



IPHC GLOSSARY OF TERMS, ACRONYMS AND ABBREVIATIONS

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GLOSSARY OF TERMS

A

Adaptive management. A structured, iterative process of robust decision making in the face of uncertainty, with an aim to reducing uncertainty over time via system monitoring, and continually improving management policies and practices by learning from the outcomes of previously employed policies and practices.

Age class. Collection of individual fish of the same age.

Age-frequency distribution. An estimate of the numbers or proportions of fish of each age group in the catch derived from catch-at-age data. Estimates are expanded from various strata to provide a statistically valid representation of the population. See also catch-at-age composition.

Age-length key or age-length curve. The mean age at length determined from the relationship between age and length that is used to predict the age of a particular aged fish.

Age-structured assessment. Estimating the status of a fish stock using a model based on the relative abundances of fish of different ages in the stock.

Aggregation. Group of fish that comes together, often to feed or spawn.

Archival tag (tagging). Implanted or externally attached electronic fish tag that detects and records ('archives') environmental variables (e.g. water temperature) and location over time. Pop-up Archival Transmitting tags (PSATs or PATs) release from the fish after a prescribed period of time, float to the surface, and relay data to scientists via satellite. Implanted tags must be retrieved manually.

Area closure. Closure of a given area/fishing ground for a defined period as a tool in the management of a fishery.

Artisanal fishing. Fishing using traditional methods. (*c.f. subsistence fishing*)

B

B (biomass). Total weight of a stock or a component of a stock.

Beach price. A price per unit of fish that excludes payments for freight, marketing and processing, as would be paid at the point of landing. Usually expressed as the weight of the fish when whole (round weight). (*c.f. ex-vessel price*)

BLIM (biomass limit reference point). The point beyond which the risk to the stock is regarded as unacceptably high.

BMEY (biomass at maximum economic yield). Average biomass corresponding to maximum economic yield.

BMSY (biomass at maximum sustainable yield). Average biomass corresponding to maximum sustainable yield.

BTARG (target biomass). The desired biomass of the stock.

B₀ (mean equilibrium unfished biomass). Average biomass level before any fishing had occurred.

Benthic. Associated with the bottom of a water body.

Beverton-Holt curve/function. Mathematical function that describes the relationship between stock size and recruitment.

Biodiversity. Biological diversity; variety among living organisms, including genetic diversity, diversity within and between species, and diversity within ecosystems.

Biological reference point. Indicator providing a standard for comparison. Can be either a 'target reference point' or a minimum biologically acceptable limit ('limit reference point'). Often based on fishing mortality rates, biomass or on the maintenance of adequate recruitment to the stock. For example, B_{TARG} and B_{LIM}.

Biological region. An area of shared biological characteristics. For example, four broad zones (IPHC Regulatory Area 2: 2A, 2B, 2C; Regulatory Area 3: 3A, 3B, Regulatory Area 4: 4A, 4CDE; and Regulatory Area 4B) within the stock's distribution using existing IPHC Regulatory Area boundaries (see IPHC Regulatory Areas), but sharing increased biological connectivity and productivity.

Bycatch. Incidentally caught fish by fisheries targeting other species and that cannot legally be retained. Bycatch mortality, or bycatch removals, refers only to those fish that subsequently die due to capture. The *North Pacific Fisheries Management Council* uses the term *Prohibited Species Catch (PSC)*. (*c.f. byproduct*)

Bycatch reduction device (BRD). A device that allows fish and other animals to escape immediately after being taken in or with fishing gear.



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Byproduct. A species taken incidentally in a fishery while fishing for the target species that has some commercial value and is retained for sale.

C

Catchability. The extent to which a stock is susceptible to fishing; quantitatively, the proportion of the stock removed by one unit of fishing effort.

Catch-at-age data. Data on the number of fish of each age group in the catch, usually derived from representative samples of the catch.

Catch-at-age composition. An estimate of the numbers or proportions of fish of each age group in the catch derived from catch-at-age data. Estimates are expanded from various strata to provide a statistically valid representation of the population. *See also age-frequency distribution.*

Catch-at-length data. Data on the number of fish of each length group in the catch, usually obtained by measuring the lengths of fish in representative samples, but occasionally derived from individual weights of fish.

Catch-at-length composition. An estimate of the numbers or proportions of fish of each length group in the catch derived from catch-at-length data. Estimates are expanded from various strata to provide a statistically valid representation of the population. *See also length-frequency distribution.*

Catch-at-weight data. Data on the number of fish of each weight group in the catch, usually obtained by measuring the individual weights of fish in representative samples.

Catch-curve. Method for estimating average recent fishing mortality, based on the age structure of the catch, biology of the species, total catch weight and selectivity of the fishing gear.

Catch per unit effort (CPUE). The number or weight of fish caught by a unit of fishing effort. Often used as a measure of relative fish abundance. (*c.f. NPUE and WPUE*).

Catch rate. *See* Catch per unit effort.

Catch Sharing Plan (CSP). Management procedures in Canada and the U.S.A. that allocate some portions of the available yield among specific user groups or management areas. Allocations are often described as percentages of the IPHC Regulatory Area catch limits.

Catch tables. Summary tables reporting detailed observed or projected removals by source and specific IPHC Regulatory Area.

