formal analysis to aid decision-making in the face of uncertainty. A decision analysis usually evaluates the expected outcomes (e.g. average catch, constancy of catch, probability of rebuilding to a given biomass target, etc.) of alternative management controls. A decision analysis can also address management consequences under different plausible assumptions about the status of the stock.[5]

Decision Rule
Specification of how pre-agreed management actions will respond to perceived or estimated states of nature.[5]

Decline
A decline is a reduction in the number of individuals, or a decrease of the area of distribution, the causes of which are either not known or not adequately controlled. It need not necessarily still be continuing. Natural fluctuations will not normally count as part of a decline, but an observed decline should not be considered part of a natural fluctuation unless there is evidence for this. A decline that is the result of harvesting that reduces the population to a planned level, not detrimental to the survival of the species, is not covered by the term.[5]

Dedicated Access Privileges (DAP)
Assigns an individual or other entity access to a pre-determined portion of the annual catch in a particular fishery. In some cases, the privilege is transferable and may be bought and sold, creating a market. The term encompasses a range of tools, including access privileges assigned to individuals (i.e. individual transferable quotas [ITQs]), and to groups or communities (e.g., community development quotas [CDQs], cooperatives, and area-based quotas).[15]

Deep Shelf and Terrace
Horizontal habitat located from about 40 to 500 meters. Insular habitats on or above the deep shelf consisting of horizontal or nearly horizontal natural typographic features interrupting a steeper slope and often occurring in a series. These habitats extend seaward from the shelf of an island or bank.[12]

Deep Slope
Vertical habitat located from about 40 to 500 meters. Insular habitats on or above the deep slope characterized by a steep (often vertical) slope extending seaward from the shelf of an island or bank These habitats may be colonized by some low-light coral and bryozoans.[12]

Delta
A low, nearly flat accumulation of sediment deposited at the mouth of a river or stream, commonly triangular or fan-shaped.[12]

Delta Method
Also known as the Taylor Series method, the Delta method is a statistical procedure used to quantify the uncertainty associated with estimates obtained from a model. More specifically, the Delta method quantifies how the variance propagates from the parameters that are estimated directly by the statistical model (e.g. current spawning stock biomass, SSB), and those parameters that are derived from the application of mathematical formulations (e.g. future SSB based on model projections).[5]

Demand Function
A function that relates the quantity of a good or service demanded to price. It is usually an inverse relationship where at higher (or lower) prices, less (or more) quantity is consumed. Other factors which influence willingness-to-pay are incomes, tastes, preferences, and price of substitutes.[9]

Demersal
Living in close relation with the bottom and depending on it. Cods, groupers, crabs, and lobsters are demersal resources. The term usually refers to the living mode of the adult, i.e. demersal fish.[5] (see *Benthic, Pelagic*)

Demography
A term referring to the study of birth rates, death rates, age distributions, and size of populations. It is a fundamental discipline within the larger field of population biology and ecology.[5] (see *Population Biology*)

Density-Dependence
The dependence of a factor influencing population dynamics (such as survival rate or reproductive success) on population density. The effect is usually in the direction that contributes to the regulative capacity of a stock.[5]

Density-Independent
External factors that influence all individuals of a population, regardless of population density, such as weather or climate.

Depleted Stock
A stock driven by fishing to very low level of abundance compared to historical levels, with dramatically reduced spawning biomass and reproductive capacity. It requires particularly energetic rebuilding strategies and its recovery time will depend on the present condition, the level of protection, and the environmental conditions.[5]

Derby Fishery
A fishery of brief duration during which fishers race to take as much catch as they can before the fishery closes.[1] (see *Olympic Fishing, Race-to-Fish*)

Deterministic
1. A deterministic process or model does not take account or include any stochastic (random) variability. The opposite is a stochastic model; 2. A model whose behavior is fully specified by its form and parameters, unlike a stochastic model.[5] (see *Simulation, Stochastic*)

Detritus
Dead organic matter and the decomposers that live on it; when broken up by decomposers, detritus provides energy to many coastal ecosystems.[12]

Directed Fishery
Fishing that is directed at a certain species or group of species. This applies to both sport and commercial fishing.[2]

Disappearance (Z)
A measure of the rate of decline in the numbers of fish caught as individuals become less numerous or available; often calculated from a catch curve.[10]

Discard
To release or return fish to the sea, dead or alive, whether or not such fish are brought fully on board a fishing vessel.[5]

Comment: Estimates of discards can be made in a variety of ways, including samples from observers and logbook records. Fish (or parts of fish) can be discarded for a variety of reasons such as having physical damage, being a nontarget species for the trip, and compliance with management regulations like minimum size limits or quotas.[5] (see *Highgrading*)

Domestic Annual Harvest (DAH)
The domestic annual fishing capacity, modified by other factors (such as economic factors), which will determine estimates of what the fleets will harvest.[1]

Domestic Annual Processing (DAP)
The amount that will be domestically processed, based not only on physical capacity but on a demonstrated intent and the effects of domestic harvesting, markets, and other fisheries.[1]

Downwelling
Hydroform created by convergence of surface currents that causes surface waters to sink, creating vertical and horizontal displacement of water and possibly carrying organisms to lower depths.[12]

E

Ebb Tide
A falling tide, the phase of the tide between high water and the succeeding low water.[12]

Ecological Reserve
Zoning that protects all living marine resources through prohibitions on fishing and on the removal or disturbance of any living or nonliving resource.[14] (see *Protected Area*)

Economic Efficiency
1. A measure of the size of consumer surplus and producer surplus. An increase in the combined surpluses is an increase in economic efficiency[9]; 2. In commercial fishing, the point at which the added cost of producing a unit of fish is equal to what buyers pay. Producing fewer fish would bring the cost lower than what buyers are paying. Producing more fish would raise the cost higher than what buyers are paying. Harvesting at the point of economic efficiency produces the maximum economic yield (MEY).[2]

Economic Overfishing
A level of fish harvesting that is higher than that of economic efficiency; harvesting more fish than necessary to have maximum profits for the fishery.[2]

Economic Rent
The total amount of profit that could be earned from a fishery owned by an individual after subtracting input costs (usually capital and labor). Individual ownership maximizes economic rent, but an open-entry policy usually results in so many fishermen that profits higher than the opportunity cost are driven to zero.[2]

Economic Value
The most people are willing to pay to use a given quantity of a good or service; or, the smallest amount people are willing to accept to forego the use of a given quantity of a good or service.[5]

Ecosystem
A geographically specified system of organisms, the environment, and the processes that control its dynamics. Humans are an integral part of an ecosystem.[8]

Ecosystem Approach to Fisheries (EAF)
An approach to fisheries management that strives to balance diverse societal objectives by taking into account the knowledge and uncertainties about biotic, abiotic, and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries. The purpose of EAF is to plan, develop, and manage fisheries in a manner that addresses the multiple needs and desires of society, without jeopardizing the options for future generations to benefit from the full range of goods and services provided by marine ecosystems.[5]

Ecosystem Approach to Management (EAM)
Management that is adaptive, is specified geographically, takes into account ecosystem knowledge and uncertainties, considers multiple external influences, and strives to balance diverse social objectives.[8]

Ecosystem Assessment
A social process through which the findings of science concerning the causes of ecosystem change, their consequences for human well-being, and management and policy options are brought to bear on the needs of decision makers.[5]

Ecosystem Function
An intrinsic ecosystem characteristic related to the set of conditions and processes whereby an ecosystem maintains its integrity. Ecosystem functions include such processes as decomposition, production, nutrient cycling, and fluxes of nutrients and energy.[5]

Ecosystem Health
A measure of the stability and sustainability of ecosystem functioning or ecosystem services that depends on an ecosystem being active and maintaining its organization, autonomy, and resilience over time. Ecosystem health contributes to human well-being through sustainable ecosystem services and conditions for human health.[5]

Ecosystem-Based Management
An approach that takes major ecosystem components and services—both structural and functional—into account in managing fisheries. It values habitat, embraces a multispecies perspective, and is committed to understanding ecosystem processes. Its goal is to rebuild and sustain populations, species, biological communities, and marine ecosystems at high levels of productivity and biological diversity so as not to jeopardize a wide range of goods and services from

marine ecosystems while providing food, revenue, and recreation for humans.[5]

Ecosystem Properties
The size, biodiversity, stability, degree of organization, and internal exchanges of materials and energy among different pools, and other properties that characterize an ecosystem.[5]

Ecosystem Services
Ecosystem services are the benefits people obtain from ecosystems. These include provisioning services, such as food and water; regulating services, such as flood and disease control; cultural services, such as spiritual and cultural benefits; and supporting services, such as nutrient cycling, that maintain the conditions for life on Earth.[5]

Ecotourism
Tourism involving travel to areas of natural or ecological interest for non-consumptive purposes such as observing wildlife or learning about the environment.

Effort
The amount of time and fishing power used to harvest fish; includes gear size, boat size, and horsepower.[10] (see *Fishing Effort*)

Egg Survey
A systematic and scientific estimation of the abundance of eggs (and larvae) in an area, through sampling at the bottom or in the water column with appropriate devices (e.g. small meshed midwater trawls, plankton nets). Used to estimate the size of the spawning stock and the importance of spawning.[5]

Elasmobranch
Describes a group of fish without a hard bony skeleton, including sharks, skates, and rays.[5]

El Niño-Southern Oscillation (ENSO)
Abnormally warm ocean climate conditions, which in some years affect the west coast of Latin America (centered on Peru) often around Christmas time. The anomaly is accompanied by dramatic changes in coastal upwelling, species abundance and distribution, higher local rainfall and flooding, and massive deaths of fish and their predators (including birds). Many other climatic anomalies around the world (e.g. droughts, floods, forest fires,) are attributed to consequences of El Niño.[5] (see *La Niña*, *Pacific Decadal Oscillation*)

Emergency Action (EA)
A fishery management council (FMC) may decide to propose an EA when a problem arises in a fishery that requires regulations sooner than a fishery management plan amendment can be proposed and implemented. Once implemented, an EA lasts for 90 days but can be extended by the Secretary of Commerce at the council's request.

Endangered Species
A species as defined in the Endangered Species Act, that is in danger of extinction through a significant portion of its range. A species classified as threatened is likely to become an endangered species.

Endangered Species Act (ESA)
The ESA is a statute which was enacted in 1973 to conserve species and ecosystems. Under its auspices, species facing possible extinction are listed as threatened or endangered, or as candidate species for such listings. When such a listing is made, recovery and conservation plans are drawn up to ensure the protection of the species and its habitat.[8]

Endemism
Of or relating to a native species or population occurring under highly restricted conditions due to the presence of a unique environmental factor that limits its distribution.[14]

Endorsement
A designation on a limited entry permit that authorizes the use of the permit for a particular gear, length of vessel, or in a particular segment of the fishery.[1]

Environmental Assessment (EA)
As part of the National Environmental Policy Act (NEPA) process, an EA is a concise public document that provides evidence and analysis for determining whether to prepare an environmental impact statement (EIS) or a finding of no significant impact (FONSI).[1]

Environmental Ethics
A cluster of beliefs, values, and norms regarding how humans should interact with the environment.[14]

Environmental Impact Statement (EIS)
As part of the National Environmental Policy Act (NEPA) process, an EIS is an analysis of the expected impacts resulting from a proposed Federal action (such as fisheries management or a development plan) on the environment. An EIS is required for all fishery management plans as well as significant amendments to existing plans. The purpose of an EIS is to ensure that the proposed Federal action gives appropriate consideration to environmental values in order to prevent harm to the environment.[1]

Environmental Protection Agency (EPA)
A Federal agency charged with enforcing numerous environmental laws (including the Clean Water Act, the Clean Air Act, and the State Drinking Water Act) and supporting state and local governments in establishing and enforcing environmental laws. In addition to enforcement, the EPA researches causes, effects, and remediation of environmental problems. All final environmental impact statements (EIS) are available from the EPA.

Epifauna
Benthic fauna living on the substrate but not burrowing into it (as on a hard seafloor) or living on other organisms.[12] (see *Benthic*)

Equilibrium Catch
The catch (in numbers) taken from a fish stock when it is in equilibrium with fishing of a given intensity, and (apart from the effects of environmental variation) its abundance is not changing from one year to the next.[6]

Equilibrium Yield (EY)
The yield in weight taken from a fish stock when it is in equilibrium with fishing of a given intensity, and (apart from effects of environmental variation) its biomass is not changing from one year to the next. Also called: sustainable yield, equivalent sustainable yield.[6]

Escapement
The number or proportion of fish surviving (escaping from) a given fishery at the end of the fishing season and reaching the spawning grounds. The term is generally used for salmon management.[1]

Essential Fish Habitat (EFH)
Congress defined EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S.C. 1802(10)). The EFH guidelines under 50 CFR 600.10 further interpret the EFH definition as follows: Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle.[7]

EFH Assessment
An EFH assessment is a written assessment of the effects of a proposed Federal action on EFH. Federal agencies must provide the National Marine Fisheries Service (NMFS) with an EFH assessment for any action that may adversely affect EFH, except for those activities covered by a general concurrence. An EFH assessment must contain 1) a description of the proposed action; 2) an analysis of the effects, including cumulative effects, of the proposed action on EFH and managed species; 3) the Federal agency's conclusions regarding the effects of the action on EFH; and 4) proposed mitigation, if applicable. If appropriate, the EFH assessment should also include the items listed at 50 CFR 600.920(e)(4). The level of detail in an EFH assessment should be commensurate with the potential impacts to EFH.[7]

EFH Consultation
An EFH consultation refers to the process of satisfying the Federal agency consultation and response requirements of section 305(b)(2) and 305(b)(4)(B) of the Magnuson-Stevens Act, and the EFH conservation recommendation requirement of section 305(b)(4)(A) of that Act. When completed, an EFH consultation generally consists of: 1) notification to the National Marine Fisheries Service (NMFS) of a Federal action that may adversely affect EFH; 2) an EFH assessment provided to NMFS; 3) EFH conservation recommendations provided by NMFS to the Federal action agency; and 4) the Federal agency's response to NMFS EFH conservation recommendations.[7]

EFH Conservation Recommendation
EFH conservation recommendations are recommendations provided by the National Marine Fisheries Service (NMFS) to a Federal or state agency pursuant to section 305(b)(4)(A) of the Magnuson-Stevens Act regarding measures that can be taken by that agency to conserve EFH. EFH conservation recommendations may be provided as part of an EFH consultation with a Federal agency, or may be provided by NMFS to any Federal or state agency whose actions would adversely affect EFH (50 CFR 600.925).[7]

Estimated Discard Mortality
Estimates of discards can be made in a variety of ways, including samples from observers and logbook records.[1]

Estuarine
1. Relating to, or formed in an estuary (e.g. estuarine currents; estuarine animals); 2. Belonging to an estuary (river mouth), an area in which sea water is appreciably diluted by fresh water from rivers.[5]

Estuary
A coastal ecological ecosystem that is partially enclosed, receives freshwater input from land, and has a horizontal

fresh-salt salinity gradient; the average salinity of estuarine waters is defined as being 30 practical salinity units (PSU) for at least 1 month per year.[12]

Euryhaline
Organisms able to tolerate a wide range of salinity.[12]

Eutrophication
Generally, the natural or man-induced process by which a body of water becomes enriched in dissolved mineral nutrients (particularly phosphorus and nitrogen) that stimulate the growth of aquatic plants and enhances organic production of the water body. Excessive enrichment may result in the depletion of dissolved oxygen and eventually to species mortality.[5]

Evolutionary Significant Unit (ESU)
An ESU is a distinctive group of Pacific salmon, steelhead, or sea-run cutthroat trout that is uniquely adapted to a particular area or environment and cannot be replaced.[1]

Excess Capacity
In the short-term, fishing capacity that exceeds the capacity required to capture and handle the allowable catch. In the long-term, fishing capacity that exceeds the level required to ensuring the sustainability of the stock and the fishery at the desired level. Fishing capacity in excess of what is required to reach the agreed catch or effort objectives materialized by agreed target reference points (e.g. MSY, $F_{0.1}$, MEY, etc.).[5]

Exclusive Economic Zone (EEZ)
The EEZ is the area that extends from the seaward boundaries of the coastal states (3 nautical miles (n.mi.) in most cases, the exceptions are Texas, Puerto Rico and the Gulf coast of Florida at 9 n.mi.) to 200 n.mi. off the U.S. coast. Within this area the United States claims and exercises sovereign rights and exclusive fishery management authority over all fish and all continental shelf fishery resources.[8]

Executive Order 12866
A presidential Executive Order that, among other things, requires Federal agencies to assess the economic costs and benefits of all regulatory proposals and complete a regulatory impact analysis (RIA) that describes the costs and benefits of the proposed rule and alternative approaches, and justifies the chosen approach.[1] (see *Regulatory Flexibility Act*)

Exempted Fishing Permit
A permit issued by NMFS that allows exemptions from some fishery regulations for testing, public display, data collection, exploratory fishing, health and safety, environmental cleanup, and/or hazard removal purposes. Previously known as an "experimental fishing permit."[1]

Existence Value
The economic value of knowing that a resource exists, irrespective of the ability to use the resource now or in the future.[9] (see *Heritage Value*)

Exploitable Biomass
Refers to that portion of a stock's biomass that is available to the fishing gear.[5]

Exploitation Pattern
The distribution of fishing mortality over the age composition of the fish population, determined by the type of fishing gear, area and seasonal distribution of fishing, and the growth and migration of the fish. The pattern can be changed by modifications to fishing gear; for example, increasing mesh or hook size, or by changing the ratio of harvest by gears exploiting the fish (e.g. gillnet, trawl, hook and line, etc.).[6]

Exploitation Rate
The proportion of a population at the beginning of a given time period that is caught during that time period (usually expressed on a yearly basis). For example, if 720,000 fish were caught during the year from a population of 1 million fish alive at the beginning of the year, the annual exploitation rate would be 0.72.[6]

Ex-Vessel
Refers to activities that occur when a commercial fishing boat lands or unloads a catch. For example, the price received by a captain (at the point of landing) for the catch is an ex-vessel price.[5]

F

F-Ratio
The ratio of fishing mortality on the oldest age group to the fishing mortality of the preceding age group. Annual F-ratios are estimable parameters in many virtual population analysis (VPA) assessments.[5]

Factory Trawler
A large stern trawler equipped with plant for gutting, filleting, freezing and storing fish, and for processing fish oil and fishmeal. Such vessels usually have extensive superstructures.[5]

Fathom
1.83 meters, equivalent to 6 feet.

Fecundity
The potential reproductive capacity of an organism or population expressed in the number of eggs (or offspring) produced during each reproductive cycle. Fecundity usually increases with age and size. The information is used to compute spawning potential.[5]

Federal Register (FR)
The Federal Register is the official daily publication for rules, proposed rules, and notices of Federal agencies and organizations, as well as executive orders and other presidential documents. Fisheries regulations are not considered final until they are published in the Federal Register.[1] (see *Rulemaking*)

Fillet
A slice of meat without bones, cut out for human consumption.[5]

Financial Analysis
Cost accounting based on market prices as opposed to opportunity costs.[9]

Financial Ratio
A method of evaluating a firm's financial position. An example is the "current ratio" which is equal to current assets divided by current liabilities.[9]

Finding of No Significant Impact (FONSI)
As part of the National Environment Policy Act (NEPA) process, a FONSI is a document that explains why an action that is not otherwise excluded from the NEPA process, and for which an environmental impact statement (EIS) will not be prepared, will not have a significant effect on the human environment.[1]

Finfish
Vertebrate and cartilanginous fishery species, not including crustaceans, cephalopds, or other mollusks.[13]

Finning
The practice of removing fins and discarding the carcass, usually pertaining to sharks.[5]

Fish
Used as a collective term, includes mollusks, crustaceans and any aquatic animal which is harvested.[5]

Fish Aggregating Device (FAD)
Artificial or natural floating objects placed on the ocean surface, often anchored to the bottom, to attract several schooling fish species underneath, thus increasing their catchability.[5]

Fish Meal
Protein-rich meal derived from processing whole fish (usually small pelagic fish, and fishery bycatch) as well as residues and byproducts from fish processing plants (fish offal). Used mainly as agriculture feeds for poultry, pigs, and aquaculture feeds for carnivorous aquatic species.[5]

Fish Stock
The living resources in the community or population from which catches are taken in a fishery. Use of the term fish stock usually implies that the particular population is more or less isolated from other stocks of the same species and hence self-sustaining. In a particular fishery, the fish stock may be one or several species of fish but here is also intended to include commercial invertebrates and plants.[5]

Fisher
A gender-neutral name for a person (male or female) participating in a fishery.[5]

Fisheries Management
The integrated process of information gathering, analysis, planning, decision making, allocation of resources, and formulation and enforcement of fishery regulations by which the fisheries management authority controls the present and future behaviors of the interested parties in the fishery in order to ensure the continued productivity of the living resources.[5]

Fisheries Management Authority
The body which makes the decisions on how the fishery is carried out, and is responsible for all ancillary services, such as statistics gathering, assessment, monitoring, control and surveillance, consultation with fishers and other users of the sea, and resource allocation or determining the conditions of access to the fishery.[5]

Fisheries Management Organization
Institution responsible for fisheries management, including the formulation of the rules that govern fishing activities. The fishery management organization, and its subsidiary bodies, may also be responsible for all ancillary services, such as the collection of information, its analysis, stock assessment, monitoring, control and surveillance, consultation with interested parties, application and/or determination of the rules of access to the fishery, and resource allocation. Also called: fishery management arrangement.[5]

Fishery
1. Generally, a fishery is an activity leading to harvesting of fish. It may involve capture of wild fish or raising of fish through aquaculture; 2. A unit determined by an authority or other entity that is engaged in raising or harvesting fish. Typically, the unit is defined in terms of some or all of the following: people involved, species or type of fish, area of water or seabed, method of fishing, class of boats, and purpose of the activities;[5] 3. The combination of fish and fishers in a region, the latter fishing for similar or the same species with similar or the same gear types.[12]

Fishery Conservation and Management Act (FCMA)
The Fishery Conservation and Management Act of 1976 is the Federal law that created the regional fishery management councils and is the Federal government's basis for fisheries management in the U.S. Exclusive Economic Zone (EEZ). It has been reauthorized a number of times and was renamed the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) in honor of the late Washington Senator, Warren G. Magnuson, in 1980, and in 1996, added Alaska Senator Ted Stevens.

