

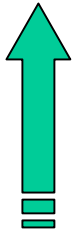



Report on the data situation

IOTC Secretariat

Billfish: Overlook

- Billfish species are caught as a by-catch of almost all fisheries  **Aggregation** (species reported all aggregated)
- Some species are difficult to identify  **Misidentification** (species wrongly classified)
- Some species are usually discarded  **Underreporting** (Discards not included in the logbooks)
- Catches do occur under all gears but are not always reported  **Underreporting** (e.g. Purse Seine and Baitboat gears catch billfish but catches have never been reported)

Billfish: Progress achieved

- **Complete revision** of the Nominal Catches database: catches of billfish species added to the DB especially in early years (1950-70)
- Review of **Indonesian longline** catch series: Major changes in the estimates, especially in recent years (1995-2000)
- Collection of size frequency data on tuna and billfish species through the sampling programs in Penang and Phuket,
- More accurate estimates of catches of **IUU fresh tuna vessels**, landed in Penang and Phuket, from the **IOTC sampling programs**
- **Improvement** in the reporting from **Sri Lanka** in 1999 (a review of the complete data series is underway)

Billfish: Remaining Problems

- High aggregation of the catches
- High catches of non reporting fleets (IUU), which need to be estimated
- Scarcity or total lack of size frequency statistics for billfish species in the IOTC databases, especially regarding Taiwan, China
- Inconsistencies between the catches in the catch and effort and nominal catches statistics for some years and countries (e.g. Korea)
- Aggregation and mislabeling of billfish species in Sri Lanka

Comparative evolution of the main fishing fleets reporting billfish catches in the Indian Ocean from 1,950 to 1,999

Catches of BIL reported since (estimated for years prior to whenever it was possible)

Previous Years	Longline					
	Gill net	Line	Japan	China (Taiwan)	Korea	Others
1950	<p>Gill net fisheries did occur before 1970 with catches no higher than those reported in the first years after that.</p> <p>Line fisheries (hand line, troll and line) did occur before 1950 (first catches reported) with catches no higher than those reported in the first years after that.</p> <p>Gradual changes in boat equipment and mechanization over the period.</p> <p>1970: First catches reported.</p> <p>Gradual changes in boat equipment and mechanization over the period.</p> <p>Use of drifting Gill Nets targeting Albacore. Banned in 1992.</p> <p>Fast development of the Gill / LL fishery in LKA</p> <p>Gradual changes in boat equipment and mechanization over the period.</p>	<p>Line fisheries (hand line, troll and line) did occur before 1950 (first catches reported) with catches no higher than those reported in the first years after that.</p> <p>Gradual changes in boat equipment and mechanization over the period.</p> <p>1970: First catches reported.</p> <p>Gradual changes in boat equipment and mechanization over the period.</p> <p>Use of drifting Gill Nets targeting Albacore. Banned in 1992.</p> <p>Fast development of the Gill / LL fishery in LKA</p> <p>Gradual changes in boat equipment and mechanization over the period.</p>	<p>No activity</p> <p>Longliners started operating gradually throughout the IO from 1952 to 1956</p> <p>First deep-freezing longliner arrived into the Indian Ocean in 1956 which open the sashimi market to the DW Japanese LL fleet</p> <p>1965: Increase in the prices of SBF and shift of LL from the AO to the IO</p> <p>1969: Increase in the prices of BET in proportion to the decrease in catches of SBF</p> <p>1981: LL fleet split into LL using surface (Albacore) and deep (Bigeye) Longlines</p> <p>1986: Fresh tuna is declared as main product (high increase in no. LL)</p> <p>Some TWN LL start targeting Swordfish, specially off Somalia and to the South of Madagascar</p>	<p>No activity</p> <p>Possible activity (no data)</p> <p>1966: First catches reported. Target species is the Yellowfin tuna</p> <p>Target species is Albacore (surface LL)</p> <p>1981: LL fleet split into LL using surface (Albacore) and deep (Bigeye) Longlines</p> <p>1986: Fresh tuna is declared as main product (high increase in no. LL)</p> <p>Some TWN LL start targeting Swordfish, specially off Somalia and to the South of Madagascar</p>	<p>No activity</p> <p>1965: Arrival of Korean longliners. Use of surface longlines</p> <p>1972: First use of deep longlines which led to an increase in the catches of BET</p>	<p>No activity</p> <p>Possible activity</p> <p>First catches of small (<100 GRT) LL (fresh tuna) estimated</p> <p>First catches of large (>100 GRT) LL NEI estimated</p> <p>First catches of FRA LL targeting SWO</p> <p>First catches of ESP LL targeting SWO</p> <p>First catches of PRT LL targeting SWO</p>
1951						
1952						
1953						
1954						
1955						
1956						
1957						
1958						
1959						
1960						
1961						
1962						
1963						
1964						
1965						
1966						
1967						
1968						
1969						
1970						
1971						
1972						
1973						
1974						
1975						
1976						
1977						
1978						
1979						
1980						
1981						
1982						
1983						
1984						
1985						
1986						
1987						
1988						
1989						
1990						
1991						
1992						
1993						
1994						
1995						
1996						
1997						
1998						
1999						

Swordfish

- Primarily caught under longline.
- Targeted by some Taiwanese vessels and French, Spanish and Seychelles' longliners
- By-catch of all other longline fisheries.
- Catches have been constantly increasing since the early-1990's.
- Primarily marketed to Japan (*sashimi*), Europe and USA (direct consumption)
- Small specimens usually discarded (below 15 kg weight).

Indo-Pacific blue marlin

- Primarily caught under longline as a by-catch although important gillnet catches reported from 1984 to 1995 in Sri Lanka.
- Difficult to distinguish from other marlin species, especially if the specimens have been processed (headed, tailed and fins off).
- Sometimes reported as black marlin by far-east countries (direct translation of the Japanese word *Kurokajiki* meaning black marlin).

Black marlin

- Primarily caught under longline as a by-catch although important gillnet catches reported from 1984 to 1995 in Sri Lanka.
- Difficult to distinguish from other marlin species, especially if the specimens have been processed (headed, tailed and fins off).
- Sometimes reported as white marlin by far-east countries (direct translation of the Japanese word *Shirokajiki* meaning white marlin).

Striped marlin

- Primarily caught under longline as a by-catch.
- Highest prices in the *sashimi* auctions.
- Difficult to distinguish from other marlin species, especially if the specimens have been processed (headed, tailed and fins off).

Indo-Pacific sailfish

- Increasing trend in catches since the mid-1980's.
- Usually discarded and not reported on longline boats.
- Most catch under gillnet as opposed to other billfish species.
- Low value; never exported.
- Sport fishing catches important but virtually unreported.

Short-bill spearfish

- Primarily caught under longline although also under line and gillnet.
- By-catch species that is almost never reported.
- Almost always discarded on longliners.
- Low value; never exported.
- Possibly miss-reported as Indo-Pacific Sailfish.

Billfish NEI

- Catches of billfish species reported aggregated are more important under artisanal (gillnet and line) than under industrial (longline) gears.
- The increase in the catches of Billfish NEI under longline since the mid-eighties is a consequence of the new estimates of NEI catches.
- There are large catches without proper gear assignment.

Figure 1. Catches of swordfish in the Indian Ocean for the period 1961-1999, in thousands of metric tons.

