

Glossary

abundance. The number of individuals in a stock or a population.

abundance index. Information obtained from samples or observations and used as a measure of the number of fish that make up a stock.

acclimate. The adaptation of an organism to environmental changes.

acclimation pond. Concrete or earthen pond or a temporary structure used for rearing and imprinting juvenile fish in the water of a particular stream before their release into that stream.

acoustic survey. Sonar equipment used to count fish. Sound waves are sent out from a moving research vessel or fixed riverside location, strike fish and are reflected back.

active gear. Active gear moved through the water either by machinery or human power and includes beach seine nets, pole seine nets, purse seine nets, trawl nets, electrofishing (shocking), boat shocking and all types of angling.

adaptive management. A systematic process for continually improving management policies and practices by learning from the outcomes of operational programs. Its most effective form—"active" adaptive management—employs management programs that are designed to experimentally compare selected policies or practices, by implementing management actions explicitly designed to generate information useful for evaluating alternative hypotheses about the system being managed.

adfluvial. Possessing a life history trait of migrating between lakes or rivers and streams.

adipose fin. Modified rayless posterior dorsal fin in some fishes. a small, tapered, fleshy lobe with no rays, located on the dorsal surface between the dorsal and caudal fins.

affluent (stream). A stream or river that flows into a larger one; a tributary.

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 5, age 5+).

age composition. Proportion of individuals of different ages in a stock or in the catches.

age-class. A group of individuals of a certain species that have the same age.

alevin. Newly hatched salmon when still attached to the yolk sac. The life stage of a salmonid between hatching from the egg and emergence from the stream gravels as a fry. The alevin stage is characterized by the presence of a yolk sac, which provides nutrition while the alevin develops in the protected gravel riverbed.

alluvial. Originating from the transport and deposition of sediment by running water.

anadromous. Fish that hatch and rear in fresh water, migrate to the ocean (salt water) to grow and mature, and migrate back to fresh water to spawn and reproduce. Highly specialized to endure the changes in salinity.

anal fin. Unpaired fin located on the ventral surface posterior to the anus.

annual total mortality rate. The number of fish which die during a year (or season), divided by the initial number. Also called "actual mortality rate" or "coefficient of mortality".

annulus. A mark or ring that forms annually on the otoliths, scales, and other bones of fish, that correspond to the annual period of slow growth that fish go through. Annuli are used by fish managers to determine age and growth of fish.

anthropogenic. Human induced.

aquaculture. The controlled cultivation and harvest of aquatic plants or animals (e.g., edible marine algae, clams, oysters, mussels, and salmon). Also known as marine farming.

aquatic ecosystem. The natural systems of interacting aquatic life within the biological and physical aquatic environment.

area frame. A sampling frame that is designated by geographical boundaries within which the sampling unites are defined as subareas.

artificial propagation. Any assistance provided by human technology to animal reproduction. In the context of Pacific salmonids, this assistance includes (but is not necessarily limited to) spawning and/or rearing in hatcheries, captive broodstock projects, or the use of remote site incubators.

attributes. any living or nonliving feature or process of the environment that can be measured or estimated and that provide insights into the state of the ecosystem. The term Indicator is reserved for a subset of attributes that is particularly information-rich in the sense that their values are somehow indicative of the quality, health, or integrity of the larger ecological system to which they belong (Noon 2003). See Indicator.

beach seining. A fishing method where a net and a length of rope are laid out from and back to the shore and retrieved by hauling on to the shore.

benthic. bottom-dwelling; living on the substrate or sea bed

biodiversity. The variety and abundance of species, their genetic composition, and the natural communities, ecosystem, and landscapes in which they occur.

biological diversity. The variety of species in a community, sometimes expressed by various quantitative measures which reflect not only the total number of species present but also the degree of domination of the system by a small number of species. Includes genetic diversity (within species), species diversity (within ecosystems) and ecosystem diversity. Diversity indices measure the richness (the number and relative numeric abundance) of species in a system, and the connections between them but are indifferent to species substitution, which may, however, reflect ecosystem stress (such as those due to high fishing intensity).

biological significance. An important finding from a biological point of view that may or may not pass a test of statistical significance.

biomass. Total weight of all individuals in a stock or a population.

blue listed species. Any species considered sensitive or vulnerable (in British Columbia). These are indigenous (native) species that are not immediately threatened but are particularly at risk for reasons including low declining numbers, a restricted distribution or occurrence at the fringe of their global range.

brackish water. A mixture of freshwater and seawater.

brailer bags. Huge bags used to carefully lift the salmon catch from fishing boats to the dock.

branchial plume. respiratory structure or external gills, usually located on the dorsal side toward the posterior

branchiostegal ray. One group of dermal bones/rays that close the branchial or gill cavity under the head.

brood stock. Adult fish used to propagate the subsequent generation of hatchery fish.

button-up fry. A salmonid fry that has not completely absorbed its yolk sac and has emerged from its spawning gravel.

by-catch. These are the other fish species, birds and marine mammals that fishers may catch while targeting a specific species.

cascade. A series of small steep drops increasing the velocity of the stream.

cast netting (also **throw netting**). A method of fishing where a circular net weighted around the edges is thrown over fish in the shallows.

