

# GLOSSARY

## of Fishery Terms

6 October, 2000

This annotated Glossary defines some of the terms frequently found in Executive Summary Reports of the International Commission for the Conservation of Atlantic Tunas' Standing Committee on Research and Statistics (SCRS). The definitions are intended for the general public. However, references are also provided for those readers seeking more detailed information on some of the more technical terms.

This Glossary is in draft form and should be considered as tentative until the SCRS finalizes it.

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### A

#### **Abundance Index**

Indice d'abondance

Indice de abundancia

A quantitative measure of fish density or abundance, usually as a time series. An abundance index can be specific to an area or to a segment of the population (e.g., large fish), or it can refer to abundance stock-wide; the index can reflect abundance in numbers or in weight (biomass). Most abundance indices currently used by the SCRS are based on standardized CPUE data, although fishery-independent abundance indices based on scientific surveys have also been used. Typically, abundance indices are in relative units (as opposed to measuring absolute abundance), and simply indicate relative changes in abundance over time.

#### **ADAPT**

ADAPT

ADAPT

A stock assessment program based on VPA and tuning of abundance indices. The population model is age-structured. (Geromont and Butterworth 1997; Powers and Restrepo 1992)

#### **Age at First Capture**

Age de première capture

Edad de primera captura

See age of recruitment.

#### **Age Composition**

Structure démographique

Composición por edad

The proportion of fish of different ages in the stock or in the catch.

#### **Age-Length Key**

Clef d'identification âge-longueur

Clave edad-talla

One approach used to assign ages to fish, given length measurements. For example, age-length keys can be used to convert catch-at-size data into catch-at-age data. The keys specify the probability that fish of a given size belong to one of several age groups. Age-length keys need to be constructed from (annual) samples of length/age data, which have proved to be very difficult for tunas. As a result, the method of cohort-slicing is used more frequently by the SCRS. (Hoenig et al. 1994)

#### **Age of Maturity**

Age de maturité

Edad de madurez

The age when 50% of the fish of a given sex are considered to be reproductively mature.

#### **Age of Recruitment**

Age de recrutement

Edad de reclutamiento

The age when fish are considered to be recruited to the fishery. In stock assessments, this is usually the youngest age group considered in the analyses, typically age 0 or 1.

#### **Age-slicing**

Découpage des âges

Corte de edad

See Cohort Slicing.

#### **Albacore (*Thunnus alalunga*)**

Germon

Atún blanco

A temperate tuna species widely distributed throughout the Atlantic Ocean and Mediterranean Sea. For assessment purposes, three stocks are assumed: northern and southern Atlantic stocks (separated at 5°N) and a Mediterranean stock. Spawning occurs in subtropi-

cal western areas of both hemispheres and throughout the Mediterranean during austral and boreal spring-summer. Until the age of maturity (about 5 years) they are mainly found in surface waters, where they are targeted by surface gears. Some adult albacore are also caught using surface gears but, as a result of their deeper distribution, they are mainly caught using longlines. Young albacore are also caught by longline in temperate waters.

### **Allocation**

**Allocation**

**Asignación**

The partitioning of fishery controls or fishing rights among participating entities or operating units. For example, the allocation of the TAC into country-specific quotas.

### **Archival Tag**

**Marque-archive**

**Marca-archivo**

A type of tag that stores information in a microchip. Archival tags are useful to learn about the biology of fish because they can store variables such as internal (body) and external temperature, pressure (to measure depth), and light levels (to infer geographic position) for several years.

### **Artisanal**

**Artisanal**

**Artesanal**

Refers to catch or effort that is neither industrial nor recreational in nature, and which is generated using simple fishing methods.

### **ASPIC**

**ASPIC**

**ASPIC**

A stock assessment program based on Schaefer's form of the production model, with non-equilibrium tuning of biomass-based abundance indices. The population model is in lumped biomass. (Prager 1992)

### **ASPM**

**ASPM**

**ASPM**

A stock assessment program based on a deterministic form of a stock-recruitment relationship, with non-equilibrium tuning of abundance indices. The population model is an age-structured production model. (Punt et al. 1992; Restrepo and Legault 1998)

### **Asymptotic Length ( $L_{\infty}$ )**

Λονγύτερο ασυμπτωτε

Λονγύτερο ασιντ λιχα

The maximum size that fish of a given species could reach on average if they lived forever. Sometimes it is mistaken for the largest observed size for the species.

### **Availability**

**Disponibilité**

**Disponibilidad**

Refers to the distribution of fish of different ages or sizes relative to the distribution of the fishery.

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## **B**

### **Base Case**

**Cas de base**

**Caso base**

Pertains to the stock assessment (model and results) that the SCRS uses as the basis to formulate management advice.

### **Bayesian**

**Bayésien**

**Bayesiano**

A formal statistical approach in which expert knowledge or beliefs are analyzed together with data. Bayesian methods make explicit use of probability for quantifying uncertainty. Bayesian methods are particularly useful for making decision analyses. (Gelman et al. 1995; Porch 1999a; Walters and Ludwig 1994)

### **BETYP**

**BETYP**

**BETYP**

Bigeye Tuna Year Program. A special research program coordinated by ICCAT that aims to augment scientific understanding of the population dynamics of bigeye tuna in the Atlantic Ocean, primarily through tagging.

### **Beverton-Holt (stock-recruitment model)**

**Beverton-Holt (modèle stock-recrutement)**

**Beverton-Holt (modelo de stock-reclutamiento)**

A particular stock-recruitment formulation in which recruitment reaches an asymptote as stock size becomes very large.

### **Bias**

**Biais**

**Sesgo**

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

### **Bigeye (*Thunnus obesus*)**

**Thon obèse**

**Patudo**

A widely-distributed species of tuna, ranging between 50° N and 45° S. This species dwells in deeper water than other tunas and shows extensive vertical movements. Spawning occurs in tropical waters when the environment is favorable. From the spawning area bigeye migrate into temperate waters as they grow. Young fish form schools mostly mixed with other tunas such as yellowfin and skipjack. These schools are often associated with drifting objects, whale shark and sea mounts. This association weakens as they grow larger. Circum-

stantial evidence suggests a single Atlantic-wide single stock.

### **Biological Reference Point (BRP)**

**Point de référence biologique**

**Punto biológico de referencia**

A benchmark against which the abundance of the stock or the fishing mortality rate can be measured in order to determine its status. These reference points can be Limits or Targets, depending on their intended usage. (Caddy and Mahon 1995; Gabriel and Mace 1999; Sissenwine and Shepherd 1987)

### **Biomass**

**Biomasse**

**Biomasa**

Biomass refers to the abundance of the stock in units of weight. Sometimes, “biomass” refers to only one part of the stock (spawning biomass, exploitable biomass) but this distinction is not always made.

### **Biomass at MSY**

**Biomasse de PME**

**Biomasa en RMS**

A biological reference point. It is the long-term average biomass value expected if fishing at  $F_{MSY}$ . The text of the International Convention for the Conservation of Atlantic Tunas states that ICCAT is responsible for “*studying and appraising information concerning measures and methods to ensure maintenance of the populations of tuna and tuna-like fishes in the Convention area at levels which will permit the maximum sustainable catch and which will ensure the effective exploitation of these fishes in a manner consistent with this catch*” (Article IV, paragraph 2.b). (Caddy and Mahon 1995)

### **Bluefin (*Thunnus thynnus thynnus*)**

**Thon rouge**

**Atún rojo**

A temperate tuna distributed throughout the north Atlantic. For assessment purposes, two stocks are assumed, although some mixing is known to occur: Western and eastern (including the mediterranean) Atlantic. Atlantic bluefin can grow to over 300 cm and reach more than 650 kg and can live for over 20 years. In the western Atlantic, bluefin generally reach a larger maximum size, and mature later than eastern bluefin. Spawning occurs from April to June in the Gulf of Mexico and the Florida Straits, and from May to July around the Balearic Islands, Tyrrhenian Sea, and central Mediterranean. Large bluefin are adapted for migration to colder waters.

### **Blue marlin (*Makaira nigricans*)**

**Makaire bleu**

**Aguja azul**

A species of billfish found throughout tropical and temperate waters of the Atlantic and adjacent seas, ranging from Canada to Argentina on the west, and from the

Azores to South Africa on the east. A single Atlantic-wide stock is assumed for assessment. Migratory patterns can be trans-Atlantic or trans-Equatorial. The species is considered to be rare and solitary compared to schooling tunas. Spawning occurs in tropical and subtropical waters in the summer and fall. Adults are found predominately in the open ocean near the surface and are caught most frequently as a by-catch by the offshore longline fisheries which target tropical or temperate tunas using shallow deployment of gear. Significant by-catch landings are also made by offshore longline fisheries that target swordfish, particularly in the West Atlantic Ocean.

### **Bootstrap**

**Bootstrap (processus itératif type bootstrap)**

**Bootstrap (muestreo repetitivo)**

A statistical methodology used to quantify the uncertainty associated with estimates obtained from a model. The bootstrap is often based on Monte Carlo resampling of residuals from the initial model fit. (Efron and Tibshirani 1991; Porch 1999b)

### **By-catch**

**Prise accessoire**

**Captura secundaria**

Catch of species other than the intended target species in a fishing operation. Bycatch can either be discarded or landed. (Alverson et al. 1994)

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## **C**

### **Calibration**

**Calibrage**

**Calibración**

See Tuning.

### **Carrying Capacity**

**Capacité de pêche**

**Capacidad (del stock, del barco)**

(1) Virgin biomass. (2) Refers to the holding capacity of a fishing vessel.