Coastal waters. The waters adjacent to the land territory of a State, extending seaward from the territorial sea baseline to a distance of three nautical miles (sometimes referred to as Inshore waters).

Closed-loop simulation: The process of simulating dynamics with a feedback loop. For example, simulating the feedback of the annual management process (i.e. setting catch levels) on a fish stock. The simulation framework incorporates an *operating model* and a *management strategy*, and all of the uncertainty that goes along with those.

Cohort. Those individuals of a stock born in the same spawning season.

Cohort analysis. Technique for estimating the magnitude of fishing mortality and the number of fish at each age in a stock by tracing the history of cohorts.

Commercial fishery. Commercial fisheries include commercial landings and discard mortality (formerly called “wastage” in IPHC reports). Commercial discard mortality continues to include estimates of sub-legal Pacific halibut (under 32 inches (81.3 cm), also called U32), fish that die on lost or abandoned fishing gear, and fish discarded for regulatory reasons.

Community Development Quota (CDQ). Program in western Alaska under which a percentage of the total allowable catch of Bering Sea commercial fisheries is allocated to specific communities.

Constant Exploitation Yield (CEY). The Total CEY (TCEY) is the amount of yield of Pacific halibut greater than 26 inches (66 cm) in length, and Fishery CEY (FCEY), is the amount of yield for the directed Pacific halibut fisheries dependent upon allocation agreements by IPHC Regulatory Area.

Continental shelf. The continental shelf has been defined in a number of ways. It can mean the area of relatively shallow water that fringes a continent from the shoreline to the top of the continental slope. The top of the continental slope is often defined by the 200 m isobaths, though may range from 200-500 m. Continental shelf is also a defined maritime zone and comprises the continental shelf where it extends beyond the limit of the EEZ to the limit of the continental margin. This area is also sometimes referred to as “extended continental shelf” and its limit is determined by the United Nations Commission on the Limits of the Continental Shelf.

Continental slope. Region of the outer edge of a continent between the relatively shallow continental shelf and the abyssal depths and often characterized by a relatively steep slope.



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Control rules. Agreed responses that management must make under pre-defined circumstances regarding stock status. Also called ‘harvest control rules’ and ‘decision rules’.

Control measure. The unit used to control the amount of fishing or resource extraction allowed (e.g. catch or effort) according to some indicator (e.g. stock status)

D

Decision table. Summary table reporting projected future coastwide catch, fishing intensity, and probability of various risk metrics.

Delay-difference model. Type of population model that incorporates age structure.

Demersal. Found on or near the benthic habitat (*c.f.* Pelagic).

Depletion (stock depletion). Reduction in the biomass of a fish stock. Also referred to as relative biomass, the ratio of current spawning biomass (SB) to average unfished equilibrium spawning biomass (SB₀).

Depredation. Removal (all or part) of captured fish by a predator (often pinnipeds and toothed whales) prior to gear coming aboard a vessel.

Discards/Discarding. Any part of the catch that is returned to the sea, whether dead or alive.

Discard mortality. Any part of the catch that is returned to the sea, which is either dead, or which dies as a result of being caught and subsequently discarded.

Discard Mortality Rate (DMR). The fraction of the fish caught that are discarded and are estimated to subsequently die. This is the product of the estimated condition(s) or injury type(s) of those fish and the discard mortality probability associated with each condition or injury.

Discard mortality probability. The estimated probability that a fish with a particular injury type or condition category will die due to injuries sustained during capture.

Dressed weight. The weight of a fish that has been gutted but still has the head attached. (*c.f.* net weight, round weight).

E

Ecologically sustainable development. Using, conserving, and enhancing the community’s resources so that ecological processes are maintained and the total quality of life, now and in the future, is improved.

Economic efficiency. A fishery is economically efficient when fishery-level efficiency and vessel-level efficiency are achieved, and management costs are as low as they can be while still providing the necessary level of management. Fishery-level and vessel-level efficiency mean that effort is restricted to the point where the difference between fishing revenue and cost is greatest, and fishers are applying that level of effort at least cost.

Ecosystem. A complex of plant, animal, and microorganism communities that, together with the non-living components, interact to maintain a functional unit.

Effort. A measure of the resources used to harvest a fishery’s stocks. The measure of effort appropriate for a fishery depends on the methods used and the management arrangements. Common measures include the number of vessels, the number of hooks set, and the number of fishing days or nights.

Effort creep. An increase in the efficiency of fishing effort through time. This usually comes about through changes to fishing gear or how fishing is undertaken.

Effort restriction. Restriction of the permitted amount of fishing effort (e.g. number of days fished) in a particular fishery; used as a management tool.

Electronic Monitoring (EM). Use of instrumentation (cameras, sensors) to collect fisheries information on fishing effort, species catch, catch disposition. One tool used in the field of fisheries monitoring. (*c.f.* Observer)

Equilibrium Model: A model that provides the long-term average results for a population given a set of assumptions.

Estimation Model: A single model or multiple models that process data in a simple or complex way to provide output to be considered by harvest control rules.

Escapement. The number, expressed as a percentage, of fish that survive through a particular event (e.g. predation, natural mortality, fishing mortality), often to spawn.

