IOTC-2006-WPBy-INF06 4/4

SCRS/2005/086 Col. Vol. Sci. Pap. ICCAT, 59(3): 1025-1036 (2006)

PRELIMINARY REASSESSMENT OF THE VALIDITY OF THE 5% FIN TO CARCASS WEIGHT RATIO FOR SHARKS

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SUMMARY

We assessed the validity of the continued use of the 5% fin weight to carcass weight ratio using available data from various fishery-independent and fishery-dependent sources. The fin to carcass ratio is highly variable, depending on species, fin set, and finning procedure. Ratios (fin weight [FW] to dressed carcass weight [DW]) range from 2.5% for the silky shark, Carcharhinus falciformis (n = 19) to 5.3% for the sandbar shark, C. plumbeus (n = 39) for the primary fin set (dorsal fin, both pectoral fins, and the lower lobe of the caudal fin). Two fishery-dependent sources report average FW:DW ratios of 4.9% and 4.5% for all species combined, whereas two fishery-independent sources report lower averages of 3.7% and 3.8% for the combined species. This may be due to differential processing of sharks by fishermen vs. researchers. Owing to the high variability among species, species-specific management would help ensure that finning (defined here as retaining only the fins and discarding the remainder of the body) does not occur on species with lower FW:DW ratios as a result of fishermen trying to meet the 5% FW:DW allowance. If species-specific management is not feasible, the available data suggest that the aggregated 5% ratio is not inappropriate when using the primary fin set in the calculations. In all, the only guaranteed method to avoid shark finning is to land sharks with all fins attached.

RÉSUMÉ

Nous avons évalué la validité de l'utilisation continue du ratio de 5% du poids ailerons-carcasse en utilisant les données disponibles de diverses sources indépendantes des pêcheries et dépendantes des pêcheries. Le ratio ailerons-carcasse est très variable, en fonction des espèces, des jeux d'ailerons et de la procédure de prélèvement des ailerons. Les ratios (poids des ailerons [FW] par rapport au poids de la carcasse manipulée [DW]) oscillent entre 2,5% pour le requin soyeux (Carcharhinus falciformis) (n = 19) et 5,3% pour le requin gris (C. plumbeus) (n = 39) pour le jeu d'ailerons principal (composé de la nageoire dorsale, des deux nageoires pectorales et du lobe inférieur de la nageoire caudale). Deux sources dépendant des pêcheries signalent que les ratios moyens FW :DW se situent à 4,9% et 4,5% pour toutes les espèces combinées, tandis que deux sources indépendantes des pêcheries indiquent des moyennes inférieures de 3,7% et 3,8% pour les espèces combinées. Ceci peut être dû aux méthodes différentes de transformation des requins par les pêcheurs et les chercheurs. En raison de la forte variabilité au sein des espèces, la gestion spécifique aux espèces contribuerait à garantir que le prélèvement des ailerons (défini dans le présent document comme le fait de ne garder que les ailerons et de rejeter le reste du corps) ne soit pas réalisé sur des espèces dont les ratios FW :DW sont inférieurs du fait que les pêcheurs essaient de respecter la tolérance de 5% FW :DW. Si la gestion spécifique aux espèces n'est pas faisable, les données disponibles suggèrent que le ratio agrégé de 5% n'est pas approprié lorsqu'on utilise le jeu d'ailerons principal dans les calculs. Finalement, la seule méthode garantie pour éviter le prélèvement des ailerons de requins est de débarquer les requins avec tous les ailerons attachés.