### **Catch (C)**

**Prise**

**Captura**

The total number of fish caught by fishing operations (sometimes “catch” is used to denote the weight of fish caught). Catch should pertain to all fish killed by the act of fishing, not just those fish that are landed. Catches are reported to ICCAT as part of the “Task I” data.

### **Catch at Age (CAA)**

**Prise par âge**

**Captura por edad**

The estimated number of fish caught, tabulated by fish age and year of capture (and by other strata such as gear or nation). CAA is estimated on the basis of CAS, using age-length keys or cohort slicing.

**Catch at Size (CAS)**

Prise par taille  
Captura por talla

The estimated number of fish caught, tabulated by size class and by other strata such as gear, nation and quarter. For any given species, CAS should include all fish killed by the act of fishing, not just those fish that are landed.

**Catchability (q)**

Capturabilité  
Capturabilidad

The fraction of the stock which is caught by a standardized (effective) unit of effort. It is also used as the constant of proportionality that relates effective effort to fishing mortality ( $q \times f = F$ ) or as the constant of proportionality that relates an index of abundance to absolute stock size ( $I = q \times N$ ). Catchability is affected by fish availability. Thus, specific climatic conditions may result increased or decreased availability of the fish. This would lead to increased (decreased) catchability and, thus, increased (decreased) fishing mortality rate with the same fishing effort.

**Catch Curve**

Courbe de capture  
Curva de captura

A graph showing the logarithm of catch in number of fish, plotted against fish age. Assuming equilibrium conditions, the descending limb of a catch curve can be used to estimate total mortality.

**CATCHEM**

CATCHEM  
CATCHEM

A stock assessment program based on separable projections and tuning of abundance indices. The population model can be age/length-structured. (Porch 1996)

**Catch per Unit Effort (CPUE)**

Capture par unité d'effort  
Captura por unidad de esfuerzo

The amount of catch that is taken per unit of fishing effort (e.g., number of fish per longline hook-months). Nominal CPUE is often used as a measure of the economic efficiency of a type of gear. Standardized CPUE is normally used as an abundance index for "tuning" or fitting assessment models.

**Catch Rate**

Taux de capture  
Tasa de captura

See Catch per Unit Effort.

**Cohort**

Cohorte  
Cohorte

The fish born in the same time period, usually a year. For instance, the 1987 cohort would refer to fish that are age 0 in 1987, age 1 in 1988, and so on.

**Cohort analysis (CA)**

Analyse des cohortes  
Análisis de cohorte

A simplified VPA algorithm based on an approximation that assumes that, in a given time period, all fishing takes place instantaneously in the middle of the time period. (Pope 1974)

**Cohort Slicing**

Découpage des cohortes  
Separación de cohorte

One approach used frequently to assign ages to fish, given length measurements. For example, cohort slicing is used to convert catch-at-size data into catch-at-age data before the application of age-structured assessment models. Cohort slicing assumes that there is a one-to-one correspondence between length and age (i.e. the approach ignores individual variability in growth).

**Commercial**

Commercial  
Comercial

Refers to catch or effort that is commercial in nature, typically using industrial-type vessels and gears.

**Conditioning**

Conditionné  
Condicionado

Statistical estimates are often based on the assumption that some of the inputs are known exactly, a practice known as conditioning. For example, a VPA is conditioned on the catch at age.

**Confidence limits**

Limites de confiance  
Límites de confianza

A statistical measure of uncertainty, providing the lower and upper bounds within which a parameter falls with a given probability. Example: the 80% confidence limits for SSB are the low and high values within which SSB lies with 80% certainty.

**Controls**

Contrôles  
Controles

Refers to the various controls (measures) that managers can impose to regulate fishing. Controls are usually classified as effort controls or catch controls, depending on what they intend to regulate. (Gulland 1974; Pallarés and Suzuki 1998)

**Conversion Factors**

Facteurs de conversion  
Factores de conversión

Multipliers applied to convert landings into Nominal Catches. These factors vary with the species involved and with the dressing of the fish (e.g. fresh, frozen, gutted, etc.,). They could also vary by country and over time.

### **Cryptic Biomass**

**Biomasse cryptique**

**Biomasa críptica**

The term is sometimes used to describe the fraction of the stock that is unavailable to the fisheries (see Availability). (Laloë 1989; Fonteneau et al. 1998)

### **CV (Coefficient of variation)**

**CV (coefficient de variation)**

**CV (coeficiente de variación)**

The standard error of a statistic, divided by its estimate. The C.V. gives an idea of the precision of an estimate, independent of its magnitude.

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## **D**

### **Decision analysis**

**Analyse de prise de décision**

**Análisis de decisión**

A formal analysis to aid decision-making in the face of uncertainty. A decision analysis usually evaluates the expected outcomes (e.g., average catch, constancy of catch, probability of rebuilding to a given biomass target, etc.) of alternative management controls. A decision analysis can also address management consequences under different plausible assumptions about the status of the stock. (Kim 1992)

### **Delta Method**

**Méthode Delta**

**Método Delta**

Also known as the Taylor Series method, the Delta method is a statistical procedure used to quantify the uncertainty associated with estimates obtained from a model. More specifically, the Delta method quantifies how the variance propagates from the parameters that are estimated directly by the statistical model (e.g., current SSB), and those parameters that are derived from the application of mathematical formulations (e.g. future SSB based on model projections). (Seber 1982)

### **Deterministic**

**Déterministe**

**Determinista**

A process that has no stochastic (random) components. For example, the population model of some stock assessment methods assumes that population growth due to recruitment follows a deterministic formulation.

### **Depleted**

**Surexploité**

**Mermado**

See Overfished.

### **Discards**

**Rejets**

**Descartes**

Refers to part of the catch that is thrown overboard at sea. Discards may be released either dead or alive. Scientists generally estimate the dead discards as part of the total catch. Estimates of discards can be made

in a variety of ways, including samples from observers and logbook records. Fish (or parts of fish) can be discarded for a variety of reasons such as having physical damage, being a non-target species for the trip, and compliance with management regulations like minimum size limits or quotas.

### **DNA**

**ADN**

**ADN**

Deoxyribonucleic acid, the molecular basis of heredity in many organisms. Genetic DNA analyses can sometimes provide information on the structure of populations and thus be used to define stocks on a biological basis.

### **Dressed Weight (DWT)**

**Poids manipulé**

**Peso eviscerado**

A type of weight measurement frequently made for ICCAT species (primarily billfishes), particularly after unloading, where the gills, guts, head and fins have been removed and discarded at sea. ICCAT catch data (yield) are in Round Weight, so conversion factors are used for each species when measurements are made in dressed weight.

### **Dynamic Pool Model**

**Modèle dynamique d'agrégation**

**"Dynamic pool model"**

The term is used to describe yield-per-recruit types of models.

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## **E**

**EEZ**

**ZEE**

**ZEE**

Exclusive Economic Zone (defined in the Law of the Sea Convention).

### **Effective Effort (f)**

**Effort effectif**

**Esfuerzo efectivo**

Measures of fishing effort such as hooks per day of fishing that have been standardized so that the measure is proportional to the fishing mortality rate that the gear(s) impose on the stock of fish. Controls purported to limit effective effort imply that the fishing mortality rate is to be limited.

### **Effort (Fishing Effort, f)**

**Effort (effort de pêche)**

**Esfuerzo (esfuerzo de pesca)**

A measure of the intensity of fishing operations. How Effort is defined depends on the type of fishery (gear) and often on the type of information available. For longline fisheries, effort is usually defined in units of number of hooks or in hook-hours. For purse-seine fisheries, effort is often defined as boat-days (time fishing plus search time). Scientists should aim to define

effort in a way that facilitates effort standardization.

### **EFL (Eye-fork length)**

**EFL (longueur cavité oculaire-fourche)**

**EFL (longitud ojo-horquilla)**

A measurement used frequently for ICCAT billfish species: Projected straight or curved-body distance between the posterior edge of the eye orbit and the fork of the tail.

### **Equilibrium**

**Conditions d'équilibre**

**Equilibrio**

A situation that arises when the fishing mortality, exploitation pattern and other fishery or stock characteristics (growth, natural mortality, recruitment) do not change from year to year. Many yield per recruit analyses assume equilibrium. That is, equilibrium yield per recruit that is computed for a given fishing mortality can be achieved if that fishing mortality is held constant for many years (as many years as there are age classes in the fishery); equilibrium yield per recruit values computed for a new level of fishing mortality or a change in selectivity would not be expected to reach equilibrium until several years from the time of implementation (see Transitional). Other types of stock assessments such as variants of stock production models or catch curves also assume equilibrium. Their non-equilibrium variants aim to better explain the dynamics of the observed data through time. (Hilborn and Walters 1992)

### **Equilibrium Yield Curve**

**Courbe de production équilibrée**

**Curva de rendimiento en equilibrio**

A function that describes the long-term yield which would be obtained at different levels of fishing mortality. At its highest point, the equilibrium yield is the Maximum Sustainable Yield (MSY) and the associated fishing mortality rate is  $F_{MSY}$ . (Restrepo et al. 1994)

### **Excess Capacity**

**Capacité excédentaire**

**Exceso de capacidad**

In the short-term, it is the fishing capacity over and above that which is needed to extract the TAC from the stock. In the long-term, it is the fishing capacity over and above that which is needed to achieve the management objectives (e.g. to generate a fishing mortality equal to  $F_{MSY}$ ).

### **Exploitable Biomass**

**Biomasse exploitable**

**Biomasa explotable**

Refers to that portion of a stock's biomass that is available to the fishing gear.

