IOTC–2013–WPEB09–INF17

GLOSSARY OF SCIENTIFIC TERMS, ACRONYMS AND ABBREVIATIONS, AND REPORT TERMINOLOGY

SC15. Para. 19: **NOTING** paper IOTC–2012–SC15–INF03 which provided a glossary of scientific terms, acronyms and abbreviations, and report terminology, for the most commonly used scientific terms in IOTC reports and Conservation and Management Measures (CMM), the SC **ENCOURAGED** all authors of papers to be submitted to the IOTC to use the definitions contained in the glossary. The SC indicated that it may wish to modify these incrementally in the future.

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GLOSSARY

A

Age–length (age–length key or curve). Relationship between age and length.

Age-structured assessment. Assessment of the status of a fish stock 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 fish tag that detects and records ('archives') environmental variables (e.g. water temperature) and location over time.

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 for subsistence using traditional methods.

Autonomous adjustment. An ongoing structural adjustment process that occurs in all fisheries. As technologies and prices change, the characteristics of the fishing fleet required to maximise the net value from the fishery will also change and, as a result, fishery fleet behaviour has a tendency to change in line with market signals. The primary role for government in structural adjustment is to establish a management regime that removes any incentives that lead to over-capacity, and that facilitates autonomous adjustment to occur in response to changing economic and biological conditions.

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.

B_{LIM} (biomass limit reference point). The point beyond which the risk to the stock is regarded as unacceptably high.

B_{MEY} (biomass at maximum economic yield). Average biomass corresponding to maximum economic yield.

B_{MSY} (biomass at maximum sustainable yield). Average biomass corresponding to maximum sustainable yield.

B_{TARG} (target biomass). The desired biomass of the stock.

B_0 (mean equilibrium unfished biomass). Average biomass level if fishing had not occurred.

Benthic. Associated with the bottom of a water body.

Beverton–Holt. 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.

Bycatch. All species, other than the 16 species listed in Annex B of the IOTC Agreement, caught or interacted with by fisheries for tuna and tuna-like species in the IOTC area of competence. A bycatch species includes those non-IOTC species which are (a) retained (byproduct), (b) incidentally taken in a fishery and returned to the sea (discarded); or (c) incidentally affected by interacting with fishing equipment in the fishery, but not taken.

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

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-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-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 fish abundance.

Catch rate. *See* Catch per unit effort.

Chondrichthyans. Fishes that have skeletons made of cartilage rather than bone. This group includes sharks and rays (elasmobranchs) and chimaeras (holocephalans).

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.

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.

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 isobath. 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 characterised by a relatively steep slope.

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

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**.**

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

Driftnet. Gillnet suspended by floats so that it fishes the top few metres of the water column.

Dropline. Fishing line with one or more hooks, held vertically in the water column with weights, generally used on the continental shelf and slope. Several droplines may be operated by a vessel, manually or mechanically.

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.

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.

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.

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).

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 an animal produces each reproductive cycle; the potential reproductive capacity of an organism or population.

Fish-aggregating device (FAD). Buoys and platforms used to attract and 'hold' pelagic fishes to enhance fishing. Can be as simple as a floating log or bamboo raft, but tuna fishers setting purse seine nets around tuna schools now deploy sophisticated FADs that allow satellite tracking and interrogation of information, such as sea surface temperature.

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

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

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, which would result in a longer measurement for full-bodied fish like tuna. *See also* Lower-jaw fork length.

G

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, usually nets or traps.

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 too many small fish; where a restraint on catching them 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). An aagreed response that management must make under pre-defined circumstances regarding stock status.

Harvest strategy. Strategy outlining how the catch in a fishery will be adjusted from year to year 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.

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. They then hope to fill the quota 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 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.

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).

Inshore waters. Waters of the shallower part of the continental shelf, usually less than 3 nm.

IOTC Species. Any or all of the 16 species listed in Annex B of the IOTC Agreement (listed in Table 1 below)

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.

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

Large-scale driftnets. Gillnets or other nets or a combination of nets that are more than 2.5 kilometers in length whose purpose is to enmesh, entrap, or entangle fish by drifting on the surface of, or in, the water column.

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. The number of individuals in a catch or catch sample in each group of lengths (length intervals). 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 benchmark which defines undesirable states of the system that should be avoided or achieved with very low probability.

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. Official record of catch and effort data made by fishers. In many fisheries, a licence condition makes the return of 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 or droppers) 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 on demersal longlines (set at the seabed with weights) are usually more closely spaced.

