Proposal for a system to assess the quality of fisheries statistics at the IOTC

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Abstract

This document presents a first proposal of scoring system to assess the quality of statistics in the IOTC database. The system proposed is intended to assess the quality of statistics by country, type of fishery and species. The quality of statistics is assessed separately for each data type, including total catch, catch-and-effort and size frequency; and for all datasets combined. Initially, the system is intended to be used for IOTC species and main species of sharks as the same data requirements apply to both groups. An alternative system is proposed for other species.

The scoring system proposed covers a wide range of criteria involving, in some cases, information that is not fully available to the IOTC, in particular documentation on sampling designs and estimation procedures. This information will need to be completed prior to full implementation of the system.

In addition, the scoring system, although informative, cannot be used to quantify uncertainty, in particular of catch series used for stock assessment. Estimates of precision and accuracy are not available for the catches or other data available at the IOTC, as this information is not requested by the IOTC. The IOTC Secretariat cannot derive such estimates at present, as catches and other information are reported to the IOTC in aggregated form, the Secretariat not having access to sampling procedures and sample data.

1. Introduction

During its last meeting, the IOTC Working Party on Data Collection and Statistics acknowledged the work undertaken by the IOTC Secretariat in assessing the quality of statistics available at the IOTC. In this regard, it was noted that the information presented covered only the status of nominal catch data, requesting the IOTC Secretariat to extend the analysis to incorporate also other types of data, including catch-and-effort and size frequency data.

The WPDCS agreed that the status of datasets in the IOTC database would be best assessed through a system that assigns scores to nominal catches, catch-and-effort and size frequency datasets on the basis of a set of agreed criteria. As a first step, the WPDCS requested the IOTC Secretariat to present a first proposal of scoring system to be reviewed during the WPDCS in 2010.

This document presents a first proposal of scoring system to assess the quality of statistics in the IOTC database. The system proposed is intended to assess the quality of statistics by country, type of fishery and species. The quality of statistics is assessed separately for each data type, including total catch, catch-and-effort and size frequency; and for all datasets combined. Initially, the system is intended to be used for IOTC species and main species of sharks as the same data requirements apply to both groups. An alternative system is proposed for other species, for which data requirements are limited to the reporting of total levels of bycatch, where possible by species.

2. Fisheries

The following fisheries are considered:

- **Surface fisheries**: refers to fisheries made up of large scale vessels (LOA≥24m), those made up of medium-scale vessels (LOA<24m) that operate on the high seas using surface gears or fleets made up of a combination of the two. The following surface gears apply:

    o Purse seine: refers to purse seines used to target tropical or temperate tunas

    o Purse seine(small): refers to purse seines used to target neritic tuna species

    o Pole-and-line: refers to both large-scale and small-scale vessels using pole-and-lines to target tropical tunas, usually in coastal waters.

    o Gillnet: refers to both large-scale and small-scale vessels using gillnets to target tropical tunas, in coastal waters, the high seas or both.

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- o Gillnet/Longline: refers to small-scale vessels using gillnets and longlines simultaneously to target IOTC species and sharks, respectively, in coastal waters, the high seas or both.
- **Longline fisheries**: refers to fisheries made up of large scale vessels (LOA≥24m), those made up of medium-scale vessels (LOA<24m) that operate on the high seas using longlines or fleets made up of a combination of the two. The following types of longline apply:
    - o Longline: refers to longlines made up of more than 2000 hooks, usually operated during the day to target yellowfin tuna (shallow) or bigeye tuna (deep), usually preserved [deep-] frozen.
    - o Longline(fresh): refers to longlines made up of up to 1800 hooks, usually operated during the day in shallow waters to target yellowfin tuna and/or bigeye tuna, usually preserved on ice.
    - o Longline(SWO): refers to longlines made up of up to 1800 hooks, usually operated during the night in shallow waters to target swordfish, usually preserved frozen.
- **Coastal fisheries**: Refers to fisheries made up of small scale vessels (LOA<24m) that operate in coastal waters, including all small-scale fisheries and those medium-scale fisheries that operate in coastal waters. The following types of gear apply: handline, trolling, gillnets and pole-and-lines other than the above and any other gear types not included above.

3. Species

The following species are considered:

- **IOTC Species and main species of sharks** as presented in Table 1.

Table 1: IOTC Species and main species of sharks				
	IOTC Code	Species English name	Species French name	Species scientific name
1.	YFT	Yellowfin tuna	Albacore	*Thunnus albacares*
2.	BET	Bigeye tuna	Patudo; Thon obèse	*Thunnus obesus*
3.	SKJ	Skipjack tuna	Listao	*Katsuwonus pelamis*
4.	ALB	Albacore	Germon	*Thunnus alalunga*
5.	SBF	Southern bluefin tuna	Thon rouge du Sud	*Thunnus maccoyii*
6.	SWO	Swordfish	Espadon	*Xiphias gladius*
7.	BLM	Black Marlin	Makaire noir	*Makaira indica*
8.	BUM	Blue Marlin	Makaire bleu	*Makaira nigricans*
9.	MLS	Striped marlin	Marlin rayé	*Tetrapturus audax*
10.	SFA	Indo-Pacific sailfish	Voilier indo-pacifique	*Istiophorus platypterus*
11.	LOT	Longtail tuna	Thon mignon	*Thunnus tonggol*
12.	KAW	Kawakawa	Thonine orientale	*Euthynnus affinis*
13.	FRI	Frigate tuna	Auxide	*Auxis thazard*
14.	BLT	Bullet tuna	Bonitou	*Auxis rochei*
15.	COM	Narrow-barred Spanish mackerel	Thazard rayé indo-pacifique	*Scomberomorus commerson*
16.	GUT	Indo-Pacific king mackerel	Thazard ponctué indo-pacifique	*Scomberomorus guttatus*
17.	BSH	Blue shark	Peau bleue	*Prionace glauca*
18.	POR	Porbeagle	Requin-taupe commun	*Lamna nasus*
19.	PSK	Crocodile shark	Requin crocodile	*Pseudocarcharias kamoharai*
20.	WSH	Great white shark	Grand requin blanc	*Carcharodon carcharias*
21.	OCS	Oceanic whitetip shark	Requin océanique	*Carcharhinus longimanus*
22.	TIG	Tiger shark	Requin tigre commun	*Galeocerdo cuvier*
23.	PST	Pelagic stingray	Pastenague violette	*Pteroplatytrygon violacea*