Exclusive Economic Zone (EEZ). The area that extends from the limit of the territorial sea, which is 12 nautical miles offshore from the territorial sea baseline, to a maximum of 200 nautical miles, measured from the territorial sea baseline. The EEZ is less than 200 nautical miles in extent where it coincides with the EEZ of another country. In this case the boundaries between the two countries are defined by treaty.



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Exploitation rate. The fraction of total animal deaths caused by fishing, usually expressed as an annual value. Can also be defined as the proportion of a population caught during a year.

Ex-vessel price. A price per unit of fish that excludes payments for freight, marketing, and processing, as would be paid at the point of landing. Usually expressed as the weight of the fish when whole. (*c.f. Beach price*)

F

F (fishing mortality). The instantaneous rate of fish deaths due to fishing a designated component of the fish stock. F reference points may be applied to entire stocks or segments of the stocks and should match the scale of management unit. Instantaneous fishing mortality rates of 0.1, 0.2, and 0.5 are equivalent to 10%, 18% and 39% of deaths of a stock due to fishing. *See also* Mortality, M (natural mortality).

FCEY (Fishery Constant Exploitation Yield). The amount of yield for the directed Pacific halibut fisheries dependent upon allocation agreements by IPHC Regulatory Area. *See* Constant Exploitation Yield.

F_{XX%} (fishing intensity). The level of fishing intensity that reduces the Spawning Potential Ratio to XX%.

F_{LIM} (fishing mortality limit reference point). The point above which the removal rate from the stock is too high.

F_{MEY} (fishing mortality at maximum economic yield). The fishing mortality rate that corresponds to the maximum economic yield.

F_{MSY} (fishing mortality maximum sustainable yield). The fishing mortality rate that achieves the maximum sustainable yield.

F_{TARG} (fishing mortality target). The target fishing mortality rate.

Fecundity. Number of eggs that a female fish produces each reproductive cycle; the potential reproductive capacity of an organism or population.

Fishery-independent survey. Systematic survey carried out by research vessels or contracted commercial fishing vessels to gather information independently of normal commercial fishing operations.

Fishing capacity. Total fishing effort that can be expended by a fleet operating in a fishery.

Fishing down (fish-down). Reduction in the average age and size of a stock that is being fished for the first time. Catches are highest at first, but the rate cannot be sustained once the abundance of older fish has been reduced.

Fishing effort. Amount of fishing taking place, usually described in terms of gear type and the frequency or period of operations (e.g. ‘hook sets’, ‘trawl hours’, ‘searching hours’).

Fishing intensity. A measure of the total fishing mortality on all sizes and through all sources and may also be thought of as the relative influence of fishing on the equilibrium Spawning Potential Ratio (SPR). An example is F_{SPR=XX%} which indicates a level of fishing that would result in an SPR of XX%.

Fishing period. The period during which a fishery can be accessed by fishers. Sometimes referred to as a fishing year or fishing season.

Fishing power. Effectiveness of a vessel’s fishing effort relative to the effectiveness of other vessels.

Fishing year. *See* Fishing season.

Flag state. State under whose laws a vessel is registered and whose flag it is entitled to fly.

Fork length (FL). Length of a fish measured as the distance between the tip of the snout and the point of the fork or ‘V’ of the tail. Commonly used to record the length of commercial fish because it is little affected by damage to the tail fin (*c.f.* Total length). Fork length is measured flat, from point to point, not by stretching a tape along the body surface.

G

Gangion. Short lines attached to a larger mainline, each with a fishing hook attached at the end.

Gear restriction. Restriction on the amount and/or type of fishing gear that can be used by fishers in a particular fishery; used as a management tool.

Generation time. Average time taken for an individual animal to replace itself in a population.

Ghost fishing. The capture of fish in gear that has been lost.

Gillnet. Type of passive fishing gear consisting of panels of net held vertically in the water column, either in contact with the seabed or suspended from the sea surface, such that fish attempting to swim through the net are entangled. The mesh size of the net determines the size range of fish caught, as smaller fish can swim through the meshes and larger fish are not



enmeshed. *See also* Driftnet.

Gross value of production (GVP). A value found by multiplying the volume of catch by the beach price per unit. In the case of a multispecies fishery, the fishery's GVP is the sum of the GVP of each species. GVP is not a good indicator of economic performance because it does not consider costs.

Growth model. Mathematical description or representation of the rate at which a species grows at different sizes or ages.

Growth overfishing. The harvesting of fish at too small a size; where catching them at a larger size would result in an overall increase in a fishery's yield.

H

Handline. Hand-held lines of various types used to catch fish.

Harvest control rule (HCR). *See* Control rules.

Harvest rate: The proportion of a specific component (exploitable) of the population that is harvested. This is commonly used for individual fisheries, but is difficult to compare among fisheries or combine across fisheries because the specific components typically differ between fisheries.

Harvest strategy. Strategy outlining how the catch in a fishery will be adjusted from year to year possibly depending on the size of the stock, the economic or social conditions of the fishery, conditions of other interdependent stocks and uncertainty of biological knowledge. Well-managed fisheries have an unambiguous (explicit and quantitative) harvest strategy that is robust in the unpredictable biological fluctuations to which the stock may be subject. A harvest strategy sets out the management actions necessary to achieve defined biological and economic objectives in a given fishery. Harvest strategies must contain 1) a process for monitoring and conducting assessments of the biological and economic conditions of the fishery, and 2) rules that control the intensity of fishing activity according to the biological and economic conditions of the fishery (as defined by the assessment). These rules are referred to as harvest control rules.