Fishery
The combination of fish and fishers in a region, the later fishing for similar or the same species with similar or the same gear types.[12]

Fishery Conservation Zone (FCZ)
The FCZ is the area from the seaward limit of state waters out to 200 nautical miles. Since 1981, it is referred to as the U.S. Exclusive Economic Zone (EEZ).

Fishery-Dependent
Data collected directly on a fish or fishery from commercial or sport fishermen and seafood dealers. Common methods include logbooks, trip tickets, port sampling, fishery observers, and phone surveys.[2] (see *Fishery-Independent*)

Fishery Economic Assessment Model (FEAM)
FEAM uses historical landings data, information on industry cost and margin structure (vessels and processors), and income multipliers generated by IMpact analysis for PLANing (IMPLAN), a regional economic impact model, to produce estimates of "regionalized" local income impact after deducting for leakage of payments to nonresidents and to non-local suppliers, wholesalers, and manufacturers.[1]

Fishery-Independent
Characteristic of information (e.g. stock abundance index) or an activity (e.g. research vessel survey) obtained or undertaken independently of the activity of the fishing sector. Intended to avoid the biases inherent to fishery-related data.[5] (see *Fishery-Dependent*)

Fishery Management Council (FMC)
A regional fisheries management body established by the Magnuson-Stevens Act to manage fishery resources in eight designated regions of the United States.[1]

Comment: "Council membership is a balance of commercial and recreational fisherman, marine scientists and state and Federal fisheries managers, who combine their knowledge to prepare fishery management plans (FMPs) for stocks of finfish, shellfish and crustaceans. In developing these FMPs the councils use the most recent scientific assessments of the ecosystems involved with special consideration of the requirements of marine mammals, sea turtles and other protected resources." [Magnuson-Stevens Act]

Fishery Management Plan (FMP)
1. A document prepared under supervision of the appropriate fishery management council (FMC) for management of stocks of fish judged to be in need of management. The plan must generally be formally approved. An FMP includes data, analyses, and management measures[5]; 2. A plan containing conservation and management measures for fishery resources, and other provisions required by the Magnuson-Stevens Act, developed by fishery management councils or the Secretary of Commerce.[3]

Fishery Management Unit (FMU)
A fishery or a portion of a fishery identified in a fishery management plan (FMP) relevant to the FMP's management objectives. The choice of stocks or species in an FMU depends upon the focus of FMP objectives, and may be organized around biological, geographic, economic, technical, social, or ecological perspectives.[5]

Fishery Models
Simplified representations of the fisheries complex reality. May or may not be a mathematical representation.[5] (see *Simulation*)

Fishery Policy
Measures by which a national government, regional or state authority, attempts to influence or control the behavior of individuals, companies, and communities in the fisheries sector to achieve certain objectives. The measures can be of varied kinds including fiscal measures, (e.g. taxes, subsidies, public investments, etc.); trade measures (e.g. import and export duties;

quotas); social measures (health and education services); regulations (i.e. on food quality; means and types of fish harvesting; individual transferable quotas); and others.[5]

Fishery Reserve
Zoning that precludes fishing activity on some or all species to protect critical habitat, rebuild stocks (long term, but not necessarily permanent closure), provide insurance against overfishing, or enhance fishery yield.[14]

Fishery Resource
In general, refers to elements of a natural aquatic resource (e.g. strains, species, populations, stocks, assemblages that can be legally caught by fishing). May sometimes be taken as including also the habitat of such resources.[5]

Fishery Technology
The equipment and practices for finding, harvesting, handling, processing, and distributing aquatic resources and their products.[5]

Fishing
Any activity, other than scientific research conducted by a scientific research vessel, that involves the catching, taking, or harvesting of fish; or any attempt to do so; or any activity that can reasonably be expected to result in the catching, taking, or harvesting of fish and any operations at sea in support of it.[5]

Fishing Capacity
1. The ability of a stock of inputs (capital) to produce output (measured as either effort or catch); 2. The maximum amount of fish over a period of time (year, season) that can be produced by a vessel or fleet of vessels if fully utilized, given the biomass and age structure of the fish stock and the present state of the technology. The "fishing fleet" is the stock of inputs (i.e. physical capital and human capital). The term "fully utilized" is used in a precautionary context in that it assumes that capacity utilization is 100 percent; 3. The quantity of fish that can be taken by a fishing unit, for example an individual, community, vessel, or fleet, assuming that there is no limitation on the yield from the stock, usually expressed in terms of some measure of vessel size, such as gross tonnage, hold capacity, horsepower. Reflects potential rather than nominal fishing effort.[5]

Fishing Community
A community that is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs. Includes fishing vessel owners, fishing families, operators, crew, recreational fishers, fish processors, gear supplies, and others in the community who depend on fishing.[1]

Fishing Effort
The amount of fishing gear of a specific type used on the fishing grounds over a given unit of time (e.g. hours trawled per day, number of hooks set per day, or number of hauls of a beach seine per day). When two or more kinds of gear are used, the respective efforts must be adjusted to some standard type before being added. Sometimes referred to as effective fishing effort.[5]

Comment: The effort may be nominal, reflecting the simple total of effort units exerted on a stock in a given time period. It may also be standard or effective when corrected to take account of differences in fishing power and efficiency and ensure direct proportionality with fishing mortality. Relates usually to a specific fishery and gear. If more than one gear is considered, standardization in relation to one of them is necessary. For biologists, a good measure of fishing effort should be proportional to fishing mortality. For economists it should be proportional to the cost of fishing.[5]

Fishing Gear
The equipment used for fishing (e.g. gillnet, hand line, harpoon, haul seine, long line, bottom and midwater trawls, purse seine, rod-and-reel, pots and traps). Each of these gears can have multiple configurations.[5]

Fishing Intensity
1. In general, and mainly for trawling, the fishing effort exerted per unit of areas (e.g. in hours of trawling per 100 square miles). In stock assessment theory, the effective (or standard) fishing effort per unit area must be proportional to fishing mortality through the relation $F = q(f/A)$ where (f/A) is the fishing intensity, and q is the catchability coefficient; 2. Effective fishing effort; 3. Fishing effort per unit area; 4. Effectiveness of fishing.[5]

Fishing Mortality (F)
1. F stands for the fishing mortality rate in a particular stock. It is roughly the proportion of the fishable stock that is caught in a year[5]; 2. A measurement of the rate of removal from a population by fishing. Fishing mortality can be reported as either annual or instantaneous. Annual mortality is the percentage of fish dying in one year. Instantaneous mortality is that percentage of fish dying at any one time.[2]

$F_{0.1}$
The fishing mortality rate which the increase in yield per recruit in weight for an increase in a unit of effort is only

10 percent of the yield per recruit produced by the first unit of effort on the unexploited stock (i.e. the slope of the yield-per-recruit curve for the $F_{0.1}$ rate is only one-tenth the slope of the curve at its origin).[6]

$F_{10\%}$
The fishing mortality rate that reduces the spawning stock biomass per recruit (SSB/R) to 10% of the amount present in the absence of fishing.[3]

F_{HIGH}
Fishing mortality rate corresponding to an equilibrium spawning potential ratio equal to the inverse of the 90th percentile observed survival ratio.[11]

F_{LOW}
Fishing mortality rate corresponding to an equilibrium spawning potential ratio equal to the inverse of the 10th percentile observed survival ratio.[11]

F_{MED}
Fishing mortality rate corresponding to an equilibrium Spawning Potential Ratio equal to the inverse of the median observed survival ratio.[11]

f_{MSY}
Effective fishing effort corresponding to F_{MSY}.[11]

F_{MSY}
The fishing mortality rate that, if applied constantly, would result in maximum sustainable yield (MSY). Used as a biological reference point, F_{MSY} is the implicit fishing mortality target of many regional and national fishery management authorities and organizations. F_{MSY} can be estimated in two ways: a) from simple biomass-aggregated production models; b) from age-structured models that include a stock-recruitment relationship.[5]

F_{MAX}
1. The level of fishing mortality (rate of removal by fishing) that produces the greatest yield from the fishery[2]; 2. A biological reference point. It is the fishing mortality rate that maximizes equilibrium yield per recruit. F_{MAX} is the F level often used to define growth overfishing. In general, F_{MAX} is different (and higher) than F_{MSY} depending on the stock-recruitment relationship. By definition, F_{MAX} is always higher than $F_{0.1}$.[5]

F_{τ} (also $F_{EXTINCTION}$, F_{CRASH})
Fishing mortality rate corresponding to an equilibrium spawning potential ratio equal to the inverse of the survival ratio at the origin of the stock-recruitment relationship. A stock fished at or above this level for a prolonged period of time is expected to collapse.[11]

$F_{X\%}$
Fishing mortality rate that results in x% equilibrium spawning potential ratio.[11]

Fishing Power
1. The catch which a particular gear or vessel takes from a given density of fish during a certain time interval. For example, larger vessels (horsepower) have a greater ability to catch more fish, thus the greater their fishing power. Also, improvements in a vessel or gear, such as fish finders, global positioning systems, etc., can increase fishing power[3]; 2. Of a boat, or of a fishing gear: The relative vulnerability of the stock to different boats or gears. Usually determined as the catch taken by the given apparatus, divided by the catch of a standard apparatus fishing at nearly the same time and place.[5] (see *Standardization*)

Comment: In such a definition, fishing power is not measured in absolute terms and is dependent on stock size. For this reason, in practice, fishing power is measured only in relative terms.[5]

Fixed Costs
Costs that do not vary with output. Fixed costs can only be avoided if the firm goes out of business.[5]

Fixed Gear
Fishing gear that is stationary after it is deployed (unlike trawl or troll gear which is moving when it is actively fishing). Fixed gear includes gillnets, long lines, pots, traps, and any other gear that is anchored at least at one end.[1]

Fjord
An estuary with a seaward sill that is formed in a deep valley created by a retreating glacier.[12]

Food and Agriculture Organization (FAO)
United Nations organization founded in 1945 with a mandate to raise levels of nutrition and standards of living, to improve agricultural productivity, and to better the condition of rural populations. FAO is active in land and water development, plant and animal production, forestry, fisheries, economic and social policy, investment nutrition, food standards, and commodities and trade.[13]

Food Chain
The transfer of energy from the source in plants through a series of organisms with repeated eating and being eaten. At each transfer, a large proportion of the potential energy is lost as heat. The shorter the food chain (or the nearest the organism is from the beginning of the food chain), the greater the available energy

which can be converted in biomass.[5] (see *Predator-Prey Relationship, Trophic Level*)

Food Security
Freedom from hunger. The capability to produce an adequate amount of food for all consumers at affordable prices.[5]

Footrope
The rope along the bottom of a trawl net's opening. Small footropes can get caught or tangled in rocky reef areas, so regulations that require small footropes protect these rocky areas by encouraging fishermen to fish elsewhere.

Forage Species
Species used as prey by a larger predator for its food. Includes small schooling fishes such as anchovies, sardines, herrings, capelin, smelts, and menhaden, and invertebrates such as squid.[5]

Fork Length
A measurement used frequently for fish length when the tail has a fork shape. Projected straight distance between the tip of the snout and the fork of the tail.[5]

Freedom of Information Act (FOIA)
Federal statute enacted in 1996 giving members of the public the right to request access to Executive Branch records for inspection or copying.

Front
In oceanographic terms, a region of sharp gradient in temperature or salinity, indicating a transition between two current systems or water masses. Intersection between the thermocline (temperature discontinuity) or halocline (salinity discontinuity) and the surface. Fronts are usually associated with high biological activity, high abundance of highly migratory resources (e.g. tunas), and are actively sought as fishing areas. Fronts can be monitored by satellite remote-sensing.[5]

Fully Exploited
Term used to qualify a stock which is probably neither being overexploited nor underexploited and is producing, on average, close to its maximum sustainable yield (MSY). This situation would correspond to fishing at F_{MSY} (in a classical production model relating yield to effort) or F_{MAX} (in a model relating yield-per-recruit to fishing mortality).[5]

G

Gastropods
Snails and other mollusks (e.g. abalone, Queen conch, and cones) that typically possess a coiled dorsal shell and a ventral creeping foot.[12]

Gear
A fishing gear is a tool used to catch fish, such as hook-and-line, trawl net, gillnet, pot, trap, spear, etc.[5]

Gear Conflict
Conflicts between fishing gear on fishing grounds where one type of gear interferes with another type of gear. An example is where mobile trawling gear damages passive gear, such as lobster traps.[5]

Gear Restriction
1. A type of input control used as a management tool whereby the amount and/or type of fishing gear used by fishers in a particular fishery is restricted by law[5]; 2. Limits placed on the type, amount, number, or techniques allowed for a given type of fishing gear.[13]

General Linear Model (GLM)
1. A mathematical formula (model) that relates one biological factor to another. Once a mathematical relationship is established, scientists use the model to predict one factor over another[2]; 2. A statistical procedure similar to an analysis of variance or a multiple regression that is used to estimate the magnitude of the effects of different factors on a variable of interest. GLM's are the tool of choice for standardizing catch per unit effort (CPUE) data in order to obtain indices of abundance. In such applications, the variable of interest is CPUE and the factors are year and perhaps others such as area, gear configuration, etc.; the standardized abundance index of annual abundance would then be given by the parameters associated with the factor, year.[5]

Generation Time
In the context of the National Standard Guidelines, generation time is a measure of the time required for a female to produce a reproductively-active female offspring for use in setting maximum allowable rebuilding time periods.[3] (see *National Standard Guidelines*)

Genetically Modified Organism
An organism in which humans by means of gene or cell technologies have altered the genetic material. These include the isolation, characterization, and modification of genes and their introduction into living cells or

viruses of DNA, as well as techniques for the production of living cells with new combinations of genetic material by the fusion of two or more cells.[5]

Geographic Information System (GIS)
A computer system for storage, analysis, and retrieval of information in which all data are spatially referenced by their geographic coordinates (latitude, longitude). In addition to primary data, such as climatic and soil characteristics, a GIS can be used to calculate derived values such as erosion hazard, forest yield class, or land suitability for specified land-use types. Data are usually derived from maps, and derived values can be printed out as maps.[5]

Geographic Region
With regard to biogeography and species distribution, a region which is separated from an adjacent region by a barrier which is usually impenetrable to many species, limiting their movement or preventing establishment outside their natural geographic range.[5]

Geothermal Vent
Submerged geoform consisting of a vent of hot, mineral-rich water on the ocean floor, generally located on or near spreading oceanic ridges or on the continental margins of subduction trenches.[12]

Ghost Fishing
The accidental capture of aquatic organisms by fishing gear (usually gillnets, or traps, pots, etc.) that has been lost or discarded into the sea and which continues to entangle or trap aquatic animals.[5]

Gillnet
With this type of gear, the fish are gilled, entangled or enmeshed in the netting. These nets can be used either alone or, as is more usual, in large numbers placed in line. According to their design, ballasting and buoyancy, these nets may be used to fish on the surface, in midwater or on the bottom.[5]

Global Positioning System (GPS)
A low cost ($1,000 to $5,000) electronic receiving system for finding three-dimensional coordinates on the earth using satellites.[5]

Gonadosomatic Index (GSI)
A ratio of the weight of a fish's eggs or sperm to its body weight, used to determine the spawning time of a species of fish.[10]

Goods and Services
Any commodities or nonmaterial goods (services) such as assistance or accommodations that yield positive utility.[5]

Governance
1. In a particular sector (e.g. fisheries), a continuing process through which governments, institutions, and stakeholders of the sector and of other interacting sectors elaborate and adopt appropriate policies, plans, and management strategies to ensure sustainable and responsible resource utilization. In the process, conflicting or diverse interests may be accommodated and cooperative action may be taken; 2. The formal and informal arrangements, institutions, and mores which determine how resources or an environment are utilized, how problems and opportunities are evaluated and analyzed, what behavior is deemed acceptable or forbidden, and what rules and sanctions are applied to affect the pattern of resource and environmental use.[5]

Gross Economic Benefits
Positive utility gained from the use of a resource prior to netting the costs. (see *Net Economic Benefits*)

Gross Register Ton (GRT)
A unit of internal volume of a ship, equal to 100 cubic feet. GRT is the total volume or capacity of a vessel.[13]

Groundfish
Collective term loosely applied to most commercially harvested marine fish other than salmonids, scombrids, and clupeids. Although many groundfish are demersal (e.g. yellowtail flounder, yellowfin sole), other species are semidemersal or pelagic (e.g. pollock, cod, haddock).[13] (see *Demersal*)

Growth
Usually an individual fish's increase in length or weight with time. Also may refer to the increase in numbers of fish in a population with time.[2]

Growth Model
1. A mathematical formula that describes the increase in length or weight of an individual fish with time[2]; 2. A mathematical description or representation of the size of a living organism at its various ages. The von Bertalanffy growth model is commonly used in fish stock assessments.[5]

Growth Overfishing
1. The situation existing when the rate of fishing is above F_{MAX} and when fish are harvested before their growth potential is fully reached[3]; 2. When fishing pressure on smaller fish is too heavy to allow the fishery to produce its maximum poundage. Growth overfishing, by itself, does not affect the ability of a fish population to replace itself.[2]

Growth Rate (K)
1. Annual or seasonal. The increase in weight of a fish per year (or season), divided by the initial weight; 2. In fish this is often measured in terms of the parameter K of the von Bertalanffy curve for the mean weight as a function of age.[5]

Guyot
Submerged earthform at depths >200 meters consisting of a flat-topped seamount with a cap of the carbonate remains of a drowned atoll.[12]

Gyre
Large cyclonic current that moves water in a circular pattern from the tropics to the polar seas.[12]

H

Habitat
1. The environment in which the fish live, including everything that surrounds and affects its life, e.g. water quality, bottom, vegetation, associated species (including food supplies); 2. The locality, site and particular type of local environment occupied by an organism.[5]

Habitat Area(s) of Particular Concern (HAPC)
Subsets of essential fish habitat that serve an important ecological function, are particularly sensitive to human-induced environmental degradation, are particularly stressed by human development activities, or comprise a rare habitat type.[2]

Hadal Zone
Deepest deep bottom area or portion of submerged geoform at depths >7,000 meters.[12]

Halophytic
Salt-tolerant vegetation.[12]

Harvest
The total number or weight of fish caught and kept from an area over a period of time. Note that landings, catch, and harvest are different.[2]

Harvest Control Rule
Describes how harvest is intended to be controlled by management in relation to the state of some indicator of stock status. For example, a harvest control rule can describe the various values of fishing mortality that will be aimed at for various values of the stock abundance. It formalizes and summarizes a management strategy. Constant catch and constant fishing mortality are two types of simple harvest control rules.[5]

Harvest Guideline
A numerical harvest level that is a general objective, but not a quota. Attainment of a harvest guideline does not require a management response, but does prompt review of a fishery.[1]

Harvest Specifications
The detailed regulations that make up management measures; for example, trawl footrope size, depth limits, net mesh-size, etc.[1]

Harvesting Capacity
The capacity of the fishing fleet to harvest fish, usually expressed in terms of some measure of vessel size, such as gross tonnage, hold capacity, horsepower.[5]

Head Boat
A fishing boat that takes recreational (sport) fishermen out for a fee per person. Different from a charter boat in that people on a head boat pay individual fees as opposed to renting the boat.[2] (see *Party Boat*)

Head Rope
The length of rope or wire in a trawl to which the top wings and cover netting are attached.[5]

Health
The condition of the marine environment from the perspective of adverse effects caused by anthropogenic (human) activities, in particular habitat destruction, changed sedimentation rates and the mobilization of contaminants. Such condition refers to the contemporary state of the ocean, prevailing trends, and the prognosis for improvement or deterioration of its quality.[5]

Heritage Value
Site possessing historical, archaeological, architectural, technological, aesthetic, scientific, spiritual, social, traditional, or other special cultural significance associated with human activity.[14]

Highgrading
Form of selective sorting of fish in which higher value, more marketable fish are retained and fish that could be legally retained, but are less marketable, are discarded.[13] (see *Discard*)

High Seas
All waters beyond the Exclusive Economic Zone (EEZ) (>200 nautical miles) of the United States and beyond any foreign nation's EEZ.[1]

High Seas Resources
Resources distributed exclusively in the high seas, i.e. in waters beyond the areas of national jurisdiction (which can be 200 nautical miles or less) excluding species fixed on the continental shelf which remain under the sovereign rights of the coastal states.[5]

Highly Migratory Species
Marine species whose life cycle includes lengthy migrations, usually through the exclusive economic zones of two or more countries as well as into international waters. This term usually is used to denote tuna and tuna-like species, sharks, swordfish, and billfish.[5]

Hook and Line
A type of fishing gear consisting of a hook tied to a line. Fish are attracted by natural bait that is placed on the hook, and are impaled by the hook when biting the bait. Artificial bait (lures) with hooks are often used. Hook-and-line units may be used singly or in large numbers.[5]

Household
All the persons, kin and non-kin, who live in the same dwelling and share income, expenses, and daily subsistence tasks. A basic unit for sociocultural and economic analysis, a household may consist of persons (sometimes one but generally two or more) living together and jointly making provision for food or other essentials elements of livelihood.[5]

Hydrothermal Vent
A place on the seafloor, generally associated with spreading centers, where warm to super-hot, mineral-rich water is released; may support a diverse community of organisms.[12]

Hypersaline
Extremely salty, having much more salt than normal seawater.