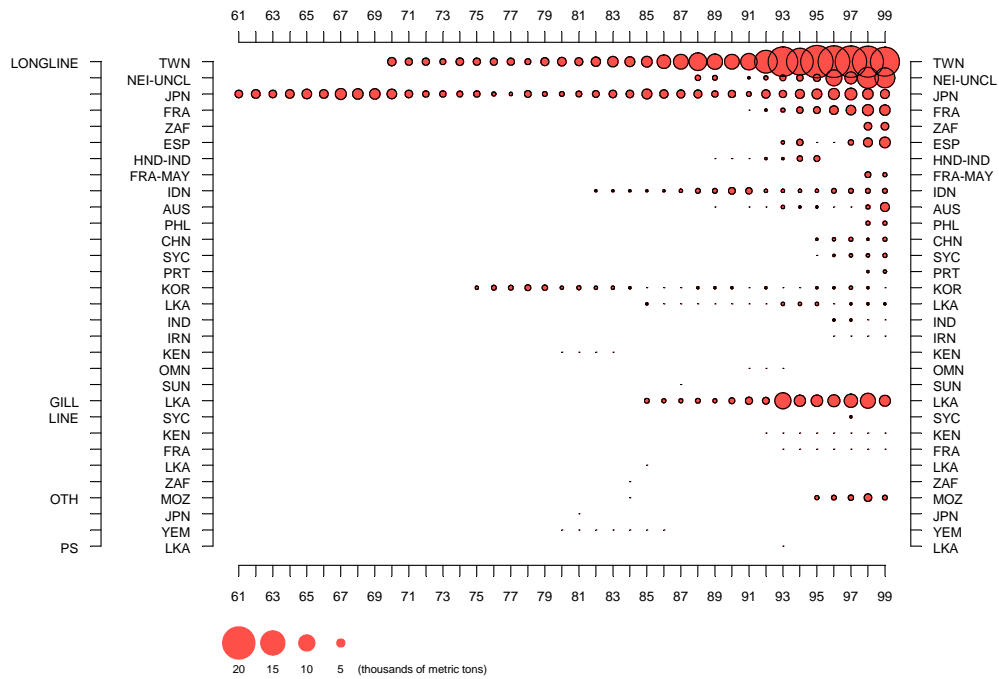


Figure 2. Catches of striped, black and Indo-Pacific blue marlin in the Indian Ocean for the period 1961-1999, in thousands of metric tons.

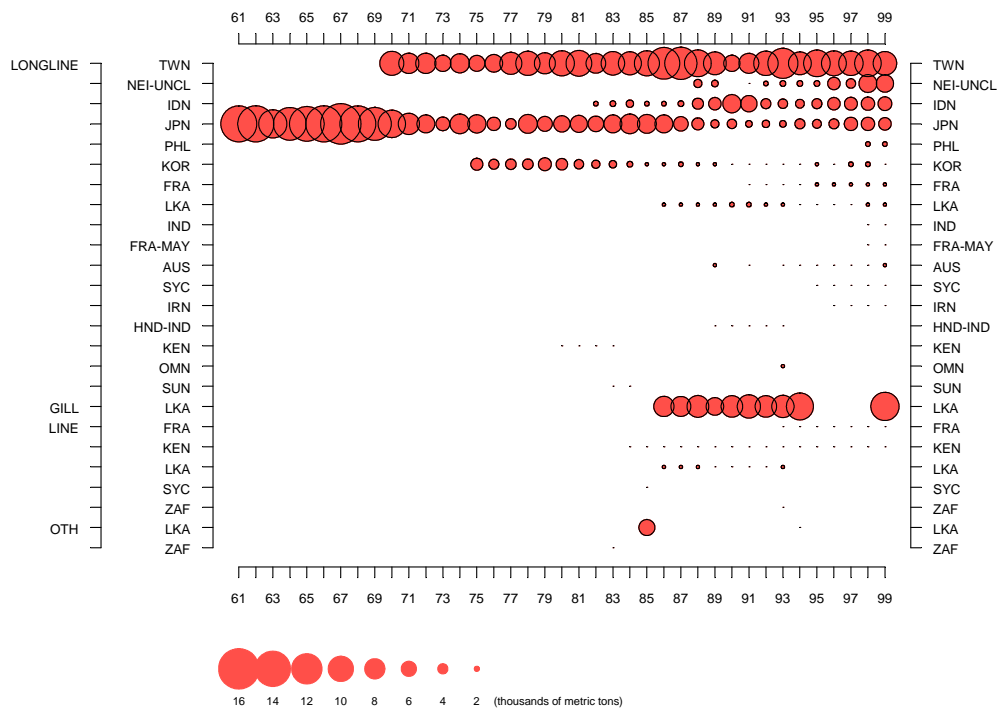


Figure 3. Catches of other Indo-Pacific sailfish and short-bill spearfish in the Indian Ocean for the period 1961-1999, in thousands of metric tons.

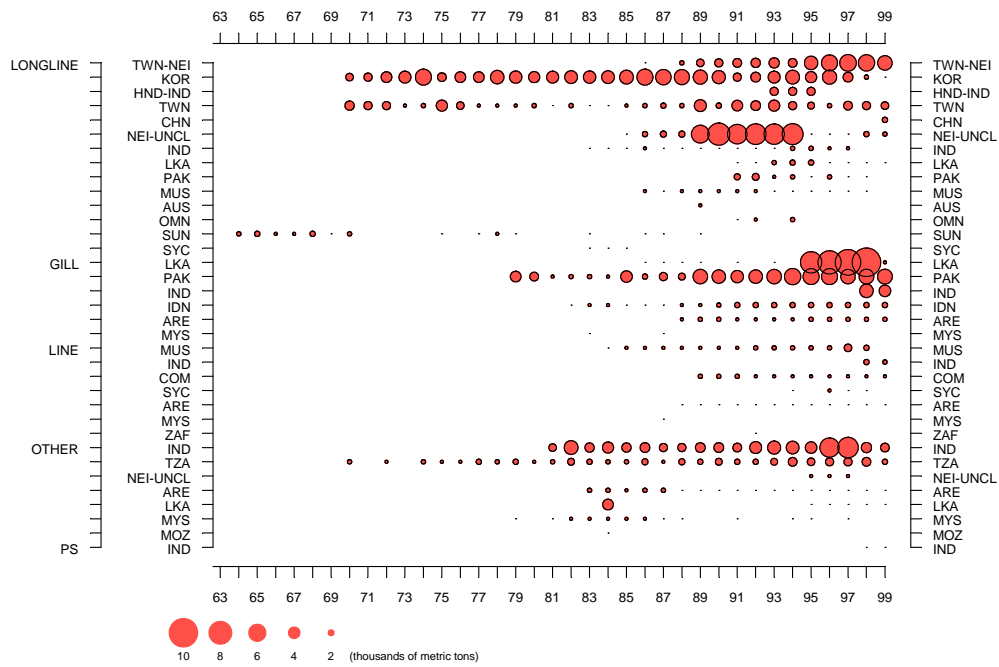


Figure 4. Catches of billfish reported aggregated in the Indian Ocean for the period 1961-1999, in thousands of metric tons.