Harvest strategy policy. The harvest strategy combined with a final step of policy decision making which may depart from the harvest strategy.

High grading. A type of discarding motivated by an output control system. Depending on the costs of fishing and price differences between large and small fish of the same species, fishers may have an incentive to discard small, damaged, or relatively low-value catch so that it does not count against their quota (or bag limit). They then hope to fill the quota (or bag limit) with a higher-value fish in the future.

High-seas. Waters outside national jurisdictions.

I

Index of abundance. Relative measure of the abundance of a stock (e.g. catch per unit of effort).

Individual fishing quota (IFQ). Shares of the total allowable catch for an area that are issued to eligible individuals within a fishery. Used in the Pacific halibut fishery operating in Alaska.

Individual transferable effort (ITE). Shares of a total allowable effort that are allocated to individuals. They can be traded permanently or temporarily. Analogous to individual transferable quotas in a fishery managed with a total unit allowable catch. Usually issued at the start of a fishing season.

Individual transferable quota (ITQ). Management tool by which portions of the total available catch quota are allocated to fishers (individuals or companies). The fishers have long-term rights over the quota but can trade quota with others. *See also* Quota.

Individual vessel quota (IVQ). Shares of the total allowable catch for an area that are issued to eligible vessels within a fishery. Used in the Pacific halibut fishery operating in British Columbia.

Input controls. Management measures that place restraints on who fishes (licence limitations), where they fish (closed areas), when they fish (closed seasons) or how they fish (gear restrictions).

IPHC Regulatory Areas. Eight management zones (2A, 2B, 2C, 3A, 3B, 4A, 4B, 4CDE) used for regulatory purposes. Area 4CDE is further divided for allocation purposes.

Isobath. Contour line linking points of the same depth.

Isotherm. Contour line linking points of the same temperature.



J

Joint venture. Collaborative fishing operation, usually involving two companies from different countries.

Juvenile. Post-settlement fish, mostly similar in form and coloration to adult fish, that are yet to attain sexual maturity.

K

Key commercial species. A species that is, or has been, specifically targeted and is, or has been, a significant component of a fishery.

L

Larva. Stage or stages in early development that take place between the time of hatching and the juvenile stage. Egg and larval stages for Pacific halibut are pelagic.

Latency. Fishing capacity that is authorised for use but not currently being used. Depending on how a fishery is managed, latency might appear as latency in effort (e.g. unused vessels, gear, quota, permits or nights fishing) or latency in quota (e.g. where TACs are not fully caught in a quota-managed fishery). It is a low-cost indicator of fishers' views about the profitability of a fishery. High levels of latency can suggest that low profits in the fishery do not justify fishing. It is likely that fisheries in which latency exists are close to the open-access equilibrium. Apart from being an indicator of efficiency, latency can also be detrimental to the fish stock and to any chances the fishery may have of being profitable in the future. For example, a significant increase in the market price of a fishery's product is likely to entice inactive effort into the fishery. Under input controlled fisheries, if enough inactive effort is triggered, the fish stock could be jeopardised and/or profits dissipated as soon as they arise if the fishery is driven to a point of open access equilibrium. In an output controlled fishery, this is less of a problem, providing that TACs are set in accordance with regard to appropriate targets.

Length–frequency distribution; modal size. An estimate of the numbers or proportions of fish of each length group in the catch derived from catch-at-length data. Estimates are expanded from various strata to provide a statistically valid representation of the population. See also catch-at-length composition. The modal size is the length group into which most individuals fall. Some distributions may show several modes, reflecting fish of different ages.

Limited entry fishery. Fishery in which the fishing effort is controlled by restricting the number of operators. Usually requires controlling the number and size of vessels, the transfer of fishing rights, and the replacement of vessels (*c.f.* Open access fishery).

Limit reference point (LRP). A Limit Reference Point indicates the limit beyond which the state of a fishery and / or a resource is not considered desirable.

Line fishing. Fishing methods that use fishing lines in one form or another, including handlines, hand reels, powered reels, pole-and-line, droplines, longlines, trotlines, and troll lines.

Logbook (Fishing). Official record of catch and effort data made by fishers. In many fisheries, a licence condition makes the return of completed logbooks mandatory.

Long-term potential yield. Estimate of the largest annual harvest that could be taken sustainably from a fish stock, allowing for variable environmental conditions. May be estimated in various ways, from taking an average of a time series of historical catches to using sophisticated mathematical models.

Longline. Fishing gear in which short lines (branchlines, droppers, or gangions) carrying hooks are attached to a longer main line at regular intervals. Pelagic longlines are suspended horizontally at a predetermined depth with the help of surface floats. The main lines can be as long as 100 km and have several thousand hooks. Droppers or gangions on demersal longlines (set at the seabed with weights) are usually more closely spaced. Demersal longlines are used in the Pacific halibut fishery.