catadromous. Refers to fishes that migrate from fresh water to salt water to spawn or reproduce such as the American eel.

catch-per-unit-effort. (CPUE) The catch of fish, in numbers or in weight, taken by a defined unit of fishing effort. Also called; catch per effort, fishing success, availability. Ex number of trout per hour, kg of fish per surface area of water seined.

catchment. The area which supplies water by surface and subsurface flow from precipitation to a given point in the drainage system.

caudal fin. The tail fin.

caudal peduncle. The tapering portion of a fish's body between the posterior edge of the anal fin base and the base of the caudal fin.

channelized. A portion of a river channel that has been enlarged or deepened, and often has armored banks.

chinook salmon. An anadromous salmonid of the genus *Oncorhynchus* and species *tshawytscha*. Also known as king, spring, or blackmouth salmon.

chum salmon. An anadromous salmonid of the genus *Oncorhynchus* and species *keta*. Also known as dog salmon, because of the large canine teeth they develop during spawning.

coastal juveniles. Juvenile salmonids inhabiting the waters of the continental shelf.

coded-wire tag (CWT). A small (0.25mm diameter × 1 mm length) wire etched with a distinctive binary code and implanted in the snout of a salmon or steelhead, which, when retrieved, allows for the identification of the origin of the fish bearing the tag. A specialized tag reader detects tags. Codes are applied to batches of fish to also allow identification of stocking date and location. This data is important to assess the impact of a stocking program.

coho salmon. An anadromous salmonid of the genus *Oncorhynchus* and species *kisutch*. Also known as silver or hooknose salmon.

co-location. Sampling of the same physical units in multiple monitoring protocols

compensatory mortality. Mortality is compensatory when the mortality rate (i.e., proportion of population affected) decreases as the population size decreases. This is in contrast to depensatory mortality, where the rate increases as the size of the population decreases.

conceptual Models. purposeful representations of reality that provide a mental picture of how something works to communicate that explanation to others.

conspecific. Individuals of the same species.

critical stock. A stock of fish experiencing production levels that are so low that permanent damage to the stock is likely or has already occurred.

critical stream flow period (CSFP). The period of lowest stream flow that the juvenile fish will encounter during the main growing season (occurs throughout most of western North America between August and October). This period represents the stream conditions most likely to limit fish production.

cubic feet per second. A measurement of stream flow; noted as ft³/s.

cycloid scales. Smooth, flat, round scales that have concentric lines called circuli, found on trout, herring, and other fish.

declining fishery. The state a fishery is said to be in when a fish stock is overfished.

delta. An alluvial landform, typically triangular in shape, composed of sediment at a river mouth that is shaped by river discharge, sediment load, tidal energy, land subsidence, and sea-level changes.

deme. Reproductive or breeding unit (spawning site) comprised of individuals who are likely to breed with each other (i.e., well mixed). A single population may include more than one deme and demes may be partially isolated from one another. Their partial isolation may or may not be persistent over generations. There will always be at least as many demes as populations.

depensatory mortality. Mortality is depensatory when its rate (i.e., proportion of population affected) increases as the size of the population decreases. This is in contrast to compensatory mortality where the mortality rate decreases as the population size decreases.

depressed stock. A stock of fish whose production is below expected levels based on available habitat and natural variations in survival levels, but above the level where permanent damage to the stock is likely.

descaling. A condition in which a fish has lost a certain percentage of scales.

detritus. Organic fragments of plant or animal matter.

dimorphism. Occurring in two distinct forms, as in sexual dimorphism, describing physical differences in the sexual forms of an organism.

dorsal fin. The fin located on the back of fishes, and in front of the adipose fin, if it is present.

drainage basin. A watershed is defined by the stream that drains it. It is the surface area that collects and discharges runoff through a given point on a stream.

drift netting. A fishing method used for catching pelagic fish, the vessel remains tied to one end of the net to stop it drifting too far. Fish swim into the net and are caught behind the gills.

driver. The major external driving forces that have large-scale influences on natural systems. Drivers can be natural forces or anthropogenic.

echo sounders. An instrument that sends out an acoustic pulse in water and measures distances in terms of the time for the echo of the pulse to return.

ecological integrity. a concept that expresses the degree to which the physical, chemical, and biological components (including composition, structure, and process) of an ecosystem and their relationships are present, functioning, and capable of self-renewal. Ecological integrity implies the presence of appropriate species, populations and communities and the occurrence of ecological processes at appropriate rates and scales as well as the environmental conditions that support these taxa and processes.

ecosystem. Defined as, "a spatially explicit unit of the Earth that includes all of the organisms, along with all components of the abiotic environment within its boundaries" (Likens 1992). A community of plants, animals and other organisms that interact with each other and with the physical environment. Rainforests, deserts, coral reefs and grasslands are examples of ecosystems.

ecosystem drivers. Major external driving forces such as climate, fire cycles, biological invasions, hydrologic cycles, and natural disturbance events (e.g., earthquakes, droughts, floods) that have large scale influences on natural systems.