Lower-jaw fork length. Length of a fish measured as the distance between the tip of the lower jaw and the point of the fork or 'V' of the tail. Commonly used to record the length of commercial fish with bills (e.g. swordfish) because it is little affected by damage to the tail fin (*c.f.* Total length) and bill. Fork length is measured flat, from point to point, not by stretching a tape along the body surface, which would result in a longer measurement for full-bodied fish like tuna.

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. Branchlines with baited hooks are attached to the mainline at regular intervals.

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

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

Management procedures. A set of formal actions, usually consisting of data collection, stock assessment, and harvest control rules, to iteratively and adaptively manage a fishery.

Management strategy evaluation (MSE). Procedure whereby management strategies are tested and compared using simulations of stock and fishery dynamics.

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).

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. Term adopted by AFMA to refer 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.

Mortality. Deaths from all causes (usually expressed as a rate or as the proportion of the stock dying each year).

MULTIFAN–CL. A length-based, age-structured model for stock assessment of fisheries.

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.

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.

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.

O

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

Offshore waters. Usually oceanic waters, but can refer to outer continental shelf waters (*c.f.* Onshore waters).

Onshore waters. Waters abutting the coastline.

Open access fishery. Fishery in which there is no limit on the number of operators or vessels (*c.f.* Limited entry fishery). Such a fishery is liable to suffer the 'tragedy of the commons'. Under open access, a fishery operates with a harvest and effort that result in total revenue equalling costs, with no economic profits being generated. The fishing effort employed at this point exceeds that which would achieve MEY. An open access equilibrium is a point where there is no limit on the number of operators or vessels allowed to operate in the fishery

Operating model. Simulation of stock dynamics (and the impact of fishing) used in management strategy evaluation.

Otoliths. Bone-like structures formed in the inner ear of fish. 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. 'Not overfished' implies that the stock is not below the threshold, and is now used where status classifications of 'fully fished' or 'underfished' were used in earlier editions of *Fishery status reports*.

Overfishing, subject to. A stock is experiencing too much fishing and the removal rate from the stock is unsustainable. Also:

Fishing mortality (F) exceeds the limit reference point (F_{LIM}). When stock levels are at or above B_{MSY}, F_{MSY} will be the default level for F_{LIM}.

Fishing mortality in excess of F_{LIM} will not be defined as overfishing if a formal 'fish down' or similar strategy is in place for a stock and the stock remains above the target level (B_{TARG}).

When the stock is less that B_{MSY} but greater than B_{LIM}, F_{LIM} will decrease in proportion to the level of biomass relative to B_{MSY}.

At these stock levels, fishing mortality in excess of the target reference point (F_{TARG}) but less than F_{LIM} may also be defined as overfishing, depending on the harvest strategy in place and/or recent trends in biomass levels.

Any fishing mortality will be defined as overfishing if the stock level is below B_{LIM}, unless fishing mortality is below the level that will allow the stock to recover within a period of 10 years plus one mean generation time, or three times the mean generation time, whichever is less.

Any directed (targeted) fishing of an overfished stock (stock level is below B_{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 surface waters rather than the sea floor. Usually applied to free-swimming species such as tunas and sharks (*c.f.* Demersal).

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

Pole-and-line fishing (poling). Fishing method in which fishers attract schools of fish to the vessel with live or dead bait, get them into a feeding frenzy with more bait and water sprayed onto the sea surface to simulate the behaviour of small baitfish, and then use poles with short, fixed lines and lures to 'pole' the fish aboard.

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 if 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.

Purse seining. Harvesting of surface-schooling pelagic fish by surrounding the school with a net. A line that passes through rings on the bottom of the net can be tightened to close the net so that the fish cannot escape (*c.f.* Danish seining).

Q

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

Recruit. Usually, a fish that has just become susceptible to the fishery. Sometimes used in relation to population components (e.g. a recruit to the spawning stock).

Recruitment overfishing. Excessive fishing effort or catch that reduces recruitment to the extent that the stock biomass falls below the predefined limit reference point.

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.

S

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

SB_{MSY}. Spawning or 'adult' equilibrium biomass at MSY.

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.

Settlement. Transition from a pelagic larval stage to a substrate-associated juvenile or adult existence.

Shot (shot-by-shot). Pertaining to each separate deployment of a fishing gear by a fishing vessel.

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

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 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.

SPR. Spawning potential ratio (or egg production) at a percentage of unfished levels.

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 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 recruitment. *See* Recruit.

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.

