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PELAGIC LONGLINE BYCATCH

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SUMMARY

Dead discard estimates for swordfish, billfish, large coastal and pelagic sharks were made using mandatory reports from longline vessels, and reports from the National Marine Fisheries Service Observer program.

RÉSUMÉ

Des estimations de rejets morts d'espadon, d'istiophoridés et de grands requins côtiers et pélagiques ont été réalisées en utilisant les carnets de bord obligatoires des palangriers ainsi que les rapports du programme d'observateurs du National Marine Fisheries Service.

RESUMEN

Se realizaron las estimaciones de descartes de peces muertos para el pez espada, los marlines y los grandes tiburones pelágicos y costeros mediante la utilización de los informes obligatorios de los palangreros y de los informes del Programa de observadores del Servicio Nacional de Pesquerías Marítimas (NMFS).

KEYWORDS

By catch, long lining, Pelagic fisheries

1. INTRODUCTION

Billfish, large coastal and pelagic sharks are frequently caught and discarded by longline vessels targeting swordfish or tuna. Earlier studies have indicated that catch which is discarded is often not reported as accurately as landed catch(Cramer et al,1997). In this paper, longline observer records are used to estimate discard rates for longline effort targeting swordfish or tuna. Estimates of the weight of dead discards from other types of gear or effort reported to the pelagic logbook were based on the numbers reported in the logbook.

2. METHODS

Description of data sources used.

[1] Southeast Fisheries Science Center. Sustainable Fisheries Division. 75 Virginia Beach Drive Miami, Florida .July, 2002. Sustainable Fisheries Division Contribution SFD-02/03-173

2.1 Large pelagic logbook (LPL)

U.S. Atlantic, Caribbean and Gulf of Mexico fishing vessels which land swordfish have been required to provide daily records of effort and catch since October 1986. Undersized swordfish, billfish, large coastal and pelagic sharks are caught as bycatch, and in the case of sharks, less frequently as targeted catch by these vessels. Although a variety of gear types are represented, the predominant gear type (90% of vessels reporting) is longline gear. Records from longline gear targeting swordfish or tuna were separated from records containing longline gear with targets other than swordfish and gear other than longline. Reported swordfish or tuna directed effort in hooks decreased from 6,724,920 in 2000 to 6,723,199 in 2001. Locations of sets reported in 2001 are shown in figure 2.

2.2 NMFS Observer (NMFSO)

Seven hundred and seventy seven longline hauls were observed and recorded in the NMFSO in 2001. Numbers of swordfish, billfish, and sharks discarded dead and some measured or estimated lengths were available by species. Locations of sets observed in 2001 are shown in figure 2. The percentage of sets and hooks observed by area and quarter are reported in Table 1.

2.3 Weight Estimates:

Metric ton estimates were calculated by multiplying the average weight (median weight in the case of swordfish and billfish) by the estimated number (longline gear) or reported number(other gear) of dead discards (table 2, Appendix 1 and 2). Weight frequency charts for each species measured are shown in Appendix 4. Lengths of fish reported discarded dead in 2001 NMFSO records were used to estimate average or median weights of dead discards for each area, quarter, and species or group. When less than 30 lengths were available from an area and quarter, the average or median weight for the year was used. The length to weight conversions (Kohler et al 1995, Scott, 1996) may be found in (Cramer and Adams, 1998).

2.4 Number Estimates:

Calculations were done separately for the species (swordfish, blue marlin, white marlin, sailfish, blue sharks, silky sharks, night sharks, and dusky sharks), or close relatives (hammerhead sharks). The species with limited representation were grouped into pelagic sharks (mako, oceanic whitetip, porbeagle, thresher, and unidentified pelagic sharks) and coastal sharks (bignose shark, blacktip shark, sandbar shark, tiger shark, white shark, spinner shark, and unidentified coastal sharks).

For longline gear targeting swordfish or tuna, catch and effort files were prepared from the NMFSO and from the LPL data. Hooks set and numbers of sharks reported discarded dead in each species group were summed by area, and quarter. Catch rates were obtained for each area, quarter and species group by dividing the number of dead discards in the group by the number of hooks set and multiplying by 1,000.