I

Ichthyoplankton
Fish eggs and larvae belonging to the planktonic community.[5]

Incidental Catch
Retained or discarded nontarget species caught when fishing for the primary purpose of catching a different species.[1,5]

Incidental Take
The "take" of protected species (such as listed salmon, marine mammals, sea turtles, or sea birds) during fishing. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct.[1]

Index of Abundance
A relative measure of the abundance of a stock; for example, a time series of catch per unit effort data.[5]

Indicators
1. A variable, pointer, or index. Its fluctuation reveals the variations in key elements of a system. The position and trend of the indicator in relation to reference points or values indicate the present state and dynamics of the system. Indicators provide a bridge between objectives and action; 2. Signals of processes, inputs, outputs, effects, results, outcomes, impacts, etc., that enable such phenomena to be judged or measured. Both qualitative and quantitative indicators are needed for management learning, policy review, monitoring, and evaluation; 3. In biology, an organism, species, or community whose characteristics show the presence of specific environmental conditions, good or bad.[5]

Indigenous Fishing
Fishing undertaken by peoples native to a land or region.[5]

Indirect Methods
Methods for stock assessment based on fishery-dependent data, such as catch and effort statistics and age structure of the catch.[5]

Individual Fishing Quota (IFQ)
A type of limited entry, an allocation to an individual (a person or a legal entity, e.g. a vessel owner or company) of a right [privilege] to harvest a certain amount of fish in a certain period of time. It is also often expressed as an individual share of an aggregate quota, or total allowable catch (TAC).[5]

Individual Transferable Quota (ITQ)
A type of individual fishing quota (IFQ) allocated to individual fishermen or vessel owners that can be transferred (sold or leased) to others.[1,5]

Industrial Fishery
A fishery for species not directly used for human food, e.g. Atlantic menhaden fishery.[2]

Infauna
Benthic fauna living in the substrate and especially in the soft seafloor.[12]

Information Management
1. A mechanism and structured set of processes, people, and equipment for converting data into information and storing and distributing information; 2. A mechanism for storing, generating and distributing information for supporting operations and management functions of an organization(s).[5]

Initial Regulatory Flexibility Analysis
An analysis required by the Regulatory Flexibility Act.[1]

Input Controls
Management instruments used to control the time and place as well as type and/or amount of fishing with the view to limit yields and fishing mortality; for example, restrictions on type and quantity of gear, effort, and capacity; closed seasons.[5]

Input-Output Analysis
A systematic method that both describes the financial linkages and network of input supplies and production which connect industries in a regional economy (however defined), and predicts the changes in regional output, income, and employment. Input-output analysis generally focuses on economic activity and the self-sufficiency of an economy, unlike cost-benefit analysis which focuses on changes in net national benefits from use of a productive resource.[9]

In-Season Adjustments
Regulatory changes that affect an ongoing fishery.[1]

Inshore Waters
Waters of the shallower part of the continental shelf.[5]

Instantaneous Rate of Fishing Mortality (F)
When fishing and natural mortality act concurrently, F is equal to the instantaneous total mortality rate, multiplied by the ratio of fishing deaths to all deaths. Also called: rate of fishing; instantaneous rate of fishing.[5]

Instantaneous Rate of Growth (G)
The natural logarithm of the ratio of final weight to initial weight of a fish in a unit of time, usually a year. When applied collectively to all fish of a given age in a stock, the possibility of selective mortality must be considered.[5]

Instantaneous Rate of Mortality (Z)
When fishing and natural mortality act concurrently, the natural logarithm of the survival rate (with sign changed) for deaths due to either natural causes (instantaneous rate of natural mortality, M) or due to fishing mortality (instantaneous rate of fishing mortality, F). The instantaneous rate of total mortality, Z, is the sum of these two rates: $Z = F + M$, also called the coefficient of decrease.[5]

Comment: Usually given on a yearly basis; the figure just described is divided by the fraction of a year represented by the "short interval" in question. This concept is used principally when the size of the vulnerable stock is not changing or is changing only slowly, since among fishes recruitment is not usually associated with stock size in the direct way in which mortality and growth are.[5]

Instantaneous Rate of Recruitment
Number of fish that grow to catchable size per short interval of time, divided by the number of catchable fish already present at that time. Usually given on a yearly basis; that is, the figure just described is divided by the fraction of a year represented by the "short interval" in question. This concept is used principally when the size of the vulnerable stock is not changing or is changing only slowly, since among fishes recruitment is not usually associated with stock size in the direct way in which mortality and growth are.[6]

Instantaneous Rate of Surplus Production
Equal to rate of growth plus rate of recruitment less rate of natural mortality—all in terms of weight and on an instantaneous basis. In a "balanced" or equilibrium fishery, this increment replaces what is removed by fishing, and rate of surplus production is numerically equal to rate of fishing. Also called instantaneous rate of natural increase.[5]

Integrated Analysis
Refers to stock assessment methodologies that attempt to integrate multiple sources of data into a single estimation framework. For example, an integrated assessment can attempt to fit the following observations based on model predictions: total landings by fleet, size samples of landings, discard estimates, size samples of discards, standardized catch per unit effort by fleet, fishery-independent surveys, and tagging records on movement, growth, and recoveries.[5]

Integrated Management
An approach by which the many competing environmental and socioeconomic issues are considered together, with the aim of achieving the optimal solution from the viewpoint of the whole community and the whole ecosystem.[14]

Interstate Marine Fisheries Commissions
Non-regulatory agencies that serve multiple states (Pacific States: Alaska, California, Idaho, Oregon, and Washington; Atlantic States: Maine, New Hampshire,

Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, and Florida; Gulf States: Texas, Louisiana, Mississippi, Alabama, and Florida) and as a mechanism for Federal funding of regional fishery projects. Interstate marine fisheries commissions provide a communication exchange between individual fishery management councils and information in the form of data services for various fisheries.[1]

Intertidal Zone
The area on a seacoast between the highest and lowest tide.[12] (see *Littoral Zone*)

Intrinsic Growth Rate (r)
A value that quantifies how much a population can grow between successive time periods. The intrinsic growth rate is often estimated with production models and plays an important role in evaluating the sustainability of different harvest levels and the capacity to recover after depletion.[5]

Intrinsic Rate of Increase (z)
The change in the amount of harvestable stock, estimated by recruitment increases plus growth minus natural mortality.[10]

Introduced Species
With respect to a particular ecosystem, any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem. Introduced species often compete with and cause problems for native species. Introduced species are also called exotic, nonnative, and alien species.[4] (see *Invasive Species*, *Native Species*)

Invasive species
An introduced species that out-competes native species for space and resources.[4] (see *Introduced Species*, *Native Species*)

Invertebrate
Animals without a backbone. In fishery management terms, refers to shellfish, including lobsters, clams, shrimps, oysters, crabs, and sea urchins.[12]

Island
Emergent land mass larger than 1 square kilometer in area, completely surrounded by water. Also refers to aquatic habitats that are associated with land masses completely surrounded by water or elevated ridges extending from the seafloor covered with shallow water (banks) which may support unconsolidated sediments (shoals), rocks, or shallow reefs rising above the surface of the water.[12]

Isobath
A line on a map connecting points of equal bathymetry, i.e. equal depth, in the ocean or another water body.[12]

J

Jigging
A method of fishing using lures on a vertical line that snag fish when they pass near. The line is moved up and down (jigged) by hand or mechanically. Extremely efficient for fishing oceanic squids at night.[5]

Juvenile
A young fish or animal that has not reached sexual maturity.[5]

K

Krill
From the Norwegian word meaning “young fish” and is now commonly used as the common term for euphausids, a family of crustaceans found throughout the world oceans. There are 85 species of krill, some of which are exploited commercially. The Antarctic krill is *Euphausia superba*. Other species include *Euphausia pacifica*, *Euphausia nana*, *Thysanoessa inermis*, *Meganyctiphanes norvegica*, *Nyctiphanes australis*.[5]

L

Lagoon
Coastal water body entirely or almost entirely enclosed by a landmass with minimal connection to the sea; a shallow, sheltered body of water separated from the open sea by coral reefs, sand bars, or barrier islands.[12]

La Niña
Climate anomaly opposite to El Niño with unusually cold ocean temperatures in the Equitorial Pacific, leading to warmer winter temperatures in the

southeastern United States and cooler temperatures in the Pacific Northwest. La Niña events occur after some, but not all El Niño events. (see *El Niño-Southern Oscillation*)

Landings
1. The number or poundage of fish unloaded by commercial fishermen or brought to shore by recreational fishermen for personal use. Landings are reported at the locations at which fish are brought to shore[2]; 2. The part of the catch that is selected and kept during the sorting procedures on board vessels and successively discharged at dockside.[5]

Landings Data
Information on the amount of fish caught and landed per year.[10]

Large Fluctuations
Large fluctuations occur in a number of species where the population size or area of distribution varies widely, rapidly, and frequently, with a variation greater than one order of magnitude.[5]

Large Marine Ecosystem (LME)
A geographic area of an ocean that has distinct bathymetry, hydrography, productivity, and trophically dependent populations.[5]

Latent Species
A species of fish that has the potential to support a directed fishery.[10]

Least Squares
A statistical criterion for the estimation of the goodness of fit in correlation analysis. Least squares methods aim to minimize the sum of squared differences between the observations and the predictions from a model. For example, virtual population analysis (VPA) tuning often involves finding the estimates of abundance and mortality rates that minimize the sum of squared differences between standardized catch per unit effort (CPUE) and predicted abundance from the VPA.[5] (see *Regression Analysis, Residual*)

Length at First Maturity
Length at which 50 percent of the individuals of a given sex (normally females) are considered to be reproductively mature.[5]

Length Frequency
A length frequency distribution is an arrangement of recorded lengths (in a total catch, a stock, or a sample) which indicates the number of individuals encountered in each length interval.[5]

Length-Frequency Distribution
The number of individuals of a catch or catch sample in each length interval. The modal size is the length group with the higher number of individuals. Distributions may be uni- or bimodal but are more generally multimodal, reflecting multiple age-groups.[5]

Length Requirement
Specifies that permits may not be registered for use with vessels more than 5 feet longer (in overall length) than the length endorsed on the permit.[1]

Length-Weight Relationship
A mathematical formula for calculating the weight of a fish in terms of its length. When only one is known, the formula can determine the other.[2] (see *Age-Length Key*)

Level of Exploitation
This can mean the amount of catch or level of fishing mortality, or is sometimes used without any precise quantity in mind.[5]

License
Also known as permit. A license or permit is a document giving the producer the right to operate in a fishery according to the terms established by the regulating authority.[5]

License Limitation
Legally restricting the number of commercial fishermen licensed to fish. Often a management agency uses this as a means of limited entry.[5] (see *Limited Entry*)

Life Cycle
Successive series of changes through which an organism passes in the course of its development.[5]

Lifespan
The maximum expected age, on average, for a species, cohort, stock, or a population in the absence of fishing or human-induced mortality. Lifespan is inversely proportional to natural mortality. Often referred to as T_{max} in stock assessment models. Different and smaller than the absolute maximum age.[5]

Limit Capacity
The maximum amount of fish that can be produced on a sustainable basis by a fully utilized fleet. Thus, the limit capacity corresponds to maximum sustainable yield (MSY).[5]

Limit Reference Points
Benchmarks used to indicate when harvests should be constrained substantially so that the stock remains within safe biological limits. The probability of

exceeding limits should be low. In the National Standard Guidelines, limits are referred to as thresholds. In much of the international literature (e.g. United Nations Food and Agricultural Organization, FAO) thresholds are used as buffer points that signal when a limit is being approached.[3] (see *National Standard Guidelines*)

Limited Entry
A program that changes a common property resource like fish into private property for individual fishermen. License limitation and individual transferable quotas (ITQ) are two forms of limited entry.[2]

Limited Entry Fishery
Fishery where the number of operators (and size of boats) is restricted through license limitation or quota systems, to control the amount of fishing effort. It frequently involves controls on the number and size of vessels, and conditions relating to the transfer of fishing rights or the replacement of vessels.[5]

Littoral Zone
The zone on the coast where land mets sea. Often called the intertidal zone but is more comprehensive, including the supratidal and infratidal zones.[12] (see *Intertidal Zone*)

Local Depletion
Local depletion occurs when localized catches take more fish than can be replaced either locally or through fish migrating into the catch area. Local depletion can occur apart form the status of the overall stock, and can be greater than decreases in the entire stock.[1]

Location
Location defines a geographically or ecologically distinct area in which a single event (e.g. pollution) will soon affect all individuals of the taxon present. A location usually, but not always, contains all or part of a subpopulation of the taxon, and is typically a small proportion of the taxon's total distribution.[5]

Logbook
A detailed, usually official, record of a vessel's fishing activity registered systematically on board the fishing vessel, usually including information on catch and its species composition, the corresponding fishing effort and location. Completion of logbooks may be a compulsory requirement for a fishing license.[5]

Longline
Fishing method using a horizontal mainline to which weights and baited hooks are attached at regular intervals. The horizonal mainline is connected to the surface by floats. The mainline can extend from several hundred yards to several miles and may contain several hundred to several thousand baited hooks.[13]

Longliner
Vessel specifically designed to catch fish using the longline fishing method.[13]

Long-Term Potential Catch (Yield)
The largest annual harvest, in weight, that can be removed from a fish stock year after year, under existing environmental conditions. This can be estimated in various ways, from maximum values from production models to average observed catches over a suitable period of years.[6] (see *Maximum Sustainable Yield*)

M

Macrofauna
Large animals (for example fish).[12]

Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act)
Federal legislation responsible for establishing the fishery management councils (FMCs) and the mandatory and discretionary guidelines for Federal fishery management plans (FMPs). This legislation was originally enacted in 1976 as the Fishery Management and Conservation Act; its name was changed to the Magnuson Fishery Conservation and Management Act in 1980, and in 1996 it was renamed the Magnuson-Stevens Fishery Conservation and Management Act.[13]

Maintainable Yield
The largest catch that can be maintained from the population, at whatever level of stock size, over an indefinite period. It will be identical to the sustainable yield for populations below the level giving the maximum sustainable yield (MSY), and equal to the MSY for populations at or above this level.[6]

Management
The art of taking actions that affect a resource and its exploitation with a view to achieve certain objectives, such as maximizing the production of that resource. Management includes, for example, fishery regulations such as catch quotas or closed seasons. Managers are those who practice management.[5]

Management Authority
The legal entity that has been assigned by a state or states with a mandate to perform certain specified

management functions in relation to a fishery, or an area (e.g. a coastal zone). Generally used to refer to a state authority, the term may also refer to an international management organization.[5]

Management Objective
A formally established, more or less quantitative target that is actively sought and provides a direction for management action.

Comment: The United Nations Food and Agricultural Organization (FAO) Code of Conduct for Responsible Fisheries provides that: "Fisheries management should promote the maintenance of the quality, diversity and availability of fishery resources in sufficient quantities for present and future generations in the context of food security, poverty alleviation and sustainable development. Management measures should not only ensure the conservation of the target species but also of species belonging to the same ecosystem or associated with or dependent upon the target species." FAO (1995, Article 6.2).

It also provides that management "maintains or restore stocks at levels capable of producing maximum sustainable yield, as qualified by relevant environmental and economic factors." FAO (1995, Article 7.2). [5]

Management Reference Points
Conventional (agreed values) of indicators of the desirable or undesirable state of a fishery resource of the fishery itself. Reference points could be biological (e.g. expressed in spawning biomass or fishing mortality levels), technical (fishing effort or capacity levels) or economic (employment or revenues levels). They are usually calculated from models in which they may represent critical values.[5]

Management Strategy
The strategy adopted by the management authority to reach established management goals. In addition to the objectives, it includes choices regarding all or some of the following: access rights and allocation of resources to stakeholders, controls on inputs (e.g. fishing capacity, gear regulations), outputs (e.g. quotas, minimum size at landing), and fishing operations (e.g. calendar, closed areas, and seasons).[5]

Comment: The management strategy may also include control laws establishing formally the course of management action in relation to stock or fishery indicators. A precautionary management strategy takes uncertainty into account in order to reduce the probability of negative outcomes.[5]

Marginal Yield
The increase in yield obtained by an increase in fishing effort (or fishing mortality) by one unit. In mathematical terms, it is given by the slope of the tangent to the relationship between effort and yield (or between fishing mortality and yield-per-recruit).[5]

Mariculture
1. Marine fish farming (aquaculture). Raising of marine animals and plants in the ocean; 2. The raising of marine finfish or shellfish under some controls. Ponds, pens, tanks, or other containers may be used, and feed is often used. A hatchery is also mariculture but the fish are released before harvest size is reached.[5]

Marine
Waters that receive no freshwater input from the land and are substantially of full oceanic salinity (>30 practical salinity units (PSU) throughout the year).[12]

Marine Mammals
Warmblooded animals that live in marine waters and breathe air directly. These include porpoises, dolphins, whales, seals, and sea lions.[2]

Marine Mammal Protection Act (MMPA)
The MMPA prohibits the harvest or harassment of marine mammals, although permits for incidental take of marine mammals while commercial fishing may be issued subject to regulation.[1] (see *Incidental Take*).