M

M (natural mortality). Deaths of fish from all causes except fishing. Usually expressed as an instantaneous rate or as a percentage of fish dying in a year. *See also* F (fishing mortality), Mortality.

Mainline. Longline fishing gear consists of a mainline kept near the surface or at a particular depth by means of regularly spaced floats or weights. Gangions (branchlines) with baited hooks are attached to the mainline at regular intervals.

Management objectives. The social, economic, biological, ecosystem, and conservation goals specified for a given management unit (e.g. stock).

Management options. Alternative management procedures from which recommended management actions will be chosen.



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Management procedure. A set of formal actions, usually consisting of data collection, stock assessment (or other indicators), and harvest control rules, able to iteratively and adaptively provide robust decisions to manage a fishery.

Management strategy evaluation (MSE). Procedure whereby alternative management procedures' performance are tested and compared using stochastic simulations of stock and fishery dynamics against a set of management objectives.

Maximum economic yield (MEY). The sustainable catch level for a commercial fishery that allows net economic returns to be maximised. Note that for most practical discount rates and fishing costs, MEY will imply that the equilibrium stock of fish is larger than that associated with MSY. In this sense, MEY is more environmentally conservative than MSY and should, in principle, help protect the fishery from unfavourable environmental impacts that may diminish the fish population.

Maximum sustainable yield (MSY). The maximum average annual catch that can be removed from a stock over an indefinite period under prevailing environmental conditions. MSY defined in this way makes no allowance for environmental variability, and studies have demonstrated that fishing at the level of MSY is often not sustainable (*c.f.* Long-term potential yield).

Measurable Objective: An objective that has an associated outcome, time-frame, and risk tolerance, and is typically developed from one of the goals. For example, if the goal is to have a healthy stock, the measurable objective be to keep the population above 20% of unfished biomass (outcome), in the long-term measured over a 10 year period (time-frame), with a probability of 99% (risk tolerance of 1%).

Migration. Non-random movement of individuals of a stock from one place to another, often in groups.

Minimum size. Size below which a captured animal may not legally be retained. Usually specified by species. May be varied as a management tool.

Minor line. Refers to several line-fishing methods, including trolling or fishing using a rod and reel, handline, or pole-and-line.

Mode; modal size. *See* Length–frequency distribution.

Model (population). Hypothesis of how a population functions; often uses mathematical descriptions of growth, recruitment and mortality.

Multi-Area Model: A coastwide model of a population where the dynamics are modeled using more than one area. These areas are not necessarily management areas, but assumptions of area-specific dynamics (e.g., migration, recruitment, growth, etc.) are necessary.

N

Nautical mile (nm). A unit of distance derived from the angular measurement of one minute of arc of latitude but standardised by international agreement as 1,852 metres (sometimes denoted as nmi).

Neritic. Designating, or of, the ecological zone (neritic zone) of the continental shelf extending from low tide to a depth of around 180 m.

Net economic returns (NER). A fishery's net economic return over a particular period is equal to fishing revenue less fishing costs. Fishing costs include the usual accounting costs of fuel, labour and repairs and maintenance, as well as various economic costs such as the opportunity costs of labour and capital. These measure how much these resources would have been compensated had they been operating in the next best alternative. The concept of net economic returns is very closely related to economic efficiency. Only in an economically efficient fishery will net economic returns be maximised.

Net weight. The weight of a fish with head and internal organs removed. In Pacific halibut, that is approximately 75% of the round weight. (*c.f.* round weight)

Non-target species. Species that are unintentionally taken by a fishery or not routinely assessed for fisheries management. *See also* Bycatch, Byproduct.

Not overfished. *See* Overfished.

Nursery ground. Geographic area where Pacific halibut larva settle in large numbers and where they remain for a period of growth prior to initiating large-scale dispersal.

O

O26. Pacific halibut greater than or equal to 26 inches (66 cm) fork length. *See* U26.

O32. Pacific halibut greater than or equal to 32 inches (81.6 cm) fork length. *See* U32.

Observer. Independent specialist (deployed by a government or third party contractor) who serves on board commercial fishing vessels,



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or in fish processing plants to monitor and collect data on fishing effort, retained and discarded catch. Data collected by observer programs is a cornerstone for bycatch estimation and monitoring. (*c.f. Electronic Monitoring*)

Oceanic. Open-ocean waters beyond the edge of the continental shelf.

Offshore waters. Usually oceanic waters, but can refer to outer continental shelf waters.

Open access fishery. Fishery in which there is no limit on the number of operators or vessels (*c.f. Limited entry fishery*).

Operating model. Model simulation of stock and fishery dynamics, including sources of uncertainty, used in management strategy evaluation.

Opportunity cost. The compensation a resource forgoes by being employed in its present use and not in the next best alternative. For example, the opportunity costs incurred by the skipper of a fishing vessel is the amount they would have received by applying their skill and knowledge in the next best alternative occupation. The opportunity cost of owning a fishing vessel might be the interest that could be earned if the vessel was sold and the capital invested elsewhere. These costs are not usually reflected in a firm's financial accounts but are very important costs nonetheless.

Otoliths. Bone-like structures formed in the inner ear of organisms. In Pacific halibut and many other fish species, the rings or layers can be counted to determine age.