### **Exploitation Pattern**

**Mode d'exploitation**

**Perfil de explotación**

The distribution of fishing mortality over the age composition of the fish, determined by the type of fish-

ing gear and spatial and seasonal distribution of fishing, and by the growth and migration of the fish. In other words, it is the combined effect of gear selectivity and fish availability. The pattern can be changed by modifications to fishing gear; for example, by increasing mesh or hook size or by changing the ratio of harvest by gears exploiting the fish (e.g., gill net, trawl, hook and line). The pattern can also change due to changes in fishing practices such as avoidance of areas where juveniles reside.

### **Exploitation Rate**

**Taux d'exploitation**

**Tasa de explotación**

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 220,000 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 0.22.

### **Exploitation Ratio**

**Ratio de l'exploitation**

**Ratio de explotación**

The ratio of fish caught to total mortality (=  $F/Z$ ).

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## **F**

$F_{0,1}$

$F_{0,1}$

$F_{0,1}$

A biological reference point. It is the fishing mortality rate at which the increase in equilibrium yield per recruit in weight for an increase in a unit of effort is 10% of the yield per recruit produced by the first unit of effort on the unexploited stock (i.e., the slope of the yield per recruit curve for the  $F_{0,1}$  rate is only 1/10<sup>th</sup> of the slope of the yield per recruit curve at its origin). [Note:  $F_{0,1}$  is sometimes computed from equilibrium yield curves]. Originally,  $F_{0,1}$  was intended as an economic reference point, measuring where additional investment into effective fishing effort would only produce a 10% marginal gain in yield per recruit. It later evolved into a conservative reference point for yield optimization because  $F_{0,1}$  results in almost as much yield per recruit as  $F_{max}$  does, but at lower levels of fishing mortality. (Caddy and Mahon 1995)

$F_{max}$

$F_{max}$

$F_{max}$

A biological reference point. It is the fishing mortality rate that maximizes equilibrium yield per recruit.  $F_{max}$  is the  $F$  level that defines growth overfishing. In general,  $F_{max}$  is different than  $F_{MSY}$  (the  $F$  that maximizes sustainable yield), and is usually higher than  $F_{MSY}$ , depending on the stock-recruitment relationship. By definition,  $F_{max}$  is always higher than  $F_{0,1}$ . (Caddy and Mahon 1995)

$F_{med}$   
 $F_{med}$   
 $F_{med}$

A biological reference point. It is the fishing mortality rate corresponding to an equilibrium SPR equal to the inverse of the median observed survival ratio (ratio of recruits to parental spawning biomass). That is, a stock exploited indefinitely at  $F_{med}$  should be able to replace itself with an abundance close to the observed historical median. In consequence, the degree of conservatism implied by  $F_{med}$  depends largely on whether the “observed” (i.e. assessed) history of the stock corresponds to an overfished state or to a lightly-exploited state. (Caddy and Mahon 1995; Sissenwine and Shepherd 1987)

$F_{MSY}$   
 $F_{PME}$   
 $F_{PME}$

A biological reference point. It is the fishing mortality rate which, if applied constantly, would result in Maximum Sustainable Yield (MSY).  $F_{MSY}$  is the implicit fishing mortality target of the International Convention for the Conservation of Atlantic Tunas (see  $B_{MSY}$ ).  $F_{MSY}$  can be estimated in two ways: (1) From simple (biomass-aggregated) production models (e.g., ASPIC, PRODFIT); (2) from age-structured models that include a stock-recruitment relationship (e.g., ASPM). (Caddy and Mahon 1995)

$f_{opt}(f_{MSY})$   
 $f_{opt}$   
 $f_{opt}$

A biological reference point. It is the effective fishing effort corresponding to  $F_{MSY}$ .  $f_{opt}$  is often reported as one of the main outputs of production models. (Fox 1975)

### F-ratio

F-ratio  
Ratio de F

The ratio of fishing mortality on the oldest age group to the fishing mortality of the preceding age group. Annual F-ratios are estimable parameters in many tuned VPA assessments.

$F_{\tau}(F_{crash})$   
 $F_{\tau}(F_{crash})$   
 $F_{\tau}(F_{crash})$

A biological reference point. It is the fishing mortality rate corresponding to an equilibrium SPR equal to the inverse of the survival ratio at the origin of the stock-recruitment relationship. A stock exploited indefinitely at  $F_{\tau}$  is expected to collapse sooner or later (hence the term “ $F_{crash}$ ”) due to recruitment failure.  $F_{\tau}$  is usually computed from age-structured data based on a fit to the stock-recruitment observations.  $F_{\tau}$  can also be represented by the highest fishing mortality value at which yield becomes 0 in an equilibrium yield curve. (Gabriel and Mace 1999)

$F_{X\%}(F_{X\%SPR})$   
 $F_{X\%}$   
 $F_{X\%}$

A family of biological reference points.  $F_{X\%}$  denotes the fishing mortality that will reduce the equilibrium spawning potential per recruit to X% of what it would be without any fishing (or, equivalently, it is the F that results in X% equilibrium spawning potential ratio). Reference points of this kind are often used as proxies to other biological reference points that require more information about the relationship between stock and recruitment. For example, based on simulation studies for groundfish stocks,  $F_{20\%}$  has been recommended as a default proxy for recruitment overfishing and  $F_{35\%}$  as a proxy for  $F_{MSY}$ . The performance of specific  $F_{X\%}$  policies for ICCAT stocks has not been studied thoroughly. (Caddy and Mahon 1995)

### FAD (Fish Aggregating Device)

DCP (Dispositif de concentration du poisson)

DCP (dispositivo de concentración de peces)

Artificial or natural objects placed on the surface that attract several species underneath, thus increasing their catchability. (Kwei and Bannerman 1993; Pallarés et al. 1998)

### Fecundity

Fécondité

Fecundidad

The number of eggs produced on average by a female of a given size/age. Fecundity information is often used to compute spawning potential.

### Finning

Prélèvement des ailerons

Corte de aletas

The practice of removing fins and discarding the carcass, usually pertaining to sharks.

### FIS

FIS

FIS

Refers to the joint France-Cote d'Ivoire-Senegal fleet that targets tropical tunas off Africa.

### Fishery-Independent

Indépendant de la pêche

Independiente de la pesquería

Refers to statistics about the stock that are collected independently of the fisheries, e.g. through scientific surveys. Most ICCAT data are fishery-dependent.

### Fishing Capacity

Capacité de pêche

Capacidad de pesca

Usually refers to the size and characteristics of individual fishing vessels (see Carrying Capacity).

## **Fishing Gears**

**Engins de pêche**

**Artes de pesca**

The equipment used for fishing. Some of the most common fishing gears for tunas and tuna-like fish are baitboat, gillnet, handline, harpoon, troll, haul seine, longline, widwater trawl, purse seine, rod-and-reel, trap, and trawler (see gear codes towards the end of the Glossary). Each of these can have multiple configurations.

## **Fishing Mortality Rate (F)**

**Taux de mortalité par pêche**

**Tasa de mortalidad por pesca**

The part of the total mortality rate that is due to fishing. Fishing mortality is usually expressed as an instantaneous rate, as discussed under Mortality Rate, and can range from 0 per year (for no fishing) to high values such as 1.0 or more per year. Fishing mortality should reflect all deaths in the stock that are due to fishing, not just those fish that are actually landed. It is common practice to refer to F as a scalar value but it would be more appropriate to refer to it as a vector. That is, it is important to consider how F is distributed among age groups (i.e. what the exploitation pattern is). For instance, an F value of 0.5 for a stock exploited by purse seines that target small fish would have very different consequences than an F=0.5 for the same stock exploited by longlines targeting large fish.

## **Fishing Pattern**

**Mode de Pêche**

**Patrón de explotación**

See Exploitation Pattern. Sometimes the term is also used in reference to the way in which fishing operations are conducted.

## **Fishing Power**

**Puissance de pêche**

**Potencia pesquera**

Refers to the efficiency of a fishing unit, usually a vessel, in capturing fish. The fishing power of individual fishing units can change over time (typically increasing) in response to technological developments in fishing gear, engines or sonar equipment, and adjustments to fishing practices.

## **Fitting**

**Ajustement**

**Ajuste**

See Tuning.

## **FL (fork length)**

**FL (longueur à la fourche)**

**FL (longitud a la horquilla)**

A measurement used frequently for tunas: Projected straight distance between the tip of the fish and the fork of the tail.

## **Flag**

**Pavillon**

**Bandera**

Refers to the State in which a boat is registered.

## **Flag of Convenience (FOC)**

**Pavillon de complaisance**

**Bandera de conveniencia**

The term pertains to cases when a boat is registered in a different State than that of ownership, for whatever reasons of convenience.

## **Fleet Statistics**

**Statistiques sur les flottilles**

**Estadísticas de flota**

Data used to monitor the basic makeup of fishing fleets. Some fleet statistics are important for measuring Fishing Capacity. ICCAT collects basic fleet statistics from all countries/entities fishing for tunas in the Atlantic under "Task I" data.

## **Floating Object**

**Objet flottant**

**Objetos flotantes**

See FAD.

## **Fox Model**

**Modèle de Fox**

**Modelo Fox**

A specific form (the "logistic" shape) of production model. Traditionally, the Fox model has been applied to catch and effort data for many stocks of tropical tunas. (Fox 1974, 1975)

## **Fully Exploited**

**Pleinement exploité**

**Plena explotación**

The term means that the stock is not being over-exploited nor underexploited. This can be interpreted in an equilibrium yield sense as fishing at  $F_{MSY}$ , or in a yield-per recruit sense as fishing at  $F_{max}$ .

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# **G**

## **Generalized Additive Model (GAM)**

**Modèle additif généralisé**

**Modelo generalizado aditivo**

A statistical procedure similar to a Generalized Linear Model, except that the response variable (e.g. CPUE) can be modeled as a nonlinear function of the dependent variables (e.g. time, latitude, etc.).