ecosystem management. The process of land-use decision making and land-management practice that takes into account the full suite of organisms and processes that characterize and comprise the ecosystem. It is based on the best understanding currently available as to how the ecosystem works. Ecosystem management includes a primary goal to sustain ecosystem structure and function, a recognition that ecosystems are spatially and temporally dynamic, and acceptance of the dictum that ecosystem function depends on ecosystem structure and diversity. The whole-system focus of ecosystem management implies coordinated land-use decisions.

egg-to-smolt survival. The numerical difference between the number of fertilized eggs produced by a groups of fish and the number of smolts resulting from those eggs.

embeddedness. The degree to which dirt is mixed in with spawning gravel.

emergence. The process during which fry leave their gravel spawning nest and enter the water column.

emigration. Referring to the movement of organisms out of an area. See immigration and migrating.

endemic. Confined to a given or defined geographic area.

enhancement. The application of biological and technical knowledge and capabilities to increase the productivity of fish stocks. It may be achieved by altering habitat attributes (e.g., habitat restoration) or by using fish culture techniques (e.g., hatcheries, production spawning channels).

escapement. The quantity of sexually mature adult salmon (typically measured by number or biomass) that successfully pass through a fishery to reach the spawning grounds. This amount reflects losses resulting from harvest, and does not reflect natural mortality, typically partitioned between enroute and pre-spawning mortality. Thus, escaped fish do not necessarily spawn successfully. (Note: "escapement" is a harvest-centered term; we encourage the development of other terminology, as we do not believe the natural migratory path of salmonids denotes an escape from capture.)

escapement goal. A predetermined biologically derived number of salmonids that are not harvested and will be the parent spawners for a wild or hatchery stock of fish.

estuary. An area at the mouth of a river or stream where salt water and fresh water meet.

euryhaline. Having a wide tolerance to salinity.

eutrophication. To add nutrients to.

evolutionarily significant unit (ESU). The U.S. National Oceanic and Atmospheric Administration (NOAA) definition of a distinct population segment that is smallest biological unit that will be considered to be a "species" under the U.S. Endangered Species Act. A population will be considered to be an ESU if (1) it is substantially reproductively isolated from other conspecific population units, and (2) it represents an important component in the evolutionary legacy of the species.

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.

extinct stock. A stock of fish that is no longer present in its original range, or as a distinct stock elsewhere. Individuals of the same species may be observed in very low numbers, consistent with straying from other stocks.

extirpation. The elimination of a species from a particular area.

eyed egg. A fish egg containing an embryo that has developed enough so the eyes are visible through the egg membrane.

fecundity. The number of eggs in the ovaries that are mature or will mature. A common measure of reproductive potential.

fingerling. Juvenile salmonids up to nine months of age and generally 5–10 cm in total length (also called parr). This term is typically used to refer to hatchery juveniles.

fishery. The process of attempting to catch fish, which then may be retained or released.

fishing mortality. Death caused by fishing. Mathematical symbol: F

fish stock. A group of individuals of the same species which are living together in the same area and can intermingle and interbreed freely. Different stocks of the same species, e.g., chinook, can be genetically different.

fishway. A device made up of a series of stepped pools, similar to a staircase, that enables adult fish to migrate up the river past dams.

fitness. The relative ability of an individual (or population) to survive and reproduce in a given environment. Floodplain. The part of a river valley composed of unconsolidated river deposits that periodically floods. Sediment is deposited on the floodplain during floods and through the lateral migration of the river channel across the floodplain. The 100-year floodplain refers to that area of a river valley that is inundated during a large-magnitude flood occurring, on average, once every one hundred years.

fluvial. Migrating between main rivers and tributaries. Of or pertaining to streams or rivers.

focal resources. resources that, by virtue of their special protection, public appeal, or other management significance, have paramount importance for monitoring regardless of current threats or whether they would be monitored as an indication of ecosystem integrity. Focal resources might include ecological processes such as deposition rates of nitrates and sulfates, or they may be a species that is harvested, endemic, alien, or has protected status.

forage fish. Small fish which breed prolifically and serve as food for predatory fish.

fork length. A fish length measurement from the tip of the nose to the fork of the tail fin.

fry. A stage of development in young salmon or trout reflecting a recently hatched fish that can swim and catch its own food. During this stage the fry is usually less than one year old, has absorbed its yolk sac, is rearing in the stream, and is between the alevin and parr stage of development.

galvanotaxis. Response or reaction to electrical stimulus.

gape. To open the mouth wide. In zoological terms, it means the measurement of the widest possible opening of a mouth.

gear restrictions. These are usually imposed to protect young fish, e.g. mesh size restrictions, net size restriction and restrictions on how a net can be set, or to limit by-catch problems.

genetic diversity. The heritable variation within and between populations of species. In this context, this encompasses all the taxonomic classifications below species that are a result of environmental heterogeneity and reproductive isolation.

genetic stock identification. A method that can be used to characterize populations of organisms based on the genetic profiles of individuals. The GSI process consists of a series of steps: (1) collect selected tissues from a representative sample of individuals from the population(s) under investigation; (2) develop genetic profiles for the individuals in each population by conducting starch-gel electrophoresis and histo-chemical staining using tissue extracts; (3) characterize each population by aggregating the individual genetic profiles and computing allele frequency distributions; and (4) conduct statistical tests using the allele counts characterizing each population to identify significantly different populations.