General Linear Models (GLM) were run to obtain an estimate of observer catch rate for areas and quarters where there had been limited observer coverage in 2001. Observed catch rates were applied in areas and quarters where at least 10 sets were observed. In areas and quarters having 1 to 10 observed sets the GLM estimated catch rate was applied. In cases where no sets were observed the reported catch rate was accepted. GLM output for model CPUE based on observed and reported CPUE may be found in appendix 3.

2.5 GLM Model:

Ln(catch rate) = area/quarter source

Variable description:

catch rate = dead discards/hooks*1,000
area/quarter = unique identifier for each area and quarter combination
source = NMFSO or LPL
Areas:

The areas used for these analyses are those typically used domestically. These areas are smaller than the ICCAT areas and are thought to correspond to different types of fishing areas and fishing effort. A map showing these areas is presented in figure 1. The final number estimates and weight estimates are reported by ICCAT areas. Dead discards estimated when area was unknown were distributed across areas in proportion to estimated dead discards within gear (longline or other). Dead discards reported for other gear were combined with longline dead discards in all areas except ICCAT areas 91 and 92. Because LPL reports of gears other than longline are more frequent in ICCAT areas 91 and 92 than in the other ICCAT areas, the dead discards from other gear in areas 91 and 92 were reported in the unclassified gear category.

3.RESULTS AND DISCUSSION

The estimated numbers and weights of dead discards are reported in table 1. Compared to the estimates for 2000, the total year 2001 estimated metric tons of dead discards of swordfish, blue marlin, white marlin, sailfish, pelagic sharks, blue sharks, night sharks, dusky sharks, and silky sharks decreased. And the discarded weight of coastal sharks, and hammerhead sharks increased.

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Table 1 . Number hooks directed at swordfish or tuna reported to the pelagic logbook and observed in 2001.

area	quarter	% observed hooks	number of hooks logbook	hooks obseved
total		7%	6,719,199	453,966
Caribbean	1	6%	151813	9016
Caribbean	3		5600	
Caribbean	4		40730	
Gulf of Mexico	1	6%	528188	31788
Gulf of Mexico	2	6%	882578	50512
Gulf of Mexico	3	5%	901068	43349
Gulf of Mexico	4	4%	623445	26738
Florida East Coast	1	1%	204525	1980
Florida East Coast	2	3%	122910	3938
Florida East Coast	3	3%	68271	2160
Florida East Coast	4	11%	29190	3233
South Atlantic Bight	1	7%	129152	9162
South Atlantic Bight	2	5%	350410	16697
South Atlantic Bight	3	8%	86091	7246
South Atlantic Bight	4	8%	53948	4313
Mid Atlantic Bight	1	9%	29193	2616
Mid Atlantic Bight	2	9%	188210	16157
Mid Atlantic Bight	3	4%	270843	10190
Mid Atlantic Bight	4	5%	466242	23596
Northeast Coastal	1		2400	
Northeast Coastal	2	6%	133209	7978
Northeast Coastal	3		563396	2200
Northeast Coastal	4	3%	136384	3576
Northeast Distant	1		1550	
Northeast Distant	2	1%	91323	867
Northeast Distant *	3	57%	122656	70040
Northeast Distant *	4	104%	90757	94560
Sargasso	1		10637	
Sargasso	2		2250	12054
Sargasso	4		800	
North Central Atlantic	1		42905	
North Central Atlantic	2		58368	
North Central Atlantic	3		2100	
North Central Atlantic	4		3770	
Tuna North	1		8826	
Tuna North	2		30963	
Tuna North	3		2700	
Tuna South	1		4650	
Tuna South	2		9600	
Tuna South	3		2050	
Tuna South	4		20400	
Unknown Area	1		77898	
Unknown Area	2		83800	
Unknown Area	3		60250	
Unknown Area	4		23150	

Table 2. The following tables show the number of estimated dead discards (DEAD_D), the estimated whole weight (MT_DEAD) in each ICCAT area for longline (LL) and other gear(OTH).