RESUMEN

Hemos evaluado la validez del uso continuado de la ratio del 5% entre el peso de las aletas y el peso de la carcasa utilizando los datos disponibles de varias fuentes dependientes e independientes de la pesquería. La ratio aleta-carcasa es muy variable, dependiendo de la especie, el conjunto de aletas considerado y el procedimiento de extracción de las aletas. Las

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ratios (entre el peso de la aleta [FW] y el peso canal de la carcasa presentada [DW]) oscilan entre un 2,5% para el tiburón jaquetón, Carcharhinus falciformis (n = 19) y un 5,3% para el tiburón trozo, C. plumbeus (n = 39) cuando se considera el conjunto principal de aletas (aleta dorsal, ambas aletas pectorales y lóbulo inferior de la aleta caudal). Dos fuentes dependientes de la pesquería comunicaron unas ratios medias FW:DW del 4,9% y 4,5% para todas las especies combinadas, mientras que dos fuentes independientes de las pesquerías comunicaron ratios medias más bajas de 3,7% y 3,8% para la especies combinadas. Esto puede deberse al diferente modo de presentar los tiburones de los pescadores y los investigadores. Dada la fuerte variabilidad entre especies, la ordenación específica de las especies contribuiría a garantizar que la extracción de aletas (definida como la retención de las aletas únicamente y el descarte del resto del cuerpo) no se produce en especies con ratios FW:DW más bajas debido a que los pescadores intentan cumplir la tolerancia del 5% FW:DW. Si no resulta viable establecer una ordenación específica para las especies, los datos disponibles sugieren que la ratio agregada del 5% no resulta apropiada cuando se utiliza el conjunto principal de aletas en los cálculos. Finalmente, el único método garantizado para evitar la extracción de aletas de tiburones es que se desembarquen los tiburones con aletas.

KEYWORDS

Elasmobranch, Sharks, Fin weight, Carcass weight, Fin to carcass weight ratio, Finning

1 Introduction

Shark finning—defined here as retaining only the fins and discarding the remainder of the body—has been a common practice in fisheries around the world for decades and probably centuries, but was exacerbated in the late 1980's and in the 1990's as a result of the increasing demand for shark fins for Asian markets (Shivji et al. 2002). Finning is considered a wasteful practice that contravenes full utilization of the catch and responsible fishing practices embraced by the Food and Agriculture Organization's (FAO) Code of Conduct for Responsible Fisheries and resolutions from a variety of international fishery bodies.

Several nations (e.g., Australia, Brazil, Canada, Costa Rica, Oman, South Africa, and the USA) have enacted regulations to ban or limit shark finning (Cunningham-Day 2001) and a number of international fishery and conservation bodies have recently proposed initiatives or approved resolutions to prohibit this practice. In the USA, for example, the Shark Finning Prohibition Act (SFPA), which was signed into law in 2000 and extended in 2002 to include any persons under U.S. jurisdiction, prohibits engaging in finning and possessing or landing shark fins without simultaneously landing the carcasses. The European Union (EU) also established regulations to reduce finning practices in 2003 (Mejuto and García-Cortés 2004). In general, international pressure to manage shark stocks and put an end to finning has been mounting, leading to the approval of several resolutions in 2004, including the ban on shark finning for Atlantic sharks unanimously endorsed by the International Commission for the Conservation of Atlantic Tunas (ICCAT) and more recently by the Inter-American Tropical Tuna Commission (IATTC), and the recommendations adopted by the World Conservation Union (WCU) urging all states to prohibit shark finning and require shark fins to be landed attached to their bodies.

From a management perspective, banning shark finning required establishing conversion factors between fin weight and dressed carcass weight to ensure that the landed fins correspond to the carcasses being landed and not to those of discarded sharks if fins are not landed still attached to the body. To that end, the U.S. Fishery Management Plan (FMP) for Sharks of the Atlantic Ocean (National Marine Fisheries Service [NMFS] 1993) introduced the 5% fin to dressed carcass weight limit, which was based on the wet fin to dressed carcass weight ratio of 12 sandbar shark (*Carcharhinus plumbeus*) specimens.

Accurate conversion factors between fin weight and body weight are thus necessary not only as a management tool to prevent shark finning, but also as an alternate estimation method of total catch. Indeed, the 2004 ICCAT assessment of blue and mako sharks (ICCAT 2005) considered scenarios that reconstructed total catches of these two species based on the Hong Kong shark fin trade (Clarke 2003) and several assumed conversion ratios. In developing conversion factors from fin weight to body weight, it is vital to clearly document the fins used in the calculation because different nations (or regions in a nation) or fisheries/fleets may use different sets of fins or even finning (cutting) procedures that will affect the fin to carcass ratio.