## **Generalized Linear Model (GLM)**

**Modèle linéaire généralisé**

**Modelo linear generalizado**

A statistical procedure similar to an Analysis of Variance or a Multiple Regression that is used to estimate the magnitude of the effects of different factors on a variable of interest. GLMs are the tool of choice for standardizing CPUE data in order to obtain indices of abundance. In such applications, the variable of inter-



est is CPUE and the factors are Year and perhaps others such as area, gear configuration, etc.; the standardized abundance index of annual abundance would then be given by the parameters associated with the factor Year. (Brown and Porch 1997; Cooke and Lankester 1996; McCullagh and Nelder 1989)

### **GENPROD**

**GENPROD**

**GENPROD**

A stock assessment computer program based on the “generalized” form of the production model, with non-equilibrium tuning of biomass-based abundance indices. The population model is in lumped biomass. (Pella and Tomlinson 1969)

### **Gilled and Guttled Weight**

**Eviscéré et sans branchies**

**Peso eviscerado y sin agallas**

A type of weight measurement frequently made for ICCAT species (yellowfin, bigeye and bluefin tunas), particularly after unloading, where the gills and guts (and sometimes the heads as well) have been removed and discarded at sea. ICCAT catch data (yield) are in Round Weight, so conversion factors are used for each species when measurements are made in gilled and gutted weight.

### **Global Model**

**Modèle global**

**Modelo global**

The terms is sometimes used to describe production models.

### **Growth Overfishing**

**Surpêche de croissance**

**Sobrepesca de crecimiento**

Growth overfishing occurs when the fishing mortality rate is above  $F_{max}$ . This means that individual fish are caught before they have a chance to reach their maximum growth potential. (Gulland 1974)

### **Growth Rate**

**Taux de croissance**

**Tasa de crecimiento**

(1) Intrinsic growth rate: A value that quantifies how much a population can grow between successive time periods. The intrinsic growth rate is often estimated with production models and plays an important role in evaluating the sustainability of different harvest levels. (2) Individual growth rate: A value that quantifies how fast the average individual in the population grows in size or in weight.

### **GRT**

**TJB**

**TRB**

Gross Registered Tonnage, a measure of a vessel’s volume.

### **GT**

**TB**

**TB**

Gross tonnage (will replace GRT in general).

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## **H**

### **Harvest Control Rule**

**Réglementation de contrôle des captures**

**Norma de control de captura**

Describes a variable over which management has some direct control as a function of some indicator of stock status. For example, a harvest control rule can describe a plan for how to adjust fishing mortality levels, depending on the abundance of a stock. Constant catch and constant fishing mortality are two types of simple harvest control rules.

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## **I**

### **Integrated Analysis**

**Analyse intégrée**

**Análisis integrado**

Refers to stock assessment methodologies that attempt to integrate multiple sources of data into a single estimation framework. For example, an integrated assessment can attempt to fit the following observations based on model predictions: Total landings by fleet, size samples of landings, discard estimates, size samples of discards, standardized CPUE by fleet, fishery-independent surveys, and tagging records on movement, growth and recoveries. (Fournier et al. 1998; Porch 1996)

### **ITQ (Individual Transferable Quota)**

**ITQ (Quota individuel transférable)**

**ITQ (Cuota individual transferible)**

A type of quota management system which typically entails the allocation of a part of the TAC to individual fishermen or vessel owners. The quota, once distributed, can be sold to others. (NRC 1999)

### **IUU**

**IUU**

**IUU**

Illegal, Unregulated and Unreported fishing vessels.

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## **L**

### **Landings**

**Débarquements**

**Desembarques**

The part of the catch that is landed.

### **Laurec-Shepherd**

**Laurec-Shepherd**

**Laurec-Shepherd**

A stock assessment method based on VPA and *Ad hoc* tuning of abundance indices. The population model is age-structured.

## **Least Squares**

Moindres carrés

Cuadrados mínimos

A statistical criterion for the estimation of parameters in regression. Least squares means that the method aims to minimize the sum of squared differences between the observations and the predictions from a model. For example, VPA tuning often involves finding the estimates of abundance and mortality rates that minimize the sum of squared differences between standardized CPUE and predicted abundance from the VPA.

## **Life History**

Evolution du cycle vital

Ciclo vital

A summary of the entire life cycle of the species which describes how the average individual is born, grows, reproduces and dies.

## **Lifespan**

Longévité

Duración de vida

A species' life expectancy in the absence of a fishery.

## **Limit Reference Point**

Points limites de référence

Punto de referencia límite

A benchmark that should not be exceeded with any significant probability according to a given set of management objectives. According to the UNIA,  $F_{MSY}$  should be a limit reference point. ICCAT's objectives do not define limit reference points explicitly, although  $F_{MSY}$  is the implied target. (Caddy and Mahon 1995)

## **LJFL (Lower jaw-fork length)**

LJFL (Longueur maxillaire inférieur-fourche)

LJFL (Longitud mandíbula inferior-horquilla)

A measurement used frequently for billfishes species: Projected straight distance between the tip of the lower jaw and the fork of the tail.

## **LOA**

LOA (Longeur hors-tout)

LOA (Eslora total)

"Length overall", a measure of the size of a fishing vessel.

## **Logbook**

Carnet de pêche

Cuaderno de pesca

An official record of a fishing vessel's fishing operations (including location and time of catches, gear configuration, nominal effort used, size samples, etc.). Logbooks are mandatory in some States and are the basis of much of ICCAT's "Task II" data.

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# **M**

## **Management Strategy**

Stratégie de gestion

Estrategia de ordenación

Refers to the management system as a whole (including support activities such as stock assessment) geared towards the achievement of specific management objectives. A management strategy can be defined more narrowly as the combination of a particular data collection system, a particular stock assessment technique and a particular harvest control rule and its implementation. In such a way, alternative management strategies can be compared against each other via simulation.

## **Maturity**

Maturité

Madurez

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

## **Maximum Economic Yield (MEY)**

Production économique maximale

Rendimiento económico máximo

Conceptually similar to Maximum Sustainable Yield, except that the objective is to maximize longterm profits.

## **Maximum Likelihood**

Probabilité maximale

Máxima verosimilitud

A statistical criterion for the estimation of parameters in models. The method aims to maximize the likelihood (probability) of having collected the observed data, given predictions from a model. For example, VPA tuning often involves finding the estimates of abundance and mortality rates that maximize the likelihood for the observed standardized CPUE. Under some conditions, the methods of Maximum Likelihood and Least Squares give similar results. (Freund and Walpole 1987)

## **Maximum Sustainable Yield (MSY)**

Production maximale soutenable (PME)

Rendimiento máximo sostenible (RMS)

The largest average yield (catch) that can be taken in the long-term from a stock, which corresponds to the yield expected from fishing at  $F_{MSY}$ . ICCAT's overarching objective is to make sure that stocks will be maintained at levels that permit harvest levels of MSY (see  $B_{MSY}$ ).

## **Microconstituent**

Microélément

Microelemento

Refers to the elemental makeup of bone structures. Like DNA, microconstituents can sometimes be used to infer something about the structure of populations.

**Minimum Size**

Taille minimale

Talla mínima

A control available to managers, intended to minimize the catches of small fish. Such a control is often decided upon based on yield per recruit considerations like avoiding growth overfishing. That is, minimum size regulations aim to alter the exploitation pattern so that young fish are given a better chance to grow before being vulnerable to fishing.

**Model**

Modèle

Modelo

A conceptual and simplified idea of how the “real world” works.

**Monte Carlo**

Monte Carlo

Monte Carlo

Monte Carlo simulation is an approach whereby the inputs that are used for a calculation are re-sampled many times assuming that the inputs follow known statistical distributions. The Monte Carlo method is used in many applications such as Bayesian analyses, parametric bootstraps and stochastic projections. (Manly 1991)

**Moratorium**

Moratoire

Moratoria

A cessation of fishing activities.

**Mortality Rate (instantaneous)**

Taux (instantané) de mortalité

Tasa de mortalidad (instantánea)

Conceptually, the easiest way to describe mortality is as a fraction (e.g. 0.3 or 30% of the fish die in a year). Because fishing and natural mortality happen continuously throughout the year, it is not straightforward to use these fractions in an additive way. Expressing these processes as instantaneous rates (i.e. as the fractions that die in infinitesimal periods of time) facilitates the stock assessment analysis computations on an annual basis, even when the catches take place daily. Instantaneous mortality rates of 0.1, 0.5 and 1.0 are equivalent to 10%, 39% and 63% mortality.

**MSP (Maximum Spawning Potential)**

MSP (Potentiel reproducteur maximal)

MSP (potencial máximo de desove)

See SPR.

**MULTIFAN-CL**

MULTIFAN-CL

MULTIFAN-CL

A stock assessment program based on length-based separable models and tuning of abundance indices. The population model is length/age-structured. (Fournier et al. 1998)

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**N****NAO (North Atlantic Oscillation index)**

NAO (Indice de l'Oscillation nord-atlantique)

NAO (Indice de oscilación del Atlántico norte)

An index of climatic conditions given by the differences in winter sea level pressures between Lisbon, Portugal, and Stykkisholmar, Iceland. Several studies have looked for correlations between NAO anomalies (deviations from the mean) and recruitment strength of tunas or swordfish. (Mejuto 1999)

**Natural Mortality Rate (M)**

Taux de mortalité naturelle

Tasa de mortalidad natural

The part of the total mortality rate that is due to causes other than fishing (e.g., predation, disease, cannibalism, and perhaps increasingly, environmental degradation such as pollution). These many causes of death are usually lumped together for convenience, because they are difficult to separate quantitatively. Sometimes natural mortality is confounded with losses of fish from the stock due to emigration. M has proven very difficult to estimate, and values are often assumed based on life history characteristics such as longevity. Also, M values are often assumed to remain constant through time and by age.