gillnet. Fishing gear; netting with weights on the bottom and floats at the top used to catch fish. Gillnets can be set at different depths and are anchored to the seabed.

gill netting. Commercial fishing with a net that catches the gills of the fish. Salmon swim partway through the mesh and become entangled. Fish are caught when their maxillary or opercular area is caught in the mesh of the net. Fish may also be entangled by their teeth, spines, girth, or scales as they try to pass through or free themselves from the mesh.

gill. Respiratory organ of many aquatic animals (e.g., crustaceans, fishes, amphibians). A plate-like or filamentous outgrowth richly supplied with blood vessels at which gas exchange between water and blood occurs.

gill cover. The operculum; the flat thin bones that cover each side of the head. See Operculum.

glide. A part of a river containing a smooth flow of water with an unbroken surface.

gradient. The amount of vertical drop a stream experiences over a given distance.

gillse. Salmon less than 22 inches (56cm) Fork Length (FL); typically 2 year-old fish; also called "Jacks".

habitat. An area that supplies food, water, shelter, and space necessary for a particular animal's existence.

handlining. Fishing using a line with usually one baited hook and moving it up and down in a series of short movements. Also called "jigging".

harvest. Fish that are caught and retained in a fishery (consumptive harvest).

harvest rate. The proportion of the available numbers of salmonids that is taken by fisheries in a specific time period.

hatchery fish. A fish that has spent some part of its life-cycle in an artificial environment and whose parents were spawned in an artificial environment.

hatchery stock (population). A stock that depends on spawning, incubation, hatching or rearing in a hatchery or other artificial propagation facility (synonymous with cultured stock).

headwaters. The upper reaches of a stream or stream system.

Holarctic. A zoogeographic region that includes North America, Europe, northern Africa, most of Asia. Fish that are Holarctic in distribution may be expected to occur in most of these regions but not necessarily throughout it.

home range. The area that an animal traverses in the scope of normal activities. This is not to be confused with territory, which is the area an animal defends.

homing. The ability of a salmon or steelhead to correctly identify and return to their natal stream, following maturation at sea.

homing rate. Of all the fish from a population that successfully return to spawn, the homing rate is the proportion that return to spawn in the same population in which their parents spawned. See also stray rate and gene flow.

hybridization. The interbreeding of fish from two or more different stocks or species.

imprinting. The physiological and behavioral process by which migratory fish assimilate environmental cues to aid their return to their stream of origin as adults.

incidental harvest. (also incidental catch) The capture and retention of species other than those a fishery is primarily opened to target/take. It can also refer to marked fish of the same species.

incubation. The period of time from egg fertilization until hatching.

independent tributary. A small stream flowing directly into marine waters.

indicators. a subset of monitoring attributes that are particularly information-rich in the sense that their values are somehow indicative of the quality, health, or integrity of the larger ecological system to which they belong (Noon 2003). Indicators are a selected subset of the physical, chemical, and biological elements and processes of natural systems that are selected to represent the overall health or condition of the system.

interorbital. The space between the eyes.

introduced species. The opposite of native species, this species does not occur naturally in an area. For example the Atlantic salmon is an introduced species in BC waters. (Also known as “exotic,” “alien,” and “non-native” species). Brought to an area by means other than its own dispersal ability.

inventory. An extensive point-in-time survey to determine the presence/absence, location or condition of a biotic or abiotic resource.

iteroparous. Species that reproduce repeatedly during their lifetime.

sack salmon. A young male salmon that matures precociously (earlier than other fish in its age-class); see also Grilse.

juvenile. Fish from one year of age until sexual maturity. A young individual resembling an adult of its kind except in size and reproductive activity.

kelt. Spent or spawned-out salmon up until the time it enters saltwater.

keystone species. A species that has a major influence on a community structure.

kokanee. The freshwater form of the sockeye salmon. Kokanee spend their entire life history in freshwater, and in some lakes are known as silver trout.

kype. The hook at the anterior portion of the snout in many breeding male salmonid species.

lacustrine. Referring to a lake environment.

large woody debris. Logs, limbs, or root wads 10 cm or larger in diameter, delivered to river and stream channels from streamside forests (in the riparian or upslope areas) or from upstream areas. LWD provides streambed stability and habitat complexity. LWD recruitment refers to the process whereby streamside forests supply wood to the stream channel to replenish what is lost by decay or downstream transport.

larva (plural **larvae**). A developmental stage in an animal, the larva hatches from an egg, looks very small and different from the adult form, eats different food, and usually lives in a different environment from the adult. The veliger is the typical larval stage of molluscs.

lateral line. Longitudinal line on each side of the body of fishes that marks the position of cutaneous sensory cells of the acoustico-lateralis system concerned with the perception of movement and sound waves in water, the cells on the lateral line being collectively known as the lateral line system.

length frequency. An arrangement of recorded lengths which indicates the number of times each length or length interval occurs.

lentic. Characterizing aquatic communities found in standing water.