In this paper we conduct a review of both fishery-dependent and fishery-independent information on fin to landed and whole body weight ratios that includes published documents, publicly available reports, and unpublished data sources. When possible, the information is summarized on a species-specific basis.

2 Materials and Methods

2.1 Fishery-dependent data sources

CSFOP.—Fishery-dependent estimates of the fin-to-carcass weight ratio were developed by the Commercial Shark Fishery Observer Program (CSFOP) while run by the Florida Program for Shark Research at the Florida Museum of Natural History, University of Florida (Burgess and Morgan). Carcass weight (dressed weight, DW) refers to the shark carcass that has been headed, gutted, and had all fins removed; fin weight (FW) refers to the wet weight of the primary fin set, which included the dorsal fin, both pectoral fins, and the lower lobe of the caudal fin. The CSFOP developed fin to carcass ratios based on more than 27,000 sharks taken in the U.S. Atlantic and Gulf of Mexico coastal bottom-longline directed shark fishery during the 1994-2002 period (data were unavailable for 1998 and 2000-2001). The authors presented annual FW:DW estimates and total fin and total carcass weights (in pounds) for all species combined (n = 29) observed in the fishery, along with overall averages.

Commercial shark fisherman.—A limited number of landing receipts was obtained from a commercial fisherman operating off the west coast of Florida, who landed sharks in the port of Madeira Beach. The receipts contained information on total fin weight (all fins), weight of the primary fin sets (defined above), and the total carcass weight of all sharks landed. All weights were reported in pounds and species was not reported. We calculated FW:DW ratios for both the primary fin sets and for total fin weights, when possible.

Canadian research program.—Information on fin to carcass ratios for the porbeagle shark, *Lamna nasus*, was obtained from a Canadian research program on the species (Campana et al. 1999, Campana unpubl. data). Data were obtained from commercial porbeagle boats on directed shark trips. The data consisted of whole or round weight (RW), dressed weight, and fin weight information in kilograms. Dressed weight refers to the shark carcass that has been headed, gutted, and had all fins removed. Fin weight (FW) refers to the wet weight of the primary fin set, which included the dorsal fin, both pectoral fins, and the lower lobe of the caudal fin.

Portuguese Observer Program.—Blue shark, *Prionace glauca*, FW:RW data were presented by Neves dos Santos and Garcia (2005). Data were obtained from the Portuguese observer program monitoring the mainland-based longline fleet targeting swordfish between October 2003 and May 2004. Round weight was determined to the nearest 0.1 kg. Total fin weight was determined to the nearest 0.001 kg. All fins were included (1st and 2nd dorsal fins, both pectorals, anal, pelvic, and entire caudal) in the total fin weight measurement. Individual fin weights were also recorded.

Spanish surface longline fleet.—Mejuto and García-Cortés (2004) reported on the relationship between fin weight and body weight ratios of sharks caught by the Spanish surface longline fleet. Data were collected by onboard observers who recorded body weight (kg), both DW and RW, along with the associated wet fin weight for the shark. The commercial fishermen processed the sharks according to standard fishery practices. The authors stated that "the caudal, first dorsal, and pectoral fins are at least used but, in some cases other fins are also taken, as pelvic fins." Given this statement, we could not ascertain which fins comprised the fin weight reported. We were able to determine that this fishery harvests the entire caudal fin (J. Mejuto, pers. comm.), not just the lower lobe as in Australia or the USA.

2.2 Fishery-independent data sources

U.S. FMP-Casey.—The 1993 Fishery Management Plan for Sharks of the Atlantic Ocean (NMFS 1993) provides data on FW:DW and FW:RW ratios for both wet and dry fin weights. Fin weight refers to the first dorsal, pectorals, and lower lobe of the caudal fin. Data were provided by Jack Casey, NMFS, Northeast Fisheries Science Center, Narragansett Laboratory in 1992, but no further details regarding data collection method or analysis are available.