- **Species of sharks for which statistics are to be reported by Genus** (two or more species combined)**,** including mako sharks (*Isurus spp.*), thresher sharks[2] (*Alopias spp.*), hammerhead sharks (*Sphyrna spp.*), and requiem sharks other than oceanic whitetip and great white shark (*Carcharhinus spp.*).

- **Other species** including seabirds, marine turtles, marine mammals and other species of sharks or finfish bycatch of fisheries for IOTC species (for details refer to the Guidelines for the reporting of fisheries data to the IOTC[3])

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[2] Refers to discards of thresher sharks, dead or alive, as the IOTC banned catches of thresher sharks in 2010

[3] http://www.iotc.org/Common/dataforms/Guidelines%20Data%20Reporting%20IOTC[E].pdf

4. Criteria used to assess the quality of fisheries statistics at the IOTC

The system proposed is intended to assess the quality of the data available for individual species and fisheries, as indicated in the previous sections (2-3), for each year. The quality of statistics (Table 3) is assessed on the basis of an initial score that is assigned to each dataset (Table 2), by stratum (of species, fishery and year) and factors associated to a set of agreed criteria (Tables 4-6). The points allocated to each dataset are subsequently broken by category of criterion (POINTS in Tables 4-6) and the resulting points multiplied by a factor (MULT in Tables 4-6) according to the criterion that applies in each case, with the highest factors (1.00) assigned to good quality data and the lowest (0.00) to data of poor quality. Thus, the datasets having the highest scores at the end of the process would be those that are presumed to be of good quality, with the lowest scores assigned to data of presumed poor quality (Table 3). An example of implementation of this process is shown in Appendix I.

The statistics for each species, fishery and year stratum are assigned 1000 points, with points assigned to the different types of datasets, including: 650 points assigned to Total Catches (TC) and Catch-and-Effort (CE); and 350 points assigned to Size Frequency (SF). The individual scores assigned to TC and CE data vary depending on the type of fisheries involved and importance of the species assessed, including:

- Type of **Fishery** (section 2): More points are allocated to catch-and-effort data from surface and longline fisheries as these fisheries are more likely to operate larger areas and change fishing grounds depending on the season than those operating in coastal waters.

- **Importance of Catch**es: More points are allocated to catch-and-effort data where the species assessed is the target species of the fishery concerned or its catches represent, in average, 20% or more of the total catches for that fishery.

- **Seasonality** of catches: More points are allocated to catch-and-effort data where, in average, the catches or average sizes caught for the species show high variability throughout the year, e.g. among months or seasons.

The points assigned and conditions that apply in each case are presented in **Table 2**.

Table 2: Points assigned to total catch (TC), catch-and-effort (CE) and size frequency (SF) data and conditions that apply in each case									
Class	**Fishery**	**Importance of Catch**	**Seasonality**	**TC**		**CE**		**SF**	
				Prop	Points	Prop	Points	Prop	Points
1	Surface and longline	Target or >=20%	Any	0.40	**400**	0.25	**250**	0.35	**350**
2	Surface and longline	Non-target and <20%	Any	0.45	**450**	0.20	**200**	0.35	**350**
2	Coastal	Target or >=20%	Any	0.45	**450**	0.20	**200**	0.35	**350**
2	Coastal	Non-target and <20%	High	0.45	**450**	0.20	**200**	0.35	**350**
3	Coastal	Non-target and <20%	Fair to low	0.50	**500**	0.15	**150**	0.35	**350**

Table 3 presents an attempt to classify the scores obtained through this process into five categories of quality, including:

- Data of **very good** quality: applies to scores that represent 85% or more of the total number of points that were initially assigned to each individual dataset or the combination of the three.

- Data of **good** quality: applies to scores that represent 70-85% of the total number of points that were initially assigned to each individual dataset or the combination of the three.

- Data of **fair** quality: applies to scores that represent 50-70% of the total number of points that were initially assigned to each individual dataset or the combination of the three.

- Data of **poor** quality: applies to scores that represent 25-49% of the total number of points that were initially assigned to each individual dataset or the combination of the three.

- Data of **very poor** quality: applies to scores that represent less than 25% of the total number of points that were initially assigned to each individual dataset or the combination of the three.