life history. The events that make up the life cycle of an animal including migration, spawning, incubation, and rearing. There is typically a diversity of life history patterns both within and between populations. Life history can refer to one such pattern, or collectively refer to a stylized description of the 'typical' life history of a population.

limnetic. The open water of a lake that is above the bottom; usually shallow enough for light to penetrate.

littoral zone. The shallow shoreward region of a water body. It usually has light penetration to the bottom and is often occupied by rooted macrophytes; that region of a lake in which the water is less than 6 m deep.

live box. A container filled with water and often equipped with accessories such as aeration equipment that is used to hold and transport live fish.

local population. Reproductive unit (spawning site) comprised of individuals who are likely to breed with each other (i.e., well mixed). A single population may include more than one deme and demes may be partially isolated from one another. Their partial isolation may or may not be persistent over generations. There will always be at least as many demes as populations.

locally adapted population. A population whose members have genetically based characteristics that increase their fitness in their local environment compared individuals that lack these characteristics.

lotic. Meaning or regarding things in running water.

management unit. A stock or group of stocks which are aggregated for the purposes of achieving a desired spawning escapement objective.

marine protected area (MPA). An MPA is a specific area of the ocean that is regulated to protect both the habitat and the species that inhabit it.

marine subadults. Post-juvenile salmonids moving into offshore waters.

maxillae. The upper jaw, the upper jaw bones. (Maxillaries).

maximum sustainable yield (MSY). The largest average annual catch that can be taken over time without reducing the stock's productive potential 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; or sustainable catch.

measures. specific feature(s) used to quantify an indicator, as specified in a sampling protocol. For example, pH, temperature, dissolved oxygen, and specific conductivity are all measures of water chemistry.

mesh size. Size of the mesh of a net. Different fisheries have different minimum mesh size regulation.

metadata. Data about data. Metadata describes the content, quality, condition, and other characteristics of data. Its purpose is to help organize and maintain an organization's internal investment in spatial data, provide information about an organization's data holdings to data catalogues, clearinghouses, and brokerages, and provide information to process and interpret data received through a transfer from an external source.

metamorphosis. The change from larva to adult

metapopulation. A population of sub-populations which are in turn comprised of local populations or demes. Note that individual sub-populations can be extirpated and consequently recolonized from other sub-populations. Stability in a metapopulation is maintained by a balance between rates of sub-population extinction and colonization. This is roughly analogous to a "classical" or "Levins" metapopulation after Richard Levins' (1969) mathematical model describing this scenario.

migrant. Life stage of anadromous and resident fish species which moves from one locale, habitat or system (river or ocean) to another.

migrating. Moving from one area of residence to another.

migration. The seasonal movement of an animal from one area to another.

milt. The sperm of fishes.

mitigation. An action intended to reduce the adverse impact of a specific project or development.

mixed stock. A stock whose individuals originated from commingled native and non-native parents; or a previously native stock that has undergone substantial genetic alteration.

monitoring. Collection and analysis of repeated observations or measurements to evaluate changes in condition and progress toward meeting a management objective (Elzinga et al. 1998). Detection of a change or trend may trigger a management action, or it may generate a new line of inquiry. Monitoring is often done by sampling the same sites over time, and these sites may be a subset of the sites sampled for the initial inventory.

mortality. The number of fish lost or the rate of loss.

narcosis. In electrofishing, a state of arrested activity induced by the use of electrical stimulation.

natal stream. Stream of birth.

native species. A species that occurs naturally in an area (is not introduced).

native stock. An indigenous stock of fish that has not been substantially impacted by genetic interactions with non-native stocks or by other factors, and is still present in all or part of its original range. In limited cases, a native population may also exist outside of its original range (e.g. in a captive broodstock program).

natural fish. A fish that has spent essentially all of its life-cycle in the wild and whose parents spawned in the wild. Synonymous with wild fish and with natural origin recruit (NOR).

natural mortality. Mortality due to natural causes. Mathematical symbol: M.

natural return rate. The number of native, naturally produced fish spawning in one generation divided by the total number of naturally spawning fish (hatchery plus naturally -produced fish) in the previous generation.

naturally spawning populations. Populations of fish that have completed their entire life cycle in the natural environment without human intervention.

nectonic. Describes organisms that are capable of swimming independent of water turbulence.

non-native stock (population). A stock (population) that has become established outside of its original range.

non-target population. Any natural populations that is not intended to be integrated with a particular artificial propagation program.

off-channel area. Any relatively calm portion of a stream outside of the main flow.

opercle. Refers to the largest bone in the operculum.

operculum. The bony (opercular bones) covering of the gill cavity of fishes.

otolith. Structure of the inner ear of fish, made of calcium carbonate. Also called “ear bone” or “ear stone”. Otoliths are used to determine the age of fish. annual rings can be observed and counted. Daily increments are visible as well on larval otoliths.

outmigration. The migration of fish down the river system to the ocean.

outplanting. Hatchery reared fish released into streams for rearing and maturing away from the hatchery sites.

overfishing. Harvesting a species in such quantity that it reduces the stock biomass and future catches below desirable levels.

parameter. A “constant” or numerical description of some property of a population (which may be real or imaginary). Cf. statistic.