Marine Pollution
The introduction by man, directly or indirectly, of substances or energy into the marine environment (including estuaries) resulting in such deleterious effects as harm to living resources, hazards to human health, hindrance to marine activities including fishing, impairment of quality for use of seawater, and reduction of amenities.[5]

Marine Protected Area (MPA)
Geographic area with discrete boundaries that has been designated to enhance the conservation of marine resources. This includes MPA-wide restrictions on some activities such as oil and gas mining and the use of zones such as fishery and ecological reserves to provide higher levels of protection.[14] (see *Marine Reserve, Protected Area*)

Marine Recreational Fisheries Statistical Survey (MRFFS)
An annual national survey conducted by the National Marine Fisheries Service (NMFS), in cooperation with the coastal states, to estimate the number, catch, and effort of recreational fishermen. It serves as a basis for many parts of fisheries management plans (FMPs).[2]

Marine Reserve
A geographically defined space in the marine environment where special restrictions are applied to protect some aspect of the marine ecosystem including plants, animals, and natural habitats.[2] (see *Marine Protected Area, Protected Area*)

Mark-Recapture
The tagging and releasing of fish to be recaptured later in their life cycles. These studies are used to elucidate fish movement, migration, mortality, and growth to estimate population size.[2]

Mature Individuals
The number of individuals known, estimated, or inferred to be capable of reproduction.[5]

Maturity
Refers to the ability, on average, of fish of a given age or size to reproduce. Maturity information, in the form of percent mature by age or size, is often used to compute spawning potential.[5]

Maximum Economic Yield (MEY)
This is the total amount of profit that could be earned from a fishery if an individual owned it. An open-entry policy usually results in participation by so many fishermen that profits higher than opportunity cost (economic rent) are driven to zero.[2] (see *Economic Rent*)

Maximum Expected Stationary Yield (MESY)
Maximum statistical expectation of long-term yield, considering uncertainties in parameter values and natural (process) variability.[11]

Maximum Expected Log Stationary Yield (MELSY)
Maximum statistical expectation of the logarithm of long-term yield, considering uncertainties in parameter values and natural (process) variability.[11]

Maximum Fishing Mortality Threshold (MFMT, $F_{threshold}$)
One of the status determination criteria (SDC) for determining if overfishing is occurring. It will usually be equivalent to the fishing mortality (F) corresponding to the maximum sustainable yield (MSY) control rule. If current fishing mortality rates are above $F_{threshold}$, overfishing is occurring.[3]

Maximum Likelihood
A statistical criterion for the estimation of parameters in models. Maximum likelihood methods aim to maximize the likelihood (or probability) of having collected the observed data, given predictions from a model. For example, virtual population analysis (VPA) tuning often involves finding the estimates of abundance and mortality rates that maximize the likelihood for the observed standardized catch per unit effort (CPUE). Under some conditions, the methods of maximum likelihood and least squares give similar results.[5] (see *Least Squares*)

Maximum Spawning Potential (MSP)
This type of reference point is used in some fishery management plans to define overfishing. The MSP is the spawning stock biomass per recruit (SSB/R) when fishing mortality is zero. The degree to which fishing reduces the SSB/R is expressed as a percentage of the MSP (i.e. %MSP). A stock is considered overfished when the fishery reduces the %MSP below the level specified in the overfishing definition. The values of %MSP used to define overfishing can be derived from stock-recruitment data or chosen by analogy using available information on the level required to sustain the stock.[3]

Maximum Sustainable Yield (MSY)
The largest average catch or yield that can continuously be taken from a stock under existing environmental conditions. For species with fluctuating recruitment, the maximum might be obtained by taking fewer fish in some years than in others. Also called: maximum equilibrium catch; maximum sustained yield; sustainable catch.[6]

Maximum Willingness to Pay
The maximum price a person is willing to pay for a good or service.

Maximum Yield-per-Recruit
Maximum expected lifetime yield per fish recruited in the stock.[5] (see *Yield-per-Recruit*)

Mean Generation Time
The average time it takes for a sexually mature female fish to be replaced by an offspring with the same reproductive capacity; used in setting maximum allowable rebuilding time periods in rebuilding plans.

Megafauna
Larger animals (e.g. whales).[12]

Meristics
A series of measurements on a fish, such as scale counts, spine counts, or fin-ray counts, which are used to separate different populations or species of fish.[10] (see *Morphometrics*)

Mesh Size
The size of holes in a fishing net. Minimum mesh sizes are often prescribed by regulations in order to avoid the

capture of the young of valuable species before they have reached their optimal size for capture.[5]

Mesopelagic Zone
The pelagic environment from a depth of approximately 100–200 meters to 1,000 meters.[12]

Metapopulation
A population that consists of a series of physically separate subpopulations linked by dispersal. Metapopulations persist as a result of a balance between extinctions of subpopulations and recolonization of habitat patches (and hence reestablishment of subpopulations).[14]

Metric Ton (t, mt)
1,000 kilograms, equivalent to 2,204.6 pounds.

Mid-Ocean Ridge
The continuous chain of volcanic submarine mountains and elongated rises on the ocean floor, extending around the earth where basalt periodically erupts, forming new ocean crust; similar to continental rift zones; includes the Mid-Atlantic Ridge and East Pacific Rise.[12]

Midwater
Any part of the water column between the surface and the seafloor. Fish living at the surface or on the seafloor do not live in midwater.[5]

Migration
1. Systematic (as opposed to random) movement of individuals of a stock from one place to another, often related to season. A knowledge of the migration patterns helps in targeting high concentrations of fish and managing shared stocks; 2. The movements of fish from feeding ground to spawning ground and back again, from nursery ground to feeding ground, and from spawning ground to nursery ground.[5]

Minimum Mesh Size
The smallest size of mesh permitted in nets and traps; this allows smaller individuals than a defined mesh size to escape unharmed.[5]

Minimum Size
The smallest individual size allowed in landings or markets. Established by fishery management councils (FMCs) and enforced through control at landing sites or markets, it is intended to minimize the catch of small (undersized) fish or juveniles giving them a better chance to grow before being vulnerable to fishing. Based on yield per recruit considerations and models, it aims at avoiding or correcting growth overfishing.[5]

Minimum Stock Size Threshold (MSST, $B_{threshold}$)
Another of the status determination criteria (SDC). The greater of (a) $\frac{1}{2}B_{MSY}$, or (b) the minimum stock size at which rebuilding to B_{MSY} will occur within 10 years while fishing at the maximum fishing mortality threshold (MFMT). MSST should be measured in terms of spawning biomass or other appropriate measures of productive capacity. If current stock size is below $B_{threshold}$, the stock is overfished.[4]

Mixed Layer
The upper water layer in a two-layer system that is mixed by the wind or by convection in circulation from top to bottom of the layer, extending from the water surface to the density-stability discontinuity.[12] (see *Pycnocline, Stratification, Thermocline*)

Mixed-Stock Exception
In "mixed-stock complexes," many species of fish swim together and are caught together. This becomes a problem when some of these stocks are healthy and some are overfished, because even a sustainable harvest of the healthy stocks can harm the depleted stock. In order to avoid having to shut down all fisheries to protect one particular overfished stock, the National Standard Guidelines allow a "mixed-stock" exception to the "overfished" definition. This would allow higher catches of some overfished species than ordinarily allowed in order to avoid severe hardship to fishing communities.[1] (see *National Standard Guidelines*)

Model
In fisheries science, a description of something that cannot be observed. Often a set of equations and data used to make estimates.[2]

Modeling
The construction of physical, conceptual, or mathematical simulations of the real world. Models help to show relationships between processes (physical, economic, or social) and may be used to predict the effects of changes in the components of a system.[5]

Mollusk
Invertebrates with a soft, unsegmented body, a muscular foot, and, with some exceptions, a calcareous shell. Includes the oyster, clam, mussel, snail, conch, scallop, squid, and octopus.[12]

Monitoring
1. To observe and record changes; 2. The collection of information for the purpose of assessment of the progress and success of a plan. Monitoring is used for the purpose of assessing performance of a management

plan or compliance scheme and revising them, or to gather experience for future plans.[5]

Monte Carlo
Monte Carlo simulation is a statistical approach whereby the inputs that are used for a calculation are resampled many times assuming that the inputs follow known statistical distributions. The Monte Carlo method is used in many applications such as Bayesian analyses, parametric bootstraps, and stochastic projections.[5] (see *Bayesian*, *Bootstrap*)

Moratorium
A mandatory cessation of fishing activities on a species (e.g. the blue whale), in an area (e.g. a sanctuary), with a particular gear (e.g. large scale driftnets), and for a specified period of time (temporary, definitive, seasonal, or related to reopening criteria).[5]

Morphometrics
The physical features of a fish (coloration for example); differences may be used to identify separate fish populations.[10] (see *Meristics*)

Mortality
Measures the rate of death of fish. Mortality occurs at all life stages of the population and tends to decrease with age. Death can be due to several factors such as pollution, starvation, and disease but the main source of death is predation (in unexploited stocks) and fishing (in exploited ones).[5]

Mortality Rate
The rate at which the numbers in a population decrease with time due to various causes. Mortality rates are critical parameters in determining the effects of harvesting strategies on stocks, yields, revenues, etc. The proportion of the total stock (in numbers) dying each year is called the "annual mortality rate."[5]

Mudflat
A muddy bottom that is exposed at low tide.[12]

Multiple-Use Marine Protected Area
An approach, often employed over much larger areas, that allows for integrated management of complete marine ecosystems, usually through a zoning process.[14]

Multispecies Fishery
Fishery in which more than one species is caught at the same time. Because of the imperfect selectivity of most fishing gears, most fisheries are "multispecies." The term is often used to refer to fisheries where more than one species is intentially sought and retained.[13]

Multiplier
A number used to multiply a dollar amount to get an estimate of economic impact. It is a way of identifying impacts beyond the original expenditure. It can also be used with respect to income and employment.[2]

N

National Academy of Sciences (NAS)
Private nonprofit, self-perpetuating society of scientists. The NAS was granted a charter by Congress in 1863 that requires it to advise the Federal government on scientific and technical matters.[13]

National Environmental Policy Act (NEPA)
Passes by Congress in 1969, NEPA requires Federal agencies to consider the environment when making decisions regarding their programs. Section 102(2)(C) requires Federal agencies to prepare an environmental impact statement (EIS) before taking major Federal actions that may significantly affect the quality of the human environment. The EIS includes the environmental impact of the proposed action, any adverse environmental effects which cannot be avoided should the proposed action be implemented, alternatives to the proposed action, the relationship between local short-term uses of the environment and long-term productivity, and any irreversible commitments of resources which would be involved in the proposed action should it be implemented.[1]

National Marine Fisheries Service (NMFS)
Federal agency within the National Oceanic and Atmospheric Administration (NOAA) and responsible for overseeing fisheries science and regulation of the fisheries.[13]

National Oceanic and Atmospheric Administration (NOAA)
A bureau within the Department of Commerce responsible for atmospheric, ocean, and coastal sciences and Federal management.[13]

National Research Council (NRC)
Operating arm of the National Academy of Sciences (NAS).[13]

National Standards
The Magnuson-Stevens Act requires that a fishery management plan and its regulations meet ten national standards.[2]

National Standard 1
Requires that "conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the U.S. industry;" where "optimum yield" is defined in terms of the amount of fish which will provide the greatest overall benefit to the Nation.

National Standard 2
Requires that "conservation and management measures shall be based upon the best scientific information available."

National Standard 3
"To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination."

National Standard 4
Requires that "conservation and management measures shall not discriminate between residents of different states. If it becomes necessary to allocate or assign fishing privileges among various U.S. fishermen, such allocation shall be (a) fair and equitable to all such fishermen; (b) reasonably calculated to promote conservation; and (c) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges."

National Standard 5
Requires that "conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose."

National Standard 6
"Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches."

National Standard 7
Requires that "conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication."

National Standard 8
States that "conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks) take into account the importance of fishery resources to fishing communities in order to (a) provide for the sustained participation of such communities, and (b) to the extent practicable, minimize adverse economic impacts on such communities."

National Standard 9
Requires that "conservation and management measures shall, to the extent practicable, (a) minimize bycatch; and (b) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch." The National Marine Fisheries Service (NMFS) has defined the term "to the extent practicable" to include a consideration of the effects of reducing bycatch and bycatch mortality on the overall benefit to the Nation.

National Standard 10
Requires that "conservation and management measures shall, to the extent practicable, promote the safety of human life at sea."

National Standard Guidelines
Advisory guidelines issued by the National Marine Fisheries Service (NMFS) to provide comprehensive guidance for the development of fishery management plans and amendments that comply with the National Standards of the Magnuson-Stevens Act. These guidelines are found in Title 50, Code of Federal Regulations, Part 600.[1]

Native Species
A local species that has not been introduced.[12] (see *Introduced Species*, *Invasive Species*)

Natural Mortality (M)
1. Deaths of fish from all causes except fishing (e.g. ageing, predation, cannibalism, disease, and perhaps increasingly pollution). It is often expressed as a rate that indicates the percentage of fish dying in a year; e.g. a natural mortality rate of 0.2 implies that approximately 20 percent of the population will die in a year from causes other than fishing; 2. The loss in numbers in a year class from one age group to the subsequent one, due to natural death.[5]

Comment: These many causes of death are usually lumped together for convenience, because they are difficult to separate quantitatively. Sometimes natural mortality is confounded with losses of fish from the stock due to emigration. M has proven very difficult to estimate directly, and is often assumed based on the general life history. M values is also often assumed to remain constant through time and by age, a very unlikely assumption.[5]

Nautical Mile
International unit of distance equal to 1,852 meters or 6,067 feet.

Nearshore
Shallow waters at a small distance from the shore.[5]

Nearshore Marine System
Those waters in the region between the coastal land margin and the 30-meter depth contour and where the salinity is substantially marine (>30 practical salinity units (PSU) throughout the year.)[12]

Nekton
Pelagic organisms that are free-swimming and so whose movements are independent of the tides, currents, and waves. Such animals include fishes, whales, squids, crabs, and shrimps. The distribution of nekton is limited by temperature and nutrient supply and decreases with decreasing depth.[4] (see *Benthic*, *Pelagic*, *Plankton*)

Neritic (Coastal) Zone
The pelagic marine environment above and on the continental shelf, landward of the shelf-slope break and having a depth of 30 to 200 meters.[12]

Neritic System
Those waters between the 30-meter depth contour and the continental shelf break, nominally at about 200 meters depth, and where the salinity is substantially marine (>30 practical salinity units (PSU) throughout the year). Although relatively farther from land than coastal systems, these regions can receive significant runoff influence from land and the water column is in close contact with the bottom relative to oceanic systems.[12]

Net Economic Benefits
Positive utility gained from the use of a resource, less the opportunity costs. (see *Gross Economic Benefits*)

Net Present Value
The value of an enterprise at the present time, after applying the process of discounting its costs and benefits.[5]

Network Marine Protected Areas
A group of reserves designed to meet objectives that single reserves cannot achieve on their own. Networks of reserves are linked by dispersal of marine organisms and by ocean currents.[14]

Nominal Catch
The sum of the catches that are landed (expressed as live weight or equivalents). Nominal catches do not include unreported discards.[6]

Nominal Effort
Nominal effort pertains to measures of fishing effort or vessel carrying capacity that have not been standardized. When catchability changes, e.g. through changes in gear technology, trends in nominal effort can give a misleading picture of trends in exploitation.[5]

Non-Consumptive Use
Individuals may use (i.e. observe), yet not consume, certain living ocean resources, like whale watching, sight-seeing, or scuba diving. Additionally, individuals might value the mere existence of living ocean resources without actually observing them.[9]

Non-Governmental Organization (NGO)
Any organization that is not a part of Federal, state, territorial, or municipal government. In fisheries, usually refers to nonprofit organizations involved in environmental issues and activities.[5]

Non-Monetary Benefits
Benefits that are not, or cannot be, directly measured in terms of monetary units. These include the satisfaction realized from enjoying a certain way of life or style of work, such as fishing in a rural coastal community.[5]

Non-Point Sources
Sources of sediment, nutrients, or contaminants that originate from many locations.[12]

Non-Target Species
Species not specifically targeted as a component of the catch; may be incidentally captured as part of the targeted catch.

Non-Users
Individuals who obtain value from a resource, but do not use the resource.[9]

Normative
Analysis leading to a recommendation or prescription that is based on value judgments or that reflects society's preferences.[5]

Norms
The understood rules for appropriate behavior. This is broader than social organization and includes nonsocial behavior.[5]

Notice Actions
Actions that a fishery management council can take

without passing an amendment to implement the regulation because the reasons for the action were prespecified in the fishery management plan (i.e. closing a fishing season if fishing mortality exceeds a set limit).

Notice of Violation and Assessment (NOVA)
Tickets and penalties issued by National Oceanic and Atmospheric Administration Office of General Counsel to fishermen in violation of fishing regulations. (see *Summary Settlement*)

Numbers-at-Age
The numbers of fish in each age class of a stock, in a particular year.[5]

Nursery
That part of a fish's or animal's habitat where the young develop and grow.

O

Objective
Expresses the object of an action or what is intended to be achieved. Any objective will include explicit statements against which progress can be measured, and identify which things are truly important and the way they interrelate; quantified objectives are referred to as targets.[5]

Observer
A certified person on board fishing vessels who collects scientific and technical information on the fishing operations and the catch. Observer programs can be used for monitoring fishing operations (e.g. areas fished, fishing effort deployed, gear characteristics, catches and species caught, discards, collecting tag returns, etc.). Observers may or may not have legal coercion powers and, their data may or may not be used for nonscientific purposes (e.g. enforcement) depending on the situation.[5]

Oceanic
Related to open ocean waters beyond the edge of the continental shelf and the neritic zone.[5] (see *Neritic*)

Oceanic System
Those waters of the open ocean, in areas beyond the shelf break in depths generally greater than 200 meters, extending to maximum ocean depths. These waters are removed from primary continental influences, and the seafloor interacts little or not at all with the water column.[12] (see *Pelagic*)

Offshore Waters
Waters located well beyond the shores (beyond the edge of the nearshore or inshore waters). Part of the oceanic environment.[5]

Olympic Fishing
A popular term to denote the "race-to-fish" phenomenon which is characterized by an increasing number of highly efficient vessels fishing at an increasing pace, with season length becoming shorter and shorter.[5] (see *Derby Fishery*, *Race-to-Fish*)

Open Access
Condition in which access to a fishery is not restricted (i.e. no license limitation, quotas, or other measures that would limit the amount of fish that an individual fisher can harvest).[13]

Open Access Resource
A good or service over which no property rights are recognized.[5]

Opportunity Costs
1. Defined as the benefit foregone by using a resource for one purpose instead of its next best alternative. Typically applied to capital and labor inputs to reflect their real costs to society as against their costs to a private entrepreneur which may be lower or higher because of subsidies, taxes, and various kinds of market distortions; 2. An amount a fisherman could earn for his time and investment in another business or occupation; 3. The benefits forgone by undertaking one activity instead of another.[5]

Optimum Age
The average age of the fish in a year-class at which the instantaneous rate of natural mortality equals the instantaneous rate of growth in weight for the year-class as a whole. At this age, the biomass of the age class is maximum.[5]

Optimum (Fishing) Capacity
The desired stock of inputs that will produce a desired level of outputs (e.g. a set of target fishing mortality rates for the species being harvested) and will best achieve the objectives of a fishery management plan (e.g. minimizing costs). Current or transient optimal capacity (related to current fleet and stock conditions) may differ from long run optimal capacity (reflecting management long-term objectives) particularly if the fishery resource is currently depleted and the management strategy is to rebuild this depleted resource.[5]

Optimum Size
The average size of the fish in a year-class at the time when the instantaneous rate of natural mortality equals the instantaneous rate of growth in weight for the year-class as a whole. At this size, the biomass of the age-class is maximum.[5]

Optimum Sustainable Population (OSP)
Defined by the Marine Mammal Protection Act (MMPA) as, "with respect to any population stock, the number of animals which will result in the maximum productivity of the population or the species, keeping in mind the carrying capacity of the habitat and health of the ecosystem of which they form a constituent element." (see *Carrying Capacity*, *Potential Biological Removal*)

Optimum Yield (OY)
1. The harvest level for a species that achieves the greatest overall benefits, including economic, social, and biological considerations. Optimum yield (OY) is different from maximum sustainable yield (MSY) in that MSY considers only the biology of the species. The term includes both commercial and sport yields[5]; 2. The amount of fish that will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities and taking into account the protection of marine ecosystems. MSY constitutes a "ceiling" for OY. OY may be lower than MSY, depending on relevant economic, social, or ecological factors. In the case of an overfished fishery, OY should provide for the rebuilding of the stock to B_{MSY}.[3]

Organic Material
Once-living material (typically with high carbon content), mostly of plant origin.[12]

Otolith
The ear bone of a fish. Otoliths have rings on them like the rings on a tree stump, and are used to find the age of the fish and its growth rate.[5]

Output Controls
Management instruments aimed at directly limiting fish catch or landings through total allowable catch (TAC) or quotas.[5]

Overcapacity
A level of fishing pressure that threatens to reduce a stock or complex below the abundance necessary to support maximum sustainable yield (MSY) and allow an economically sustainable fishing industry.[1]

Overcapitalization
Where the amount of harvesting capacity in a fishery exceeds the amount needed to harvest the desired amount of fish at least cost.[5]

Over-Exploitation
Rate of exploitation where the resource stock is drawn below the size that, on average, would support the long-term maximum sustainable yield (MSY) of the fishery.[5]

Overexploited
When stock abundance is too low. The term is used when biomass has been estimated to be below a limit biological reference point that is used as the threshold that defines "overfished conditions."[5]

Overfished
1. An overfished stock or stock complex "whose size is sufficiently small that a change in management practices is required to achieve an appropriate level and rate of rebuilding." A stock or stock complex is considered overfished when its population size falls below the minimum stock size threshold (MSST). A rebuilding plan is required for stocks that are deemed overfished[2]; 2. A stock is considered "overfished" when exploited beyond an explicit limit beyond which its abundance is considered 'too low' to ensure safe reproduction. In many fisheries fora the term is used when biomass has been estimated to be below a limit biological reference point that is used as the signpost defining an "overfished condition." This signpost is often taken as being F_{MSY}, but the usage of the term may not always be consistent.[5] (see *Minimum Stock Size Threshold*)

Comment: The stock may remain overfished (i.e. with a biomass well below the agreed limit) for some time even though fishing pressure might be reduced or suppressed.[5]

Overfishing
1. According to the National Standard Guidelines, "overfishing occurs whenever a stock or stock complex is subjected to a rate or level of fishing mortality that jeopardizes the capacity of a stock or stock complex to produce maximum sustainable yield (MSY) on a continuing basis." Overfishing is occurring if the maximum fishing mortality threshold (MFMT) is exceeded for 1 year or more[3]; 2. In general, the action of exerting fishing pressure (fishing intensity) beyond the agreed optimum level. A reduction of fishing pressure would, in the medium term, lead to an increase in the total catch.[5] (see *National Standard Guidelines*, *Maximum Fishing Mortality Threshold*, *Maximum Sustainable Yield*)

Comment: For long-lived species, overfishing (i.e. using excessive effort) starts well before the stock becomes overfished. The use of the term "overfishing" may not always be consistent.[5]

Overfishing Limit (OFL)
Point at which fishing seriously compromised a fishery's continued, sustained productivity. Overfishing limits may be set based on standardized biological criteria established for a particular fishery. Overfishing limits may also incorporate economic and social considerations relevant to a particular fishery.[13]

P

P_{MAX}
The probability of rebuilding a fish stock by T_{MAX}; a higher P_{MAX} probability is associated with a lower fishing mortality rate.