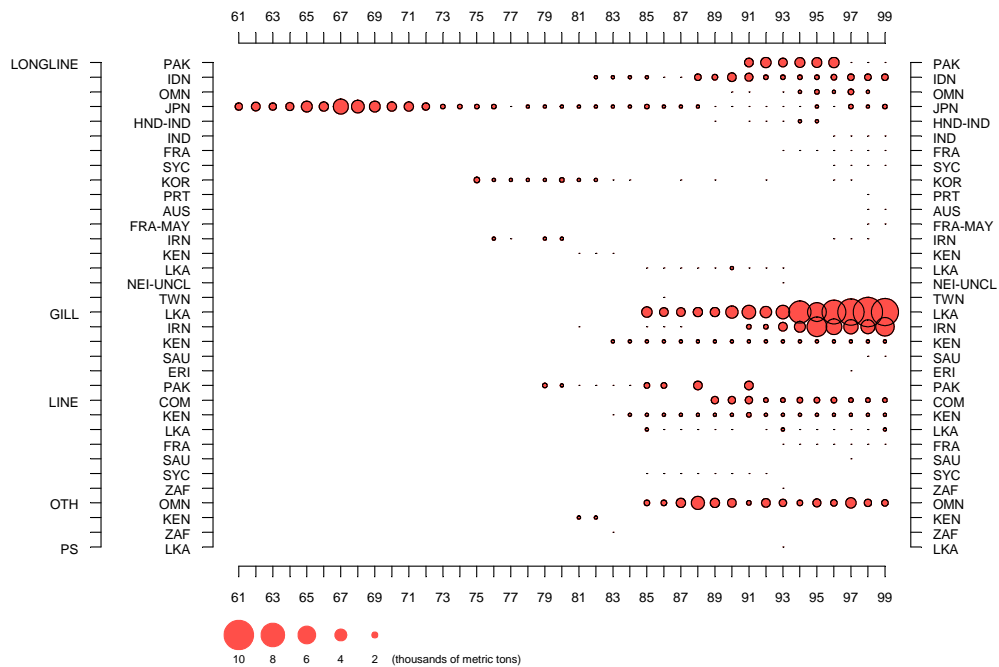


Figure 5.. Catches reported aggregated of seerfish, other tunas and billfish species in the Indian Ocean for the period 1961-1999, in thousands of metric tons.

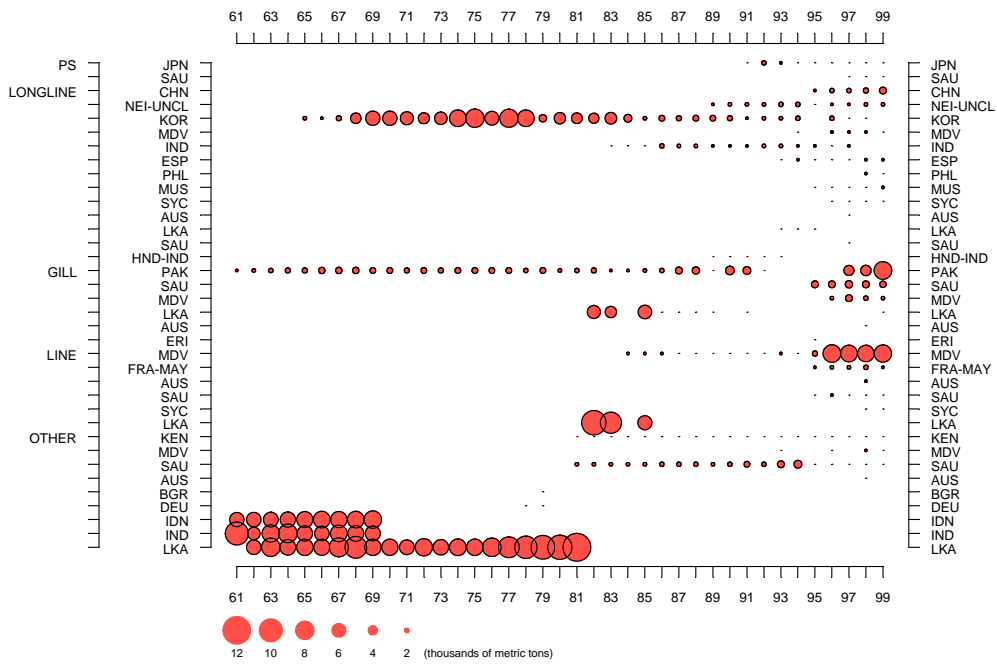


Table 1: Catches of swordfish (SWO) in the Indian Ocean for the period 1961-1999 (in thousands of metric tonnes)

Gear	Flag	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	Flag													
LL	TWN	17.0									1.2	0.9	0.9	0.6	1.0	0.9	0.9	0.9	0.6	1.1	1.3	1.1	1.5	1.9	1.7	2.0	3.2	3.8	5.4	4.1	3.8	4.7	9.0	15.3	12.5	18.3	17.6	17.3	16.8	14.7	TWN													
	NEI-UNCL	4.9									1.2	0.9	0.9	0.6	1.0	0.9	0.9	0.9	0.6	1.1	1.3	1.1	1.5	1.9	1.7	2.0	3.2	3.8	5.4	4.1	3.8	4.7	9.0	15.3	12.5	18.3	17.6	17.3	16.8	14.7	NEI-UNCL													
	JPN	1.9									1.6	1.0	0.7	0.7	0.6	0.7	0.3	0.2	0.8	0.4	0.4	0.6	0.8	1.0	1.0	1.0	1.7	1.2	1.1	1.1	0.7	0.9	0.4	1.2	0.9	1.4	1.7	2.1	2.4	2.1	1.9	1.4	JPN											
	FRA	1.5									1.6	1.0	0.7	0.7	0.6	0.7	0.3	0.2	0.8	0.4	0.4	0.6	0.8	1.0	1.0	1.0	1.7	1.2	1.1	1.1	0.7	0.9	0.4	1.2	0.9	1.4	1.7	2.1	2.4	2.1	1.9	1.4	FRA											
	ESP	0.8																																										ESP										
	ZAF	0.4																																										ZAF										
	IDN	0.4																																											IDN									
	AUS	0.4																																											AUS									
	CHN	0.2																																												CHN								
	FRA-MAY	0.2																																												FRA-MAY								
	SYC	0.2																																													SYC							
	PHL	0.1																																														PHL						
	HND-IND	0.1																																														HND-IND						
	KOR	0.1																																															KOR					
	LKA	0.1																																																LKA				
	PRT	0.1																																																	PRT			
	IND	0.0																																																	IND			
	IRN	0.0																																																		IRN		
	GILL	LKA	2.8																																																LKA			
LINE	SYC	0.0																																																		SYC		
	KEN	0.0																																																			KEN	
	FRA	0.0																																																				FRA
OTHR	MOZ	0.5																																																				MOZ
Gear	Flag	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	Flag													

Table 2: Catches of Indo-Pacific blue marlin (BLZ) in the Indian Ocean for the period 1961-1999 (in thousands of metric tonnes)