Table 3: Data quality categories assigned on the basis of the scores obtained for:									
• All datasets combined (All combined)									
• Type of dataset and Class involved (from Table 2), including Total Catch (TC), Catch-and-Effort (CE), and Size Frequency (SF) data									
Quality	**% points**	**All combined**	**TC**			**CE**			**SF**
			1	2	3	1	2	3	All
Very good	≥85	850-1000	340-400	382-450	425-500	212-250	170-200	127-150	297-350
Good	70-85%	700-849	280-339	315-381	350-424	175-211	140-169	105-126	245-296
Fair	50-70%	500-699	200-279	225-314	250-349	125-174	100-139	75-104	175-244
Poor	25-49%	250-499	100-199	112-224	125-249	62-124	50-99	37-74	87-174
Very poor	<25%	0-249	0-99	0-111	0-124	0-61	0-49	0-36	0-86

i. Total catch

Table 4: Criteria used to assess the quality of Retained Catches and Discards and initial scores (POINTS) and factors (MULT) allocated in each case		
Criteria	**POINTS**	**MULT**
A. Composition of catches		
a. *Ratio (r) retained catches:discards is known*		
b. *Ratio (r) retained catches:discards is not known:*		
i. Retained catches are thought to represent 96% or more of the total catches ($r = 0.98$)		
ii. Retained catches are thought to represent 75-95% of the total catches ($r = 0.85$)		
iii. Retained catches are thought to represent 45-74% of the total catches ($r = 0.60$)		
iv. Retained catches are thought to represent 25-44% of the total catches ($r = 0.35$)		
v. Retained catches are thought to represent 5-24% of the total catches ($r = 0.15$)		
vi. Retained catches are thought to represent less than 5% of the total catches ($r = 0.02$)		
B. Retained catches (RC)		
a. *Completeness of estimates*	TC*0.50*r	
i. Catches are in live weight or, where catches represent processed weight/numbers conversion factors/average weights are regularly estimated and provided		(1.00)
ii. Catches are in processed weight and conversion factors have not been provided; live weights estimated by the Secretariat using alternative conversion factors		(0.90)
iii. Catches are in number and average weights and length frequency data are not available; live weights estimated by the Secretariat using alternative average weights		(0.50)
iv. Catches are [thought to be] incomplete or not available: a proportion (**P**) of the catches has not been reported and was estimated by the Secretariat or other alternative sources (e.g. catches are only available for part of the fleet concerned or catches for the species are fully or partially combined with the catches of other species and total retained catches need to be estimated)		(1-**P**)
b. *Sampling design*	TC*0.20*r	
i. <u>Coastal fisheries</u>		
1. Last frame survey (fisheries census):		
a. Conducted within 2 years before the year concerned		(1.00)
b. Conducted between 2 and 5 years before the year concerned		(0.80)
c. Conducted between 6 and 10 years before the year concerned		(0.50)
d. None of the above or no information available		(0.00)
2. Sampling survey		
a. Vessel activity (effort data)		
i. Field sampling that covers 25% or more of the vessel activities and is well distributed in time and space		(1.00)
ii. Field sampling that covers between 5% and 24% of the vessel activities and is well distributed in time and space		(0.80)
iii. Field sampling that covers less than 5% of the vessel activities and is fairly distributed in time and space		(0.50)
iv. No field sampling; effort data reported by the fishing sector not validated through field sampling		(0.25)
v. Effort data not collected or no information available		(0.00)
b. Catches		
i. Field sampling that covers 10% or more of the catches unloaded and is well distributed in time and space		(1.00)
ii. Field sampling that covers between 5% and 9% of the catches unloaded and is well distributed in time and space		(0.90)
iii. Field sampling that covers less than 5% of the catches unloaded and is fairly distributed in time and space		(0.70)
iv. No field sampling; catches reported by the fishing sector not validated through field sampling		(0.50)
v. Catch data not collected or no information available		(0.00)
ii. <u>Surface and longline fisheries:</u>		

Criteria	POINTS	MULT
1. Vessel information and monitoring of vessel activities:		
a. Total number of vessels operated during the year concerned known:		
i. Identification, dimensions and other vessel attributes known for all vessels; all vessels monitored through a vessel monitoring system		(1.00)
ii. Identification, dimensions and other vessel attributes known for a proportion (**P**) of the vessels; a proportion of the vessels is monitored through VMS (**V**)		(**P*V**)
b. Total number of vessels operated during the year concerned not known:		
i. Identification, dimensions and other vessel attributes known for a significant amount of vessels (thought to be ≥50% of the total)		(0.50)
ii. Identification, dimensions and other vessel attributes known for some vessels (thought to be <50% of the total)		(0.20)
iii. Identification, dimensions and other vessel attributes not known for any vessel		(0.00)
2. Sampling survey:		
a. Retained catches monitored for all vessel trips (e.g. vessel logbook, shipping agents, stevedores, processing plants, IOTC transhipment programme, etc.):		
i. Samples collected for a proportion of the catches that represents 5% or more of the total catches unloaded or total number of fishing events (sets)		(1.00)
ii. Samples collected for a proportion (**P**) of the catches that represents less than 5% of the total catches unloaded or total number of fishing events (sets)		(**P***20)
b. Retained catches monitored for a proportion (**T**) of the total number of trips or fishing events:		
i. Samples collected for 5% or more of the total number of fishing trips or fishing events (sets)		(**T**)
ii. Samples collected for a proportion (**P**) of the trips or fishing events that represents less than 5% of the total number of trips or events		(**T***(**P*20**))
c. Retained catches not monitored at all		(0.00)
c. Estimation procedures	**TC*0.20*r**	
i. Fully documented and available at the IOTC		
1. Estimation procedure is thought to be appropriate (unbiased) and is fully implemented		(1.00)
2. Estimation procedure is thought to not be fully appropriate (e.g. it has not been revised to account for changes in data collection), and/or is not fully used to estimate catches		(0.30)
3. Estimation procedure is thought to be inappropriate (biased) and/or is not used at all to estimate catches		(0.00)
ii. Documented but not available at the IOTC		(0.10)
iii. Not documented		(0.00)
d. Reporting procedures	**TC*0.10*r**	
i. <u>Surface and coastal fisheries</u>:		
1. Retained catches reported before the deadline for data submission (30 June)		(1.00)
2. Retained catches reported within the month after the deadline for data submission (up to 31 July)		(0.75)
3. Retained catches reported at a later time		(0.00)
ii. <u>Longline fisheries</u>:		
1. Preliminary and final retained catches reported before the deadlines for data submission (30 June and 30 December, respectively)		(1.00)
2. Preliminary and/or final retained catches reported within the month after the deadlines for data submission (up to 31 July and 30 January)		(0.75)
3. Preliminary and final retained catches reported at a later time		(0.00)
C. Discards (DI)		
a. Completeness of estimates	**TC*0.50*(1-r)**	