Baremore et al. data.— Baremore et al. (2005, in prep.) collated data from four sources for sharks caught in the U.S. Atlantic Ocean and Gulf of Mexico from 1984 through 2003. Information on collection method can be found in **Table 1**. All lengths and weights were taken by biologists or trained fisheries observers. The NMFS data source contained accumulated data from commercial fishing vessels and recreational fishing tournaments, as well as fishery-independent longline surveys. All sharks were processed following the apparent general trend in U.S. fisheries and described by NMFS (1993). Sharks were 'logged' by removing the head just posterior to the termination of the pectoral fins, removing the tail at the precaudal notch, gutting the shark, and removing the belly flap from the pelvic fins forward to the termination of the pectoral fins so that the pelvic fins were removed as well (**Figure 1**). The Branstetter data included the belly flap in the dressed weight of some sharks. Wet fin weight was defined as the combined weight of the first dorsal, both pectorals, and the lower lobe of the caudal fin in kilograms (kg); dressed weight refers to the weight of the logged shark (kg); and round weight is the weight of the whole shark (kg). Percent of fin weight to body weight is equal to the fin weight divided by the body weight, averaged for each species, and multiplied by 100.

Maldives data.—A small amount of fin to carcass ratio information was reported by Anderson and Ahmed (1993) for the Maldives. The authors conducted interviews with fishermen and collected limited biological data during a survey to review the shark fisheries of the Maldives. The authors state that four fins are normally taken by fishermen: first dorsal, both pectorals, and the lower lobe of the caudal fin. They further state that "The dorsal and pectoral fins are normally round cut, often with considerable flesh attached. The lower caudal lobe and sometimes the other fins are straight-cut" (**Figure 2**). We calculated FW:DW ratios using information on percentage of meat produced by each shark to calculate dressed weight.

3 Results

3.1 Fishery-dependent sources

CSFOP.—The FW:DW ratios ranged from 4.4% to 5.3% annually, with an overall average of 4.9% for all shark species combined (Burgess and Morgan; **Table 2**). The authors state that the fishery largely targets the sandbar shark, a large-finned species, and other requiem sharks (Carcharhinidae) and that the average ratio of 4.9% is somewhat inflated because hammerhead sharks, which usually were not landed, and other species discarded or retained for use as bait, often were finned during this study.

Commercial shark fisherman.—We obtained data from 15 receipts from this source. Fin weight to carcass weight ratios for the primary fin set ranged from 2.3% to 6.2% per trip, with an average FW:DW ratio of 4.5% for all 15 trips (**Table 3**). Total fin weight to carcass ratios ranged from 4.5% to 6.5%, with an average of 5.8% (**Table 3**).

Canadian research program.—Data on FW:DW and FW:RW ratios were available for 703 and 619 porbeagle sharks, respectively (Campana et al. 1999, Campana unpubl. data). The average FW:DW ratio was 3.6%, with a range of 1.1 to 7.2%. Fin weight:RW ratios ranged from 0.7 to 4.1%, with an average ratio of 2.2%.

Portuguese Observer Program.—Data for 99 blue sharks were available from the Portuguese swordfish longline observer program. The authors (Neves dos Santos and Garcia 2005) reported an average FW:RW ratio of 6.6% (FW is for all fins combined). A ratio for the primary fin set (1st dorsal, both pectorals, and the lower lobe of the caudal) could not be calculated from the data provided in the report.

Spanish surface longline fleet.—Mejuto and García-Cortés (2004) reported on FW:DW and FW:RW ratios for seven and three species of sharks caught by the Spanish surface longline fleet, respectively (**Table 4**). Ratios ranged from 5.8% FW:DW for shortfin mako, *Isurus oxyrinchus,* to 21.6% FW:DW for the oceanic whitetip shark, *Carcharhinus longimanus*. Note that we were unable to determine exactly which fins were included in these ratio calculations, preventing further comparisons to other studies.