**NEI (Not Elsewhere Included)**

NEI

NEI

Refers to catch statistics that cannot be linked directly to a State or fishing entity, for whatever reason.

**Nominal**

Nominal

Nominal

Refers to quantities as they are reported, before any analyses or transformations. Nominal catch is the sum of catches that have been reported as round weight or, equivalently, the landings (nominal catches do not include such measures as unreported dead discards). Nominal effort pertains to measures of fishing effort or vessel carrying capacity that have not been standardized. When catchability changes, e.g., through changes in gear technology, trends in nominal effort can give a misleading picture of trends in exploitation.

**Non-equilibrium**

Non-équilibre

No equilibrio

See Equilibrium.

**Numbers at age (N)**

Nombre à l'âge

Números por edad

The number of fish in each age class in the stock at a particular point in time. Age-structured assessment models aim at estimating these quantities.

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## O

### **Observer**

**Observateur**

**Observador**

An independent person that collects information onboard fishing vessels. Observer programs can be used for quantifying bycatch and dead discards, collecting tag returns, etc. (Matsumoto and Miyabe 1999)

### **Optimum**

**Optimal**

**Optimo**

The term is used to mean that the stock is being exploited in complete harmony with management objectives. Since these objectives can be biological, economic or social, the term Optimum can have different implications in terms of harvest rates.

### **Otolith**

**Otolithe**

**Otolito**

The ear bone of a fish. Otoliths are used for ageing fish of many species, like rings are used in trees. However, the otoliths of most ICCAT species are notoriously difficult to extract and read, and thus they are not used routinely to prepare age-length keys.

### **Overfished**

**Surexploité**

**Sobreexplotado**

Overfished means that the abundance of the stock is “too low”. In many fisheries for the term is used when biomass has been estimated to be below a limit biological reference point that is used as the signpost that defines an “overfished condition”. ICCAT has not formally defined when a stock is to be categorized as being overfished, so usage of the term may not always be consistent. (Mace 1998)

### **Overfishing**

**Surpêche**

**Sobrepesca**

The term generally means that the fishing mortality being exerted on the stock is “too high”. In many fisheries for the term is used when  $F$  has been estimated to be above a limit biological reference point that is used as the signpost that defines “overfishing”. Usage of the term is not limited to “growth overfishing” situations; it can also pertain to recruitment overfishing and to other types of overfishing. As with the term Overfished, ICCAT usage of “overfishing” may not always be consistent. (Mace 1998)

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## P

### **Parameter**

**Paramètre**

**Parámetro**

A quantity that characterizes a population variable

in a statistical sense. In population dynamics models, parameters such as the rates of growth, mortality and reproduction provide the essential characteristics of the population.

### **Partial Recruitment**

**Recrutement partiel**

**Reclutamiento parcial**

See Exploitation Pattern.

### **Pelagic**

**Pélagique**

**Pelágico**

A species that lives in midwater or close to the surface. Tunas and tuna-like fishes are generally referred to as “large pelagics”.

### **Population**

**Population**

**Población**

A group of fish of one species which shares common ecological and genetic features. The stocks defined for the purposes of stock assessment and management do not necessarily coincide with self-contained populations.

### **Population Dynamics**

**Dynamique des populations**

**Dinámica de poblaciones**

In general, refers to the study of fish stock abundance and why it changes over time.

### **Population Model**

**Modèle de population**

**Modelo de poblaciones**

A component of a stock assessment model, made up of formulations that describe how the population changes from one time period to the next. The types of population models used by ICCAT vary, depending on the species life history and on data availability. Population models can roughly be classified as age/size structured or biomass-based; deterministic or stochastic; density-dependent or density-independent; spatially-structured or spatially aggregated; equilibrium or non-equilibrium.

### **Pop-up Tag**

**Marques pop-up**

**Marcas pop-up**

A tag that detaches itself from the fish after a predetermined period of time has elapsed since tagging. After detachment, the tag sends a signal via satellite, providing its position and downloading any other available information (if the pop-up tag is also an archival one). This technology does not rely on the recapturing/reporting of tagged fish to recover the information. (de Metrio et al. 1999)

### **Precautionary Approach**

**Approche de précaution**

**Enfoque precautorio**

“A set of agreed cost-effective measures and actions, including future courses of action, which ensures prudent foresight, reduces or avoids risk to the resource, the environment, and the people, to the extent possible, taking explicitly into account existing uncertainties and the potential consequences of being wrong” (García 1996)

### **PRODFIT**

**PRODFIT**

**PRODFIT**

A stock assessment computer program based on the generalized form of the production model, with equilibrium tuning of biomass-based abundance indices. The population model is in lumped biomass. The “Fox Model” is one of the optional production functions that can be used. (Fox 1975)

### **Production Model**

**Modèle de production**

**Modelo de producción**

A population model that describes, using simple functions, how the population biomass changes from year to year (or, how biomass changes in equilibrium as a function of fishing mortality). The simplest production functions aggregate all of the biological characteristics of growth, natural mortality and reproduction into a simple, deterministic model using three or four parameters. Production models are primarily used in simple-data situations, where total catch and effort data are available but age-structured information are either unavailable or deemed to be less reliable (although some versions of production models allow the use of age structured data). (Cadima and Pinho 1996)

### **Projection**

**Projection**

**Proyección**

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

### **Proxy**

**Indice approachant**

**Aproximación**

A substitute for some quantity. Scientists often use proxies for quantities that are not easy to estimate. For example,  $F_{0.1}$  or  $F_{x\%SPR}$  are sometimes used as proxies for  $F_{MSY}$ .

### **PWG**

**PWG**

**GTP**

Permanent Working Group for the Improvement of ICCAT Statistics and Conservation Measures.

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## **Q**

### **Quota**

**Quota**

**Cuota**

A portion of a TAC allocated to a fishery or to an operating unit, such as a size class of vessels or a country.

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## **R**

### **Raising**

**Extrapolation**

**Extrapolación**

A procedure for estimating the total from a sample, by multiplying all the fractions in the sample by a “raising factor” equal to the proportion of the total which the sample represents. For example, the total catch at size for a fishery is obtained by raising catch-at-size samples to the magnitude of the total catches, i.e. by multiplying the sampled numbers times the ratio of sample weight to total catch weight (or the ratio of sample numbers to total numbers).

### **Rebuilding**

**Rétablissement**

**Recuperación**

Refers to the trajectory of a stock from an overfished condition to a defined target. For example, a stock may be rebuilt to the  $B_{MSY}$  level.

### **Recommendation**

**Recommandation**

**Recomendación**

A decision made by the Commission, typically of a regulatory nature, which should be implemented domestically by Contracting Parties.

### **Recreational**

**Sportif**

**Deportivo/a**

Refers to catch or effort that is exerted by sportsmen.

### **Recruitment**

**Recrutement**

**Reclutamiento**

The amount of fish that first become vulnerable to the fishery each year due to growth and/or migration into the fishing area.

### **Recruitment Overfishing**

**Surpêche de recrutement**

**Sobrepesca de reclutamiento**

The rate of fishing above which the recruitment to

the exploitable stock becomes significantly reduced. This is characterized by a greatly reduced spawning stock, a decreasing proportion of older fish in the catch, and generally very low recruitment year after year. Recruitment overfishing can lead to stock collapse.

### **Regime Shift**

Changement de régime  
Cambio de régimen

A (medium- or long-term) shift in environmental conditions that impacts the productivity of a stock. (Beamish et al. 1999)

### **Replacement Yield**

Production de remplacement  
Rendimiento de reemplazo

The amount of yield in weight that can be removed from a population of fish and have that stock neither increase nor decline in biomass. When the population productivity is high under proper exploitation, then replacement yield will also be high. Conversely, when the population is underexploited or overexploited, then replacement yields will be low. In either case, if the actual yield taken is equal to the replacement yield, then the biomass will not change from one year to the next. See also surplus production.

### **Residual**

Valeur résiduelle  
Residuo

In statistical models, a residual is the difference between an observed quantity and the prediction given by the model (see Least Squares).

### **Resilience**

Résistance  
Elasticidad

Refers to the ability of a stock to recover from overfishing once fishing mortality rates are lowered.

### **Resolution**

Résolution  
Resolución

A decision made by the Commission which is not binding (see Recommendation).

### **Retrospective Pattern**

Mode rétrospectif  
Esquema retrospectivo

A diagnostic that indicates a potentially serious bias in a stock assessment. A retrospective pattern indicates that, as new years worth of data are added, the model estimates for the most recent years change substantially and in a systematic fashion. For example, the estimate of  $F$  for 1995 is very high when 1995 is the last year in the model; as more years are added, the estimate becomes progressively smaller (or, viceversa, the tendency could be one of increasing  $F$  with increasing data). (Hiramatsu 1993)

### **Ricker (stock-recruitment model)**

Ricker (modèle stock-recrutement)

Ricker (modelo de stock-reclutamiento)

A particular stock-recruitment formulation in which recruitment is dome-shaped, reaching a maximum at an intermediate level of parental stock size.

### **Risk**

Risque  
Riesgo

The term is used loosely to mean the probability of some undesired event (e.g., the risk of stock collapse). More rigorously, in decision analyses, it means the probability of an undesired event times a quantitative measure of the consequence(s) of the bad event. (Punt et al. 1996)

### **Round Weight**

Poids vif  
Peso en vivo

The whole weight of an individual fish, i.e. before it is processed (see gilled and gutted). ICCAT Task I data are in round weight units.