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Criteria	POINTS	MULT
i. Discards are in live weight or, where discards represent processed weight/numbers, conversion factors/average weights are regularly estimated and provided		(1.00)
ii. Discards are in processed weight and conversion factors have not been provided; live weights estimated by the Secretariat using alternative conversion factors (**F**)		(0.90)
iii. Discards are in number and average weights and length frequency data are not available; live weights estimated by the Secretariat using alternative average weights (**W**)		(0.50)
iv. Discards are [thought to be] incomplete or not available: a proportion (**P**) of the discards has not been reported being estimated by the Secretariat or other alternative sources (e.g. discards are only available for part of the fleet concerned or discards for the species are fully or partially combined with the discards of other species and total discards need to be estimated)		(1-(**P**/2))
v. Discard levels are not available and cannot be estimated due to lack of data from alternative sources		(0.00)
b. ***Sampling design***	**TC*0.20*(1-r)**	
i. Discards monitored for all vessel trips, recorded on the vessel logbooks		
1. Samples collected at sea for 5% or more of the total number of fishing events (sets)		(1.00)
2. Samples collected at sea for a proportion (**P**) of the fishing events that represents less than 5% of the total number of events		(**P***20)
ii. Discards monitored for a proportion (**E**) of the total number of fishing trips (from logbooks):		
1. Samples collected at sea for 5% or more of the total number of fishing events (sets)		(**E**)
2. Samples collected at sea for a proportion (**P**) of the fishing events that represents less than 5% of the total number of events		(**E***(**P***20))
iii. Discards not monitored at all		(0.00)
c. ***Estimation procedures***	**TC*0.20*(1-r)**	
i. Fully documented and available at the IOTC		
1. Estimation procedure is thought to be appropriate (unbiased) and is fully implemented		(1.00)
2. Estimation procedure is thought to not be fully appropriate (e.g. it has not been revised to account for changes in data collection), and/or is not fully used to estimate catches		(0.30)
3. Estimation procedure is thought to be inappropriate (biased) and/or is not used at all to estimate catches		(0.00)
ii. Documented but not available at the IOTC		(0.10)
iii. Not documented		(0.00)
d. ***Reporting procedures***	**TC*0.10*(1-r)**	
i. Surface and coastal fisheries:		
1. Discards reported before the deadline for data submission (30 June)		(1.00)
2. Discards reported within the month after the deadline for data submission (up to 31 July)		(0.75)
3. Discards reported at a later time		(0.00)
ii. Longline fisheries:		
1. Preliminary and final discards reported before the deadlines for data submission (30 June and 30 December, respectively)		(1.00)
2. Preliminary and/or final discards reported within the month after the deadlines for data submission (up to 31 July and 30 January)		(0.75)
3. Preliminary and final discards reported at a later time		(0.00)

ii.   *Catch-and-Effort data*

Table 5: Criteria used to assess the quality of Catch-and-Effort data and initial scores (POINTS) and factors (MULT) allocated in each case