3.2 Fishery-independent sources

U.S. FMP-Casey.—NMFS (1993) reported FW:DW ratios for 12 species of sharks and FW:RW ratios for 21 species (**Tables 5** and **6**). Species-specific FW:DW ratios ranged from 2.4 to 5.1%, with an overall average of 3.7%. The overall average FW:RW ratio was 1.8%, with species-specific values ranging from 1.3 to 2.6%. It is important to note that the original "5% Rule" implemented in the USA in 1993 and often cited by other studies is based on the 5.07% FW:DW ratio for the 12 sandbar sharks examined during this study.

Baremore et al. data.— Baremore et al. (2005, in prep.) reported FW:DW ratios for 14 species and FW:RW ratios for 16 species of sharks (**Tables 5** and **6**). Species-specific FW:DW ratios ranged from 2.5 to 5.3%, with an overall average of 3.8%. The overall average FW:RW ratio was 1.9%, with species-specific values ranging from 1.4 to 2.6%. The FW:DW ratio was greatest for the sandbar shark at 5.34%.

Maldives data.—Fin to carcass ratio data were available for six species from the Maldives (**Table 7**). Species-specific FW:DW ratios ranged from 4.8 to 10.6%, while FW:RW estimates ranged from 3.0 to 5.4%. Note that sample sizes for each species were very small.

4 Discussion

The available data show that there are considerable differences in the fin to body weight ratios among species. The FW:DW ratios developed by Baremore et al. (2005, in prep.), generally agreed with the estimates presented in the NMFS 1993 FMP—which were based on substantially smaller sample sizes—, but there were some exceptions, notably for the blacktip shark (4.7% vs. 2.9%). Differences in the FW:RW ratios from these two data sources were of smaller magnitude.

The finning procedure has an obvious effect on the ratios obtained. In the USA alone, although the fishery-independent and fishery-dependent estimates are not directly comparable (all species are combined in the fishery-dependent data and in the case of the CSFOP some additional fins might have been included in the fin weights that were used to calculate annual FW:DW ratios), the fin cut from fishermen vs. researchers may have differed. Differences in selection of cutting points by fishermen from different fleets is illustrated by comparing USA and Maldivian fin cutting practices, which in the latter case include round cuts of some fins, implying that more meat is attached and higher FW:DW ratios obtained. Even within a fishing fleet, the selection of cutting points may vary, as is the case for the caudal fin in the Spanish surface fleet (Mejuto and Garcia-Cortés 2004).

The choice of the set of fins used in the calculation of fin to body weight ratios has a large effect on the calculations as might be expected. Ratios reported by Mejuto and García-Cortés (2004) for seven species of sharks were much higher than those from other studies because their fin set includes the whole tail (upper and lower lobe of the caudal fin and caudal peduncle) and in some cases other additional fins. For example, the FW:RW ratio for blue sharks was 6.5% vs. 2.2% in Baremore et al.'s (2005, in prep.) study. Neves dos Santos and Garcia (2005), who also included the whole caudal tail in addition to all the shark fins, found a FW:RW ratio of 6.6% for blue shark, essentially the same as found by Mejuto and García-Cortés (2004). These fishery/fleet-specific differences are illustrated by the different fin sets kept by the Spanish and Portuguese fleets when compared to those in the USA and Australia for example, which generally keep only the first dorsal fin, both pectoral fins, and the lower lobe of the caudal fin. The data from the Florida commercial fisherman, although limited, also show that the fin to dressed carcass weight ratio will vary—as expected—depending on whether the primary set or all fins are used in the calculation.

Fin-to-body weight ratios do not seem to vary considerably with shark size in most species in which this relationship has been examined. Blue shark and shortfin mako ratios did not vary appreciably across a wide size range (Mejuto and García-Cortés 2004), and Baremore et al. (2005, in prep.) only found statistically significant intra-specific differences in fin to body weight ratios between juvenile and adult sharks in the scalloped hammerhead shark, *Sphyrna lewini*, out of the six species they examined. Further research to explore potential variation of fin to body weight ratios with size in additional shark species is needed.

From an assessment perspective, development of species-specific fin to body weight conversion ratios would facilitate estimation of total catch based solely on fins. The importance of accurate conversion ratios is manifest, since lower conversion ratios would lead to proportionately higher catch estimates.