Pacific Decadal Oscillation (PDO)
A long-term pattern of Pacific Ocean climate variability, with events lasting 20 to 30 years and oscillating between warm and cool regimes. Unlike the El Niño-Southern Oscillation (ENSO), the North Pacific and North America are most strongly affected, with secondary signatures seen in the tropics. The PDO has been linked to major changes in northeastern Pacific marine ecosystems—during warm events, coastal productivity is enhanced in Alaska and inhibited off the U.S. west coast; the opposite pattern is seen during cool events. (see *El Niño-Southern Oscillation*)

Pacific Coast Fisheries Information Network (PacFIN)
PacFIN provides commercial fishery information for Washington, Oregon, and California. Maintained by the Pacific States Marine Fisheries Commission (PSMFC).[1]

Pacific States Marine Fisheries Commission (PSFMC)
The PSMFC is a non-regulatory agency that serves Alaska, California, Idaho, Oregon, and Washington. PSMFC (headquartered in Portland) provides a communication exchange between the Pacific Fishery Management Council and the North Pacific Fishery Management Council, and a mechanism for Federal funding of regional fishery projects. The PSMFC provides information in the form of data services for various fisheries.[1]

Paralytic Shellfish Poisoning (PSP)
Condition in humans caused by the ingestion of bivalve mollusks that have accumulated dangerous levels of neurotoxins from plankton.[13] (see *Red Tide*)

Parameter
A "constant" or numerical description of some property of a population (which may be real or imaginary).[5]

Partial Recruitment
1. The degree to which a year class has joined the fishable stock. When a year class is young, only some of its fish are big enough to be caught, so it is partly but not fully recruited[5]; 2. Patterns of relative vulnerability of fish of different sizes or ages due to the combined effects of selectivity and availability.[6]

Party Boat
Any vessel-for-hire engaged in recreational fishing and hired (or leased, in whole or part) per a per-capita fee on a first-come, first-served basis.[9] (see *Head Boat*)

Pelagic
Inhabiting the water column as opposed to being associated with the sea floor; generally occurring anywhere from the surface to 1,000 meters.[1] (see *Benthic*, *Demersal*, *Oceanic*)

Pelagic Fish
Fish that live in the open ocean at or near the water's surface and usually migrate long distances. Examples include swordfish, tunas, and many species of billfish and shark.[12]

Permit Stacking
The registration of more than one limited entry permit for a single vessel, where a vessel is allowed additional catch for each additional permit registered for use with the vessel.[1]

Photic Zone
The surface layer where there is sufficient light for photosynthesis to occur.[12]

Phytoplankton
Small, usually microscopic plants drifting in the upper layers of the ocean, consuming nutrients and light energy to produce biomass. In particularly nutrient-rich conditions (including eutrophication) phytoplankton blooms may occur and can be toxic.[5] (see *Primary Production*, *Red Tide*, *Zooplankton*)

Pinniped
Of or belonging to the *Pinnipedia*, a suborder of carnivorous aquatic mammals that includes the seals, walruses, and similar animals having finlike flippers used for locomotion.[4]

Plankton
Floating organisms whose movements are more or less dependent on currents. While some zooplankton exhibit active swimming movements that aid in maintaining vertical position, plankton as a whole are unable to move against appreciable currents.[5] (see *Zooplankton*)

Poaching
Catching fish for which no quota is held. Illegally harvesting fish.[13]

Point Source
A source of sediment, nutrients, or contaminants into a water body that comes from one discharge location.[12]

Policy
A fisheries policy is the definite course or method of action, selected from among alternatives, by a government or its mandated fisheries authority, in light of given conditions including legal and constitutional constraints, to guide and determine present and future development and management actions towards satisfaction of agreed objectives.[5]

Policymaker
A person with power to influence or determine policies and practices at an international, national, regional, or local level.[5]

Pollution
1. The introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life; hazards to human health; hindrance to marine activities, including fishing and other legitimate uses of the sea; impairment of quality of sea water; and reduction of amenities; 2. Presence of substances and heat in environmental media (air, water, land) whose nature, location, or quantity produces undesirable environmental effects; 3. Activity that generates pollutants.[5]

Pop-Up Tag
A tag that detaches itself from an animal after a predetermined period of time has elapsed since tagging. After detachment, the tag sends a signal via satellite, providing its position and downloading any other available information (if the pop-up tag is also an archival one). This technology does not rely on the recapturing/reporting of tagged individuals to recover the information.[5]

Population
The number of individuals of a particular species that live within a defined area.[4] (see *Stock*)

Population Dynamics
The study of fish populations and how fishing mortality, growth, recruitment, and natural mortality affect them.[2]

Population Model
A component of a stock assessment model, made up of formulations that describe how the population changes from one time period to the next. The types of population models vary depending on the species life history and on data availability. Population models can roughly be classified as age/size structured or biomass-based, deterministic or stochastic, density-dependent or density-independent, spatially structured or spatially aggregated, equilibrium or nonequilibrium.[5] (see *Model*, *Simulation*)

Possession Limit
The number and/or size of a species that a person can legally have at any one time. Applies to commercial and recreational fishermen. A possession limit generally does not apply to the wholesale market level and beyond.[2]

Post Larvae
Fish that have changed from the larval form to the very first stages of juvenile or adult form.[5]

Potential Biological Removal (PBR)
The maximum number of individuals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population.[1] (see *Optimum Sustainable Population*)

Pots
Traps, designed to catch fish or crustaceans, in the form of cages or baskets of various materials (wood, wicker, metal rods, wire netting, etc.) and having one or more openings or entrances. Usually set on the bottom, with or without bait, singly or in rows, connected by ropes (buoy-lines) to buoys on the surface showing their position.[5]

Practical Salinity Unit (PSU)
A unit of measurement of salinity similar to parts per thousand (ppt).[12]

Precautionary Approach (PA)
Set of measures taken to implement the Precautionary Principle. A set of agreed cost-effective measures and actions, including future courses of action, which

ensures prudent foresight, reduces or avoids risk to the resource, the environment, and the people, to the extent possible, taking explicitly into account existing uncertainties and the potential consequences of "being wrong."[5]

Precision
Is the closeness to each other of repeated measurements of the same quantity or object, while accuracy is the closeness of a measured or computed value to its true value.[6] (see *Accuracy*)

Predation
Relationship between two species of animals in which one (the predator) actively hunts and lives off the meat and other body parts of the other (the prey).[5]

Predator-Prey Relationship
The interaction between a species (predator) that eats another species (prey). The stages of each species' life cycle and the degree of interaction are important factors.[5] (see *Food Chain*, *Trophic Level*)

Preferred Alternative
The alternative that is identified as preferred by the authors of an environmental impact statement or environmental assessment. It is identified to indicate which alternative is likely to be selected, thereby helping the public focus its comments.[1]

Pre-Recruits
Fish that have not yet reached the recruitment stage (in age or size) to a fishery.[5]

Primary Production
Assimilation (gross) or accumulation (net) of energy and nutrients by green plants and by organisms that use inorganic compounds as food.[5] (see *Phytoplankton*)

Primary Productivity
A measurement of plant production that is the start of the food chain. Much primary productivity in marine or aquatic systems is made up of phytoplankton, which are one-celled algae that float freely in the water.[2]

Principal Species
Species important to the viability of the fishery, both target and nontarget.[5]

Private Costs and Benefits
Costs and benefits directly felt by individual economic agents or groups as seen from their perspective (externalities imposed on others are ignored). Costs and benefits are valued at the prices actually paid or received by the group, even if these prices are highly distorted. Sometimes termed "financial" costs and benefits. Compare social costs and benefits.[5]

Processing
The preparation or packaging of fish to render it suitable for human consumption, retail sale, industrial uses, or long-term storage, including but not limited to cooking, canning, smoking, salting, drying, filleting, freezing, or rendering into meal or oil, but not heading and gutting unless additional preparation is done.[1]

Producer Surplus
Producer surplus is defined as the difference between what producers actually receive when selling a product and the amount they would be willing to accept for a unit of the good. (see *Consumer Surplus*, *Total Welfare*)

Production
1. The total output especially of a commodity or an industry; 2. The total living matter (biomass) produced by a stock through growth and recruitment in a given unit of time (e.g. daily, annual production). The "net production" is the net amount of living matter added to the stock during the time period, after deduction of biomass losses through mortality; 3. The total elaboration of new body substance in a stock in a unit of time, irrespective of whether or not it survives to the end of that time.[5]

Production Expansion Factor (PEF)
The total number of Pacific salmon released from a west coast hatchery divided by the total number of tagged fish released. Used to elucidate hatchery contribution and fish survival rates.[1]

Production Model
1. The highest theoretical equilibrium yield that can be continuously taken (on average) from a stock under existing (average) environmental conditions without affecting significantly the reproduction process. Also referred to sometimes as potential yield; 2. Maximum sustainable yield (MSY) or sustainable yield (SY). The largest average catch or yield that can continuously be taken from a stock under existing environmental conditions. For species with fluctuating recruitment, the maximum might be obtained by taking fewer fish in some years than in others.[5] (see *Carrying Capacity*, *Maximum Equilibrium Catch*, *Maximum Sustainable Yield*, *Schaefer Model*, *Sustainable Yield*)

Productivity
Relates to the birth, growth and death rates of a stock. A highly productive stock is characterized by high birth,

growth, and mortality rates, and as a consequence, a high turnover and production to biomass ratios (P/B). Such stocks can usually sustain higher exploitation rates and, if depleted, could recover more rapidly than comparatively less productive stocks.[5]

Profit
The total revenue obtained from using a productive resource minus all opportunity costs of production (opportunity costs of entrepreneurs' skills, labor, capital, and ownership of natural resources).[9]

Programmatic Environmental Impact Statement (PEIS)
An environmental impact statement (EIS) that applies to an entire program or management regime, rather than a specific action.[1]

Prohibited Species
Any species of fish that a vessel is not specifically allocated or authorized to retain, including fish caught or received in excess of any allocation or authorization.[5]

Projection
A computation of how the stock and fishery will behave in the future. Projections are made to address "what-if" questions of relevance to management. Short-term (1–4 years) projections are typically used in support of decision-making on quotas. Longer term projections become much more uncertain in terms of absolute quantities, because predicted recruitment tends to dominate the results and recruitment itself is very difficult to predict. For this reason, long-term projections are more useful to evaluate overall management strategies than for making detailed decisions.[5]

Property
Is a benefit (or income) stream associated with a property right.[5]

Property Rights
1. A legal right or interest in respect to a specific property. A type of resource ownership by an individual (individual right) or a group (communal right); 2. A claim to the benefit stream that some higher authority, usually government, will agree to protect through the assignment of duty to others who may covet, or somehow interfere with, the benefit stream.[5]

Proposed Alternatives
Alternatives proposed by a fishery management council (FMC) for a proposed management action (such as annual management specifications). The alternatives are presented to the public for comment, and are voted upon at a subsequent council meeting. The options always include a "status quo" alternative; for example, maintaining the current seasons allowable biological catches (ABCs) and optimum yields (OYs).[1]

Proposed Rule
The regulation that implements a fishery management plan (FMP) and is incorporated in the Code of Federal Regulations (CFR) when approved. The public can comment on the proposed rule as well as the FMP. (see *Code of Federal Regulations*, *Rulemaking*)

Protected Area
1. An area set aside for the preservation and protection of highly important natural and cultural features and for the regulation of the scientific, educational, and recreational use. Such areas include national parks, Nature reserves, wildlife sanctuaries, natural monuments, archaeological reserves, forest reserves, and marine reserves; 2. A geographically defined area which is designed and managed to achieve specific conservation objectives.[5] (see *Marine Protected Area*, *Marine Reserve*)

Protected Species
Refers to any species which is protected by either the Endangered Species Act (ESA) or the Marine Mammal Protection Act (MMPA), and which is under the jurisdiction of the National Marine Fisheries Service (NMFS). This includes all threatened, endangered, and candidate species, as well as all cetaceans and pinnipeds, excluding walruses.[8]

Pulse Fishing
Harvesting a stock of fish, then moving on to other stocks or waiting until the original stock recovers.[10]

Probability
The statistical likelihood that something will occur.

Producer Surplus
The welfare a producer derives from selling a good, represented by the difference between the revenue the seller gets for a good and the minimum amount they would accept to produce it.

Pure Public Good
A good that can be used by anyone and for which one person's use does not diminish the good's value for others.[5]

Purse Seine
Nets characterized by the use of a purse line at the bottom of the net. The purse line enables the net to be closed like a purse and thus retain all the fish caught. The purse seines, which may be very large, are operated by one or two boats. The most usual case is a purse seine

operated by a single boat, with or without an auxiliary skiff.[5]

Pycnocline
1. The transitional zone in the water column between layers of two densities; 2. Pycnocline or sharp density gradients; this parcel includes the air-water interface. Pycnoclines are generally formed by salinity or temperature differences between the upper and lower water layers and create effective barriers to transport across layers.[12] (see *Mixed Layer*, *Stratification*, *Thermocline*)

Q

q ("que")
(see *Catchability Coefficient*)

Quota
A specified numerical harvest objective, the attainment (or expected attainment) of which causes closure of the fishery for that species or species group.[1]

Quota Shares
A share of the total allowable catch (TAC) allocated to an operating unit such as a vessel, a company or an individual fisherman (individual fishing quota, IFQ) depending on the system of allocation. Quotas may or may not be transferable, inheritable, and tradable. While generally used to allocate total allowable catch, quotas could be used also to allocate fishing effort or biomass.[5]

R

Race-to-Fish
A pattern of fishing characterized by an increasing number of highly efficient vessels fishing at an increasing pace, with season length becoming shorter and shorter.[5] (see *Derby Fishery*, *Olympic Fishing*)

Rate of Fishing
(see *Instantaneous Rate of Fishing Mortality*)

Rate of Exploitation
The fraction, by number, of the fish in a population at a given time, which is caught and killed by man during the year immediately following. The term may also be applied to separate parts of the stock distinguished by size, sex, etc.[5]

Rate of Natural Increase
(see *Instantaneous Rate of Surplus Production*)

Rate of Removal
An inexactly defined term that can mean either rate of exploitation or rate of fishing, depending on the context.[5]

Rebuilding
1. Implementing management measures that increase a fish stock to its target size[1]; 2. For a depleted stock, or population, taking action to allow it to grow back to a predefined target level. Stock rebuilding at least back to the level (B_{MSY}) at which a stock could produce maximum sustainable yield (MSY).[5]

Rebuilding Analysis
An analysis that uses biological information to describe the probability that a stock will rebuild within a given time frame under a particular management regime.[1]

Rebuilding Plan
1. A document that describes policy measures that will be used to rebuild a fish stock that has been declared overfished[1]; 2. A plan that must be designed to recover stocks to the B_{MSY} level within 10 years when they are overfished (i.e. when biomass [B] < minimum stock size threshold [MSST]).[4] (see *Minimum Stock Size Threshold*)

Recreational Fishery
Harvesting fish for personal use, sport, and challenge (e.g. as opposed to profit or research). Recreational fishing does not include sale, barter, or trade of all or part of the catch.[5]

Recreational Fishery Information Network (RecFin)
A database managed by the Pacific States Marine Fisheries Commission (PSMFC) that provides recreational fishery information for Washington, Oregon, and California.[1]

Recruit
1. A young fish entering the exploitable stage of its life cycle; 2. A member of "the youngest age group which is considered to belong to the exploitable stock."[5]

Recruitment (R)
1. The amount of fish added to the exploitable stock each year due to growth and/or migration into the fishing area. For example, the number of fish that grow to become vulnerable to the fishing gear in one year would be the recruitment to the fishable population that year; 2.

This term is also used in referring to the number of fish from a year class reaching a certain age. For example, all fish reaching their second year would be age 2 recruits.[6]

Recruitment Curve
A graph of the progeny from an adult year-class at the time they reach a specified age (for example, the age at which half of the brood has become vulnerable to fishing), plotted against the abundance of the stock that produced them.[5]

Recruitment Overfishing
A situation in which the rate of fishing is (or has been) such that annual recruitment to the exploitable stock has become significantly reduced. The situation is characterized by a greatly reduced spawning stock, a decreasing proportion of older fish in the catch, and generally very low recruitment year after year. If prolonged, recruitment overfishing can lead to stock collapse, particularly under unfavorable environmental conditions.[5]

Recruitment per Spawning Stock Biomass (R/SSB)
The number of fishery recruits (usually age 1 or 2) produced from a given weight of spawners, usually expressed as numbers of recruits per kilogram of mature fish in the stock. This ratio can be computed for each year class and is often used as an index of pre-recruit survival, since a high R/SSB ratio in one year indicates above-average numbers resulting from a given spawning biomass for a particular year class, and vice versa.[3]

Recruits
The numbers of young fish that survive (from birth) to a specific age or grow to a specific size. The specific age or size at which recruitment is measured may correspond to when the young fish become vulnerable to capture in a fishery or when the number of fish in a cohort can be reliably estimated by a stock assessment.[5]

Red Tide
Proliferation of marine plankton that is toxic and often fatal to fish. This natural phenomenon is stimulated by phosphorus and other nutrients that are discharged into waterways by human beings. The color of the tide can be red, yellow, green, or brown.[5] (see *Phytoplankton*)

Reef
A large ridge or mound-like structure within a body of water that is build by calcareous organisms such as coral, red algae, and bivalves.[12] (see *Atoll*)

Reef Fish
Fish that live mostly on or around reefs. Reef fish include snappers, groupers, grunts, porgies, and others.

Reference Level
A particular level of an indicator (e.g. level of fishing effort, fishing mortality, or stock size) used as a benchmark for assessment and management performance.[5]

Reference Point
1. A reference point indicates a particular state of a fishery indicator corresponding to a situation considered as desirable (target reference point) or undesirable and requiring immediate action (limit reference point and threshold reference point); 2. An estimated value derived from an agreed scientific procedure and/or model, which corresponds to a specific state of the resource and of the fishery, and that can be used as a guide for fisheries management. Reference points may be general (applicable to many stocks) or stock-specific[5]; 3. Values of parameters (e.g. B_{MSY}, F_{MSY}, $F_{0.1}$) that are useful benchmarks for guiding management decisions. Biological reference points are typically limits that should not be exceeded with significant probability (e.g. MSST) or targets for management (e.g. OY).[3]

Refuges
A part of the range of a stock that is not accessible to fishing. If the species in question is not too diffusive, the existence of such refuges may enable it to persist under a higher level of fishing mortality than it otherwise would.[5]

Regime Shift
A (medium- or long-term) shift in environmental conditions that impacts the productivity of a stock.[5]

Regression Analysis
A statistical method to estimate any trends that might exist among important factors; an example in fisheries management is the link between catch and other factors like fishing effort and natural mortality.[10] (see *Least Squares*, *Residuals*)

Regulative Capacity
A population's tendency to revert towards some typical average level of abundance rather than to increase or decline indefinitely or to drift aimlessly. The regulative mechanisms by which this can be achieved include, for example, inverse dependence of survival rate (and/or reproductive success) on population density, a phenomenon often used synonymously with density-dependence and sometimes called homeostasis.[5]

Regulatory Amendment
An option available to fishery management councils for making regulatory changes to a fishery management

plan; different from a full amendment but still requires some opportunity for public input.[10]

Regulatory Flexibility Act (RFA)
Enacted in 1980 to reduce the burden of regulatory and record-keeping requirements on small businesses organizations. The RFA requires that fishery management plans undergo a regulatory flexibility analysis. (see *Executive Order 12866*)

Regulatory Flexibility Analysis
Conducted for each fishery management plan (FMP) to study the costs and benefits that the plan may have on an individual small business or organization (e.g. a single fishing vessel). The Regulatory Flexibility Act (RFA) mandates this analysis and allows it to be combined with the draft regulatory impact review (RIR). (see *Executive Order 12866*)

Regulatory Impact Review (RIR)
A regulatory impact review (RIR) is required by the National Marine Fisheries Service (NMFS) for all regulatory actions of public interest. It is the basis for determining whether any proposed regulations are a "significant regulatory action" under certain criteria provided in Executive Order 12866 and whether the proposed regulations will have a "significant economic impact on a substantial number of small entities" in compliance with the Regulatory Flexibility Act (RFA).