Criteria	POINTS	MULT
A. Catch-and-Effort data available		
a. Completeness of catch-and-effort data	CE*0.50	
i. Coastal fisheries:		
1. Availability		
a. Time:		
i. CE data available by month		(1.00)
ii. CE data available by quarter		(0.75)
iii. None of the above		(0.25)
b. Geographic area:		
i. CE data available by fishing areas that are representative of the fishery concerned		(1.00)
ii. CE data not available by fishing areas that are representative of the fishery concerned		(0.25)
c. Gear type:		
i. CE data available by gear type		(1.00)
ii. CE data not available by gear type		(0.00)
2. Catch data:		
a. Catches are in live weight or, where catches represent processed weight conversion factors are regularly estimated and provided		(1.00)
b. Catches are in processed weight and conversion factors have not been provided; live weights estimated by the Secretariat using alternative conversion factors		(0.90)
c. Catches are in number and average weights and length frequency data are not available; live weights estimated by the Secretariat using alternative average weights		(0.50)
3. Effort data:		
a. Units of effort that are representative of the fishery concerned (e.g. number of man-operated lines by fishing day for line fisheries, number of nets set by gillnet fisheries, etc.) and proportional to the probability of capture		(1.00)
b. Units of effort not fully representative of the fishery concerned and/or not fully proportional to the probability of capture		(0.50)
c. Units of effort not representative of the fishery concerned and not proportional to the probability of capture		(0.10)
ii. Longline fisheries:		
1. Availability		
a. Time:		
i. CE data available by month		(1.00)
ii. CE data available by quarter		(0.50)
iii. None of the above		(0.00)
b. Geographic area:		
i. CE data available by 5 degrees square grid		(1.00)
ii. CE data available by areas larger than 5 degrees square, but not beyond 10 degrees latitude by 20 degrees longitude areas		(0.50)
iii. None of the above		(0.00)
2. Catch data:		
a. Catches are in live weight or number and conversion factors/average weights (or size data) are regularly estimated and provided		(1.00)
b. Catches are in processed weight and conversion factors have not been provided; live weights estimated by the Secretariat using alternative conversion factors		(0.90)

Criteria	POINTS	MULT
c. Catches are in number and average weights and length frequency data are not available; live weights estimated by the Secretariat using alternative average weights		(0.50)
3. Effort data:		
a. Effort in number of hooks set		(1.00)
b. Alternative units of effort reported that are not fully representative of the fishery concerned and/or not fully proportional to the probability of capture		(0.50)
c. Effort not available, or units of effort not representative of the fishery concerned or not proportional to the probability of capture		(0.10)
iii. Surface fisheries:		
1. Availability		
a. Time:		
i. CE data available by month		(1.00)
ii. CE data available by quarter		(0.75)
iii. None of the above		(0.00)
b. Geographic area:		
i. CE data available by 1 degree square grid		(1.00)
ii. CE data available by areas larger than 1 degree square, but not beyond 5 degrees square areas		(0.50)
iii. None of the above		(0.00)
c. Fishing mode (purse seine only):		
i. CE data available by fishing mode		(1.00)
ii. CE data not available by fishing mode		(0.00)
d. Support (supply) vessels and FADs (purse seine only):		
i. Effort from support vessels and total number of FAD's available		(1.00)
ii. Effort from support vessels or total number of FAD's not available		(0.75)
iii. Effort from support vessels and total number of FAD's not available		(0.50)
2. Catch data:		
a. Catches are in live weight or, where catches represent processed weight conversion factors are regularly estimated and provided		(1.00)
b. Catches are in processed weight and conversion factors have not been provided; live weights estimated by the Secretariat using alternative conversion factors		(0.90)
c. Catches are in number and average weights and length frequency data are not available; live weights estimated by the Secretariat using alternative average weights		(0.50)
3. Effort data:		
a. Units of effort that are representative of the fishery concerned (e.g. number of days fished for purse seiners on free-schools, number of log sets for purse seiners on associated schools, number of poles used by day for baitboats, etc.) and proportional to the probability of capture		(1.00)
b. Units of effort not fully representative of the fishery concerned and/or not fully proportional to the probability of capture		(0.50)
c. Units of effort not representative of the fishery concerned and not proportional to the probability of capture		(0.10)
b. *Sampling design*	**CE*0.20**	
i. Coastal fisheries		
1. CE data are collected as per minimum IOTC data requirements		
a. CE reported by the fishing sector and/or field sampling that covers 10% or more of the trips and is well distributed in time and space		(1.00)
b. CE reported by the fishing sector and/or field sampling that covers between 5% and 9% of the trips and is well distributed in time and space		(0.90)
c. CE reported by the fishing sector and field sampling that covers less than 5% of the trips and is fairly distributed in time and space		(0.70)

Criteria	POINTS	MULT
d. CE reported by the fishing sector not validated through field sampling		(0.50)
2. CE data collected by any other alternative means		(0.10)
ii. <u>Surface and longline fisheries</u>:		
1. CE data are collected as per minimum IOTC data requirements (IOTC logbooks)		
a. Logbooks collected for a proportion (**P**) of the total number of trips; logbook data validated using alternative data sources (e.g. landings, transshipments, VMS data); observer data collected for 5% or more of the fishing events (sets)		(**P**)
b. Logbooks collected for a proportion (**P**) of the total number of trips; logbook data not validated using alternative data sources; observer data collected for less than 5% of the fishing events		(**P**/2)
2. CE data collected by any other alternative means		(0.10)
c. ***Estimation procedures***	**CE*0.20**	
i. Fully documented and available at the IOTC		
1. Estimation procedure is thought to be appropriate (unbiased) and is fully implemented		(1.00)
2. Estimation procedure is thought to not be fully appropriate (e.g. it has not been revised to account for changes in data collection), and/or is not fully used to estimate catches		(0.30)
3. Estimation procedure is thought to be inappropriate (biased) and/or is not used at all to estimate catches		(0.00)
ii. Documented but not available at the IOTC		(0.10)
iii. Not documented		(0.00)
d. ***Reporting procedures***	**CE*0.10**	
i. <u>Surface and coastal fisheries</u>:		
1. CE data reported before the deadline for data submission (30 June)		(1.00)
2. CE data reported within the month after the deadline for data submission (up to 31 July)		(0.75)
3. CE data reported at a later time		(0.00)
ii. <u>Longline fisheries</u>:		
1. Preliminary and final CE data reported before the deadlines for data submission (30 June and 30 December, respectively)		(1.00)
2. Preliminary and/or final CE data reported within the month after the deadlines for data submission (up to 31 July and 30 January)		(0.75)
3. Preliminary and final CE data reported at a later time		(0.00)
B. Catch-and-Effort data not available at all	**CE*1.00**	(0.00)