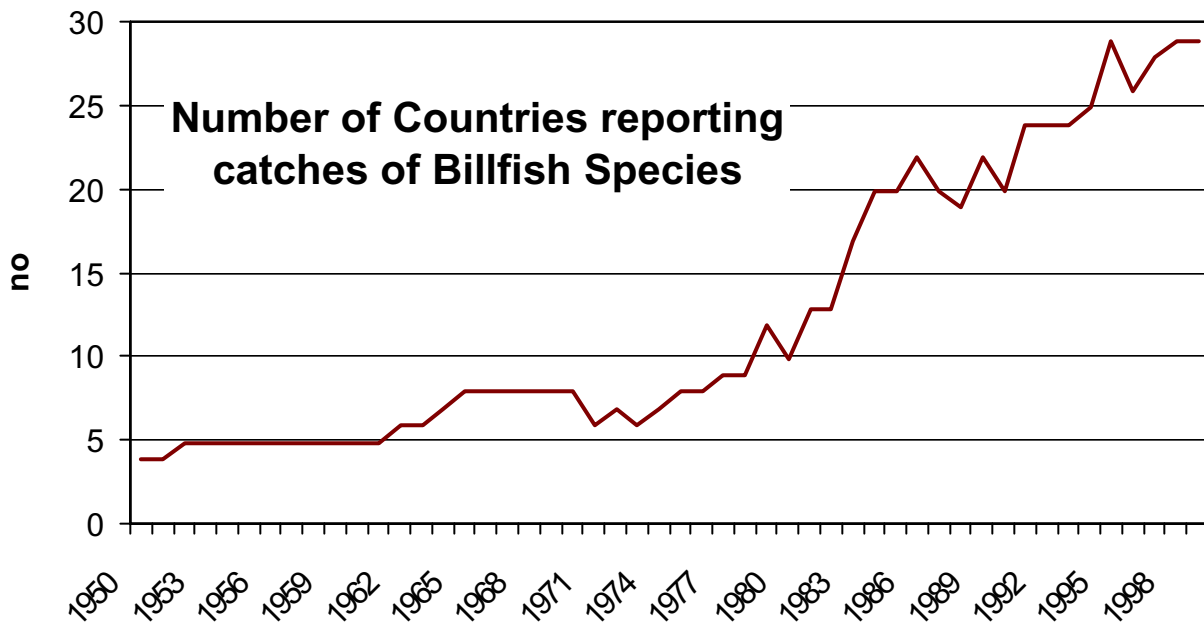
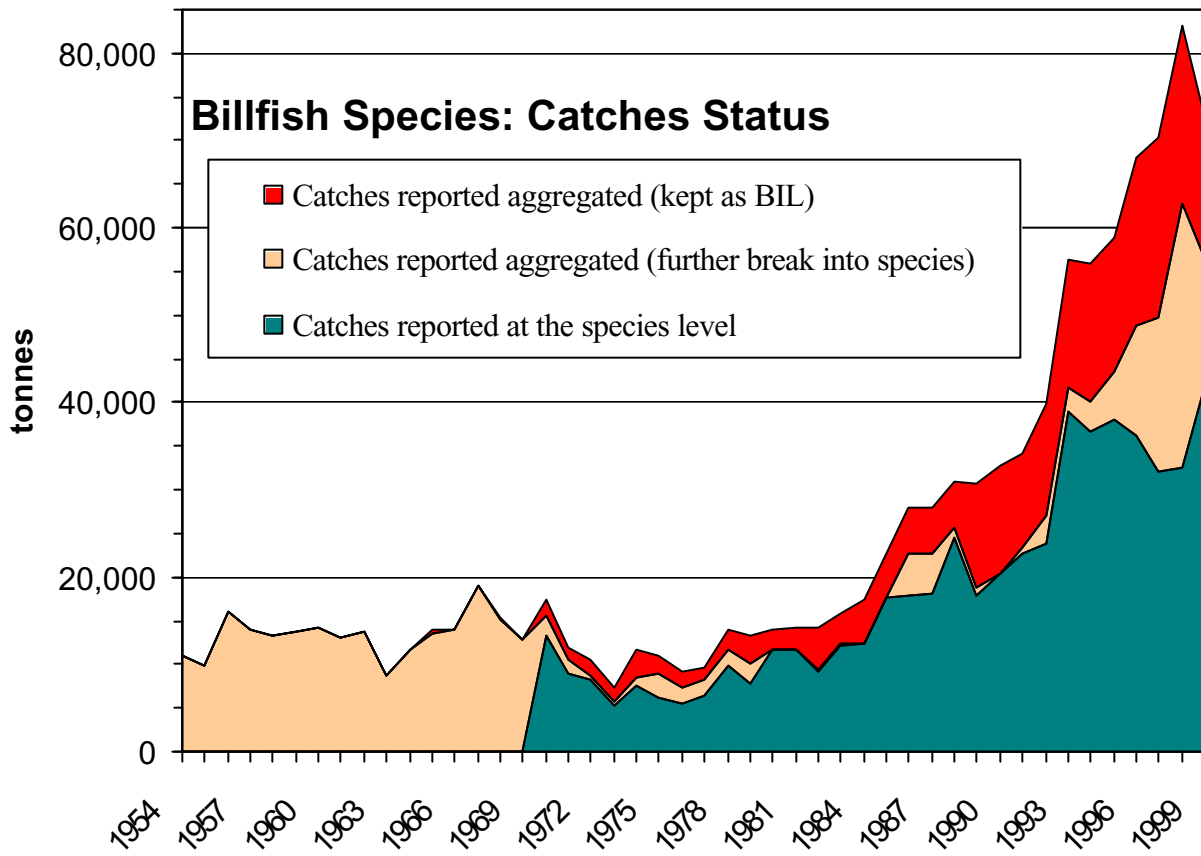
Gear	Flag	AVC	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	Flag					
LL	TWN	2.8										2.4	2.0	2.0	1.3	1.2	1.1	0.7	1.0	1.2	1.4	1.4	1.3	1.3	1.7	2.3	2.1	3.6	4.2	2.8	1.9	1.2	1.4	2.7	3.3	1.4	2.2	2.2	3.0	3.7	2.9	TWN					
	IDN	1.0																																										IDN			
	NE-JUNCL	0.9																																											NE-JUNCL		
	JPN	0.8	5.4	5.4	3.2	4.7	4.8	5.2	6.1	4.6	3.7	2.5	1.6	1.5	0.8	1.3	1.1	0.6	0.3	1.0	0.5	0.8	1.0	1.2	1.7	1.6	1.3	0.9	0.8	0.4	0.5	0.2	0.3	0.2	0.6	0.4	0.6	1.2	1.2	0.9	JPN						
	KOR	0.0																																											KOR		
	PHL	0.0																																											PHL		
	LKA	0.0																																												LKA	
	SYC	0.0																																												SYC	
	AUS	0.0																																													AUS
	KEN	0.0																																													
Flag	AVC	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	Flag						

Table 3: Catches of black marlin (BLM) in the Indian Ocean for the period 1961-1999 (in thousands of metric tonnes)