Surface fishery. Fishing with pole and line, bait vessel, troll or purse seine to target surface-swimming species.

Surplus-production. Inherent productivity of a fish stock that can be harvested sustainably. Based on the theory that, at large stock size, rates of reproduction and stock increase are slowed by self-regulating mechanisms, and that the stock increases faster after removals as it attempts to rebuild. In theory, fishing can be moderated to take advantage of the more productive rates of stock increase, provided it does not exceed the stock's capacity to recover.

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; used to study fish growth, movement, migration, stock structure and size. *See also* Archival tag.

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

Target reference point (TRP). A benchmark which assesses the performance of management in achieving one or more operational management objectives.

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.

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.

Total allowable catch (TAC). For a fishery, a catch limit set as an output control on fishing (*see also* Output controls). Where resource sharing arrangements are in place between commercial and recreational fishers, the term total allowable commercial catch (TACC) will apply. The term 'global' is applied to TACs that cover fishing mortality from all fleets, including Commonwealth, states and territory's.

Total allowable catch, actual. The actual TAC for a species is the agreed TAC (defined above) with amendments applied, such as carryover or debits from the previous year.

Total allowable catch, agreed. The TAC for individual quota species as determined by a Management body.

Total allowable commercial catch (TACC). *See* Total allowable catch (TAC).

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

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).

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.

Trolling. Fishing method in which lines with baits or lures are dragged by a vessel at 2–10 knots. Used widely to catch fish such as Spanish mackerel and several tuna species.

U

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.

Virgin biomass. Biomass of a stock that has not been fished (also called the 'unfished' or 'unexploited' biomass).

W

Wire trace/leader. Relatively short length of steel wire placed between a swivel and the hook. Reduces chance of gear being bitten off and increases retention of some species, such as sharks and other large pelagic fish.

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 and natural mortality interact to determine the best 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.

TABLE 1. IOTC SPECIES AND SHARKS

ALB	Albacore (*Thunnus alalunga*)
BET	Bigeye tuna (*Thunnus obesus*)
BLT	Bullet tuna (*Auxis rochei*)
BLM	Black marlin (*Makaira indica*)
BUM	Blue marlin (*Makaira nigricans*)
COM	Narrow-barred Spanish mackerel (*Scomberomorus commerson*)
FRI	Frigate tuna (*Auxis thazard*)
GUT	Indo-Pacific king mackerel (*Scomberomorus guttatus*)

KAW	Kawakawa (*Euthynnus affinis*)
LOT	Longtail tuna (*Thunnus tonggol*)
MLS	Striped marlin (*Tetrapturus audax*)
SBT	Southern Bluefin tuna (*Thunnus maccoyii*)
SFA	Indo-Pacific sailfish (*Istiophorus platypterus*)
SKJ	Skipjack tuna (*Katsuwonus pelamis*)
SWO	Swordfish (*Xiphias gladius*)
YFT	Yellowfin tuna (*Thunnus albacares*)
Sharks	
BTH	Bigeye thresher sharks (*Alopias superciliosus*)
BSH	Blue sharks (*Prionace glauca*)
FAL	Silky sharks (*Carcharhinus falciformis*)
OCS	Oceanic whitetip sharks (*Carcharhinus longimanus*)
PTH	Pelagic thresher sharks (*Alopias pelagicus*)
SMA	Shortfin mako sharks (*Isurus oxyrinchus*)
SPL	Scalloped hammerhead sharks (*Sphyrna lewini*)

ACRONYMS AND ABBREVIATIONS

ACAP	Agreement on the Conservation of Albatrosses and Petrels
aFAD	Anchored fish aggregation device
AIC	Akaike Information Criterion
ASPIC	A Stock-Production Model Incorporating Covariates
B	Biomass (total)
B_{MSY}	Biomass which produces MSY
BRD	Bycatch reduction device
CBD	Convention on Biological Diversity
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CE	Catch and effort
CI	Confidence interval
CMM	Conservation and Management Measure (of the IOTC; Resolutions and Recommendations)
CoC	Compliance Committee
CPCs	Contracting parties and cooperating non-contracting parties