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## **S**

### **Safe Biological Limit**

Limite biologique de sécurité  
Límite biológico de seguridad

A Limit reference point, usually the stock biomass below which recruitment will decline substantially.

### **Sailfish (*Istiophorus albicans*)**

Voilier  
Pez vela

A billfish distributed around tropical and subtropical waters, with high concentrations in coastal waters but also found in oceanic waters. Eastern and western stocks are assumed for assessment. Sailfish are the most common Atlantic istiophorid and are can occur in small groups of a dozen or more fish. They are found predominately near the surface and are caught most frequently as a bycatch of the offshore longline fisheries. Spawning occurs in tropical and subtropical waters from the spring through summer.

### **Schaefer Model**

Modèle de Schaefer  
Modelo Schaefer

A specific form (the “parabolic” shape) of aggregated biomass stock production model. In the Schaefer model,  $B_{MSY}$  is at one-half of the carrying capacity. (Prager 1992; Schaefer 1994)

### **School**

Banc (matte)  
Cardumen

A group of fish swimming together. Schools are often formed by fish of the same species and age or size. Some tuna fishing gears are designed to target schools.

**Scientific Survey****Campagne d'échantillonnage scientifique****Encuesta científica**

A fishery-independent survey that is designed scientifically to achieve a given objective. For instance, a scientific survey can aim to produce an abundance index that is not affected by changes in catchability due to changes in gear technology.

**SCRS****SCRS****SCRS**

Standing Committee on Research and Statistics (ICCAT).

**Search time****Temps de recherche****Tiempo de búsqueda**

Refers to the time that a fishing vessel spends looking for fish schools. For purse seine operations, search time is often calculated as the time at sea minus the duration of the set.

**Selectivity****Sélectivité****Selectividad**

The relative vulnerability of different age or size classes to the fishing gear. Selectivity and exploitation pattern are often used interchangeably.

**Sensitivity Analysis****Analyse de la sensibilité****Análisis de sensibilidad**

The process of testing the sensitivity of input parameters on model results. For example, an estimation procedure such as VPA might be used to determine the fishing mortality rates over several years. The results might be conditioned on an assumed annual natural mortality rate ( $M$ ) of 0.2. The Sensitivity of this assumption might be examined by redoing the virtual population analysis based upon a different  $M$ , perhaps  $M=0.3$ . From the sensitivity analysis one can determine the importance of particular parameters to the overall scientific advice. (Vaughan et al. 1987)

**Separability****Séparabilité****Separable**

Age-structured stock assessment models track changes in fishing mortality by fish age and by fishing year. Separability is the assumption, made in some of these models, that the fishing mortality matrix can be partitioned into two components: An age-specific component that does not vary over time (i.e. a constant exploitation pattern), and an annual multiplier that scales the age-specific pattern up or down. (Kimura and Scott 1994)

**Sequential Population Analysis (SPA)****Analyse séquentielle des populations****Análisis secuencial de poblaciones**

Stock assessment methods consisting of a VPA and a statistical criterion for fitting indices of abundance (e.g., ADAPT).

**Set****Opération de pêche****Lance**

Refers to a fishing operation in which the gear is deployed and retrieved once, usually for purse-seines or longlines.

**Sexual Dimorphism****Dimorphisme sexuel****Dimorfismo sexual**

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

**Shrinking****Shrinking****Constricción**

A procedure applied in some assessment models in order to constrain how much parameter estimates can vary between consecutive years or between consecutive ages. Fishing mortality is sometimes extremely difficult to estimate with adequate precision in the most recent years; "shrinking" allows the assessment scientist to constrain the  $F$  for the last year so that it does not differ substantially from, say, the average  $F$  for the preceding 3-year period.

**Simulation****Simulation****Simulación**

The body of numerical techniques in which a calculation is performed using specified inputs in order to simulate how a population of fish might react. Simulations may be deterministic (for each set of inputs there will be one output of the calculation) or stochastic (multiple calculations are performed to characterize the range of variability in the results). Sensitivity analyses are a form of simulation. Projections of the status of the population into the future is another type of simulation. Often stochastic simulations are conducted in which an assessment calculation is repeated a large number of times, where each time the inputs are randomly selected with error. The range of outcomes in the calculations will indicate how sure one is of the results. There are several ways of accounting for uncertainty in the inputs, such as bootstrapping, Bayesian methods, and Monte Carlo simulations. In either case, stochastic methods are used to determine confidence in the results of a particular analysis.

### **Size samples**

Echantillons de taille

Muestras de talla

Refers to samples taken from the catch (from the landings) in order to determine the size distribution of the catches. This information is important for stock assessments (particularly for age/size-structured methods) and management advice. Size samples are reported to ICCAT as “Task II” data. When size samples are not available for a given type of fishing operation, Substitutions are used.

### **Skipjack (*Katsuwonus pelamis*)**

Listao

Listado

A cosmopolitan tuna species forming schools in the tropical and subtropical waters of the three oceans. Eastern and western stocks are assumed for assessment, separated at 30° W. Spawning is opportunistic throughout the year in vast areas of the Atlantic. Growth is variable and seasonal, and substantial differences in growth rates have been reported between areas. This species is associated with floating objects, both natural and artificial (FADs) which have been used extensively since the early 1990s by purse seiners and baitboats. Skipjack caught with FADs are usually associated with small yellowfin, bigeye and other tuna species.

### **SMT (Small Tunas)**

SMT (Thons mineurs)

SMT (Pequeños túnidos)

These species (BLF, BLT, BON, BOP, BRS, CER, FRI, KGM, KGX, LTA, MAW, SSM, and WAH) are typically exploited by coastal fisheries. For logistical reasons, ICCAT does not conduct assessments of these species, although some stocks are assessed by Member States.

### **Spawners**

Géniteurs

Reproductores

Refers to fish that are reproductively mature.

### **Spawning Potential Ratio (SPR)**

Ratio potentiel de reproduction

Ratio potencial de desove

The ratio of spawning potential per recruit under a given fishing regime relative to the spawning potential per recruit with no fishing (also known as %MSP for Maximum Spawning Potential). SPR's require information on natural mortality, growth, spawning potential at age and the relative vulnerability by age to fishing. If possible, spawning potential per recruit is measured in fecundity per recruit, but often spawning stock biomass per recruit (SSB/R see below) is an appropriate substitute. SPR and SSB/R are simple extensions to yield per recruit (see below) in that there are two ways in which recruits can be used: they can be caught, in which case they are part of the yield (yield per recruit), or they can survive, in which case they are part of the SPR, SSB/R.

SPR is expressed as a ratio of a fished condition to an unfished condition, thus the ratio varies from 0 to 1. Additionally, empirical studies have shown that for some populations SPR's in the order of 20% to 30% may run the risk of recruitment declines, thus there is a basis of comparison between populations. Therefore,  $F_{X\%SPR}$  fishing mortality rates are sometimes used as biological reference points. (Note: SPR is sometimes used to mean “spawners per recruit”, but this usage should be avoided and replaced by SSB/R). (Goodyear 1990)

### **Spawning Stock Biomass (SSB)**

Biomasse du stock reproducteur (SSB)

Biomasa del stock reproductor (SSB)

The total weight of sexually mature fish in the population (usually males and females combined, but sometimes female SSB, alone, is used). This quantity depends on the abundance of year classes, the exploitation pattern, the rate of growth, both fishing and natural mortality rates, the onset of sexual maturity, and environmental conditions. Many types of analyses that address reproductive (spawning) potential should use a measure of production of viable eggs (e.g. fecundity). However, when such life-history information is lacking, SSB is used as a proxy.

### **Spawning stock biomass per recruit (SSB/R)**

Biomasse du stock reproducteur par recrue (SSB/R)

Biomasa del stock reproductor por recluta (SSB/R)

The expected lifetime contribution to the spawning stock biomass for the average recruit to the fishery. For a given exploitation pattern, rate of growth, maturity schedule and natural mortality, an equilibrium value of SSB/R can be calculated for any level of F. SSB/R decreases monotonically with increasing F.

### **SST**

SST

SST

Sea Surface Temperature.

### **STACFAD**

STACFAD

STACFAD

Standing Committee on Finance and Administration (ICCAT).

### **Standardized**

Standarisé

Estandarizado

Refers to quantities that have been adjusted to be directly comparable to a unit that is defined as the “standard” one. Nominal CPUE is standardized to remove the effect of factors which are known not to be related to abundance. This means that the effects of factors such as vessel size or spatial availability, which clearly affect CPUE, are removed, e.g. by adjusting all observations to the “standard vessel” in the “standard area”. A variety of techniques are available for standardization such as GLMs. (Cooke and Lankester 1996)



**Stationary**

Stationnaire

Estacionario

Refers to a parameter or life history characteristic that does not change over time. "Stationary" is closely related to Equilibrium, although it is possible to have one without the other. For example, yield-per-recruit can be constant (if the fishing and natural mortality, exploitation pattern, and growth remain stationary) but the overall yield can vary over time if the number of recruits varies.

**Statistical Model**

Modèle statistique

Modelo estadístico

A component of an estimation model, that defines the criteria for how the observations are fitted. The types of statistical models used in ICCAT analyses vary, including Least Squares, Maximum Likelihood, Bayesian, and *Ad hoc* procedures.

**Status**

Etat

Estado

Refers to a determination made, on the basis of stock assessment results, about the condition of the stock and of the fishery. Status determinations are often made with respect to biological reference points (e.g., a stock is Overfished if its biomass is below the agreed limit reference point). The SCRS strives to report status with respect to  $F_{MSY}$  and  $B_{MSY}$  because these quantities play a role in the Convention texts (see  $B_{MSY}$ ).