parr. The developmental life stage of salmon and trout between alevin and smolt, when the young have developed parr marks and are actively feeding in fresh water.

parr marks. Distinctive vertical bars on the sides of young salmonids.

passive gear. Passive gear is usually set and left stationary for a period of time. Passive gear includes: gill nets, enmeshing (trammel) nets, gee minnow traps, trap nets, Fyke nets, set lines, inclined plane traps and rotary screw traps.

passive integrated transponder. Passive Integrated Transponder (PIT) tags are used for identifying individual salmon for monitoring and research purposes. This miniaturized tag consists of an integrated microchip that is programmed to include specific fish information. The tag is inserted into the body cavity of the fish and decoded at selected monitoring sites.

peak flows. Extremely high winter-time flows which can cause excessive streambed scour and damage or destroy salmon eggs incubating in the gravel. Peak flows can become more severe as a result of an increase in impervious surfaces and a reduction of hydrologic maturity, both of which increase the rate of water delivery to stream channels.

pectoral fins. The anterior(front) paired fins, attached to pectoral (shoulder) girdle.

pelagic. Of or pertaining to the open waters of a lake or ocean, especially where the water is greater than 20 m deep; term applied to organisms that occupy the open waters of a lake or ocean.

pelvic fins. The most posteriorly located of the paired fins; ventral, paired fins on the underside of body, representing the hind limbs of land vertebrates.

pink salmon. An anadromous salmonid of the genus *Oncorhynchus* and species *gorbuscha*. Also known as humpy or humpback salmon. The most abundant Pacific salmon with a short life cycle of two years.

plankton. Marine plants and animals that drift with the ocean's current; they are usually very small but some are large. including jellyfish. Base of the marine food chain.

pond. A body of water smaller than a lake, often artificially formed.

pool. A relatively deep, still section in a stream.

population. Group of interbreeding salmon that is sufficiently isolated from other populations so that there will be persistent adaptations to the local habitat.

population viability analysis. A statistical analysis that provides an estimate of the probability that a population will become extinct over a specific time frame.

post-orbital hypural length. Another measurement often used for salmon that have undergone morphological changes associated with breeding (MacLellan, 1987). It is the distance from the posterior margin of the eye orbit to the posterior end of the hypural bone (last vertebrae).

post-smolt. Life stage of salmon from the time it departs from the river as a smolt until the end of its first winter at sea.

precautionary approach. 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.

precocious. Fish that have matured quickly, or faster than the remaining fish of its age-class.

presence/absence sampling. A method of sampling whereby organisms are noted as present or absent without enumeration.

pre-spawning mortality. Generally refers to non-fishery mortality of adult salmon and steelhead between the time the fish enter the Columbia River and the completion of spawning.

productivity. A measure of a biological system's ability to supply organisms with energy and resources to feed, grow, and survive.

protocols. Detailed study plans that explain how data are to be collected, managed, analyzed and reported and are a key component of quality assurance for natural resource monitoring programs (Oakley et al. 2003).

purse seine. Fishing gear. large net is laid in a circle around a school of fish and then the bottom is drawn closed, entrapping the fish.

radio-telemetry. Automatic measurement and transmission of data from remote sources via radio to a receiving station for recording and analysis.

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. Also called; *fishing coefficient.

rearing. Refers to the amount of time that juvenile fish spend feeding in nursery areas of rivers, lakes, streams and estuaries before migration.

reach. (see Stream Reach)

recovery project. Artificial production projects primarily designed to aid in the recovery, conservation or reintroduction of particular natural population(s).

recruitment. Addition of new fish to a defined life history stage by growth from among smaller size categories. Also used to describe the number of fish that existing the non-migratory juvenile population, or number of young fish that will eventually enter the migratory population and return to successfully spawn. Often used in context of management, where the stage is the point where individuals become vulnerable to fishing gear.

redd. A nest of fish eggs consisting of gravel, typically formed by digging motion performed by an adult female salmon.

red listed species. Any species that is designated as being threatened or endangered. Endangered species are indigenous (native) species facing imminent extirpation or extinction. Threatened species are likely to become endangered if limiting factors are not reversed.

relative abundance. An estimate of actual or absolute abundance; usually stated as some kind of index.

riffle. A shallow gravel area of a stream that is characterized by increased velocities and gradients, and is the predominate stream area used by salmon for spawning.

riparian. Referring to the transition area between aquatic and terrestrial ecosystems. The riparian zone includes the channel migration zone and the vegetation directly adjacent to the water body, that influence channel habitat through alteration of microclimate or input of LWD.

river mile. A statute mile measured along the center line of a river. River mile measurements start at the stream mouth (RM 0.0).

riverine. Referring to the entire river network, including tributaries, side channels, sloughs, intermittent streams, etc.

riverine sockeye. Small populations of sockeye salmon that spawn and rear in some rivers systems that have no available lake for rearing.

roe. The mass of eggs within the female fish.

run. A group of fish of the same species that migrate together up a stream to spawn, usually associated with the seasons, e.g., fall, spring, summer, and winter runs. Members of a run may interbreed, and may be genetically distinguishable from other individuals of the same species.

run reconstruction. A post-season accounting of all salmon escaping and harvested from individual stocks or management areas.

salmonid. Fish of the family Salmonidae, including salmon and steelhead, trout, and char.