CPUE	catch per unit effort
current	Current period/time, i.e. $F_{current}$ means fishing mortality for the current assessment year
CV	Coefficient of variance
EBSA	Ecologically or biologically significant marine areas
EEZ	Exclusive Economic Zone
ERA	ecological risk assessment
EU	European Union
F	Fishing mortality; F_{2010} is the fishing mortality estimated in the year 2010
FAD	Fish Aggretation device
FAO	Food and Agriculture Organization of the United Nations
FL	Fork length
F_{MSY}	Fishing mortality at MSY
GIS	Geographic information system
GLM	Generalised liner model
GVP	Gross value of production
HCR	Harvest control rule
HBF	Hooks between floats
HS	Harvest strategy
HSF	Harvest strategy framework
HSP	Commonwealth Fisheries Harvest Strategy Policy 2007
IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
IO	Indian Ocean
IOTC	Indian Ocean Tuna Commission
IOSEA	Indian Ocean - South-East Asian Marine Turtle Memorandum
IOSSS	Indian Ocean Swordfish Stock Structure
IPA	International Plan of Action
ITQ	Individual transferable quota
IUCN	International Union for the Conservation of Nature
IUU	Illegal, unregulated and unreported (fishing)

LJFL	Lower-jaw fork length
LRP	Limit reference point
LL	Longline
LSTLV	Large-scale tuna longline fishing vessel
M	Natural Mortality
MEY	Maximum economic yield
MFCL	Multifan-CL
MOU	Memorandum of understanding
MP	Management procedure
MPA	Marine Protected Area
MPF	Meeting Participation Fund
MSE	Management strategy evaluation
MSY	Maximum sustainable yield
n.a.	Not applicable
NGO	Non-governmental organization
NPOA	National plan of action
OFCF	Overseas Fishery Cooperation Foundation of Japan
OM	Operating model
OT	Oversears Territory
PS	Purse seine
PSA	Productivity Susceptibility Analysis
PSAT	Pop-up satellite tag
q	Catchability
RBC	Recommended biological catch
RFMO	Regional fisheries management organisation
ROP	Regional Observer Programme
ROs	Regional Observer Scheme
RTTP-IO	Regional Tuna Tagging Project of the Indian Ocean
SB	Spawning biomass (sometimes expressed as SSB)
SB_{MSY}	Spawning stock biomass which produces MSY

SC	Scientific committee
SCAF	Standing Committee on Administration and Finance
SE	Standard error
SIOFA	Southern Indian Ocean Fisheries Agreement
SWIOFC	South West Indian Ocean Fisheries Commission
SWIOFP	South West Indian Ocean Fisheries Project
SS3	Stock Synthesis III
SSB	Spawning stock biomass
TAC	Total allowable catch
TAE	Total allowable effort
Taiwan,China	Taiwan, Province of China
TCAC	Technical Committee on Allocation Criteria
TEP	Threatened, endangered or protected (species)
TOR	Terms of reference
tRFMO	tuna Regional Fishery Management Organization
TRP	Target reference point
TrRP	Trigger reference point
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNGA	United Nations General Assembly
VME	Vulnerable marine ecosystems
VMS	Vessel Monitoring System
WP	Working Party of the IOTC
WPB	Working Party on Billfish
WPEB	Working Party on Ecosystems and Bycatch
WPDCS	Working Party on Data Collection and Statistics
WPFC	Working Party on Fishing Capacity
WPM	Working Party on Methods
WPNT	Working Party on Neritic Tunas
WPTmT	Working Party on Temperate Tunas

WPTT	Working Party on Tropical Tunas

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	centimetre
kg	kilogram
Km	kilometre
km^2	square kilometre
M	metre
Mm	millimetre
Nm	nautical mile
t	tonnes (metric ton, 1000 kg)

IOTC REPORT TERMINOLOGY

Level 1

RECOMMENDED, RECOMMENDATION: Any conclusion from a subsidiary body of the Commission which is to be formally provided to the next level in the structure of the Commission for its consideration/endorsement (e.g. from a Working Party to the Scientific Committee). The intention is that the higher body will consider the recommended action for endorsement.

Level 2

REQUESTED: A request from an IOTC body to a particular CPC, the IOTC Secretariat, or other body to carry out a specified task. Ideally this should be highly specific and contain a timeframe for the completion of the task.

Level 3

AGREED: Any point of discussion from a meeting which the IOTC body considers to be an agreed course of action for the IOTC body, or a general point of agreement among participants of the meeting.

NOTED/NOTING: Any point of discussion from a meeting which the IOTC body considers to be important enough to record in a meeting report for perpetuity.

Other

Any other term may be used in addition to the above key terms to highlight to the reader the importance of the relevant paragraph in a report. However, other terms used are considered for explanatory/informational purposes only and have no rating within the reporting terminology hierarchy described above (e.g Considered; Urged).