**Stochastic**

Stochastique

Estocástico

A process that has random components. For example, stock projections are usually made that future recruitment has a stochastic component.

**Stock**

Stock

Stock

The term has different meanings. In general, a stock is a biological unit of one species forming a group of similar ecological characteristics and, as a unit, is the subject of assessment and management. However, there are many uncertainties in defining spatial and temporal geographical boundaries for such biological units that are 100% compatible with established data collection and geopolitical systems. For this reason, the term stock is often synonym with assessment/management unit, even if there is migration of the same species to and from adjacent areas.

**Stock Assessment**

Evaluation de stock

Evaluación de stock

The application of statistical and mathematical tools to relevant data in order to obtain a quantitative understanding of the status of the stock as needed to

make quantitative predictions of the stock's reactions to alternative future regimes.

**Stock-Recruitment Relationship**

Rapport stock-recrutement

Relación stock-reclutamiento

A function that describes how recruitment varies with changes in the reproductive output (or biomass) of the parental stock. Two common forms are the Beverton-Holt and the Ricker relationships. The stock-recruitment relationship is particularly important for the understanding of the sustainability of alternative harvesting regimes. Some stock assessment methods incorporate the estimation of such a relationship directly into the model, either explicitly (e.g. some age-structured assessments) or implicitly (most stock production models). (Hayasi 1974)

**Stock Structure**

Structure du stock

Estructura de stock

(1) Refers to the geographical boundaries of the stocks assumed for assessment and management purposes (e.g., a species may be assumed to be comprised of three separate stocks in the North Atlantic, South Atlantic, and Mediterranean Sea). (2) Refers to boundaries that define self-contained populations in a genetic sense.

**Substitutions**

Substitutions

Substituciones

Refers to the practice of substituting information from one type of fishing operation for missing data in another type of fishing operation. Substitutions are often needed to obtain estimates of the total catch at size for a species.

**Surface fisheries**

Pêcheries de surface

Pesquerías de superficie

Refers to fisheries that target tunas or swordfish using surface gears, such as surface longlines, baitboats, purse-seines and harpoons.

**Surplus Production**

Production excédentaire

Producción excedente

The amount of biomass produced by the stock (through growth and recruitment) over and above that which is required to maintain the total stock biomass constant between consecutive time periods. See also Replacement Yield.

**Survey**

Echantillonnage scientifique

Prospección

Refers to the collection of data that is controlled by scientists, for example by collecting fish from research vessels by following a pre-determined scientific design. See Fishery-independent.

## **Survival Ratio**

Taux de survie

Ratio de supervivencia

Ratio of recruits to spawners (or parental biomass) in a stock-recruitment analysis. Changes in survival ratios indicate that the productivity of a stock is changing.

## **Sustainability**

Durabilité

Sostenibilidad

Pertains to the ability to persist in the long-term. Sustainable fishing is a manner of fishing that ensures that future generations will also be able to fish. Because fish populations exhibit natural variability, it is not possible to keep all population and fishery attributes at a constant level simultaneously, thus sustainable fishing does not imply that the fishery and stock will persist in a constant equilibrium state. Because of natural variability, even if  $F_{MSY}$  could be achieved exactly each year, both catches and stock biomass would oscillate around their “equilibrium” MSY levels.

## **Swordfish (*Xiphias gladius*)**

Espadon

Pez espada

Swordfish are distributed widely in the Atlantic Ocean and Mediterranean Sea, and range from Canada to Argentina on the western side, and from Norway to South Africa on the eastern side. Three stocks are assumed for assessment purposes: Mediterranean, North and South Atlantic. They are typically caught on pelagic longlines at night when they feed in surface waters. Spawning occurs in the warm tropical and subtropical waters throughout the year, although seasonality has been reported. Swordfish are found in the colder northern waters during summer months.

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# **T**

## **Tag**

Marque

Marca

A mark implanted on (or inside) a fish. Tagging data are used to learn about a species' biology but also as auxiliary data for stock assessments. “Conventional” or streamer tags are used to collect information about point of capture, point of recapture and growth. More modern tags use archival and/or pop-up technology.

## **Target Reference Point**

Point cible de référence

Niveles de referencia previstos

A benchmark that should be achieved on average according to a given set of management objectives. ICCAT's implied targets are  $F_{MSY}$ ,  $B_{MSY}$  and MSY. (Caddy and Mahon 1995)

## **Task I Data**

Données Tâche I

Datos de la Tarea I

Atlantic tuna statistics collected by ICCAT consisting of: (i) Nominal annual catch of tuna and tuna like fish, by region, gear, flag and species, and, where possible, by EEZ and High Seas; (ii) number of fishing vessels by size class, gear and flag, and, where possible, by EEZ and High Seas. In general, the primary responsibility for reporting catch and landing data rests on the flag State.

## **Task II Data**

Données Tâche II

Datos de la Tarea II

Atlantic tuna statistics collected by ICCAT consisting of: (i) Catch and effort statistics by small area ( $1^\circ \times 1^\circ$  or  $5^\circ \times 5^\circ$  squares), gear, flag, species and month; (ii) actual size frequencies of samples caught by small area, gear, flag, species and month.

## **Taylor Series Method**

Méthode de Taylor

Modelo de series de Taylor

See Delta Method.

## **Terminal F**

F terminal

F terminal

Refers to fishing mortality values in the last year for which data are available in an assessment.

## **Thermocline**

Thermocline

Termoclina

A transition zone in the ocean between the upper warm water layer and the lower cold water layer. The position of some fishing gears with respect to the thermocline can affect catchability.

## **Threshold**

Seuil

Umbral

A biological reference point used to indicate that a Limit reference point is being approached. (Note: In some of the fisheries literature, “Threshold” is used to denote a “Limit”).

## **Total Allowable Catch (TAC)**

Total de prises permmissibles

Total admisible de capturas

A management control to limit the catch (yield) for the entire stock. TACs are typically partitioned into quotas.

## **Total mortality rate (Z)**

Taux global de mortalité

Tasa de mortalidad total

The sum of natural and fishing mortality rates.

### **Transitional**

Transitoire

Transitorio

Refers to the non-equilibrium trajectory between two equilibrium states. For example, equilibrium yield analyses might indicate that a given regulation will increase equilibrium yield by, say, two-fold. However, the transition between the two levels of yield will actually involve a short-term loss in yield.

### **Tuning**

Calibrage

Calibración

The fitting of indices of abundance with catch data, using a stock assessment model. Tuning usually aims to minimize differences between the observed abundance indices and the abundance predicted by the model.

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## **U**

### **Uncertainty**

Incertitudes

Incertidumbre

Uncertainty results from a lack of perfect knowledge of many factors that affect stock assessments, estimation of biological reference points, and management. Sources of uncertainty include measurement error (in observed quantities), process error (or natural population variability, e.g. in recruitment), model error (mis-specification of assumed values or population model structure), estimation error (in population parameters or reference points, due to any of the preceding types of errors), and implementation error (or the inability to implement management controls for whatever reason).

### **Undersized**

Sous-taille

Bajo talla

Refers to fish that are smaller than a minimum size limit established by regulation.

### **UN Fish Stocks Agreement (UNFSA)**

Accord de l'ONU sur les stocks (UNFSA)

Acuerdo ONU sobre stocks de peces (UNFSA)

Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (also known as the "Straddling Stocks Agreement").

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## **V**

### **Vessel Monitoring System (VMS)**

Système de suivi des bateaux

Sistema de seguimiento de barcos

A system for tracking the position and operation of fishing vessels electronically, with real-time data transmission via satellite.

### **Virgin**

Vierge

Virgen

Refers to an unfished condition of the stock in an equilibrium sense. For instance, Virgin Biomass is equivalent to the stock's carrying capacity.

### **Virgin biomass ( $B_0$ )**

Biomasse vierge

Biomasa virgen

A biological reference point. It is the long-term average biomass value expected in the absence of fishing mortality. In production models,  $B_0$  is also known as carrying capacity.

### **Viscosity (of the stock)**

Viscosité (du stock)

Viscosidad (del stock)

A term used to describe the notion that, throughout its area of distribution, mixing of individuals is neither complete and instantaneous, nor inexistent. Thus, what a fishery does in a particular subarea of the stock impacts the entire stock in a time scale and to a degree that are a function of the stock's "viscosity". ICCAT does not have quantitative measures of viscosity, and its assessments are not spatially-structured, so that this concept is only used in a qualitative fashion. (Fonteneau et al. 1998; MaCall 1990)

### **Virtual Population Analysis (VPA)**

Analyse des populations virtuelles

Análisis de población virtual

An algorithm for computing historical fishing mortality rates and stock sizes by age, conditioned on catches, natural mortality, and certain assumptions about mortality for the last year and last age group. A VPA essentially reconstructs the history of each cohort, assuming that the observed catches are exact and known without error. (Powers and Restrepo 1992)

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## **W**

### **White marlin (*Tetrapturus albidus*)**

Makaire blanc

Aguja blanca

A billfish species found throughout tropical and temperate waters of the Atlantic Ocean and adjacent seas. Their range is almost identical to that of blue marlin, although they seem to be less abundant in the eastern Atlantic. A single Atlantic-wide stock is assumed for assessment. White marlin occur only in the Atlantic Ocean, which is not the case for blue marlin and sailfish. Although white marlin are considered to be rare and solitary compared to schooling tunas, they are known to occur in small groups of several fish. Spawning occurs in tropical and subtropical waters in mid- to late spring. White marlin are found predominately in the open ocean near the surface and are caught most frequently as a by-catch by the offshore longline fisheries which target tropical or temperate tunas. Significant by-catch

landings are also made by offshore longline fisheries that target swordfish, particularly in the west Atlantic Ocean.