iii.   *Size frequency data*

Criteria	POINTS	MULT
A. Size data available		
a. Completeness of size data	SF*0.50	
i. Coastal fisheries:		
1. Availability		
a. Time:		
i. SF data available by month		(1.00)
ii. SF data available by quarter		(0.75)
iii. None of the above		(0.25)
b. Geographic area:		
i. SF data available by fishing areas that are representative of the fishery concerned		(1.00)
ii. SF data not available by fishing areas that are representative of the fishery concerned		(0.25)
c. Gear type:		
i. SF data available by gear type		(1.00)
ii. SF data not available by gear type		(0.00)
2. Type of measurements taken:		
a. Specimens measured in straight fork length (lower-jaw fork length for billfish) or, where other types of measurements are used, non-standard measurements to fork length keys are provided that allow to derive fork lengths from the measurements provided		(1.00)
b. Specimens measured in straight fork length (lower-jaw fork length for billfish) or, where other types of measurements are used, non-standard measurements to fork length keys exist at the IOTC that allow to derive fork lengths from the measurements provided		(0.90)
c. Specimens not measured in straight fork length (lower-jaw fork length for billfish) and non-standard measurements to fork length keys are not available		(0.20)
3. Type of size data available		
a. Size data refers to non-weighted samples or, where it refers to weighted samples or catch-at-size data sample numbers are provided for each individual stratum		(1.00)
b. Size data refers to weighted samples or catch-at-size data and sample numbers for each individual stratum are not available		(0.75)
ii. Surface and longline fisheries:		
1. Availability		
a. Time:		
i. SF data available by month		(1.00)
ii. SF data available by quarter		(0.50)
iii. None of the above		(0.00)
b. Geographic area:		
i. SF data available by 5 degrees square grid		(1.00)
ii. SF data available by areas larger than 5 degrees square, but not beyond 10 degrees latitude by 20 degrees longitude areas		(0.50)
iii. None of the above		(0.00)
c. Fishing mode (purse seine only):		
i. SF data available by fishing mode		(1.00)
ii. SF data not available by fishing mode		(0.25)
2. Type of catch:		

Table 6: Criteria used to assess the quality of Size Frequency data and initial scores (POINTS) and factors (MULT) allocated in each case

Criteria	POINTS	MULT
a. Size distributions collected for both retained catches and discards, in particular where discards make more than 5% of the total catches estimated		(1.00)
b. Size distributions collected only for retained catches while discards make more than 5% of the total catches estimated		(0.70)
c. Size distributions collected only for discards where nominal catches make more than 20% of the total catches estimated		(0.20)
3. Type of measurements taken:		
a. Specimens measured in straight fork length (lower-jaw fork length for billfish) or, where other types of measurements are used, non-standard measurements to fork length keys are provided that allow to derive fork lengths from the measurements provided		(1.00)
b. Specimens measured in straight fork length (lower-jaw fork length for billfish) or, where other types of measurements are used, non-standard measurements to fork length keys exist at the IOTC that allow to derive fork lengths from the measurements provided		(0.90)
c. Specimens not measured in straight fork length (lower-jaw fork length for billfish) and non-standard measurements to fork length keys are not available		(0.20)
4. Type of size data available		
a. Size data refers to non-weighted samples or, where it refers to weighted samples or catch-at-size data sample numbers are provided for each individual stratum		(1.00)
b. Size data refers to weighted samples or catch-at-size data and sample numbers for each individual stratum are not available		(0.75)
b. ***Sampling design***	**SF*0.20**	
i. SF data are collected as per minimum IOTC data requirements		
1. SF reported by the fishing sector and/or field/at sea sampling that covers at least 1 fish by ton unloaded and is well distributed in time and space		(1.00)
2. SF reported by the fishing sector and/or field/at sea sampling that covers between 0.5 and 1 fish by ton unloaded and is well distributed in time and space		(0.90)
3. SF reported by the fishing sector and field/at sea sampling that covers less than 0.5 fish by ton unloaded and is fairly distributed in time and space		(0.70)
4. SF reported by the fishing sector not validated through field sampling		(0.50)
ii. SF data collected by any other alternative means		(0.10)
c. ***Estimation procedures***	**SF*0.20**	
i. Fully documented and available at the IOTC		
1. Estimation procedure is thought to be appropriate (unbiased) and is fully implemented		(1.00)
2. Estimation procedure is thought to not be fully appropriate (e.g. it has not been revised to account for changes in data collection), and/or is not fully used to estimate catches		(0.30)
3. Estimation procedure is thought to be inappropriate (biased) and/or is not used at all to estimate catches		(0.00)
ii. Documented but not available at the IOTC		(0.10)
i. Not documented		(0.00)
d. ***Reporting procedures***	**SF*0.10**	
i. <u>Surface and coastal fisheries:</u>		
1. SF data reported before the deadline for data submission (30 June)		(1.00)
2. SF data reported within the month after the deadline for data submission (up to 31 July)		(0.75)
3. SF data reported at a later time		(0.00)
ii. <u>Longline fisheries:</u>		
1. Preliminary and final SF data reported before the deadlines for data submission (30 June and 30 December, respectively)		(1.00)
2. Preliminary and/or final SF data reported within the month after the deadlines for data submission (up to 31 July and 30 January)		(0.75)
3. Preliminary and final SF data reported at a later time		(0.00)