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.)

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

selective fishery. A fishery that allows the release of non-targeted fish stocks/runs, including unmarked fish of the same species.

self-sustaining population. A population of salmonids that exists in sufficient numbers to replace itself through time without supplementation with hatchery fish. It does not necessarily produce surplus fish for harvest.

semelparous. Species that reproduce only once during their lifetime.

SCUBA . Self Contained Underwater Breathing Apparatus

siltation. The process of covering or obstructing with silt.

smolt. Refers to the salmonid or trout developmental life stage between parr and adult, when the juvenile is at least one year old and has adapted to the marine environment.

smoltification. Refers to the physiological changes anadromous salmonids and trout undergo in freshwater while migrating toward saltwater that allow them to live in the ocean.

sockeye salmon. An anadromous salmonid of the genus *Oncorhynchus* and species *nerka*. Also known as red or blueback salmon. Spawning adults develop dull, green colored heads with brick red to scarlet bodies. (See Kokanee).

sonar. Equipment used to measure surfaces and density of fish groups under water through the use of transmitted sound waves.

spawn. The act of reproduction of fishes; the mixing of sperm of a male fish and eggs of a female fish.

spawner. Sexually mature individual.

spawning grounds. The areas that a fish stock or species will move to, to spawn.

spawning stock. Mature part of a stock responsible for the reproduction. Strictly speaking, the part of an overall stock having reached sexual maturity and able to spawn. Often conventionally defined as the number of biomass of all individuals beyond the "age at first maturity" of size at first maturity (i.e. beyond the age or size class in which 50% of the individuals are mature).

spawning stock biomass. The total weight of all sexually mature fish in the population. This quantity depends on year class abundance, the exploitation pattern, the rate of growth, fishing and natural mortality rates, the onset of sexual maturity and environmental conditions.

spawning stock biomass-per-recruit. The expected lifetime contribution to the spawning stock biomass for a recruit of a specific age (e.g., per age 2 individual). For a given exploitation pattern, rate of growth, and natural mortality, an expected equilibrium value of SSB/R can be calculated for each level of F. A useful reference point is the level of SSB/R that would be realized if there were no fishing. This is a maximum value for SSB/R, and can be compared to levels of SSB/R generated under different rates of fishing. For example, the maximum SSB/R for Georges Bank haddock is approximately 9 kg for a recruit at age 1.

species. A taxon of the rank of species; in the hierarchy of biological classification the category below genus; the basic unit of biological classification; the lowest principal category of zoological classification.

standard length. The straight distance between the tip of the snout and the base of the caudal fin rays.

standardization. The procedure of maintaining methods and equipment as constant as possible.

stock. Individuals that share 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 which are old enough to reproduce. (This level of classification typically subsumes race, metapopulation, subpopulation, and demes. Used in the context of management.)

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 probably future condition of a fishery.

stock origin. The genetic history of a stock.

stray. An individual that breeds in a population other than that of its parents.

stray rate. The proportion of a population that consists of strays.

straying. A natural phenomena of adult spawners not returning to their natal stream, but entering and spawning in some other stream.

stream reach. A section of a stream at least 20 times longer than its average channel width that maintains homogeneous channel morphology, flow, and physical, chemical, and biological characteristics

stressors. Physical, chemical, or biological perturbations to a system that are either (a) foreign to that system or (b) natural to the system but applied at an excessive [or deficient] level (Barrett et al. 1976, p192). Stressors cause significant changes in the ecological components, patterns and processes in natural systems. Examples include water withdrawal, pesticide use, timber harvesting, traffic emissions, stream acidification, trampling, poaching, land-use change, and air pollution.

subadult. A developmental life stage when fish exhibit most but not all traits of an adult fish.

sub-population. A well-defined set of interacting individuals that compose a proportion of a larger, interbreeding metapopulation.

subspecies. A population of a species occupying a particular geographic area, or less commonly, a distinct habitat, capable of interbreeding with other populations of the same species.

subtidal zone. Shallow-water areas below mean low water.

subyearling. A developmental life stage of fish that are less than one year old.

supplementation. The use of artificial propagation to maintain or increase natural production while maintaining the long-term fitness of the target population, and keeping the ecological and genetic impacts to non-target populations within specified biological limits.

survival rate. Number of fish alive after a specified time interval, divided by the initial number, usually on a yearly basis.

sustainability. Maintaining a population at levels so that exploitation does not affect its reproductive ability and genetic diversity.

sustainable yield. The number or 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.

sustainable. A sustainable way of life is one in which human needs are met without diminishing the ability of other people, creatures, and future generations to survive.

sustained yield. A method of salmon management that guarantees a consistent supply of the resource.

sympatric. Living in the same place, or at least overlapping in ranges.

tagging. Process where scientists catch fish record their physical characteristics, tag the fish and release them. When fishers catch tagged fish they return the tags (and if possible the fish) with information on the fish and where the fish was caught.

taxonomy. Classification of plants and animals into established groups or categories on the basis of their natural relationships.