From a management standpoint, use of species-specific ratios could aid in the prevention of finning of species with low ratios by fishermen trying to meet the 5% allowance, which can occur under the current regulations. Another option could be to group species with similar ratios to facilitate management. For example, Baremore et al. (2005, in prep.) identified three groups based on species with ratios that were not statistically significant from each other. In all, the only guaranteed method to avoid shark finning is to land sharks with all fins attached (they could still be headed, gutted, and bled). Some Australian states (Victoria, New South Wales, Western Australia, and Tasmania) have implemented this regulation, which also applies to sharks caught as bycatch in federally managed tuna fisheries.

5 Acknowledgments

We thank Ivy Baremore for expeditiously making her summary data available to us. We also thank Mark Harrison for providing the landing receipts from the Florida commercial fisherman.

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Table 1. Collection information from several sources used by Baremore et al. (in prep., 2005). FI = fishery-independent; FD = fishery-dependent.

Source name	*Data source*	*Sampling area*	*Sampling gear*	*Sampling years*
Winner	FI	U.S. Atlantic Ocean	Longline	1985 - 2002
Baremore	FI	Gulf of Mexico	Gillnet	2002
NMFS	FI/FD	U.S. Atlantic Ocean	Longline, hook & line	1987 - 1992
Branstetter	FI	Gulf of Mexico	Longline	1984 - 1985

Table 2. Annual and overall average of fin weight to dressed carcass weight ratios obtained from the Commercial Shark Fishery Observer Program, 1994 – 2002. (Adapted from Burgess and Morgan).

		Weight (lbs)		*Number of Sharks*		
Year	*Fin Weight (%)*	*Fin*	*Dressed carcass*	*Landed*	*Bait*	*Discarded*
1994	5.09	3,856	75,729	2,243	247	137
1995	4.90	7,243	147,744	5,423	1,166	173
1996	4.97	4,512	90,794	3,884	571	144
1997	5.28	2,996	56,749	2,744	545	279
1999	4.40	2,675	60,818	2,659	1,957	108
2002	4.76	3,774	79,307	3,405	1,101	452
Total	**4.90**	**25,056**	**511,141**	**20,358**	**5,587**	**1,293**

Table 3. Fin weight to dressed carcass weight information obtained from landing receipts from a commercial fisherman in Florida, USA.

Total sharks *Dressed weight (lbs)*	*Primary Fins* *Wet weight (lbs)*	*%* *FW:DW (primary)*	*Total fins* *Wet weight (lbs)*	*%* *FW:DW (total)*
3288	78	2.4	147	4.5
4060	250	6.2	280	6.9
6191	339	5.5	383	6.2
4076	163	4.0	213	5.2
2626	152	5.8	172	6.5
4099	208	5.1	236	5.8
3929	196	5.0	253	6.4
4055	211	5.2	249	6.1
2677	90	3.4	136	5.1
6644	326	4.9	404	6.1
2817	119	4.2	148	5.3
2434	130	5.3	146	6.0
875	20	2.3	47	5.4
2912	152	5.2	.	.
1838	68	3.7	95	5.2
	AVERAGE	**4.5**		**5.8**

Table 4. Fin weight to dressed and round carcass weight for select shark species encountered in the Spanish surface longline fleet. Adapted from Mejuto and García-Cortés (2004).

	% FW:DW				% FW:RW			
Species	*n*	*mean*	*min*	*Max*	*n*	*mean*	*min*	*Max*
Carcharhinus falciformis	11	11.09	10.00	12.73	2	6.50	5.33	7.67
Carcharhinus longimanus	39	21.55	9.30	31.43	7	9.60	7.92	11.67
Prionace glauca	736	14.72	5.79	30.00	184	6.53	4.63	10.00
Galeocerdo cuvier	1	8.33	.	.				
Isurus oxyrinchus	101	5.81	3.00	7.89				
Isurus paucus	3	7.22	6.54	7.62				
Sphyrna zygaena	4	8.38	6.91	10.00				

Table 5. Wet fin weight to dressed carcass weight ratios reported from the fishery- independent research conducted in the USA.