Criteria	POINTS	MULT
B. Size data not available at all	**SF*1.00**	(0.00)

5. Other species bycatch of IOTC fisheries

The requirements existing at the IOTC for non-IOTC species are limited, in most cases, to the reporting of total levels of bycatch, by year and, where possible, by species. Therefore, the quality of these datasets cannot be assessed by species and shall only be based on estimates of total levels of by-catch.

The criteria proposed to assess the completeness and quality of by-catch levels estimated for seabirds (**SBR**), marine turtles (**MTR**) and other species is presented below:

By-catch levels fully available by IOTC standards, considered to be of **good quality**, including:

- Sampling design and raising procedures well documented and validated regularly (e.g. every other year or following changes in the fleet concerned).

- Data collected through observers for at least 5% of the total activity (e.g. number of trips) of the fleet, as representative as possible of the fishery concerned.

- Incidental mortality of seabirds (**SBR**), marine turtles (**MTR**) or other species available by year and, where possible, by species, for the fleet concerned.

By-catch levels available but not fully available by IOTC standards or considered to be of **fair quality**, including:

- Sampling design and raising procedures well documented and validated regularly (e.g. every other year or following changes in the fleet concerned).

- Data collected through observers for less than 5% of the total activity (e.g. number of trips) of the fleet.

- Incidental mortality of seabirds (**SBR**), marine turtles (**MTR**) or other species estimated from data collected in recent years (within the last five years).

By-catch levels not available at all or considered to be of **poor quality**, including any of the following:

- Sampling design and raising procedures not documented or not validated regularly.

- Data not collected through observers.

- Incidental mortality of seabirds (**SBR**), marine turtles (**MTR**) or other species not available at all or not estimated from data collected within the last five years.

By-catch levels are **not** thought to be **significant** or they do not occur at all.

6. Conclusion

This document presents a first proposal of scoring system to assess the quality of statistics in the IOTC database. It is important to note that the scoring system proposed covers a wide range of criteria involving, in some cases, information that is not fully available to the IOTC, in particular documentation on sampling designs and estimation procedures. Consequently, the quality of datasets for fisheries for which this information is not available will be set to poor, as the lowest scores are used for unknowns. For this reason, the scores assigned to those criteria for which little information is still available might need to be downsized until the countries concerned provide this information. This information will need to be completed prior to full implementation of the system.

In addition, the scoring system, although informative, cannot be used to quantify uncertainty, in particular of catch series used for stock assessment. Estimates of precision and accuracy are not available for the catches or other data available at the IOTC, as this information is not requested by the IOTC. The IOTC Secretariat cannot derive such estimates at present, as catches and other information are reported to the IOTC in aggregated form, the Secretariat not having full access to information on sampling and estimation procedures and sample data.

APPENDIX I

Examples of Implementation of IOTC Scoring System

Industrial purse seine fishery of EU-France

Type of fishery: Surface

Year: 2009

Target species: Skipjack tuna and yellowfin tuna

Other species: Bigeye tuna, albacore, frigate tuna, bullet tuna, kawakawa, swordfish, black marlin, blue marlin, striped marlin, Indo-Pacific sailfish, silky shark, oceanic whitetip shark and other sharks, rays and finfish and marine turtles.

Assessing the quality of statistics for skipjack tuna:

Scores to be assigned by dataset (Class 1 from Table 2):

Species	Importance of Catch	TC	CE	SF
Skipjack tuna (SKJ)	Target	400	250	350

Assessing the quality of statistics by dataset (refer to Tables 4-6 for details):

Country: **EU-France**	Fishery: **Purse seine**	Species: **Skipjack tuna**	Year: **2009**	Final Score: **962.75**	Quality: **Very Good (850-1000)**