terminal fisheries. A fishery in a river or near the mouth of a river where returning salmon pass through or congregate near to an prior to spawning, and where stocks are relatively unmixed; occurring close to point where local populations separate.

tetanus. State of a muscle undergoing a continuous fused series of contractions due to electrical stimulation.

thermocline. A well-defined vertical temperature change or boundary often associated with stratification in lakes.

total length. Total length is the distance from the most anterior part of the head to the tip of the longest caudal fin ray when the fin lobes of the tail are pressed. In BC, total length is the measurement most commonly used on fish without forked tails such as burbot and sculpins.

trawl. Fishing gear. cone-shaped net towed in the water by a boat called a "trawler". Bottom trawls are towed along the lake or ocean floor to catch species such as groundfish. Mid-water trawls are towed within the water column.

trawl surveys. Scientists catch fish with a trawl net and record what they catch and note the changes when they fish the same area later.

trawling. Fishing methods where a single vessel, or a pair of vessels, tows a large netting bag (trawl net) behind the vessel.

trend. The directional change over time in a series of data via monitoring. Trends can be measured by examining individual change (change experienced by individual sample units) or by examining net change (change in mean response of all sample units).

tributary. A smaller stream which flows into a larger stream.

trolling. A fishing method where baited hooks or lures are towed behind a vessel

turbidity. Muddiness created by stirring up sediment.

undulating. To move in waves. Referring to the movement of a female fish's tail in a waving motion used to move gravel for the construction of a redd.

upwelling. The movement of nutrient rich waters from the bottom of the ocean to the surface.

ventral. On the lower surface; pertaining to the abdomen or belly.

viable population. A population that maintains its vigor and its potential for evolutionary change.

viable salmonid population. NOAA Fisheries term defined as "an independent population of any Pacific salmonid that has negligible risk of extinction due to threats from demographic variation (random or directional), local environmental variation, and genetic diversity changes (random or directional) over a 100-year time frame."

vital signs. are a subset of physical, chemical, and biological elements and processes of ecosystems that are selected to represent the overall health or condition of resources, known or hypothesized effects of stressors, or elements that have important human values. The elements and processes that are monitored are a subset of the total suite of natural resources that include water, air, geological resources, plants and animals, and the various ecological, biological, and physical processes that act on those resources. Vital signs may occur at any level of organization including landscape, community, population, or genetic level, and may be compositional (referring to the variety of elements in the system), structural (referring to the organization or pattern of the system), or functional (referring to ecological processes).

warmwater fish. A broad classification on non-salmonid fish that generally have at least one spiny ray, have pelvic and pectoral fins located behind the gills, and are usually suited for water that consistently exceeds 70° F.

watershed. An area drained by a particular stream. Includes all the vegetation, manmade structures, groundwater and surface water.

weak stock. Listed in the Integrated System Plan's list of stocks of high or highest concern; listed in the American Fisheries Society report as at high or moderate risk of extinction; or stocks the National Marine Fisheries Service has listed. "Weak stock" is an evolving concept; the Northwest Power and Conservation Council does not purport to establish a fixed definition. Nor does the Council imply that any particular change in management is required because of this definition.

weight-at-age. Average weight of individuals in each age class of a particular stock.

weir. Usually a barrier constructed to catch upstream migrating adult fish.

wild population. Fish that have maintained successful natural reproduction with little or no supplementation from hatcheries.

wild salmon. Salmon produced by natural spawning in fish habitat from parents that were spawned and reared in fish habitat.

within-stock diversity. The overall genetic variability among individuals of a single population or stock.

year class (or cohort). Fish in a stock born in the same year. For example, the 1987 class of cod includes all cod born in 1987, which would be age 1 in 1988. Occasionally, a stock produces a very small or very large year class that can be pivotal in determining stock abundance in later years.

yield per recruit. The expected lifetime yield per fish of a specific age (e.g., per age 2 individual). For a given exploitation pattern, rate of growth, and natural mortality, an expected equilibrium value of Y/R can be calculated for each level of F.

yolk. The food part of an egg.

Literature Cited

- Bain, M. B. and N. J. Stevenson. 1999. Aquatic Habitat Assessment: Common Methods. American Fisheries Society Bethesda, Maryland.
- Barrett, G. W., G. M. Van Dyne, and E. P. Odum. 1976. Stress ecology. *BioScience* 26:192–194.
- Elzinga, C. L., D. W. Salzer, and J. W. Willoughby. 1998. Measuring and monitoring plant populations. BLM Technical Reference 1730-1. BLM/RS/ST-98/005+1730.
- Likens, G. 1992. An ecosystem approach. its use and abuse. Excellence in ecology. book 3. Ecology Institute, Oldendorf/Luhe, Germany.
- Noon, B. R. 2003. Conceptual issues in monitoring ecological systems. Pages 27–71 in D. E. Busch and J. C. Busch, D. E. and J. C. Trexler, eds. 2002. *Monitoring ecosystems: Interdisciplinary approaches for evaluating ecoregional initiatives*. Island Press, Washington, D.C.
- Oakley, K. L., L. P. Thomas and S. G. Fancy. 2003. Guidelines for long-term monitoring protocols. *Wildlife Society Bulletin* 31:1000–1002.