Swordfish

AREA	GEAR	DEAD_D	MT_DEAD
91	LL	10488	68.63
92	LL	13003	185
93	LL	866	15.26
94	LL	1137	18.71
96	LL	7	0.11
99	LL	1000	15
91	OTH	765	4.85
92	OTH	45	0.65
96	OTH	10	0.15

Sailfish

91	LL	458	8.24
92	LL	124	2.23
93	LL	2	0.04
94	LL	0	0
96	LL	0	0
99	LL	19	0.34
91	OTH	6	0.11

Blue Marlin

91	LL	168	9.41
92	LL	194	10.86
93	LL	22	1.23
94	LL	0	0
96	LL	0	0
99	LL	16	0.9
91	OTH	39	2.18

White Marlin

91	LL	531	10.09
92	LL	270	5.13
93	LL	39	0.74
94	LL	18	0.34
96	LL	0	0
99	LL	31	0.59
91	OTH	56	1.07

AREA	GEAR	DEAD_D	MT_DEAD

Pelagic Shark

91	LL	149	7.9
92	LL	672	35.72
93	LL	2	0.11
94	LL	60	3.18
96	LL	0	0
99	LL	38	2.01
91	OTH	10	0.53
92	OTH	8	0.43

Blue Shark

91	LL	0	0
92	LL	2562	66.08
93	LL	0	0
94	LL	2472	36.06
96	LL	0	0
99	LL	155	3.26
92	OTH	2	0.08
94	OTH	25	0.33
96	OTH	3	0.06

Coastal Shark

91	LL	150	3.6
92	LL	599	14.38
93	LL	0	0
94	LL	0	0
96	LL	0	0
99	LL	28	0.67
91	OTH	470	11.28
92	OTH	3	0.06

Dusky Shark

91	LL	17	0.48
92	LL	72	2.02
93	LL	0	0
94	LL	0	0
96	LL	0	0
99	LL	4	0.11
92	OTH	1	0.03

AREA	GEAR	DEAD_D	MT_DEAD
Silky Shark			
91	LL	436	6.98
92	LL	1476	23.62
93	LL	0	0
94	LL	0	0
96	LL	0	0
99	LL	88	1.41
91	OTH	2	0.03
Hammerhead			
91	LL	66	3.76
92	LL	803	45.77
93	LL	34	1.94
94	LL	0	0
96	LL	0	0
99	LL	41	2.34
91	OTH	10	0.57
92	OTH	24	1.36
Night Shark			
91	LL	0	0
92	LL	1151	23.24
93	LL	17	0.36
94	LL	0	0
96	LL	0	0
99	LL	64	1.34
92	OTH	1	0.02

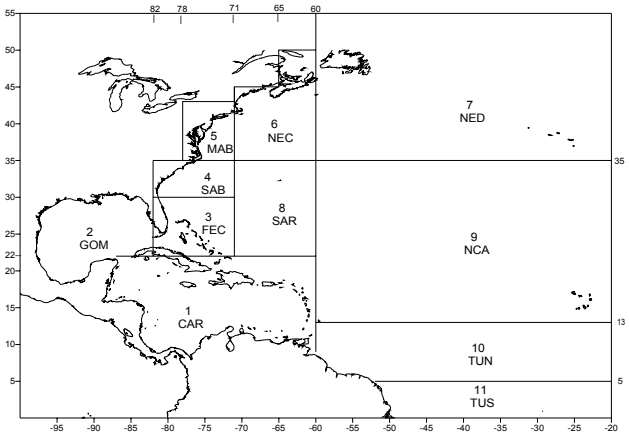
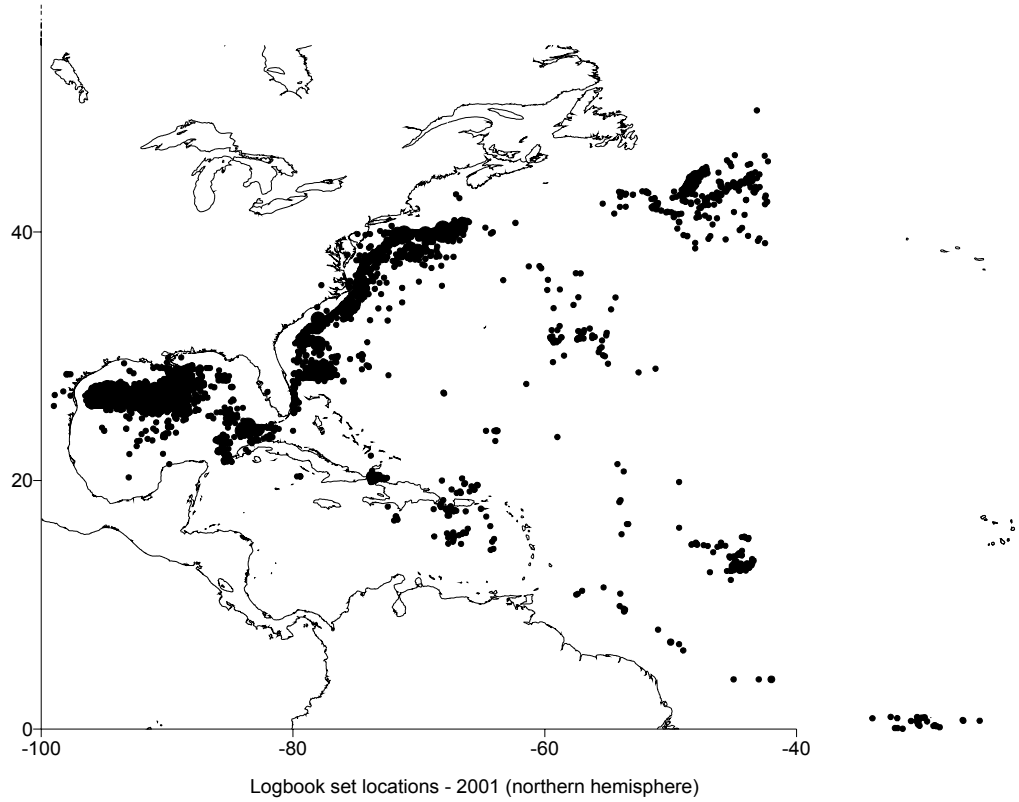