Data	Key						Description	Points	MULT	Cat Points	Acc Score
TC							**Total catches surface fishery, target species** (TC = 400)	1000	0.40	**400.00**	
RC	A	b	i				***Retained catches represented more than 98% of the total catches in 2007 (r=0.98)***	*400*	*0.98*	***392.00***	
	B						**Completeness of retained catches**	392	0.50	196.00	
	B	a	i				Catches in live weight; conversion factors provided	196	1.00		196.00
		b					**Sampling design and implementation**	392	0.20	78.40	
		b	ii	1	a		Total number of vessels operated is known		1.00		
				2	a	i	Samples collected over more than 5% of the total number of sets	78.4	1.00		274.40
		c					**Estimation procedures**	392	0.20	78.40	
		c	i	1			Estimation procedure is appropriate and unbiased	78.4	1.00		352.80
		d					**Reporting procedures**	392	0.10	39.20	
		d	i	1			Retained catches reported before 30 June 2010	39.2	1.00		392.00
DI	A	b	i				***Retained catches represented more than 98% of the total catches in 2007 (1-r=0.02)***	*400*	*0.02*	***8.00***	
	A	b	i				**Completeness of discards**	8	0.50	4.00	
	C	a	iv				100% of discards (P=1.00) estimated using data collected in 2003-07 (1-(P/2) = 0.50)	4	0.50		394.00
		b					**Sampling design and implementation**	8	0.20	1.60	
		b	iii				Discards not monitored at all	1.6	0.00		394.00
		c					**Estimation procedures**	8	0.20	1.60	
		c	i	3			Estimation procedure was not used to estimate discards due to lack of samples	1.6	0.00		394.00
		d					**Reporting procedures**	8	0.10	0.80	
		d	ii	3			No discards reported	0.8	0.00		394.00
CE							**Catch-and-Effort surface fishery, target species** (CE = 250)	1000	0.25	**250.00**	
	A	a					**Completeness of catch-and-effort data**	250	0.50	125.00	
	A	a	iii	1	a	i	CE available by month		1.00		
					b	i	CE available by 1 degree square grid		1.00		
					c	i	CE available by fishing mode		1.00		
					d	ii	Number of FADs by quarter not available		0.75		
				2	a		Catches in live weight; conversion factors available		1.00		
				3	a		Units of effort representative of the fishery concerned	125	1.00		487.75
		b					**Sampling design and implementation**	250	0.20	50.00	
		b	ii	1	a		Logbooks collected for all trips (100% coverage)	50.00	1.00		537.75
		c					**Estimation procedures**	250	0.20	50.00	
		c	i	1			Estimation procedure is appropriate and fully implemented	50	1.00		587.75
		d					**Reporting procedures**	250	0.10	25.00	
		d	i	1			CE data reported before 30 June 2010	25	1.00		612.75
SF							**Size Frequency surface fishery, target species** (SF = 350)	1000	0.35	**350.00**	
	A	a					**Completeness of size frequency data**	350	0.50	175.00	
	A	a	ii	1	a	i	SF available by month		1.00		
					b	i	SF available by 5 degree square grid		1.00		
					c	i	SF available by fishing mode		1.00		
				2	a		SF collected only for retained catches (discards are very low)	175	1.00		787.75

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Data	Key				Description	Points	MULT	Cat Points	Acc Score
		3	a		Measurements in fork length or other lengths converted to fork length (keys available)		1.00		
		4	a		SF raised to represent total catches; sample numbers provided		1.00		
	b				**Sampling design and implementation**	350	0.20	70	
	b	i	1		Samples collected in port with more than 1 fish measured by ton caught	70	1.00		857.75
	c				**Estimation procedures**	350	0.20	70	
	c	i	1		Procedures documented and implemented	70	1.00		927.75
	d				**Reporting procedures**	350	0.10	35	
	d	i	1		SF reported before 30 June	35	1.00		962.75
								TOTAL SCORE	**962.75**

Country: **EU-France** | Fishery: **Purse seine** | Species: **Skipjack tuna** | Year: **2009** | Final Score: **962.75** | Quality: **Very Good (850-1000)**

Coastal fisheries of Comoros

Type of fishery: Coastal

Year: 2009

Target species: Skipjack tuna and yellowfin tuna

Other species: Bigeye tuna, albacore, frigate tuna, bullet tuna, kawakawa, narrow-barred Spanish mackerel, Indo-Pacific king mackerel, longtail tuna, Indo-Pacific sailfish, and various species of sharks, rays, finfish and marine turtles.

Assessing the quality of statistics for yellowfin tuna:

Scores to be assigned by dataset (Class 2 from Table 2):

Species	Importance of Catch	TC	CE	SF
Yellowfin tuna (YFT)	Target	**450**	**200**	**350**

Assessing the quality of statistics by dataset (refer to Tables 4-6 for details):

Country: **Comoros** | Fishery: **Coastal** | Species: **Yellowfin tuna** | Year: **2009** | Final Score: **0.00** | Quality: **Very Poor (0-249)**

Data	Key				Description	Points	MULT	Cat Points	Acc Score
TC					**Total catches coastal fishery, target species** (TC = 450)	1000	0.45	**450.00**	
RC	A	a	i		*All catches are retained on board; fishery has no discards (r=1.00)*	*450*	*1.00*	*450.00*	
	B				**Completeness of retained catches**	450	0.50	225.00	
	B	a	iv		100% of the catches estimated from some unknown indicators (P=1.00) (1-P=0.00)	225	0.00		0.00
	b				**Sampling design and implementation**	450	0.20	90.00	
	b	i	1	d	Last frame survey conducted in 1993		0.00		
		2	a	v	Effort data not collected		0.00		
			b	v	Catch data not collected	90	0.00		0.00
	c				**Estimation procedures**	450	0.20	90.00	
	c	i	3		Estimation procedure needs to be revised and implemented	90	0.00		0.00
	d				**Reporting procedures**	450	0.10	45.00	
	d	i	3		Retained catches not reported (data from FAO is unreliable)	45	0.00		0.00
DI	A	b	i		*All catches are retained on board; fishery has no discards (r=1.00) (1-r=0.00)*	*450*	*0.00*	*0.00*	
CE					**Catch-and-Effort coastal fishery, target species** (CE = 200)	1000	0.20	**200.00**	
	B				CE not available at all	200	0.00		0.00
SF					**Size Frequency coastal fishery, target species** (SF = 350)	1000	0.35	**350.00**	
	B				SF not available at all	350	0.00		0.00
								TOTAL SCORE	**0.00**