Output controls. Management measures that place restraints on what is caught, including total allowable catch, quota, size limits and species.

Overfished. A fish stock with a biomass below the biomass limit reference point (SB_{LIM}) (*c.f. Not overfished*).

Overfishing, subject to. A stock is experiencing too much fishing and the removal rate from the stock is unsustainable. Fishing mortality (F) exceeds the limit reference point ($FLIM$). Any directed (targeted) fishing of an overfished stock (stock level is below SB_{LIM}) will amount to overfishing.

P

Parameter. Characteristic feature or measure of some aspect of a stock, usually expressed as a numerical value (e.g. *see M* (natural mortality)).

Parental biomass. Weight of the adult (reproductively mature) population of a species. *See also* Spawning biomass.

Pelagic. Inhabiting the upper layers of the water column rather than the sea floor. Usually applied to free-swimming species such as tunas and sharks (*c.f. Demersal*).

Performance metrics/indicators. A set of consistent statistics used to evaluate how well management objectives have been achieved.

Population structure. Composition of a population in terms of size, stock (genetic or regional), age class, sex, etc.

Potential yield. *See* Long-term potential yield.

Precautionary approach. Approach to resource management in which, where there are threats of serious irreversible environmental damage, lack of full scientific certainty is not used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and an assessment of the risk-weighted consequences of various options.

Productivity (biological). An indication of the birth, growth, and death rates of a stock. A highly productive stock is characterised by high birth, growth and mortality rates, and can sustain high harvesting rates.

Productivity (economic). The ability of firms or an industry to convert inputs (labour, capital, fuel etc.) into output. Economic productivity is often measured using productivity indexes which shows whether more or less output is being produced over time with a unit of input. The index is calculated by comparing changes in total output (fish) to changes in total inputs such as fuel, labour and capital.

Profit, accounting. The difference between total revenue and explicit costs. Explicit costs refers to costs such as wages, fuel, repairs, maintenance, and depreciation of physical capital (e.g. vessels). Where costs exceed total revenue, it is an accounting loss. Unlike economic profit, it does not include opportunity cost. *See also* Profit, economic.

Profit, economic. The difference between total revenue and explicit and opportunity costs (*see* Opportunity cost). Explicit costs refer to costs such as wages, fuel, repairs, and depreciation of physical capital (e.g. vessels). Economic profit differs from accounting profit in that opportunity cost is not considered in accounting profit. *See also* Profit, accounting.

Q

Quota. Amount of catch allocated to a fishery as a whole (total allowable catch) or to an individual fisher or company (e.g. individual transferable quota).



Quota species. Species for which catch quotas have been allocated.

R

Rebuilding plan. Management plan to rebuild a stock when the measure of its status (e.g. its biomass) is below the (biomass) limit reference point (i.e. it is assessed as overfished). Stock rebuilding plans should include elements that define rebuilding targets, rebuilding time horizons and control rules related to the rate of progress.

Recovery plan. Management process to rebuild a stock when a measure of its status (e.g. its biomass) is outside a defined limit (i.e. it is assessed as overfished). Recovery plans should include elements that define stock-specific management objectives, harvesting strategies specified by control rules and recovery periods.

Recreational fishery. (formerly called sport) include recreational landings (including landings from commercial leasing) and discard mortality.

Recruit. Used in relation to a fish joining a specific population component (e.g. a recruit to the population, spawning stock, or fishery).

Recruitment. Process by which new fish are incorporated into the stock. The number of fish surviving to enter the fishery or to some life history stage such as settlement or maturity.

Recruitment overfishing. Excessive fishing effort or catch that reduces recruitment such that a reduction in fishing would generate a greater average yield.

Reference point. Indicator of the level of fishing (or stock size); used as a benchmark for assessment (*see also* Biological reference point).

Ricker curve/function. Mathematical function that describes the relationship between stock size and recruitment.

Risk analysis. Analysis that evaluates the possible outcomes of various harvesting strategies or management options.

Round weight. Weight of a (generally fresh) fish prior to dressing/processing so that head, gills, and internal organs are intact.

S

SB (spawning biomass). The total weight of all adult (reproductively mature) female fish in a population. Also called ‘spawning stock biomass’.

SB₀. The average total weight of all adult (reproductively mature) fish in a population before fishing occurred.

SB_{MSY}. Spawning or ‘adult’ equilibrium biomass at MSY.

Scenario: A specific set of assumptions for the operating model to determine how the population and fishery are simulated. These assumptions are what we cannot (or choose not to) control and include three broad categories: 1) dynamics that are completely out of our control, such as size-at-age, recruitment patterns, acts of nature, etc., 2) aspects that may be under the control of others, but a management procedure would not apply to (e.g., some fishery dynamics such as where they choose to fish), and 3) management procedures that we choose not to control (e.g. bycatch).

Seacat. An oceanographic instrument manufactured by Seabird Electronics Inc. used to collect environmental data (pressure, temperature, salinity, dissolved oxygen, pH, and chlorophyll concentration) throughout the water column.

Seasonal closure. Closure of a fishing ground for a defined period; used as a management tool, often to protect a particular component of the stock.

Set. Pertaining to each separate deployment of a fishing gear by a fishing or survey vessel

Settlement. The physiological transition from a pelagic larval stage to a substrate-associated juvenile stage.