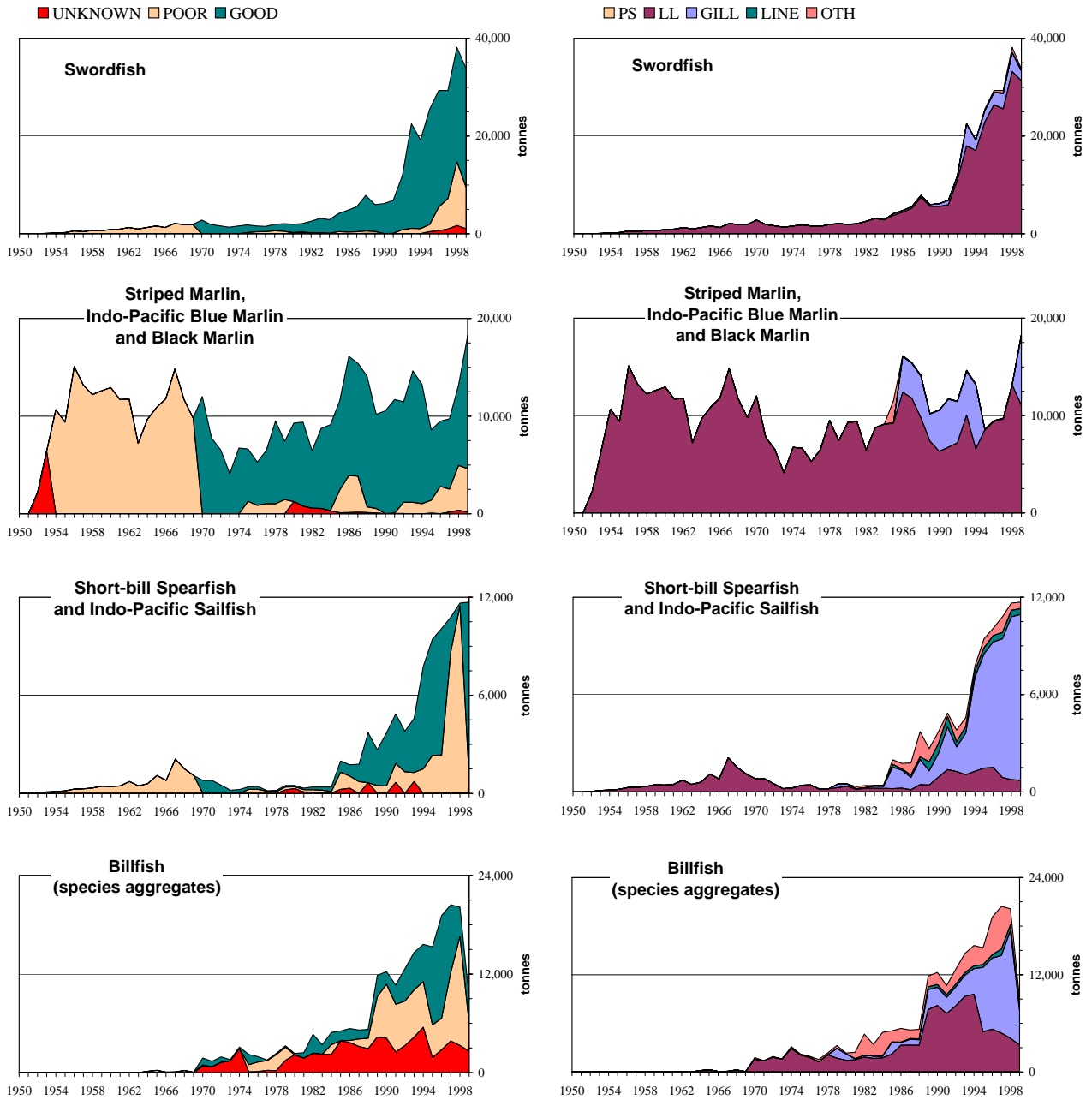
Gear	Flag	AVC	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	Flag							
LL	TWN	0.4										1.1	0.8	0.8	0.5	0.8	0.5	0.2	0.3	0.2	0.2	0.4	0.4	0.3	0.7	0.5	0.6	0.8	1.0	0.7	0.6	0.3	0.3	0.9	0.2	0.4	0.6	0.4	0.3	0.5	0.4	0.5	0.4	TWN					
	IDN	0.2																																												IDN			
	JPN	0.1	3.2	4.1	2.4	3.1	2.7	2.8	3.1	4.1	3.2	2.3	1.5	0.5	0.4	0.9	1.0	0.4	0.2	0.4	0.2	0.4	0.4	0.3	0.5	0.7	0.6	0.4	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	JPN					
	NE-JUNCL	0.1																																													NE-JUNCL		
	LKA	0.0																																													LKA		
	KOR	0.0																																														KOR	
	IRN	0.0																																														IRN	
	AUS	0.0																																														AUS	
	SYC	0.0																																															SYC
	KEN	0.0																																															
Flag	AVC	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	Flag								

Table 4: Catches of striped marlin (MLS) in the Indian Ocean for the period 1961-1999 (in thousands of metric tonnes)

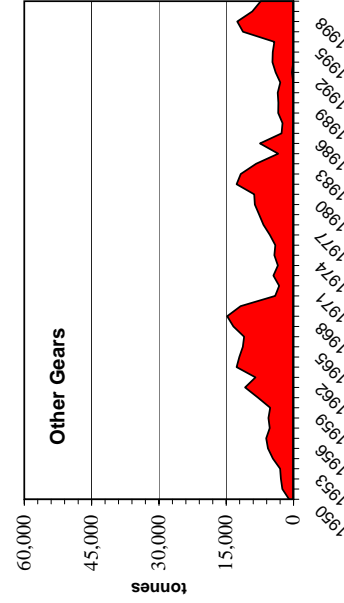
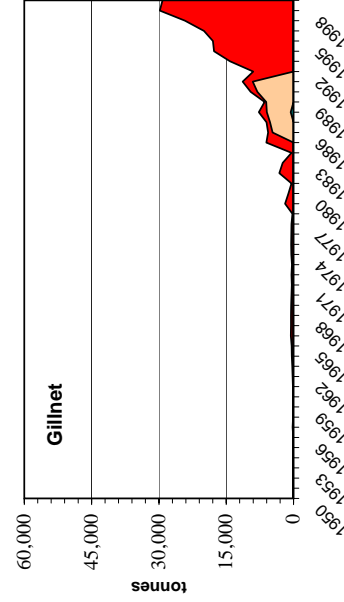
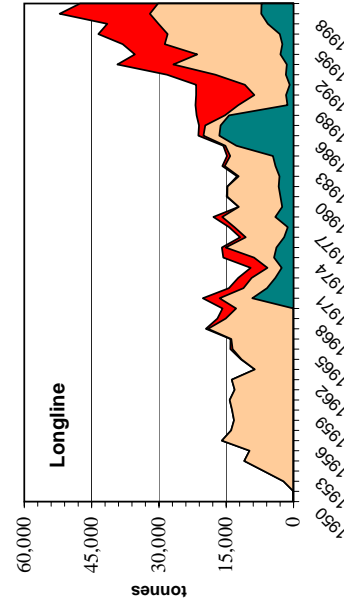
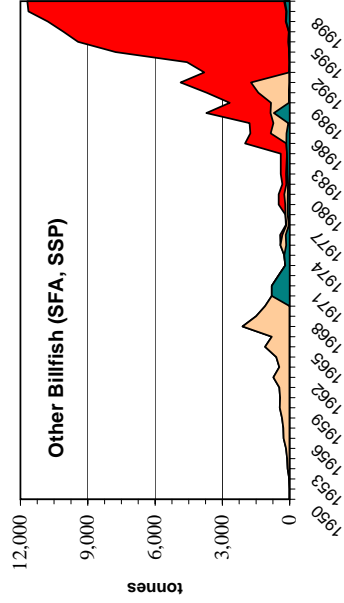
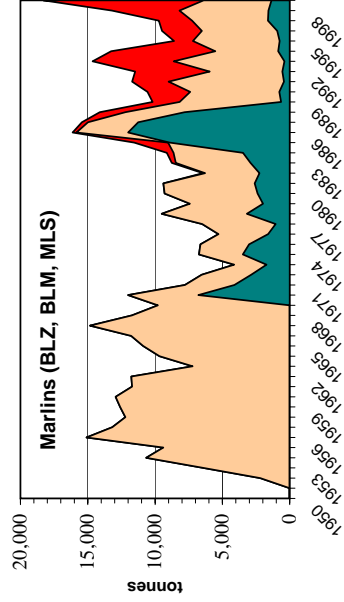
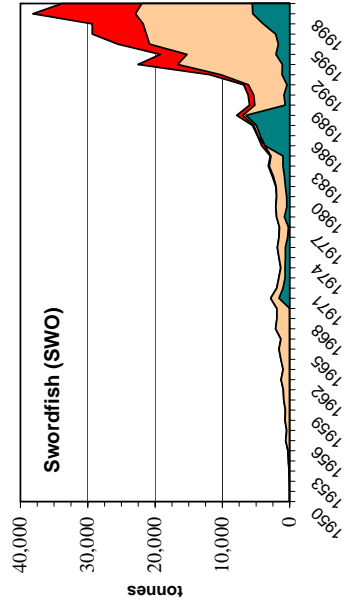
Gear	Flag	AVC	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	Flag									
LL	TWN	2.5										1.7	0.9	0.9	0.6	1.2	0.8	1.9	3.2	4.0	2.4	3.9	4.4	1.8	2.6	2.1	3.0	4.8	4.3	2.9	2.2	0.9	1.9	1.7	4.7	2.8	3.6	3.0	2.1	2.3	1.7	TWN									
	NE-JUNCL	0.6																																													NE-JUNCL				
	JPN	0.3	3.1	2.2	1.6	1.9	3.4	3.8	5.6	3.0	2.9	2.0	1.0	0.9	0.5	1.3	0.9	0.6	0.5	1.8	1.2	1.2	1.2	0.7	0.8	1.2	1.0	1.1	0.7	0.3	0.2	0.1	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.3	0.3	0.3	0.3	JPN							
	IDN	0.2																																														IDN			
	PHL	0.0																																															PHL		
	KOR	0.0																																																KOR	
	AUS	0.0																																																AUS	
	SYC	0.0																																																SYC	
	KEN	0.0																																																	KEN
	Flag	AVC	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	Flag									