Relative Abundance
Relative abundance is an estimate of actual or absolute abundance; usually stated as some kind of index; for example, as bottom trawl survey stratified mean catch per tow.[6]

Reliability
The extent to which a resource, if managed properly, can be depended on to provide a reasonably constant yield. An unreliable resource is one that may fail suddenly due to causes not obviously related to fishing.[5] (see *Robustness*)

Removals
All of the fish "removed" from a stock by fishing, including the catch and any fish killed but not caught.[5]

Renewable Natural Resource
Natural resources that, after exploitation, can return to their previous stock levels by natural processes of growth or replenishment. Conditionally renewable resources are those whose exploitation eventually reaches a level beyond which regeneration will become impossible. Such is the case with the clear-cutting of tropical forests.[5]

Rent
1. In a sole ownership fishery, the difference between the total revenues obtained from the fishery resource and the total costs of production, i.e. capital and labor valued at their opportunity costs. The total costs of production include a reasonable profit and the rent is often considered as a "surplus" profit, over and above what would be considered a 'normal' rate of return. For this reason, the decision as to who gets the rent (e.g. society, the management authority, or the fishermen) remains a key policy issue; 2. Any payment to an owner of a productive resource that is an amount in excess of the payment needed to keep the resource in its current use. Applied to fisheries, the amount of pure profit that can be gained from a fishery resource by using no more fishing effort than needed to harvest the resource. Under open access, the resource would yield no economic rent, whereas a sole owner would seek to maximize economic rent.[5]

Replacement Yield
The amount of yield in weight that can be removed from a population of fish without leading to biomass increase or decline. When the population net productivity is high (e.g. at medium levels of, close to maximum sustainable yield, MSY), the replacement yield will also be high. Conversely, when the productivity is low (e.g. when the population is underexploited or overexploited), the replacement yield will be low. In either case, if the actual yield taken is equal to the replacement yield, then the biomass will not change from one year to the next.[5]

Residual
In statistical models, a residual is the difference between an observed quantity and the prediction given by the model.[5] (see *Least Squares*, *Regression Analysis*)

Resilience
Capacity of a natural system (fisheries community or ecosystem) to recover from heavy disturbance such as intensive fishing.[5]

Resource Rent
In the fisheries context, the value to fishers of the fish in the water before they are caught. It is usually a large component of the economic rent.[5]

Resource Valuation
Calculation or estimation of the economic value of a natural resource.[5]

Resources
1. A natural source of wealth and revenue. Biological resources include genetic resources, organisms or parts thereof, populations, or any other biotic component

of ecosystems with actual or potential use of value for humanity. Fishery resources are those resources of value to fisheries; 2. Anything that has value; living and nonliving components of nature such as fish, oil, water, and air.[5]

Responses
Human actions, including policies, strategies, and interventions, to address specific issues, needs, opportunities, or problems. In the context of ecosystem management, responses may be of legal, technical, institutional, economic, and behavioral nature and may operate at local or micro, regional, national, or international level and at various time scales.[5]

Responsible Fisheries
The concept of responsible fisheries encompasses the sustainable utilization of fishery resources in harmony with the environment; the use of capture and aquaculture practices which are not harmful to ecosystems, resources, and their quality; the incorporation of added value to such products through transformation processes meeting the required sanitary standards; the conduct of commercial practices so as to provide consumers access to good quality products.[5]

Retention
In stock assessment, the probability of a fish encountering fishing gear (hook, webbing, mesh, trap) and being retained by it after coming in contact with it. Often expressed as a function of size or age.[5] (see *Retention Curve*)

Retention Curve
Relationship between the size (age) of a fish and its probability to be retained by the gear (a hook, a webbing, a mesh, a trap) after encountering it.[5]

Reversibility
The extent to which a change in a stock or ecosystem induced by exploitation will reverse itself when the causative factor is removed. Extinction of a species is an example of an irreversible change.[5]

Riparian
Living on or near the bank of a river or lake.[13]

Riparian Habitat
Areas adjacent to rivers and other water bodies that have a high density and large variety of plants and animal species relative to nearby uplands.[5]

Risk
1. In general, the possibility of something undesirable happening, of harm or loss. A danger or a hazard. A factor, thing, element, or course involving some uncertain danger; 2. In decision-theory, the degree or probability of a loss; expected loss; average forecasted loss. This terminology is used when enough information is available to formulate probabilities; 3. The probability of adverse effects caused under specified circumstances by an agent in an organism, a population, or an ecological system[5]

Risk Assessment
A process of evaluation including the identification of the attendant uncertainties, of the likelihood and severity of an adverse effect(s)/event(s) occurring to man or the environment following exposure under defined conditions to a risk source(s). A risk assessment comprises hazard identification, hazard characterization, exposure assessment, and risk characterization.[5]

Risk Management
The process of weighing policy alternatives in the light of the result of a risk assessment and other relevant evaluation and, if required, selecting and implementing appropriate control options (which should, where appropriate, include monitoring or surveillance).[5]

River Plume
Turbid freshwater flowing from land and generally in the distal part of a river (mouth) outside the bounds of an estuary or river channel.[12]

Robustness
The capacity of a population to persist in the presence of fishing. This depends on the existence of compensatory mechanisms.[5] (see *Reliability*)

Round Weight
The weight of the whole fish before processing or removal of any part.[5]

Run
Seasonal migration undertaken by fish, usually as part of their life history; for example, spawning run of salmon, upstream migration of shad. Fishers may refer to increased catches as a "run" of fish, a usage often independent of their migratory behavior.[5]

Runoff
Portion of rainfall, melted snow, or irrigation water that flows across the ground's surface and is eventually returned to streams. Runoff can pick up pollutants from air or land and carry them to receiving waters.[5]

Resource Management Plan (RMP)
A plan that covers impacts to listed species from activities of state and local governments, under section 4(d) of the Endangered Species Act (ESA).[1]

Rulemaking
The process of developing Federal regulations which occurs in several steps, including publishing proposed rules in the Federal Register, accepting comments on the proposed rule, and publishing the final rule. An "advanced notice of proposed rulemaking" is published when dealing with especially important or controversial rules.[1] (see *Code of Federal Regulations*, *Proposed Rule*)

S

Salinity
The total mass of salts dissolved in seawater per unit mass of water; generally expressed in parts per thousands (ppt).[12]

Salt Marsh
A macrohabitat comprised of emergent rooted macrophytes in a soft sedimentary substrate tolerant of long periods of partial submersion along the shores of estuaries and sheltered coasts.[12]

Salt Wedge
A layer of denser, saltier seawater that intrudes into coastal waters in the form of a wedge along the seabed and flows landward along the bottom in estuaries. The lighter freshwater from riverine sources overrides the denser saltwater.[12]

Saltonstall-Kennedy Act (SK Funds)
The Saltonstall-Kennedy Act allocates 30% of the collected duties for imported fishery products to technological, biological, marketing, and other research and services in order to promote the free flow of domestically produced fishery products and to develop markets for domestic fishery products.[1]

Sample
A proportion or a segment of a fish stock that is removed for study, and is assumed to be representative of the whole. The greater the effort, in terms of both numbers and magnitude of the samples, the greater the confidence that the information obtained is a true reflection of the status of a stock (level of abundance in terms of numbers or weight, age composition, etc.).[6]

Sampling Design
The sampling design of a scientific survey refers to the statistical techniques and methods adopted for selecting a sample and obtaining estimates of the survey variables from the selected sample.[5]

Sashimi
Japanese term for sliced fish (especially tuna) and shellfish (scallop, abalone, lobster, squid, octopus) served raw as a delicacy.[5]

Satellite Imagery
Remote sensing imagery gathered by earth-orbiting satellites (e.g. Landsat). Images are in specific wavebands (visible, infrared, etc.), which may be combined for purposes of interpretation.[5]

Comment: Images look like photographs but are not obtained by photographic methods, hence the terms "images or imagery." Data from satellite imagery can be interpreted visually or analyzed by computers in digitized form; they can also be entered directly into geographic information systems (GIS).[5]

Scattergram
A visual (not statistical) method; graphically shows the relationship between two factors (such as fish age and fish size).

Scenario
A plausible and often simplified description of how the future may develop based on a coherent and internally consistent set of assumptions about key driving forces (e.g., rate of technology change, prices) and relationships. Scenarios are neither predictions nor projections and sometimes may be based on a "narrative storyline." Scenarios may be derived from projections but are often based on additional information from other sources.[5]

Schaefer Model
The basic form of production model in which the relation between yield and effort takes the form of a symmetric parabola. In the Schaefer Model, B_{MSY} is at one-half of the carrying capacity.[5] (see *Carrying Capacity*, *Production Model*)

School
Aggregation of fish that move together as a group. It is usually considered that schooling reduces the impact of predation. Schools can be themselves aggregated in concentrations.[5]

Scientific Cruise
The period of time during which a scientific research

vessel is operated in furtherance of a scientific research project, beginning when the vessel leaves port to undertake the project and ending when the vessel completes the project as provided for in the applicable scientific research plan.[5]

Scientific Fishery (Resource) Survey
Sampling, collecting, observing, or surveying the fish or fishery resources, on board scientific research vessels, to increase scientific knowledge of the fishery resources or their environment, or to test a hypothesis as part of a planned, directed investigation or study conducted according to methodologies generally accepted as appropriate for scientific research.[5]

Comment: A scientific survey may involve fishing, but is usually exempted from fishing regulations. It may address one or more issues involving taxonomy, biology, physiology, behavior, disease, aging, growth, mortality, migration, recruitment, distribution, abundance, ecology, stock structure, bycatch, and catch estimation of finfish and shellfish (invertebrate) species considered to be a component of the fishery resources. It does not include the collection and retention of fish outside the scope of the applicable research plan. The capture and landing of quantities of fish or invertebrates for commercial testing of fishing gear, product development, market research, and/or public display may not be considered scientific research activities and require permission under exempted fishing procedures. The activity of foreign fishery research vessels in an exclusive economic zone (EEZ) will usually be considered as scientific research if they are carried out in full cooperation with the coastal state.[5]

Scientific (Fisheries) Research Vessel
A vessel owned or chartered by, and controlled by, a government agency, a university (or other educational institution accredited by a recognized national or international accreditation body), an international treaty organization, or a scientific institution. The vessel must have scientific research as its exclusive mission during the scientific cruise in question and its operations must be conducted in accordance with a scientific research plan.[5]

Scientific and Statistical Committee (SSC)
An advisory committee of a regional fishery management council (FMC) composed of scientists, economists, and other technical experts. The Magnuson-Stevens Act requires that each council maintain an SSC to assist in gathering and analyzing statistical, biological, ecological, economic, social, and other scientific information that is relevant to the management of council fisheries.[1] (see *Advisory Panel*)

Seagrass
Rooted, grasslike flowering plants, such as eelgrass, that are adapted to live at sea, submersed, and can tolerate a saline environment.[12]

Seamount
A large isolated elevation rising more than 1,000 meters above the sea floor, and characteristically of conical form.[5] (Notable examples include Shimada Seamount in the Eastern Equatorial North Pacific and Bear Seamount in the New England Seamount Chain.)

Seasonal Closure
Closed season. The banning of fishing activity (in an area or of an entire fishery) for a few weeks or months, to protect juveniles or spawners.[5]

Secretary of Commerce
The Secretary has responsibility for reviewing, approving, and implementing fishery management plans (FMPs).

Secretarial Fishery Management Plan
A plan developed by the Secretary of Commerce in response to an emergency, a council's failure to act, or for highly migratory species.[2]

Sedentary Species
Organisms which, at the harvest stage, either are immobile on or under the seafloor or are unable to move except in constant physical contact with the seafloor or the subsoil.[5]

Seine Net
Nets that are usually set from a boat, and can be operated either from the shore (beach seines) or from the boat itself (e.g. purse seines). The manner of capture is to surround an area of water with a very long net, with or without a bag at the center. The net is usually operated by two ropes fixed to its ends, used both for hauling it in and for herding the fish.[5] (see *Purse Seine*)

Selective Gear
A gear allowing fishers to capture few (if any) species other than the target species.[5]

Selectivity
1. Ability to target and capture fish by size and species during harvesting operations, allowing bycatch of juvenile fish and nontarget species to escape unharmed;
2. In stock assessment, conventionally expressed as a relationship between retention and size (or age) with no reference to survival after escapement.[5]

Sensitivity Analysis
In stock assessment modeling, the process of testing the sensitivity of model results in relation to errors and uncertainties in the input parameters. For example, a virtual population analysis (VPA) might be used to determine the fishing mortality rates over several years. The results might be conditioned on an assumed annual natural mortality rate (M) of 0.2. The sensitivity of this assumption might be examined by redoing the VPA based upon a different M, perhaps M=0.15 to 0.3. From the sensitivity analysis one can determine the importance of particular parameters to the overall scientific advice.[5]

Separability
1. Separability is the assumption, made in some age-structured stock assessment models (used to track changes in fishing mortality by fish age and by fishing year) that the fishing mortality matrix can be partitioned into two components: An age-specific component that does not vary over time (i.e. a constant exploitation pattern), and an annual multiplier that scales the age-specific pattern up or down; 2. Independence among resources and in economics; an ability to substitute environmental inputs in order to produce outputs. Therefore, these resources may be managed or utilized separately due to the lack of strong linkages to other large marine ecosystem (LME) components.[5]

Sequential Population Analysis
Generic name for methods of back-calculating stock sizes, recruitment levels, and fishing mortality for different ages/years using catch-at-age data. A statistical criterion may be used in addition to fit indices of abundance.[5]

Sessile
Attached to the substrate.[5]

Set Gillnet
A gillnet fixed to the bottom, or at a certain distance above it, by means of anchors or ballast sufficiently heavy to neutralize the buoyancy of the floats.[5]

Set Longline
Longlines consist of a main line, sometimes of considerable length, to which snoods with baited or unbaited hooks are fixed at regular intervals. The main line is set either horizontally on or near the bottom or less commonly near the surface.[5]

Sexual Dimorphism
Pertains to systematic differences between males and females. Several species of tunas and billfishes show sexual dimorphism in growth or mortality.[5]

Shadow Price
In economic analysis, this is any distortion of a free market price that is made in order to reflect the real scarcity value of foods or services, including labor. An example of a shadow price is the elimination of the effect of taxes or subsidies.[5]

Shared Stock
Stocks of fish that migrate across the exclusive economic zone (EEZ) boundary of adjacent or opposite coastal states.[5]

Shelf Break
Region where the continental shelf and continental slope meet; i.e. where the more gently sloping region of the seabed adjacent to a landmass rather abruptly slopes steeply down towards the ocean depths; commonly around depths of 200 meters.[5]

Shelf Edge
A narrow zone at the outer margin of a shelf along which there is a marked increase of slope.[5]

Shellfish
Shellfish include both mollusks, such as clams, and crustaceans, such as lobsters.[5]

Shoal
School of fish, but usually at the surface or in shallow water.[5]

Shoaling Fish
Species of relatively small (usually pelagic) fish that congregate in large schools, such as anchoveta and sardines.[5]

Sink
Habitats in which birth rates are lower than dealth rates and emigration is lower than immigration, as applied to equilibrium populations. A more general definition is that a sink is a compartment that is a net importer of individuals.[14] (see *Source*)

Simulation
In fisheries, the use of a body of numerical techniques and specified inputs to reproduce by calculations the functioning of a stock or fishery.[5] (see *Model*, *Population Model*)

Comment: Simulations may be deterministic (assuming no variability) or stochastic (to explore the range of variability in the results). Sensitivity analyses and projections of the status of the fishery system into the future are forms of simulation. There are several ways of accounting for uncertainty in simulations, such as

bootstrapping, Bayesian methods, and Monte Carlo simulations.[5] (see *Bayesian*, *Deterministic*, *Monte Carlo*, *Sensitivity Analysis*, *Stochastic*)

Single-Species Fishery
A type of fishery in which fishers target only one species of fish, although it is usually impossible not to catch others incidentally.

Single-Species Model
A model describing the dynamics of a species that does not explicitly incorporate the effects of interactions with other species.[5]

Size Distribution
A breakdown of the number of fish of various sizes in a sample or catch, most often shown on a chart; the sizes can be in length or weight.[10]

Size Limit
A minimum or maximum limit on the size of fish that may be legally be caught.[5]

Size Samples
Refers to samples taken from the catch (from the landings) in order to determine the size distribution of the catches. This information is important for stock assessments (particularly for age/size-structured methods) and management advice.[5]

Size-at-Age
Length or weight at a particular age.[5]

Size-at-First-Maturity
Length or weight of the fish when it attains maturity as defined by: 1) the minimal size at which maturity is reached; 2) the size at which 50 percent of the fish of that size is mature.[5]

Slope
The slope seaward from the shelf edge to the beginning of a continental rise or the point where there is a general reduction in slope.[5]

Slot Limit
1. A limit on size of fish that may be kept—allows a harvester to keep fish under a minimum size and over a maximum size, but not those in between the minimum and maximum; 2. Size limits that allow a harvester to keep only fish that fall between a minimum and maximum size.[10]

Small-Scale Producers
Producers operating at a small scale, used to distinguish from industrialized producers. In truth, the line separating small and large-scale producers is arbitrary. What is considered small scale in one country or region may be considered large scale in another.[5]

Smolt
An adolescent salmon which has metamorphosed and which is found on its way downstream toward the sea.[5]

Social Capital
The social resources (networks, memberships of groups, relationships of trust, access to wider institutions of society) upon which people draw in pursuit of livelihoods.[5]

Social Costs
Costs associated with the disruption of communities, households, and related social structures resulting in the loss of human potential.[5]

Social Costs and Benefits
Costs and benefits as seen from the perspective of society as a whole. These differ from private costs and benefits in being more inclusive (all costs and benefits borne by some member of society are taken into account) and in being valued at social opportunity cost rather than market prices, where these differ. Sometimes termed "economic" costs and benefits. Compare private costs and benefits.[5]

Social Discount Rate
The rate used in estimating the present value to society of an enterprise. It is sometimes held that, to reflect social values, the social discount rate should be lower than the discount rate used in the private sector.[5]

Social Factors
In addition to factors related to economics such as benefits, capital, and labor, considerations such as social structure and social organization, people's knowledge and views (norms and values) about their work and how this relates to the resource. Also referred to as: cultural factors.[5]

Social Impacts
The changes in people, families, and communities resulting from a fishery management decision.[10]

Social Impact Assessment
An evaluation of the likely outcomes and impacts of a specific policy or regulation on a designated target group or groups, as well as likely ripple effects to other groups.[5]

Social Rate of Time Preference
The rate used for discounting future benefits and costs

based on the way that society values present, as opposed to future, consumption; typically one component of the social discount rate.

Socio-Economic
Pertaining to the combination or interaction of social and economic factors and involves topics such as distributional issues, labor market structure, social and opportunity costs, community dynamics, and decision-making processes.[5]

Socio-Economic Benefits
Benefits to humans gained through utilization of resources, including both economic and social benefits.[5]

Sonar
An apparatus that uses sound waves to detect objects underwater by measuring or classifying the echoes received from them. An echo sounder is a sonar that transmits vertically. In practice, a sonar is an apparatus other than an echo sounder, i.e. a sonar transmits horizontally.[5]

Source
Patches in which birth rates are higher than death rates and emigration rates are higher than immigration rates, as applied to equilibrium populations. A more general definition is a compartment that, over a large period of time (e.g. several generations), shows no net change in population size, but nonetheless is a net exporter of individuals.[14] (see *Sink*)

Spatial (Area) Closures
Permanent or seasonal ban of fishing activities in an area.[5]

Spatial Heterogeneity
The non-homogeneous nature of habitats or spatial distributions of organisms, often ignored in simple models.[5]

Spawner-Recruit Relationship
The concept that the number of young fish (recruits) entering a population is related to the number of parent fish (spawners).[2] (see *Recruitment*)

Spawning
Release of ova, fertilized or to be fertilized.[5]

Spawning Biomass
The total weight of all sexually mature fish in the population.