Simulation. An imitation of a real world system used to gain insight into how the system operates.

Single-area model: A coastwide model of the population where the dynamics are modeled as one area (i.e. no migration).

Size-at-age. Length or weight of fish at a particular age.

Size-at-first-maturity. Length or weight of fish when they reach reproductive maturity.

Size–frequency. *See* Length–frequency distribution.

Spawner-per-recruit (spawner-recruit). An index that gives the number or biomass of spawners of age X divided by the initial number of recruits.

Species group. Group of similar species, often difficult to differentiate without detailed examination.



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Spawning potential ratio (SPR). The SPR is the average fecundity of a recruit over its lifetime when the stock is fished, divided by the average fecundity of a recruit over its lifetime when the stock is unfished. Lower values indicate higher fishing intensity.

Standardised data. Data that have been adjusted to be directly comparable to a unit that is defined as the ‘standard’ one. For example, catch per unit effort data are often used as an indicator of fish abundance.

Standard length (SL). The length of a fish measured from the tip of the snout to the posterior end of the last vertebra or to the posterior end of the mid-lateral portion of the hypural plate.

Steepness. Steepness (h) is conventionally defined as the proportion of unfished recruitment (R_0) that would be expected to be produced if the spawning biomass were reduced to 20% of unfished spawning biomass (S_0). Stocks with high steepness produce many more births than deaths on average when the spawning stock is reduced to low levels by fishing. A greater excess of births over deaths means that a stock with high steepness enables a greater number of individuals to be taken from the stock sustainably, by fishing, than a comparable stock with lower steepness. The steepness of a stock is typically both very difficult to estimate and highly influential on harvest policy and stock assessment model outputs such as maximum sustainable yield and spawning stock biomass. It therefore represents a major source of uncertainty in most comprehensive stock assessments.

Stock. Functionally discrete population that is largely distinct from other populations of the same species and can be regarded as a separate entity for management or assessment purposes.

Stock distribution. Estimate of the geographical distribution for a component of the stock. See catch distribution.

Stock recruitment. *See* Recruit, Recruitment

Stock–recruitment relationship. Relationship between the size of the parental biomass and the number of recruits it generates. Determination of this relationship is difficult, and involves studying the population’s size–age composition, growth and mortality rates.

Straddling stock. Migratory species that spend part of their life cycle in two or more jurisdictions, especially those that migrate between EEZs and the high seas.

Subsistence fisheries. (formerly called personal use/subsistence): are non-commercial, customary, and traditional use of Pacific halibut for direct personal, family, or community consumption or sharing as food, or customary trade. Subsistence fisheries include:

- i) ceremonial and subsistence (C&S) removals in the Regulatory Area 2A treaty Indian fishery,
- ii) the sanctioned First Nations Food, Social, and Ceremonial (FSC) fishery conducted in British Columbia,
- iii) federal subsistence fishery in Alaska that uses Alaska Subsistence Halibut Registration Certificate (SHARC), and
- iv) U32 Pacific halibut retained in Regulatory Areas 4D and 4E by the CDQ fishery for personal use.

Surplus-production. The biomass that could be harvested as a point in time which would result in the same stock size the following year.

Surplus-production model. Mathematical representation of the way a stock of fish responds to the removal of individuals (e.g. by fishing).

Sustainable yield. Catch that can be removed over an indefinite period without reducing the biomass of the stock. This could be either a constant yield from year to year, or a yield that fluctuates in response to changes in abundance.

T

Tagging. Marking or attaching a tag to an animal so that it can be identified when recaptured or tracked during a certain period of time; used to study fish growth, movement, migration, stock structure, injury survival, and size. *See also* Archival tag.

Target fishing (targeting). Fishing selectively for particular species or sizes of fish.

Target reference point (TRP). A state of a fishery and / or a resource which is considered desirable.

Target species. *See* Key commercial species.

Taxonomic group. An organism’s location in the biological classification system; used to identify and group those with similar physical, chemical and/or structural composition.

TCEY distribution. The management procedure for distributing the TCEY among IPHC Regulatory Areas. This may be comprised of stock distribution and management procedures unrelated to stock distribution.

Tori line. Line with streamers, towed as a scaring device over the area behind a vessel where sinking baited hooks are within range of diving seabirds; attached to a tori pole (boom) at the vessel’s stern.



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Total allowable catch (TAC). For a fishery, a catch limit set as an output control on fishing (*see also* TCEY).

Total allowable effort (TAE). An upper limit on the amount of effort that can be applied in the fishery.

Total Constant Exploitation Yield (TCEY). The TCEY corresponds approximately to the mortality comprised of Pacific halibut greater than 26 inches (66 cm) in length. See Constant Exploitation Yield

Total length (TL). The length from the tip of the snout to the tip of the longer lobe of the caudal fin, usually measured with the lobes compressed along the midline. It is a straight-line measure, not measured over the curve of the body (*c.f.* Fork length).

Total mortality. A tally of all deaths in a fish stock caused by fishing during a certain period of time (often annual). Synonymous with total removals.

Total removals. A tally of all deaths in a fish stock caused by fishing during a certain period of time (often annual). Synonymous with total mortality.