## X

**XBT**  
**XBT**  
**XBT**

Expendable bathy-thermograph, an instrument that records water temperature against depth.

**XSA**  
**XSA**  
**XSA**

“Extended Survivors Analysis.” A stock assessment program based on VPA and tuning of abundance indices. (Darby and Flatman 1994)

## Y

**Year Class**

**Classe annuelle**

**Clase anual**

The fish spawned or hatched in a given year. See cohort.

**Yellowfin (*Thunnus albacares*)**

**Albacore**

**Rabil**

A cosmopolitan tuna species distributed mainly in the tropical and subtropical oceanic waters of the three oceans, where they form large schools. Smaller fish form surface schools mixed with skipjack and young bigeye, while larger fish are found in surface and sub-surface waters. A single Atlantic-wide stock is assumed for assessment. The main spawning ground is the equatorial zone of the Gulf of Guinea, with spawning occurring from January to April. Spawning also occurs from May to November in the Gulf of Mexico and southeastern Caribbean Sea. From the Gulf of Guinea, juveniles move towards more coastal waters off Africa. Later they may migrate westward to the American coasts, to return to the east Atlantic fishing grounds for spawning when they reach maturity.

**Yield**

**Production**

**Rendimiento**

Catch in weight.

**Yield per Recruit (Y/R)**

**Production par recrue**

**Rendimiento por recluta**

The expected lifetime yield for the average recruit. For a given exploitation pattern, rate of growth, and natural mortality, an equilibrium value of Y/R can be calculated for each level of F. Y/R analyses play an important role in advice for management, particularly as it relates to minimum size controls.

# Acronyms

## Assessment Symbols and

### Acronyms (see definitions)

<b>B</b>	Biomass
<b>B<sub>MSY</sub></b>	Biomass at MSY
<b>B<sub>0</sub></b>	Virgin (unexploited level) biomass
<b>CA</b>	Cohort analysis
<b>CAA</b>	Catch at age
<b>CAS</b>	Catch at size
<b>CPUE</b>	Catch per unit effort (catch rate)
<b>F</b>	Fishing mortality rate
<b>K</b>	Carrying capacity of the stock
<b>L<sub>∞</sub></b>	Asymptotic (maximum) length
<b>M</b>	Natural mortality rate
<b>MSY</b>	Maximum sustainable yield
<b>q</b>	Catchability
<b>r</b>	(Intrinsic) growth rate
<b>SPA</b>	Sequential Population Analysis
<b>SPR</b>	Spawners per recruit
<b>SSB</b>	Spawning stock biomass
<b>SSB/R</b>	Spawning stock biomass per recruit
<b>t<sub>c</sub></b>	Age of recruitment
<b>VPA</b>	Virtual population analysis
<b>Y/R</b>	Yield per recruit
<b>Z</b>	Total mortality rate

## ICCAT Species Codes

<b>ALB</b>	Albacore <i>Thunnus alalunga</i> .
<b>BET</b>	Bigeye tuna <i>Thunnus obesus</i> .
<b>BFT</b>	Bluefin tuna <i>Thunnus thynnus thynnus</i> .
<b>BGT</b>	Big tunas, unclassified.
<b>BIL</b>	Billfishes, unclassified.
<b>BLF</b>	Blackfin tuna <i>Thunnus atlanticus</i> .
<b>BLM</b>	Black marlin <i>Makaira indica</i> .
<b>BLT</b>	Bullet tuna <i>Auxis rochei</i> .
<b>BON</b>	Atlantic bonito <i>Sarda sarda</i> .
<b>BOP</b>	Plain bonito <i>Orcynopsis unicolor</i> .
<b>BUM</b>	Atlantic blue marlin <i>Makaira nigricans</i> .
<b>CER</b>	Cero <i>Scomberomorus regalis</i> .
<b>FRI</b>	Frigate tuna <i>Auxis thazard</i> .
<b>KGM</b>	King mackerel <i>Scomberomorus cavalla</i> .
<b>KGX</b>	<i>Scomberomorus</i> , unclassified.
<b>LTA</b>	Atlantic black skipjack <i>Euthynnus alletteratus</i> .
<b>MAW</b>	W African Spanish mackerel <i>Scomberomorus tritor</i> .
<b>OTH</b>	Mixed or unknown species.
<b>SAI</b>	Atlantic sailfish <i>Istiophorus albigans</i> .
<b>SBF</b>	Southern bluefin tuna <i>Thunnus maccoyii</i> .
<b>SKJ</b>	Oceanic skipjack <i>Katsuwonus pelamis</i> .
<b>SPF</b>	Spearfish <i>Tetrapturus pfluegeri</i> and <i>T. belone</i> .
<b>SSM</b>	Spotted Spanish mackerel <i>Scomberomorus maculatus</i> .
<b>SWO</b>	Broadbill swordfish <i>Xiphias gladius</i> .
<b>WAH</b>	Wahoo <i>Acanthocybium solandri</i> .
<b>WHM</b>	Atlantic white marlin <i>Tetrapturus albidus</i> .
<b>YFT</b>	Yellowfin tuna <i>Thunnus albacares</i> .
<b>YOU</b>	Young tunas, unclassified.

## Fishing Gears and Codes

- BB** Baitboat. Pole-and-line fishing, chumming live bait for attracting schools of tuna.
- GILL** Gillnet. A set of nets (either drifting or afixed to the bottom) used for entangling fish.
- HAND** Handline. Fishing lines held by had, with or without chumming live bait.
- HARP** Harpoon. Harpoons or spears thrown either by hand or an auxiliary mechanism to catch fish.
- HS** Haul seine. Beach seine.
- LL** Longline. A set of lines to which branch lines with hooks are attached.
- MWT** Mid-water trawl. A net that is trawled below the surface, but not touching the bottom.
- PS** Purse seine. A seine with a purse-like mechanism at the bottom, used to close the net after encircling a school.
- RR** Rod-and-reel. Rod and line fishing (sports fishing).
- TRAP** Trap. Fixed gear anchored to the bottom, usually containing a guide net that leads fish into an enclosure.
- TRAW** Trawl. A net that is trawled over the bottom.
- TROL** Troller. A boat equipped with lines that have one or more hooks, wich are trolled from the running boat.

## Organizations/Instittutes

- AZTI** Instituto Tecnologico Pesquero y Alimentario. ([www.azti.es](http://www.azti.es))
- CCAMLR** Commission for the Conservation of Antarctic Marine Living Resources. ([www.ccamlr.org](http://www.ccamlr.org))
- CCSBT** Convention for the Conservation of Southern Blue-fin Tuna. ([www.home.aone.net.au/ccsbt](http://www.home.aone.net.au/ccsbt))
- CITES** Convention on International Trade in Endangered Species of Wild Fauna and Flora. ([www.cites.org](http://www.cites.org))
- COFI** Committee on Fisheries, United Nations.
- CRODT** Centre de Recherches Océanographiques Dakar-Thiaroye, Sénégal.
- CSIRO** Council of Scientific and Industrial Research Organization, Australia. ([www.marine.csiro.au](http://www.marine.csiro.au))
- CWP** Coordinating Working Party on Fishery Statistics (a group composed by FAO and regional agencies involved in the collection and compilation of fishery statistics). ([www.fao.org/fi/body](http://www.fao.org/fi/body))
- DFO** Department of Fisheries and Oceans, Canada. ([www.dfo-mpo.gc.ca](http://www.dfo-mpo.gc.ca))

- EU** European Union. ([www.europa.eu.int](http://www.europa.eu.int))
- FAO** Food and Agriculture Organization. ([www.fao.org/fi](http://www.fao.org/fi))
- FONAIAP** Fondo Nacional de Investigaciones Agropecuarias (Venezuela).
- GFCM** General Fisheries Commission of the Mediterranean.
- IATTC** Inter-American Tropical Tuna Commission. ([www.iatcc.org](http://www.iatcc.org))
- ICES** International Council for the Exploration of the Seas. ([www.ices.dk](http://www.ices.dk))
- IBAMA** Instituto Brasileiro do Meio Ambient e dos Recursos Naturais Renováveis, Brazil. ([www.ibama.gov.br](http://www.ibama.gov.br))
- IEO** Instituto Español de Oceanografía, Spain. ([www.ieo.es](http://www.ieo.es))
- IFREMER** Institut Français de Recherche pour l'Exploitation de la Mer, France. ([www.ifremer.fr](http://www.ifremer.fr))
- INAPE** Instituto de Pesca Marítima, Uruguay.
- IOC** Intergovernmental Oceanographic Commission.
- IOF** Institute of Oceanography and Fisheries, Croatia.
- IOTC** Indian Ocean Tuna Commission. ([www.seychelles.net/iotc](http://www.seychelles.net/iotc))
- IRD** Institut de Recherche pour le Développement, France (formerly **ORSTOM**). ([www.ird.fr](http://www.ird.fr))
- ISPM** Institut Scientifique des Pêches Maritimes, Maroc.
- NAFO** Northwest Atlantic Fisheries Organization. ([www.nafo.ca](http://www.nafo.ca))
- NRIFSF** National Research Institute of Far Seas Fisheries, Japan. ([www.enyo.affrc.go.jp](http://www.enyo.affrc.go.jp))
- NMFS** National Marine Fisheries Service, USA. ([www.nmfs.gov](http://www.nmfs.gov))
- ORSTOM** Office de la Recherche Scientifique et Technique Outre-Mer, France (now **IRD**).
- SPC** Secretariat of the Pacific Community. ([www.spc.org.nc/oceanfish](http://www.spc.org.nc/oceanfish))

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