Spawning Output per Recruit (SPR)
Amount of per capita spawning biomass (or other appropriate measure of reproductive output) obtained from a given value of fishing mortality, conditional values of partial recruitment, growth, maturity (and/or fecundity), and natural mortality.[11]

Spawning Potential Ratio (SPR)
The number of eggs that could be produced by an average recruit in a fished stock divided by the number of eggs that could be produced by an average recruit in an unfished stock. SPR can also be expressed as the spawning stock biomass per recruit (SSBR) of a fished stock divided by the SSBR of the stock before it was fished.[2]

Comment: SPR's require information on natural mortality, growth, spawning potential at age, and the relative vulnerability by age to fishing. If possible, spawning potential per recruit is measured in fecundity-per-recruit, but often spawning stock biomass per recruit (SSB/R, see below) is an appropriate substitute. SPR and SSB/R are simple extensions to yield-per-recruit in that there are two ways in which recruits can be used: they can be caught, in which case they are part of the yield (yield-per-recruit), or they can survive, in which case they are part of the SPR, SSB/R. SPR is expressed as a ratio of a fished condition to an unfished condition, thus the ratio varies from 0 to 1. Additionally, empirical studies have shown that for some populations SPR's in the order of 20% to 30% may run the risk of recruitment declines, thus there is a basis of comparison between populations. Therefore, $F_{X\%}$SPR fishing mortality rates are sometimes used as biological reference points. (Note: SPR is sometimes used to mean "spawners per recruit," but this usage should be avoided and replaced by SSB/R). [5]

Spawning Stock
1. Mature part of a stock responsible for reproduction; 2. Strictly speaking, the part of an overall stock having reached sexual maturity and able to spawn. Often conventionally defined as the number or biomass of all individuals beyond "age at first maturity" or "size at first maturity"; that is, beyond the age or size class in which 50 percent of the individuals are mature.[5]

Spawning Stock Biomass (SSB)
1. The total weight of all fish (both males and females) in the population that contribute to reproduction. Often conventionally defined as the biomass of all individuals beyond "age at first maturity" or "size at first maturity," i.e. beyond the age or size class in which 50 percent of the individuals are mature; 2. The total biomass of fish of reproductive age during the breeding season of a stock.[5]

Comment: Most often used as a proxy for measuring egg production, the SSB depends on the abundance of the various age classes composing the stock and their past exploitation pattern, rate of growth, fishing and natural mortality rates, onset of sexual maturity, and environmental conditions.[5]

Spawning Stock Biomass per Recruit (SSB/R or SBR)
The expected lifetime contribution to the spawning stock biomass for the average recruit, SSB/R is calculated assuming that fishing mortality is constant over the life span of a year class. The calculated value is also dependent on the exploitation pattern and rates of growth and natural mortality, all of which are also assumed to be constant.[3]

Spawning Substrate
The type of bottom habitat required by a fish species for spawning.[5]

Species
Group of animals or plants having common characteristics, able to breed together to produce fertile (capable of reproducing) offspring, and maintaining their "separateness" from other groups.[5]

Species Assemblage
Group of species co-occurring in a given area and likely to be caught together in a given gear.[5] (see *Species Group*)

Species Diversity
The variety of species in a community, which can be expressed quantitatively in ways which reflect both the total number of species present and the extent to which the system is dominated by a small number of species.[5] (see *Biological Diversity*)

Species Group
Group of species considered together, often because they are difficult to differentiate without detailed examination (very similar species) or because data for the separate species are not available (e.g. in fishery statistics or commercial categories).[5] (see *Species Assemblage*)

Species Richness
Species richness/abundance is the distribution of the number of species and the number of individuals of each species in a community.[5]

Spill-Over Effects
Sometimes referred to as externalities, an unintended effect (positive or negative, benefit or cost) imposed on others and not borne by the party responsible for the effect.[5]

Stability
This term is applied very loosely to ecosystems or communities, but it usually means their tendency to retain their essential characteristics in the shorter or longer term. It sometimes refers to the more particular capacity of systems to return to their original state following a disturbance.[5]

Stakeholder
1. A large group of individuals and groups of individuals (including governmental and non-governmental institutions, traditional communities, universities, research institutions, development agencies and banks, donors, etc.) with an interest or claim (whether stated or implied) that has the potential of being impacted by or having an impact on a given project and its objectives. Stakeholder groups that have a direct or indirect "stake" can be at the household, community, local, regional, national, or international level; 2. An actor having a stake or interest in a physical resource, ecosystem service, institution, or social system, or someone who is or may be affected by a public policy.[5]

Standard
A criterion (or indicator, or reference point) that has been formally established and is enforced by an authority.[5]

Standardization (Calibration)
The procedure of maintaining methods and equipment as constant as possible. Without standardization one cannot determine whether measurements of yearly differences in relative abundance are caused by actual fluctuations in stock abundance or by differences in the measurement procedure used. The lack of standardization is one reason why surveys using different commercial fishing vessels in different years do not produce comparable information. For example, if two vessels of different horsepower are used in separate years, the results cannot be compared unless vessel mensuration experiments are performed. This would involve a comparison of the two vessels' catches to determine the influence of their fishing power on the size of the catch, and a determination of a correction factor.[6]

Standardized
Refers to quantities that have been adjusted to be directly comparable to a unit that is defined as the "standard" one. Nominal catch per unit effort (CPUE) is standardized to remove the effect of factors that are known not to be related to abundance.[5]

Comment: This means that the effects of factors such as vessel size or spatial availability, which clearly affect CPUE, are removed, e.g. by adjusting all observations

to the "standard vessel" in the "standard area." A variety of techniques are available for standardization such as generial linear models (GLMs).[5]

Standard Length (SL)
The length of a fish as measured from the tip of the snout to the hidden base of the tail fin rays.[2]

Standing Stock
1. The total weight of a group (or stock) of living organisms (e.g. fish, plankton) or of some defined fraction of it (e.g. spawners), in an area, at a particular time. Example: the spawning biomass of the cod stock on the Georges Bank in 1999; 2. The weight of a fish stock, or of some defined portion of it.[5] (see *Abundance*)

State of Stocks
An appreciation of the situation of a stock, usually expressed as: protected, underexploited, intensively exploited, fully exploited, overexploited, depleted, extinct, or commercially extinct.[5]

Stated Preference Methods
General category of valuation methods that includes contingent choice and contingent valuation techniques. Individuals are asked to makes choices concerning their willingness to pay (or accept compensation) for, rank, or make choices among alternative provisions of environmental goods.

States of Nature
A description of a condition and dynamics of the resource and the fishery, including parameters such as stock abundance, age structure, fishing mortality, the economic condition of the industry and the state of the environment.[5]

Stationary
Things that do not change over time. In fishery science, refers usually to a parameter or life history characteristic that does not change over time. The concept is closely related to that of equilibrium, although it is possible to have one without the other. For example, yield-per-recruit can be stationary (constant) if the fishing and natural mortality, exploitation pattern, and growth remain stationary, but the overall yield can vary over time if the number of recruits varies.[5]

Statistic
The estimate of a parameter, which is obtained by observation, and which in general is subject to sampling error.[5]

Statistical Model
A component of an estimation model, that defines the criteria for how the observations are fitted. Statistical models include least squares, maximum likelihood, Bayesian, and ad hoc procedures.[5] (see *Least Squares, Bayesian*)

Status Determination Criteria (SDC)
Objective and measurable criteria used to determine if a stock is being overfished or is in an overfished state according to National Standard Guidelines.[3] (see *National Standard Guidelines*)

Status of Exploitation
An appraisal of exploitation is given for each stock using the terms unknown, protected, not exploited, underexploited, moderately exploited, fully exploited, and overexploited. These terms describe the effect of current fishing effort on each stock, and are based on current data and the knowledge of the stocks over time.[6]

Status Quo
Can mean the general current state of affairs in a fishery.[5]

Steady State
A population in a steady state may fluctuate about a mean but does not increase or decline in a systematic way with time.[5]

Stern Trawler
A fishing vessel designed for trawling, in which the nets are hauled over the stern, up a ramp, or over a roller or the bulwark, with the aid of a derrick or gantry.[5]

Stochastic
1. Where system components are affected by random variability. For example, when fishery stock projections are elaborated, future recruitments are projected with a stochastic component (i.e. the values introduced in the projection randomly vary from year to year); 2. A stochastic model is a model whose behavior is not fully specified by its form and parameters, but which contains an allowance for unexplained effects represented by random variables.[5] (see *Deterministic*)

Stock
A part of a fish population usually with a particular migration pattern, specific spawning grounds, and subject to a distinct fishery. A fish stock may be treated as a total or a spawning stock. Total stock refers to both juveniles and adults, either in numbers or by weight, while spawning stock refers to the numbers or weight of individuals that are old enough to reproduce.[6]

Comment: In theory, a unit stock is composed of all the individual fish in an area that are part of the same

reproductive process. It is self-contained, with no emigration or immigration of individuals from or to the stock. On practical grounds, however, a fraction of the unit stock is considered a "stock" for management purposes (or a management unit), as long as the results of the assessments and management remain close enough to what they would be on the unit stock.[5]

Stock Assessment
The process of collecting and analyzing biological and statistical information to determine the changes in the abundance of fishery stocks in response to fishing, and, to the extent possible, to predict future trends of stock abundance. Stock assessments are based on resource surveys; knowledge of the habitat requirements, life history, and behavior of the species; the use of environmental indices to determine impacts on stocks; and catch statistics. Stock assessments are used as a basis to assess and specify the present and probable future condition of a fishery.[5]

Stock Assessment and Fishery Evaluation Report (SAFE)
A report that provides a summary of the most recent biological condition of a stock of fish and the economic and social condition of the recreational fishermen, commercial fishermen, and seafood processors who use the fish. The report provides information to the fishery management councils (FMCs) for determining harvest levels.[5]

Stock Structure
1. The spatial organization of a species in terms of the genetic structure of the species across geographic space (e.g., a species of large pelagic fish (tunas) may be composed of three separate stocks in the North Atlantic, South Atlantic, and Pacific Ocean); 2. The structure of a particular stock, in terms of its size or age composition or in terms of its species composition (for a multispecies stock).[5]

Stock-Recruitment Relationship (SRR)
The relationship between the level of parental biomass (e.g. spawning stock size) and subsequent recruitment level. Determination of this relationship is useful to analyze the sustainability of alternative harvesting regimes and the level of fishing beyond which stock collapse is likely. The relation is usually blurred by environmental variability and difficult to determine with any accuracy.[5]

Comment: Such a relationship always exists in principle, in that the existence of a parent stock is a prerequisite for the generation of recruitment. However, in many cases there exist regulatory mechanisms such that the number of recruits is not strongly related to the parent stock size over the range of stock sizes observed: this situation is sometimes described as the absence of a stock-recruitment relationship, but is more logically described as a special case of a stock-recruitment relationship. Some stock assessment methods incorporate the estimation of such a relationship directly into the model, either explicitly (e.g. some age-structured assessments) or implicitly (most stock production models).[5]

Stocking
The practice of putting artificially reared young fish into a sea, lake, or river. These are subsequently caught, preferably at a larger size.[5]

Straddling Stock
1. A stock which occurs both within the exclusive economic zone (EEZ) and in an area beyond and adjacent to the EEZ; 2. Fish stocks that migrate between national EEZs and the high seas.[5]

Strategy
A statement involving the projections of actions, including the direction of means, to achieve an objective.[5]

Stratification
The separation of the water column into layers, with the densest at the bottom and the lease dense at the surface, typically caused by temperature and/or salinity. A stratified water column is said to be stable.[12] (see *Mixed Layer*, *Pycnocline*, *Thermocline*)

Stratified Mean (Average) Catch Per Tow
From research vessel surveys, for separate species of fish, each average catch per tow, determined from a series of tows, in each geographic stratum of a region is multiplied by that area (square nautical miles) of the stratum in which the tows are made. All of the individual products are added together and the total is divided by the sum of the entire area of the region. The final result is stratified mean catch per tow; this is used as an index of relative abundance. For example, a scientist wishes to calculate the stratified mean catch per tow of cod in a region (perhaps Georges Bank) that measures 100 square nautical miles. The region has been divided into 5 strata on the basis of depth. In each stratum, 5 tows are made and the average catch of cod is calculated.[6]

Submarine Canyon
Submerged earthform consisting of an incised large-scale submarine feature on a high angle slope normally associated with the continental shelf.[12]

Submerged Bank
Large, relatively flat shoal or other expansive submerged feature that is markedly shallower than the surrounding ocean bottom (e.g. Georges Bank with water depths between 30 to 50 meters).[12]

Subpopulations
Subpopulations are defined as geographically or otherwise distinct groups in the population between which there is little exchange.[5]

Subsidence
The sudden sinking or gradual downward settling of the Earth's surface with little or no horizontal motion.[12]

Subsidy
A direct or indirect payment, economic concession, or privilege granted by a government to private firms, households, or other governmental units in order to promote a public objective.[5]

Subsistence Fishery
A fishery where the fish caught are shared and consumed directly by the families and kin of the fishers rather than being sold at the next larger market.[5]

Substitutions
In data processing, refers to the practice of substituting missing information (e.g. the catch composition of country A vessels) with an available one (e.g. the catch composition of country B vessels), assuming some degree of similarity (e.g. same fishing area, gear, and practice). Substitutions are often needed to obtain estimates of the total catch-at-size for a species with incomplete datasets.[5]

Substrate
Seafloor or other solid surface to which animals or plants attach, or on which they move.[5]

Subtidal
Permanently below the level of low tide, an underwater environment.[12]

Summary Settlement
A ticket with a discounted fine that is issued to a fisherman prior to the issuance of a notice of violation and assessment (NOVA), offered only in cases where the violation is not contested. Allows violators to quickly resolve their case without incurring the expense of the legal process. Any property that was seized is forfeited by paying the penalty.[10] (see *Notice of Violation and Assessment*)

Super Seiner
A large purse seiner, usually more than 70 meters long and equipped with considerable freezing and storage facilities, capable of undertaking extended transoceanic voyages for harvesting fish.[5]

Supply Function
The relationship between the quantity of good or service supplied and price.

Supply Gluts
A situation in which the market is supplied with an unusually large amount of product, which strains the capacity of primary buyers, processors, and wholesalers and causes prices to drop to very low levels.[5]

Support
Any operation by a vessel assisting fishing by foreign or national vessels, including supplying water, fuel, provisions, fish processing equipment, or other supplies to a fishing vessel.[5]

Supporting Ecosystem Services
Supporting ecosystem services are those services (e.g. primary production, oxygen production, soil formation) that are necessary for the production of all other ecosystem services (e.g. food, employment, recreation, erosion control, etc.).[5]

Supporting Services
Ecosystem services those are necessary for the production of all other ecosystem services. Some examples include biomass production, production of atmospheric oxygen, soil formation and retention, nutrient cycling, water cycling, and provisioning of habitat.[5]

Supratidal
Above the level of high tide; a terrestrial environment that is influenced by proximity to the sea, including influency by sea spray, sea breezes, and aeolian processes, and geological and biological "spillover" such as dune development.[12]

Surface (Mixed) Layer
The upper layer of water that is mixed by wind, waves, and currents.[12]

Surface Runoff
The flow across the land of water that accumulates on the land surface when the rainfall rate exceeds the infiltration capacity of the soil.[12]

Surface Water
All water naturally open to the atmosphere, including rivers, lakes, reservoirs, streams, impoundments, seas, estuaries, and so on. The term also covers springs, wells or other collectors of water that are directly influenced by surface waters.[5]

Surimi
Protein paste derived from processing raw fish, primarily Alaska (walleye) pollock and Pacific whiting (hake). Surimi can be combined with flavoring agents and other substances and extruded to create marketable foodstuffs (e.g. imitation crab meat).[13]

Surplus Production
1. The amount of biomass produced by the stock (through growth and recruitment) over and above that which is required to maintain the total stock biomass at a constant level between consecutive time periods; 2. Production of new biomass by a fishable stock, plus recruits added to it, less what is removed by natural mortality. This is usually estimated as the catch in a given year plus the increase in stock size (or less the decrease). Also called: natural increase, sustainable yield, and equilibrium catch.[5]

Surplus Production Model
Mathematical representation of the way a stock of fish responds to the removal of its individuals (for example by fishing). In fisheries, usually represented by a relationship between yield and/or catch per unit effort (CPUE) and fishing effort or mortality.[5]

Survey Design
The overall survey design refers to the definitions and the established methods and procedures concerning all phases needed for conducting the survey: the sample design, the selection and training of personnel, the logistics involved in the management of the field force, the distribution and receipt of survey questionnaires and forms, and the procedures for data collection, processing and analysis.[5]

Survival Rate
Number of fish alive after a specified time interval, divided by the initial number. Usually on a yearly basis.[5]

Survival Ratio
1. Ratio of recruits to spawners (or parental biomass) in a stock-recruitment analysis. Changes in survival ratios indicate that the productivity of a stock is changing; 2. Number of fish alive after a specified time interval, divided by the initial number. Usually calculated on a yearly basis.[5]

Sustainability
1. Ability to persist in the long-term. Often used as "short hand" for sustainable development; 2. Characteristic of resources that are managed so that the natural capital stock is non-declining through time, while production opportunities are maintained for the future.[5]

Sustainability Indicators
A variable, a pointer, an index of a complex phenomenon. Its fluctuations reveal the variations in components of the ecosystem, the resource, or the sector. The position and trend of the indicator in relation to the criteria indicate the present state and dynamics of the system. Ideally, composite indicators are needed, the position and trajectory of which, within a system of reference of related criteria, would allow simple holistic assessment of sustainability. One can distinguish indicators of state of the system, pressure (or stress, driving forces) on the system, and response (reflecting action taken to mitigate, reduce, eliminate, or compensate for the stress).[5]

Sustainable Catch (Yield)
The number (weight) of fish in a stock that can be taken by fishing without reducing the stock biomass from year to year, assuming that environmental conditions remain the same.[6]

Sustainable Development
1. Management and conservation of the natural resource base, and the orientation of technological and institutional change in such a manner as to ensure the attainment of continued satisfaction of human needs for present and future generations. Such sustainable development conserves land and water, plant and animal genetic resources, is environmentally non-degrading, technologically appropriate, economically viable, and socially acceptable; 2. Development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs.[5]

Sustainable Fishing
Fishing activities that do not cause or lead to undesirable changes in the biological and economic productivity, biological diversity, or ecosystem structure and functioning from one human generation to the next.[5]

Comment: Fishing is sustainable when it can be conducted over the long-term at an acceptable level of biological and economic productivity without leading to ecological changes that foreclose options for future generations.[5]

Sustainable Fisheries Act (SFA)
The SFA is a statute enacted in 1996 which amended the Magnuson-Stevens Act. Among its provisions were mandatory ovefishing elimination and stock rebuilding, the establishment of a program to protect essential fish habitat, and the establishment of a new national standard for bycatch reduction.[8]

Sustainable Use
The use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations.[5]

Sustainable Yield
1. Equilibrium yield; 2. The amount of biomass or the number of units that can be harvested currently in a fishery without compromising the ability of the population/ecosystem to regenerate itself.[5]

Sustained Use
Continuing use without severe or permanent deterioration in the resources.[5]

Systems Analysis
The analysis and modeling of interrelated processes and operations with a view to designing a more efficient use of resources.[5]

T

Tagging
Marking an individual or group of individuals (e.g. by clipping a fin, injecting a die, inserting a tag) in order to identify it when recaptured. Tagging allows the study of growth, mortality, and migration as well as the estimation of the stock size.[5]

Target Fishing
Fishing for the primary purpose of catching a particular species or species group.[1] (see *Target Species*)

Target Fishing Capacity
The maximum amount of fish over a period of time (year, season) that can be produced by a fishing fleet if fully utilized while satisfying fishery management objectives designed to ensure sustainable fisheries: YT = Y (ET, S) in which YT is target yield or catch; ET is target effort generated by a fully-utilized fleet; and S is stock size (biomass). The "fishing fleet" is meant to be the stock of inputs (i.e. physical capital and human capital). The term "fully-utilized" is used in a precautionary context in that it is assumed that capacity utilization is 100%. The maximum catch that capital stocks could remove can be determined by observing the fishery under study during a period with few restrictions.[5]

Target Reference Point (TRP)
1. Benchmarks used to guide management objectives for achieving a desirable outcome (e.g. optimum yield, OY). Target reference points should not be exceeded on average[3]; 2. Corresponds to a state of a fishery or a resource that is considered desirable. Management action, whether during a fishery development or a stock rebuilding process, should aim at bringing the fishery system to this level and maintaining it there. In most cases a TRP will be expressed in a desired level of output for the fishery (e.g. in terms of catch) or of fishing effort or capacity, and will be reflected as an explicit management objective for the fishery.[5]

Target Species
Those species primarily sought by the fishermen in a particular fishery. The subject of directed fishing effort in a fishery. There may be primary as well as secondary target species.[5]

Target Strength
The ratio of received signal to transmitted signal from an object as at 1 meter from the transmitter, expressed in decibels.