Figure 1: Areas used in analyses.

ICCAT Area	Area (domestic)
93	1 Caribbean
91	2 Gulf of Mexico
92	3 Florida East Coast
92	4 South Atlantic Bight
92	5 MidAtlantic Bight
92	6 Northeast Coastal
94	7 Northeast Distant
93	8 Sargasso
93	9 North Central Atlantic
93	10 Tuna North
96	11 Tuna South
99	0 unknown area



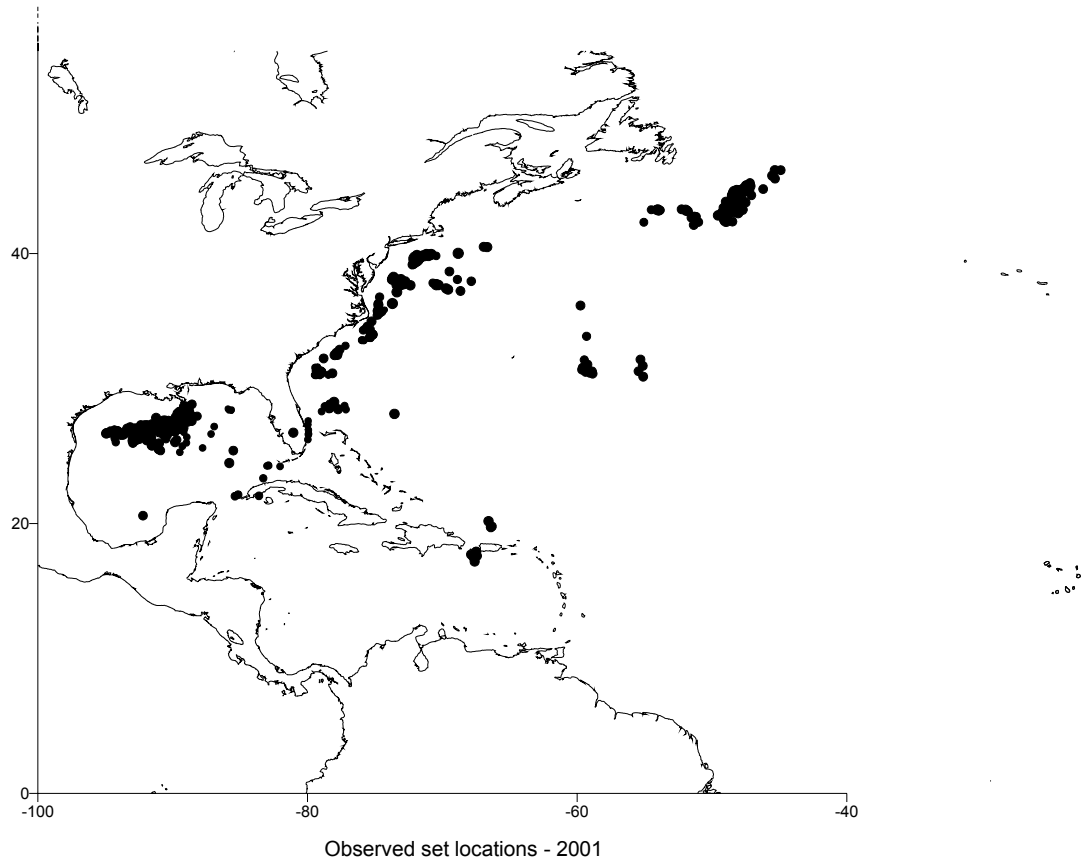
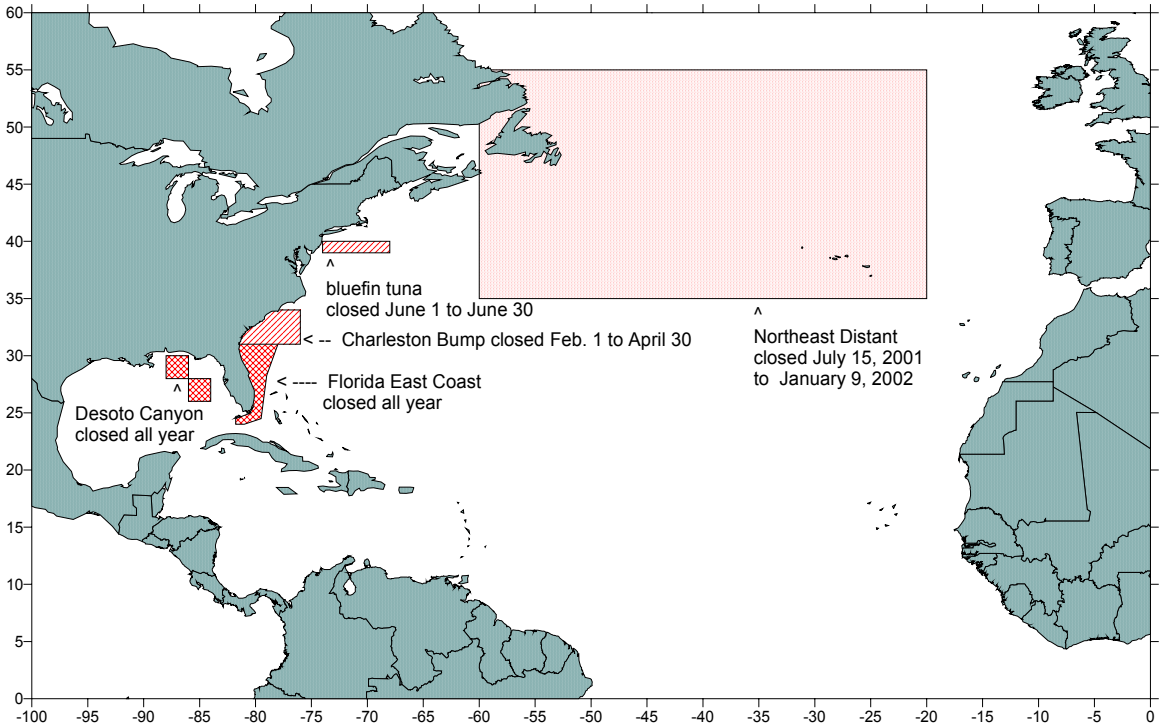


Figure 2. Locations of effort reported to the large pelagic logbook in 2001 and 2001 observed set locations.

Appendix . Affect of time/area closures on U.S. swordfish catch.

During the year, 2001, U.S pelagic longline fishing was prohibited or restricted in the five areas and times shown in figure 1. The three southern areas, (Charleston Bump, Florida East Coast, and Desoto Canyon), were selected, at least in part, to reduce the catch of swordfish < 125 cm and other bycatch. The bluefin tuna area was closed primarily to reduce the catch of bluefin smaller than legal size for sale by U.S. fishers. Longline vessels were allowed to fish in the Northeast Distant area if they participated in a turtle study and carried an observer.