Billfish: Catches per species and year (left) break according to the quality code assigned in the IOTC Nominal Catches database *versus* the catches for those species (right) split according to the gear under which they were reported



Proportion of the total catch (NC) per species (above) and gear (below) covered in the catch and effort (CE) and size frequency (SF) databases held at the IOTC Secretariat








NOTE: Catch and Effort (CE) and/or size frequency (SF) records were assumed fully representative of the total catches (NC) of a country and year whenever one or more records were found in the Catch and Effort and/or Size Frequency databases for that year and country.

Data Catalogues

1/ Availability

(Availability of Nominal Catches, Catch and Effort and Size Frequency Statistics in the IOTC databases)

Legend:

SpC	Mean catches of the Species during 1995-99	
Ag	Presence of catches recorded under BIL (aggregated catches) during 1995-99	( Catches Recorded)
	Nominal catches available	 Catches reported aggregated (under BIL) likely to contain catches of this species
	Catch and Effort data available	
	Size frequency data available	

Data Catalogues

2/ Quality

(Quality of the statistics held in the Nominal Catches, Catch and Effort and Size Frequency databases)

Nominal Catches Database: The higher or lower quality of each individual record (strata) was assigned depending on whether the catches reported (or estimated) in that strata (Country-RepCountry-Year-Gear-Area-Species-Source) were thought to accurately represent the actual catches occurred in the strata concerned.

Catch and Effort Database: The higher or lower quality of each individual record (strata) was assigned depending on whether the catches reported (or estimated) in that strata (Country-RepCountry-Year-Gear-Area-Species-Source) were thought fully representative of the total catches occurred in the strata concerned.

Size Frequency Database: The higher or lower quality of each individual record (strata) was assigned depending on whether the specimens sampled in that strata (Country-RepCountry-Year-Gear-Area-Species-Source) were thought fully representative of all specimens caught in the strata concerned.

Legend:

SpC Mean catches of the Species during 1995-99



Poor quality

Fair quality

Good quality

Unknown quality

Striped, Blue and Black Marlins

Nominal Catches Database

Gear	Country	SpC	61	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	Country	
LONGLINE	TWN	5.75																						TWN
	NEI-UNCL	1.62															1 1	1 1	1 1	1 1	1 1	1 1	1 1	NEI-UNCL
	IDN	1.39																		1 1	1 1	1 1	1 1	IDN
	JPN	1.25	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1												JPN
	PHL	0.18																						PHL
	KOR	0.09								1 1	1 1	1 1												KOR
	FRA	0.08																	1 1					FRA
	LKA	0.05														1 1					1	1 1	1 1	LKA
	IND	0.03																					1	IND
	FRA-MAY	0.02																						FRA-MAY
	AUS	0.02																1	1	1 1	1			AUS
	SYC	0.01																						SYC
	IRN	0.00																			1 1	1 1		IRN
	HND-IND																			1 1				HND-IND
	KEN												1 1	1 1										KEN
OMN																							OMN	
SUN														1 1									SUN	
GILL	LKA	7.17														1 1								LKA
LINE	FRA	0.04																						FRA
	KEN	0.04																			1 1	1 1	1 1	KEN
	LKA															1 1								LKA
	SYC																							SYC
	ZAF																							ZAF
OTH	LKA															1								LKA
	ZAF																							ZAF

Catch and Effort Database

Gear	Country	SpC	61	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	Country	
LONGLINE	TWN	5.75																1 1	1 1					TWN
	JPN	1.25										1 1								1				JPN
	KOR	0.09								1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	KOR
	IND	0.03																						IND
	AUS	0.02																		1				AUS
	SYC	0.01																						SYC
	HND-IND																							HND-IND
OMN																							OMN	
GILL	LKA	7.17																						LKA
	TWN																							TWN
LINE	LKA																							LKA
	ZAF																							ZAF
OTH	LKA																							LKA