Technological Interaction
An interaction between fisheries resulting from the impact of one fishery using a particular technology (e.g. trawl gear) on another fishery, usually using a different technology (e.g. pots), but exploiting the same resources as target or bycatch. Because of their importance, the cross-impact of various fleets targeting overlapping species groups must be assessed. Major source of failure in total allowable catches (TACs) and quotas management strategies for multispecies and multigear fisheries.[5]

Temperate Waters
Waters in the region of higher (cooler; more pole-ward) latitudes than tropical latitudes; literally those between the Tropic of Cancer and the Arctic Circle in the northern hemisphere, and the Tropic of Capricorn and the Antarctic Circle in the southern hemisphere.[5]

Tenure
Socially-defined agreements held by individuals or groups (either recognized by law or customary norms)

on the rights of access and the rules for use of either a land area or associated resources such as individual trees, plant species, water, or animals.[5]

Terminal F
In a stock assessment (e.g. a virtual population analysis), refers to fishing mortality values in the last year for which data are available.[5]

Terrace
A relatively flat horizontal or gently inclined surface, sometimes long and narrow, which is bounded by a steeper ascending slope on one side and by a steeper descending slope on the opposite side.[5]

Territorial Sea
Extends 12 nautical miles offshore of the United States. States exercise authority over marine fisheries in waters from the coastline to 3 nautical miles offshore, and out to 9 nautical miles for Texas, Puerto Rico, and the Gulf coast of Florida.[1]

Thermocline
Region below the surface layer of the sea or lake, where the temperature gradient increases abruptly (i.e. where temperature decreases rapidly with increasing depth). A thermocline may reach the surface and become a front. It is usually an ecological barrier, and its oscillations have significant consequences on stock distribution and ocean productivity.[5] (see *Mixed Layer*, *Pycnocline*, *Stratification*)

Threshold Reference Point (ThRP)
Indicates that the state of a fishery and/or a resource is approaching a target reference point (TRP) or a limit reference point (LRP), and that a certain type of action (usually agreed beforehand) needs to be taken. Fairly similar to a LRP in their utility, the ThRP specific purpose is to provide an early warning, reducing further the risk that the LRP or TRP are inadvertently passed due to uncertainty in the available information or inherent inertia of the management and industry systems. Adding precaution to the management setup, they might be necessary only for resources or situations involving particularly high risk.[5]

Thresholds
1. Levels of environmental indicators beyond which a system undergoes significant changes; points at which stimuli provoke significant response; 2. A point or level at which new properties emerge in an ecological, economic, or other system, invalidating predictions based on mathematical relationships that apply at lower levels. For example, species diversity of a landscape may decline steadily with increasing habitat degradation to a certain point, and then fall sharply after a critical threshold of degradation is reached. Human behavior, especially at group levels, sometimes exhibits threshold effects. Thresholds at which irreversible changes occur are especially of concern to decision-makers.[5]

Tidal Current
An alternating, horizontal movement of water associated with the rise and fall of the tide, these movements being caused by gravitational forces due to the relative motions of Moon, Sun, and Earth.[12]

Tidal Flat
Level, muddy surface bordering an estuary, alternately submerged and exposed to the air by changing tidal levels.[5]

Tidal Marsh
Low, flat marshland traversed by channels and tidal hollows and subject to tidal inundation. Normally, the only vegetation present are salt-tolerant bushes and grasses.[5]

Tidal Range
The difference in water level between successive high and low tides.[12]

Tidal Wetlands
A coastal area that experiences periodic inundation as a result of daily tides.[12]

Top-Down Management
A process of management in which management information and decisions are centralized and resource users are kept outside the decision-making process.[5]

T_{MAX}
The maximum time period to rebuild an overfished stock, according to National Standard Guidelines. Depends on biological, environmental, and legal/policy factors.[1] (see *National Standard Guidelines*)

T_{MIN}
The minimum time period to rebuild an overfished stock, according to National Standard Guidelines. Technically, this is the minimum amount of time in which a fish stock will have a 50% chance of rebuilding if no fishing occurs (depends on biological and environmental factors).[1] (see *National Standard Guidelines*)

Total Allowable Catch (TAC)
The annual recommended or specified regulated catch for a species or species group. The regional fishery management council sets the TAC from the range of acceptable biological catch (ABC).[2]

Total Catch
Total catch (optimum yield, OY). The landed catch plus discard mortality.[1]

Total Economic Value Framework
A framework that incorporates all components of economic value, including use value (consumptive and non-consumptive use) and non-use value (option, quasi-option, and existence values).

Total Length (TL)
The length of a fish defined as the straight-line distance from the tip of the snout to the tip of the tail (caudal fin) while the fish is lying on its side, normally extended.[5]

Total Maximum Daily Load
The amount of pollutant that a water body can receive and still meet water quality standards. Set by the Environmental Protection Agency.[1]

Total Mortality (Z)
1. A measurement of the rate of removal of fish from a population by both fishing and natural causes. Total mortality can be reported as either annual or instantaneous. Annual mortality is the percentage of fish dying in 1 year. Instantaneous mortality is that percentage of fish dying at any one time[2]; 2. The sum of natural (M) and fishing (F) mortality rates.[5]

Total Welfare
The sum of consumer surplus and producer surplus.[9] (see *Consumer Surplus*, *Producer Surplus*)

Tradable Permits
An economic policy instrument under which rights to discharge pollution or exploit resources can be exchanged through either a free or a controlled -permit-market. Examples include individual transferable quotas (ITQs) in fisheries, tradable depletion rights to mineral concessions and marketable discharge permits for waterborne effluents.[5]

Trade Analysis
Economic analysis of the trade of goods and services between countries.[9]

Trade-Off
A balancing of factors all of which are not attainable at the same time (e.g. maximum economic yield, MEY, and maximum sustainable yield, MSY). A giving up of one thing in return for another.[5]

Comment: Sustainability can be evaluated by the sum of the various social, economic, and natural resources where the degree of use, exchange, and trading among resources will vary according to the values given to each. The understanding of social dynamics and resource-use systems and the evaluation of related trade-offs, in terms of equity, productivity, resilience, and environmental stability, are useful to envision alternative development scenarios.[5]

Tradeoffs
Compromises among resource uses that are required because some bundles of entitlements defy divisibility/separability.[5]

Traditional Rights
Rights of indigenous or traditional people which (to present) have not been considered in a national and international context or have not (yet) been recorded, and which are based on the legal system of the individual cultures.[5]

Tragedy of the Commons
The overuse of a resource resulting from a lack of assigned and enforceable property rights.

Transaction Costs
1. In the context of a market exchange of goods and services, transaction costs include the costs of time, effort, and other resources necessary to search out, negotiate, and consummate an exchange. In a resource management context, transaction costs include the costs of describing the principal elements of a fishery (resource, producers, processors, markets), and designing, implementing, monitoring, and enforcing regulation; 2. Collection of costs involved with gathering information on, and otherwise delineating, a resource; establishing contracts (formal or informal) that define the entitlement; monitoring and enforcing the entitlement.[5]

Transboundary Stocks
Stocks of fish that migrate across international boundaries or, in the case of the United States, across the boundaries between states or fishery management council (FMC) areas of control.[5]

Transferred Species
Transplanted species. Any species intentionally or accidentally transported and released by humans into an environment inside its present range. Also referred to as a "Transfer."[5]

Transgenic
Organisms whose genetic makeup includes a gene or genes from another genus or species.[5]

Transshipment
Transfer of product from one ship to another at sea for further transport.[13]

Transitional
Relates usually to the more or less abrupt passage (or evolution) from one state, stage, subject, or place to another. In fishery science, refers to what happens between two equilibrium states corresponding to two different fishing regimes (i.e. the non-equilibrium trajectory between two states).[5]

Comment: Transitional situations may be extremely important in terms of comparing performance of different management options. For example, equilibrium yield analyses might indicate that a given regulation will increase equilibrium yield by, say, twofold. However, the transition between the two levels of yield will actually involve a short-term loss in yield, and hence may meet with stakeholders' resistance.[5]

Translocation
Movement of native or introduced (exotic) species to waters or habitats outside their natural or previous distribution.[5]

Transnational Fisheries
Fisheries in which the same resource stock(s) crosses the exclusive economic zones (EEZs) of two or more countries.[5]

Transparency
The openness of governance processes and decision-making to stakeholders and the public.

Transshipment
1. Act of transferring the catch from one fishing vessel to either another fishing vessel or to a vessel used solely for the carriage of cargo; 2. Off loading and on loading or otherwise transferring fish or fish products and/or transporting fish or products made from fish.[5]

Trap Fishing
Fishing by means of devices able to trap fish in a confined environment (traps, pots) often designed and baited to catch a particular species—crab pot, lobster pot, tuna trap, fyke nets.[5]

Trawl Net
Towed net consisting of a cone-shaped body closed by a bag or codend and extended at the opening by wings. It can be towed by one or two boats and, according to the type, used on the bottom or in midwater (pelagic). In certain cases, as in trawling for shrimp or flatfish, the trawler can be specially rigged with outriggers to tow up to four trawls at the same time (double rigging).[5]

Trawling
Fishing technique in which a net is dragged behind the vessel and retrieved when full of fish. This technique is used extensively in the harvest of pollock, cod, and other flatfish in North Pacific and New England fisheries. It includes botto- and midwater fishing activities.[13]

Trench
A long, narrow, characteristically very deep and asymmetrical depression of the sea floor, with relatively steep sides.[5]

Trip Limits
A quota that each fisher or vessel is allowed to catch per trip out to sea. Trip limits are the commercial equivalent of a recreational bag limit.

Troller
A vessel used for catching pelagic fish by towing a number of lines fitted with lures.[5]

Trolling
A surface and subsurface fishing method in which lines with baits or lures are dragged by a vessel at a speed of 2–10 knots. Trolling is used to catch tuna and tuna-like fish.[5]

Trophic Group
Group of organisms eating resources from a similar level in the energy cycle.[5]

Trophic Level
1. Classification of natural communities or organisms according to their place in the food chain. Green plants (producers) can be roughly distinguished from herbivores (consumers) and carnivores (secondary Syn: Trophic group consumers); 2. Group of organisms eating resources from a similar level in the energy cycle; 3. Position in food chain determined by the number of energy-transfer steps to that level. Plant producers constitute the lowest level, followed by herbivores and a series of carnivores at the higher levels.[5] (see *Food Chain*, *Predator-Prey Relationship*)

T_{TARGET}
The target year set by policy for a fish stock to be completely rebuilt.[1]

Tuning
Improving the fit between observed and calculated data using a mathematical (stock assessment) model.[5]

Turtle Excluder Device (TED)
A gear modification used on shrimp trawls that enables incidentally caught sea turtles to escape from the nets.

Two-pie System
Form of quota allocation in which both harvesters and processors are allocated shares of quota. The harvester and processor allocations would be transferable within but not between each category.[13]

Typographic Features
The relief features of the Earth's surface, above and below sea level; the set of landforms in a region.[12]

Turbidity
The condition resulting from the presence of suspended particles in the water column which attenuate or reduce light penetration.[12]

U

Unblocked Quota
Quota shares in the Alaskan halibut and sablefish individual fishing quota (IFQ) programs that are allowed to be subdivided when transferred. There are limits on the total number of unblocked quota shares that an individual may own.[13] (see *Blocked Quota*)

Uncertainty
1. In general, the incompleteness of knowledge about the states and processes in nature[5]; 2. In statistics and risk analysis, refers to the estimated amount (or percentage) by which an observed or calculated value may differ from the true value; 3. Lack of perfect knowledge of many factors that affect stock assessments, estimation of biological reference points, and management.[5]

Comment: Sources of uncertainty include measurement error (in observed quantities), process error (or natural population variability (e.g. in recruitment), model error (misspecification of assumed values or population model structure), estimation error (in population parameters or reference points, due to any of the preceding types of errors), and implementation error (or the inability to implement management controls for whatever reason).[5]

UNCLOS
United Nations Convention on the Law of the Sea. Adopted in 1982. Entered into force in 1994.[5]

Underfished
Characteristic of a stock that may sustain catches higher than current ones.[5]

Undersized
Fish (caught) at a size smaller than the minimum size limit established by regulation.[5]

Underutilized Species
A species of fish that has potential for large additional harvest.[5]

Undeveloped Fishery
A fishery in its very early stage of development, with very low levels of fishing effort, producing much lower quantities of fish than its potential maximum yield.[5]

Unit Stock
A population of fish grouped together for assessment purposes, which may or may not include all the fish in a stock.[5] (see *Stock*)

Unregulated Fishery
A fishery in which producers (and any other participants) are not subjected to any regulations.[5]

Upland
An area that is higher relative to the surrounding areas, but not mountainous.[12]

Upwelling
Upward movement of cool and nutrient-rich subsurface waters towards the surface often leading to exceptionally rich areas. There exist various types of upwelling. For fisheries, the most important type is the wind-induced coastal upwelling where the upward movement is a consequence of wind stress (along shore) and Eckman transport (offshore).[5]

Usable Stock
The number or weight of all fish in a stock that lie within the range of sizes customarily considered usable (or designated so by law). Also called: standing crop.[5]

Use Rights
Rights for the use of resources that can be defined by local custom, mutual agreements, or prescribed by other entities holding access rights. These rights may restrict the use of particular resources to specific levels of consumption or particular harvesting techniques.[5]

User
The term includes a commercial, recreational, and indigenous fisher; fish watcher (scuba diver); and

a member of the community. What constitutes a "significant user interest" must be decided on in a case-by-case basis.[5]

User Group
A group of individuals that utilize a resource in a specific manner such as inshore lobster fishermen.[5] (see *Stakeholder*)

User-Pays Principle (UPP)
The UPP states that the price of a natural resource should reflect the full range of costs involved in using it, including the costs of the external effects associated with exploiting, transforming, and using the resource, together with the cost of the future uses forgone. It follows that the price for the use of a resource should be the full long-run marginal social cost of using it, including the external costs associated with its development and any resultant pollution prevention and control activities.[5]

Utility
1. The level of welfare that a person gets from consuming a good or undertaking an activity; 2. In economics, the measure of the degree of satisfaction or happiness of a person.[5]

Utilized Stock
The part, by number, of the fish alive at a given time, which will be caught in future.[5]

V

Valuation
The process of expressing a value for a particular good or service in a certain context (e.g. of decision-making) usually in terms of something that can be counted, often money, but also through methods and measures from other disciplines (sociology, ecology, and so on).[5]

Value
1. Market and nonmarket values, gross and net values, and net benefits to consumers or goods and services; 2. The contribution of an action or object to user-specified goals, objectives, or conditions.[5]

Value Added
The dollar value of a firm's output (i.e. harvest) minus the dollar value of the inputs it purchases from other firms.[9]

Values
Ideals, customs, and beliefs of a given society.[5]

Variable
Anything changeable. A quantity that varies or may vary. Part of a mathematical expression that may assume any value.[5]

Variable Costs
Costs that vary with the level of output.[9]

Vertical Integration
A fishery (or industry) is vertically integrated when firms in the fishery engage in multiple levels of the supply chain. For example, a firm that operates and manages fishing vessels, processing plants, and a wholesale distribution operation is considered vertically integrated.[5]

Vessel Catch Limits
A limit on the quantity each individual vessel can land per trip or short period of time (e.g. day, week).[5]

Vessel Class
Commercial fishing vessels are classified according to their gross registered tons (GRT) of displacement. Vessels displacing less than 5 GRT are not routinely monitored, and are referred to as undertonnage.[6]

Vessel Monitoring System (VMS)
A satellite communications system used to monitor fishing activities—for example, to ensure that vessels stay out of prohibited areas. The system is based on electronic devices (transceivers), which are installed on board vessels. These devices automatically send data to a shore-based "satellite" monitoring system.[1]

Vessel Operator
The master or other individual aboard and in charge of that vessel.[5]

Vessel Owner
Any person who owns a vessel in whole or in part; any charter of the vessel, whether bare boat, time, or voyage; any person who acts in the capacity of a charterer, including, but not limited to, parties to a management agreement, operating agreement, or any similar agreement that bestows control over the destination, function, or operation of the vessel; or any agent designated as such by a person described in this definition.[5]

Virgin Biomass (B_0)
The average biomass of a stock that has yet not been fished (in an equilibrium sense). Biomass of an unexploited (or quasi unexploited) stock. Rarely measured. Most often inferred from stock modeling. Used as a reference value to assist the relative health of a stock, monitoring changes in the ratio between current and virgin biomass (B/B_0). It is usually assumed that, in absence of better data, $B = 0.30\ B_0$ is a limit below which a stock should not be driven.

Comment: Virgin Biomass corresponds to a stock's theoretical carrying capacity.[5]

Virgin Stock
A stock of fish with no commercial or recreational harvest. A virgin stock changes only in relation to environmental factors and its own growth, recruitment, and natural mortality.[2]

Virtual Population Analysis (VPA)
A retrospective analysis of the catches from a given year class which provides estimates of fishing mortality and stock size at each age over its life in the fishery. This technique is used extensively in fishery assessments.[3] (see *Cohort Analysis*)

Viscosity
1. The property of resistance to flow in a fluid or semi fluid. By analogy, in fisheries: the property of resistance of elements of a stock to move and mix together. As a consequence of stock "viscosity," mixing of individuals is neither complete nor instantaneous and the transfer of the local impact of fishing to the entire stock (through directional or turbulent mixing) is a function of the stock´s "viscosity." If there is zero mixing, the viscosity is infinite. Because of lack of data on mixing rates, the term "viscosity" is often used only in a qualitative fashion.[5]

Vital Rates
Rates (such as natural mortality, fecundity, and growth rates) affecting the dynamics of a stock.[5]

Vulnerability
A term equivalent to catchability (q) but usually applied to separate parts of a stock, for example those of a particular size, or those living in a particular part of the range.[5]

W

Waste
Physical waste is product that is caught but does not have market value. It is a byproduct of the production process that is not utilized.

Water Column
The vertical column of seawater that extends from the surface to the bottom.[12]

Water Mass
A body of water that can be identified by its temperature and salinity.[12]

Water Pollution
Presence in water of harmful and objectionable material—obtained from sewers, industrial wastes, and rainwater runoff—in sufficient concentrations to make it unfit for use.

Water Quality
The chemical, physical, and biological characteristics of water in respect to its suitability for a particular purpose.

Water Quality Criteria
Specific levels of water quality desired for identified uses, including drinking, recreation, farming, fish production, propagation of other aquatic life, and agricultural and industrial processes.

Water Resources
Water usable as inputs for economic production and livelihoods. A distinction is made between renewable and nonrenewable water resources. Nonrenewable water resources are not replenished at all or for a very long time by nature. This includes the so-called fossil waters. Renewable water resources are rechargeable due to the hydrological cycle unless they are overexploited, comprising groundwater aquifers and surface water like rivers and lakes.

Watershed
The areas which supplies water by surface and subsurface flow from rain to a given point in the drainage system.

Weight-at-Age
The average individual weight of the fish in each age class of a particular stock.

Welfare
The prosperity or, more broadly, the well being of a person or group.

Wetland
Partially or permanently flooded, soft bottom flat that is vegetated by vascular plants.[12]

Y

Year Class
Fish in a stock born in the same year. For example, the 1987 year class of cod includes all cod born in 1987. This year class would be age 1 in 1988, age 2 in 1989, and so on. Occasionally, a stock produces a very small or very large year class that can be pivotal in determining stock abundance in later years.[3] (see *Cohort*)

Yield
1. The yield curve is the relationship between the expected yield and the level of fishing mortality or (sometimes) fishing effort; 2. Catch in weight. Catch and yield are often used interchangeably. Amount of production per unit area over a given time. A measure of agricultural production.[5]

Yield per Recruit (Y/R or YPR)
1. A model that estimates yield in terms of weight, but more often as a percentage of the maximum yield, for various combinations of natural mortality, fishing mortality, and time exposed to the fishery[2]; 2. The average expected yield in weight from a single recruit. Y/R is calculated assuming that fishing mortality is constant over the life span of a year class. The calculated value is also dependent on the exploitation pattern, rate of growth, and natural mortality rate, all of which are assumed to be constant.[3]

Yield-per-Recruit Analysis
Analysis of how growth, natural mortality, and fishing interact to determine the best size of animals at which to start fishing them, and the most appropriate level of fishing mortality. The yield-per-recruit models do not consider the possibility of changes in recruitment (and reproductive capacity) due to change in stock size. They also do not deal with environmental impacts.[5]

Z

Zero Opportunity Costs
Where the next best income alternative yields zero additional earnings.[5]

Zero Mortality Rate Goal (ZMRG)
A goal stated in the Marine Mammal Protection Act (MMPA) that the "incidental kill or incidental serious injury of marine mammals permitted in the course of commercial fishing operations be reduced to insignificant levels approaching a zero mortality and serious injury rate."[1]

Zoning
A process in which a protected area is divided into discrete zones and particular human uses of each zone is permitted, often with conditions such as gear limitations in fishing and waste discharge prohibitions in tourism.[14]

Zooplankton
Non-photosynthetic, heterotrophic planktonic organsisms, including protists, small animals, and larvae, which exist within the water column.[12] (see *Phytoplankton*)

Numbered Terms

602 Guidelines
Rules for fishery management plans (FMPs); require an FMP to define overfishing, to specify measures to prevent overfishing, and to establish a program for rebuilding a stock if overfishing already exists.[10]

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