Trigger catch limit. When catches reach this limit, management actions are triggered to assess whether fishing should continue and at what level.

Trigger reference point (TrRP). A particular state of the system that triggers a predefined change in the management response.

U

U26. Pacific halibut less than 26 inches (66 cm) fork length. Removals of these fish are not explicitly included in the Total Exploitation Yield (TCEY).

U32. Pacific halibut less than 32 inches (81.3 cm) fork length. This corresponds to the current minimum size limit imposed by the IPHC on the directed commercial fishery.

Uncertain. Status of a fish stock that might be overfished or not overfished, subject to overfishing or not subject to overfishing, but for which there is inadequate or inappropriate information to make a reliable assessment.

Underfished. Status of a fish stock that has potential to sustain catches higher than those currently taken. Not applied to stocks where catches have been limited to enable the stock to rebuild. *See also* Overfished.

V

Vessel-level efficiency. Vessel-level efficiency requires that revenues be maximised and catching costs be minimised for a given quantity of catch. The choice of management regime will have a substantial bearing on whether vessel-level efficiency is achieved, as it largely defines the incentive structure that fishers operate within.

Vessel monitoring system (VMS). Electronic device that transmits the identity and location of a vessel.

Viability assessment: evaluating the severity of injuries and responsiveness of fish to be discarded. Viability categories are used in the determination of likelihood of post release survival. (*c.f.* DMR)

Virgin biomass. Average equilibrium biomass of a stock that has not been fished (SB_0 ; also called the ‘unfished’ or ‘unexploited’ biomass).

W

Water column profiler. Oceanographic instrument used to collect environmental data throughout the water column. (see also Seacat).

Weight-Per-Unit-Effort (WPUE). The catch (by weight) of Pacific halibut per standardized skate of longline gear (1,800-foot skate of gear, with 100 hooks at an 18-foot spacing). This metric is used to compare catch-rates between the IPHC’s fishery-independent setline survey and the directed commercial Pacific halibut fishery and temporal trends in each.

X

Nil

Y

Year class. Individuals spawned in the same year (or spawning season, when that spans the end of one year and the beginning of the next).



Yield. Total weight of fish harvested from a fishery.

Yield-per-recruit analysis. Analysis of how growth, natural mortality, fishing mortality and fishing selectivity interact to determine the optimal size of animals to harvest; for example, it may be more economically beneficial to catch fish when they are young and plentiful, or when they are older and larger but fewer.

Z

Nil

ACRONYMS AND ABBREVIATIONS

B	Biomass (total)
B _{MSY}	Biomass which produces MSY
BRD	Bycatch reduction device
CDQ	Community Development Quota
CE	Catch-and-effort
CEY	Constant Exploitation Yield
CI	Confidence interval
CPUE	catch per unit effort
current	Current period/time, i.e. F _{current} means fishing mortality for the current assessment year
CV	Coefficient of variation
EBSA	Ecologically or biologically significant marine areas
EZ	Exclusive Economic Zone
ERA	ecological risk assessment
F	Fishing mortality; F ₂₀₁₆ is the fishing mortality estimated in the year 2016
FCEY	Fishery Constant Exploitation Yield
FL	Fork length
F _{MSY}	Fishing mortality at MSY
GAM	Generalized additive model
GIS	Geographic information system
GLM	Generalised linear model
GVP	Gross value of production
HCR	Harvest control rule
HS	Harvest strategy
HSF	Harvest strategy framework



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IBQ	Individual bycatch quota
IFQ	Individual fishing quota
ITQ	Individual transferable quota
IVQ	Individual vessel quota
IUU	Illegal, unregulated and unreported (fishing)
LJFL	Lower-jaw fork length
LRP	Limit reference point
LL	Longline
M	Natural Mortality
MEY	Maximum economic yield
MOU	Memorandum of understanding
MP	Management procedure
MPA	Marine Protected Area
MSE	Management strategy evaluation
MSY	Maximum sustainable yield
n.a.	Not applicable
NGO	Non-governmental organization
OM	Operating model
OT	Overseas Territory
PIT	Passive integrated transponder (tag)
PDO	Pacific Decadal Oscillation
PSA	Productivity Susceptibility Analysis
PSAT (PAT)	Pop-up satellite tag
q	Catchability
RBC	Recommended biological catch
RFMO	Regional fisheries management organisation
SB	Spawning biomass (sometimes expressed as SSB)
SB _{MSY}	Spawning stock biomass which produces MSY
SE	Standard error
SPR	Spawning Potential Ratio
SS3	Stock Synthesis III



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SSB	Spawning stock biomass
TAC	Total allowable catch
TAE	Total allowable effort
TCEY	Total Constant Exploitation Yield
TEP	Threatened, endangered or protected (species)
TOR	Terms of reference
TRP	Target reference point
TrRP	Trigger reference point
VME	Vulnerable marine ecosystems
VMS	Vessel Monitoring System

UNITS

'	minutes of latitude or longitude (for example, 34° 20' S)
°E, °N, °S, °W	degrees east, north, south, west of Greenwich
°C	degrees Celsius
cm	centimeter
kg	kilogram
km	kilometre
km ²	square kilometre
m	metre
mm	millimetre
nm	nautical mile
t	tonne (metric ton, 1000 kg)