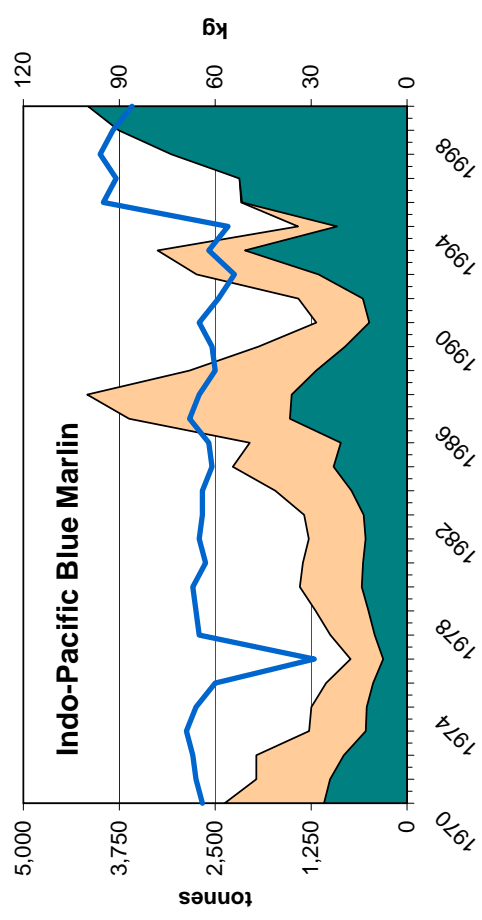
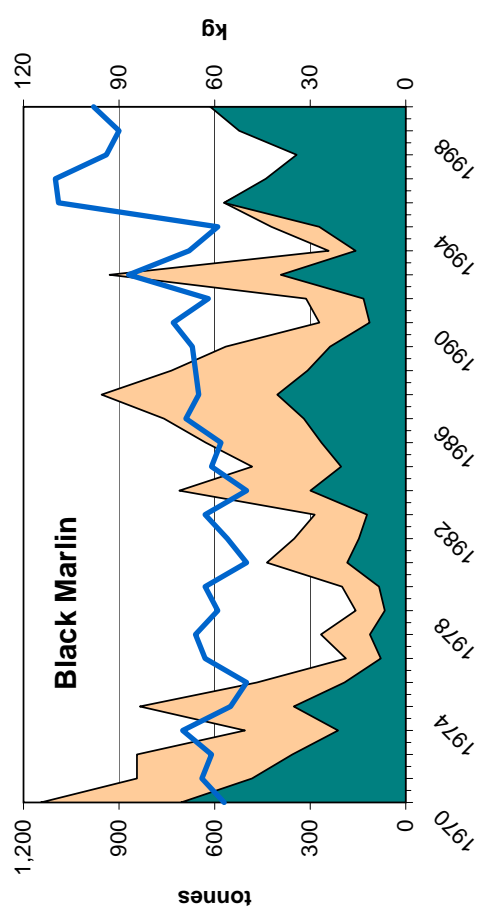
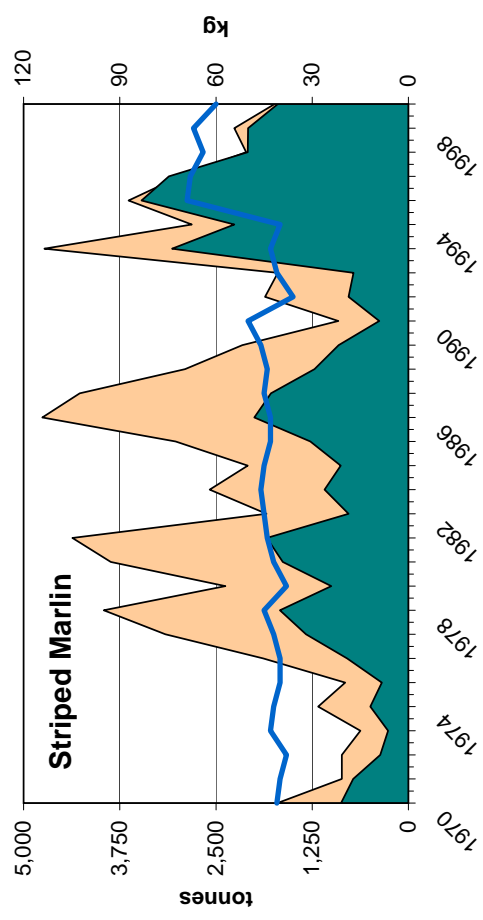
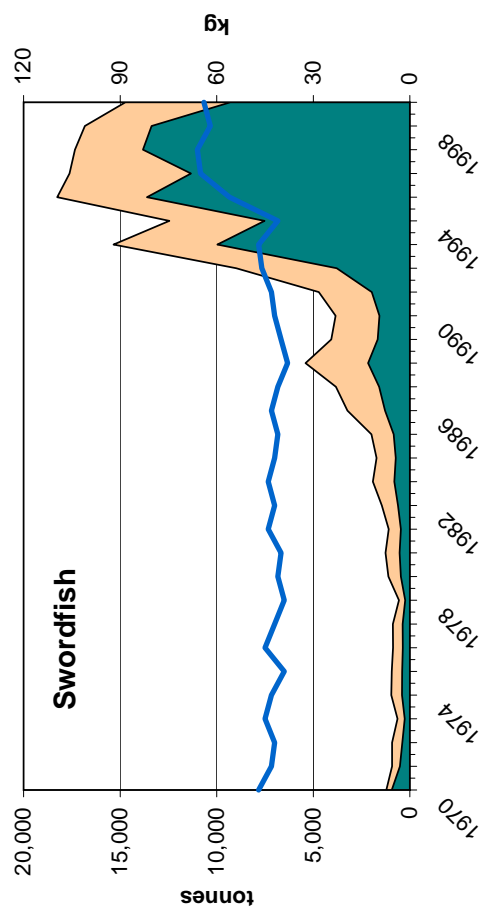
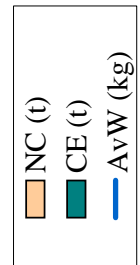
Size Frequency Database

Gear	Country	SpC	61	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	Country	
LONGLINE	TWN	5.75																						TWN
	JPN	1.25																						JPN
	CHN																							CHN
	TWN-NEI																							TWN-NEI
GILL	PAK																							PAK