The number of longline vessels in the U.S. fishery targeting swordfish has declined steadily since the mid 1990's. Reported effort (hooks) declined initially but has remained fairly stable since 1998 (Table 1)**.** The percentage effort in hooks and estimated catch of swordfish < 125 cm in numbers and in metric tons in 2001 is compared to the average effort and catch from 1997 through 1999 (Table 2). There was little overall reduction in effort, reported in hooks fished. Some of the effort previously reported from the Florida East Coast fishing area appears to have redistributed into the Gulf of Mexico and up to the south Atlantic and Mid Atlantic Bights. The year 2001 and average (1997-1999) estimated catch of swordfish < 125 cm in numbers and in metric tons and effort in hooks are reported by area and time/area status in Table 3. Although the metric tons of swordfish < 125 cm estimated caught increased in some areas compared to the 1997-99 average, notably the Gulf of Mexico, the overall change in estimates was a reduction of nearly 50%**.**



Appendix Figure 1. Time/area closures for the U.S. longline fishery in 2001.

Appendix Table 1. *Numbers of Active Vessels.* "Fished" implies a vessel submitted at least one positive fishing report during that year, "Caught Swordfish" means the vessel reported catching at least one swordfish during that year and "Caught Swordfish in 5 months" means the vessel reported catching at least one swordfish per month in at least five months of that year. "Hooks Reported" includes all submitted logbooks whether or not they represented single pelagic longline sets, summary records, bottom longline records, or sets with less than 100 hooks fished.

NUMBERS OF ACTIVE VESSELS

YEAR	FISHED	CAUGHT SWORDFISH	CAUGHT SWORDFISH IN 5 MONTHS	HOOKS REPORTED
1987	297	273	180	6,557,776
1988	387	337	210	7,010,008
1989	455	415	250	7,929,927
1990	416	362	209	7,495,419
1991	333	303	175	7,746,837
1992	337	302	183	9,056,908
1993	434	306	175	9,721,036
1994	501	306	176	11,270,632
1995	489	314	198	10,976,048
1996	367	276	189	10,213,223
1997	350	264	167	10,212,823
1998	286	231	134	7,886,088
1999	224	199	140	7,768,790
2000	199	181	129	7,876,642
2001	184	168	113	7,889,137

Appendix Table 3. Catch in numbers (# small) and in metric tons (mt small) of swordfish < 125 cm and effort (hooks) by longline (LL) or other (OTH) gear for years 2001 and the average for years 1997, 1998, and1999 (Average) by area, (Caribbean (CAR). Gufl of Mexico (GOM), Florida East Coast (FEC), South Atlantic Bight (SAB), Mid Atlantic Bight (MAB), Northeast Coastal (NEC), and Northeast Distant (NED)) and status of time/area closure.

gear	area	time/area	2001 # small	2001 hooks	Average # small	Average hooks	2001 mt small	Average mt small	change in mt
LL	CAR	open	303	198,143	485	244,660	16	23	-8
LL	GOM	closed	25	20,900	1,126	1,376,412	1	32	-31
LL	GOM	open	2,188	2,918,799	570	1,313,014	69	16	53
LL	FEC	closed	322	163,707	1,215	338,353	27	92	-65
LL	FEC	open	104	261,189	613	278,593	6	31	-25
LL	SAB	closed	105	58,587	1,787	417,902	7	125	-118
LL	SAB	open	1,012	566,464	1,257	179,378	64	88	-24
LL	MAB	closed	0	400	166	42,315	0	10	-10
LL	MAB	open	1,387	959,248	1,021	921,878	31	40	-9
LL	NEC	closed	1	2,400	11	40,025	0	0	0
LL	NEC	open	784	832,989	741	722,962	49	47	2
LL	NED	closed	663	162,646	114	76,198	11	2	9
LL	NED	open	172	143,640	861	422,341	4	19	-15
LL	total LL	closed	1,116	408,640	4,418	2,291,205	46	262	-215
LL	total LL	open	6,223	6,315,963	6,112	4,677,586	248	275	-28

Appendix Table 2. Catch in numbers (# small) and in metric tons (mt small) of swordfish < 125 cm and effort (hooks) in year 2001 expressed as a percentage of the average from years 1997 through 1999.

gear	area	# small	mt small	hooks
LL	CAR	63%	67%	81%
LL	GOM	130%	145%	109%
LL	FEC	23%	27%	69%
LL	SAB	37%	34%	105%
LL	MAB	117%	62%	100%
LL	NEC	104%	104%	109%
LL	NED	86%	72%	61%
LL	total LL	70%	55%	96%
LL & OTH	total	69%	54%	92%