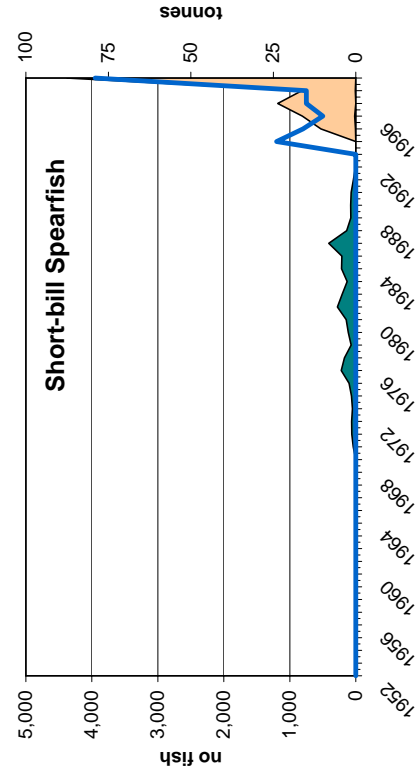
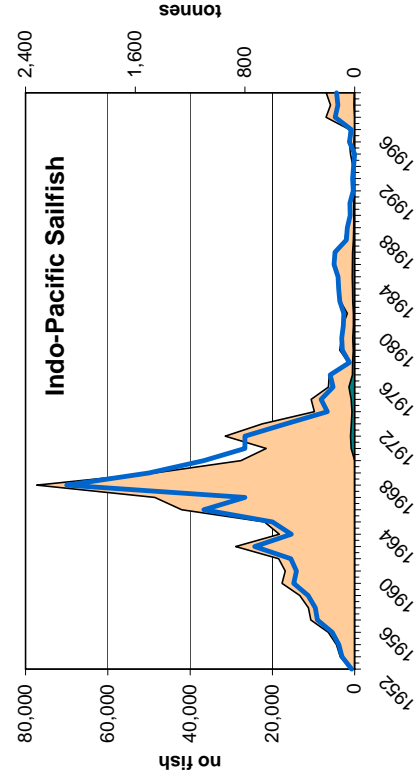
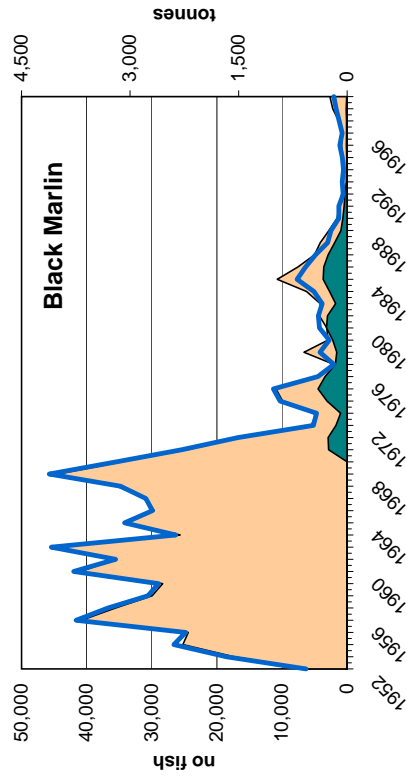
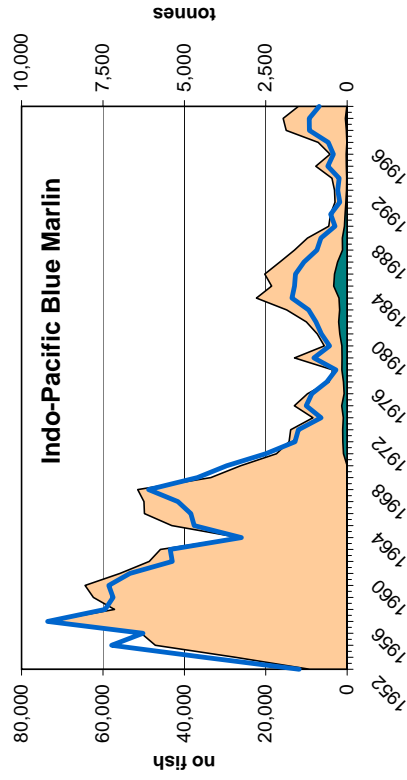
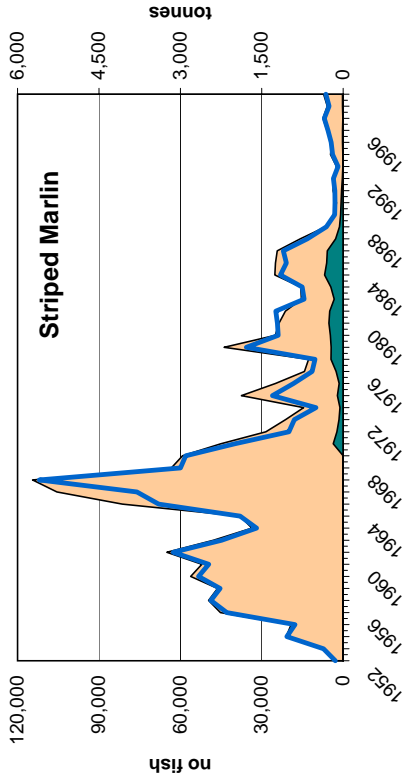
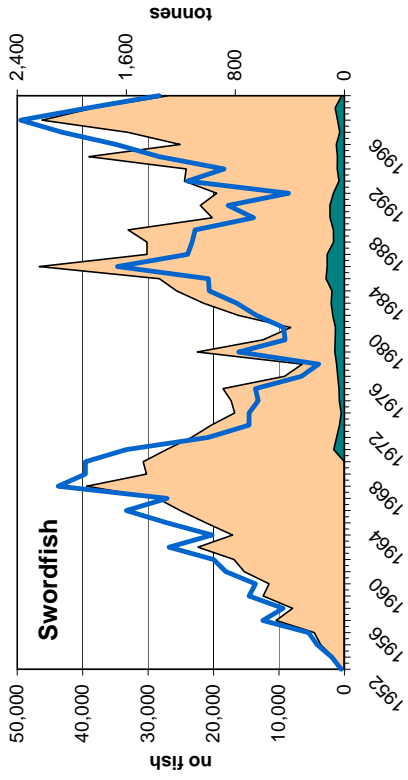
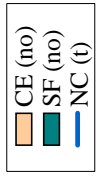
Table 9: Billfish species: Main problems regarding the data in the NC, CE and SF databases held at the IOTC Secretariat

DB	COUNTRY	GEAR			PERIOD		REASON
		LL	GI	OT	FROM	TO	
Nominal Catches	Taiwan,China				1985	1992	No data (drifting gillnets)
					1966	1969	No data (deep-freezing longliners)
	Sri Lanka				1950	1961	No data
					1962	1984	Catches probably under-reported and highly aggregated (species)
					1985	1998	Catches probably under-reported; mislabelling of species over the years
	IUU				1985	1999	Catches probably underestimated (estimated on the basis of the number of longliners operating, reported by several sources); some catches may be lost in previous years
							Catches per species estimated by assuming that all vessels belong to Taiwanese interests, which probably is not always the case (some KOR and JPN vessels also reflagged to FoC flags)
	Korea				1965	1974	Catches probably under-reported and highly aggregated
	Indonesia				1980	1999	Catches probably under-estimated and highly aggregated (species, gear)
	Other (Art.)				1950	1970	No catches, in some cases up to the middle or late eighties; catches highly aggregated (species)
All (Ind. LL)				1952	1999	Catches probably under-reported (incidental catches and discards) (JPN, TWN, KOR, IUU, etc.)	
All (Ind. PS)				1977	1999	No by-catch data (EU, SUN, SYC, MUS, EU-Foc, SGP-FoC)	
Catch & Effort	Taiwan,China				1985	1992	No data (drifting gillnets)
					1966	1969	No data (deep-freezing longliners)
					1990	1992	Catch and effort records inconsistent (deep-freezing longliners)
					1986	1999	No data (fresh tuna longliners)
	Sri Lanka				1950	1985	No data
					1992	1999	No data
	IUU				1985	1999	No data
	Korea				1965	1974	No data
					1975	1999	Catch and effort records inconsistent (when compared to nominal catches)
	Indonesia				1980	1999	No data
Other (Art)				1950	1999	Data scarce or not available for almost all fisheries	
All (Ind. LL)				1952	1999	Catches probably under-reported (incidental catches and discards) (JPN, TWN, KOR, etc.)	
All (Ind. PS)				1977	1999	No by-catch data (EU, SUN, SYC, MUS, EU-Foc, SGP-FoC)	
Size Frequency	Taiwan,China				1985	1992	No data (drifting gillnets)
					1966	1984	No data (deep-freezing longliners)
					1989	1999	No data (deep-freezing longliners)
					1986	1997	No data (fresh tuna longliners)
	Japan				1952	1970	No data
					1971	1999	Sample sizes very low, especially in recent years
	Sri Lanka				1950	1999	No data
	Other (Art)				1950	1999	Data scarce or not available for almost all fisheries
	All (Ind. LL)				1965	1999	No data for IDN, CHN, KOR, PHL, IUU and other LL fleets.
All (Ind. PS)				1977	1999	No data (EU, JPN, SUN, SYC, MUS, EU-Foc, SGP-FoC)	

Billfish species (Taiwan, China): Total catches recorded in the Catch and Effort (CE) *versus* Nominal Catches (NC) databases held at the IOTC Secretariat and average weights estimated for each species (CE database)



Billfish species (Japan): Total number of specimens versus total catches recorded in the Catch and Effort (CE), Size Frequency (SF) and Nominal Catches (NC) databases held at the IOTC Secretariat



Billfish species (Korea, Republic of): Total number of specimens *versus* total catches recorded in the Catch and Effort (CE) and Nominal Catches (NC) databases held at the IOTC Secretariat