	Wet Fin weight to Dressed weight					
	Baremore et al. (Unpub. Data)			*NMFS FMP 1993*		
Species	*%*	*N*	*SD*	*%*	*N*	*SD*
Carcharhinus acronotus	3.4	19	1.04	3.40	6	NA
Carcharhinus altimus	.	.	.	4.16	1	NA
Carcharhinus brevipinna	4.53	46	1.44	3.32	11	NA
Carcharhinus falciformis	2.53	18	0.73	.	.	NA
Carcharhinus limbatus	4.65	57	1.40	2.86	4	NA
Carcharhinus obscurus	3.55	6	0.82	4.58	1	NA
Carcharhinus plumbeus	5.34	39	1.28	5.07	12	NA
Carcharhinus signatus				2.64	2	NA
Galeocerdo cuvier	3.74	17	0.71	2.90	3	NA
Isurus oxyrinchus	2.99	9	0.89	4.22	5	NA
Mustelus canis	3.51	6	1.84	.	.	NA
Prionace glauca	4.46	12	0.53	3.74	8	NA
Rhizoprionodon terraenovae	3.88	44	0.70	.	.	NA
Sphyrna lewini	2.85	25	0.78	2.39	9	NA
Sphyrna mokarran	2.94	5	1.96	.	.	NA
Sphyrna tiburo	4.91	74	0.98	4.69	2	NA
AVERAGE	**3.81**			**3.66**		

Table 6. Wet fin weight to round carcass weight ratios reported from the fishery-independent research conducted in the USA.

	Wet Fin weight to Round weight					
	Baremore et al. (Unpub. Data)			*NMFS FMP 1993*		
Species	*%*	*N*	*SD*	*%*	*N*	*SD*
Alopias vulpinus	2.06	5	0.17	2.06	5	NA
Carcharias taurus				1.34	1	NA
Carcharhinus acronotus	1.75	21	0.49	1.55	6	NA
Carcharhinus altimus	2.13	6	0.61	1.79	5	NA
Carcharhinus brevipinna	2.4	47	1.00	1.73	11	NA
Carcharhinus falciformis	1.45	19	0.28	1.62	1	NA
Carcharhinus limbatus	2.24	64	0.72	1.59	5	NA
Carcharhinus obscurus	1.74	5	0.33	2.08	1	NA
Carcharhinus perezi	.	.	.	1.37	2	NA
Carcharhinus plumbeus	2.55	67	0.47	2.46	36	NA
Carcharhinus signatus	.	.	.	1.30	2	NA
Galeocerdo cuvier	1.37	30	0.40	1.27	17	NA
Isurus oxyrinchus	1.76	46	0.33	1.68	28	NA
Lamna nasus	.	.	.	2.19	1	NA
Mustelus canis	1.69	6	0.75	.	.	NA
Negaprion brevirostris	.	.	.	2.30	1	NA
Prionace glauca	2.16	65	0.37	2.06	52	NA
Rhizoprionodon terraenovae	1.82	44	0.24	1.47	1	NA
Sphyrna lewini	1.66	43	0.33	1.58	24	NA
Sphyrna mokarran	1.84	7	0.96	2.03	1	NA
Sphyrna tiburo	2.46	74	0.49	2.56	2	NA
Sphyrna zygaena	.	.	.	1.49	1	NA
AVERAGE	**1.94**			**1.79**		

Table 7. Biological information, fin weight and body weight information for Maldivian sharks. Adapted from Anderson and Ahmed (1993).

Species	Length (cm)	Sex	Round weight (kg)	FW:RW %	Dressed Weight* (kg)	FW:DW* %
Nebrius ferrugineus	93	F	4.3	5.8	2.2	11.2
	107	F	5.6	4.3	2.9	8.3
	162	M	18.8	6.1	9.2	12.4
Average				**5.4**		**10.6**
Carcharhinus amblyrhynchos	127	M	12.2	3.3	6.3	6.4
	140	F	18	4.4	9.4	8.4
	144	F	21.0	4.3	10.8	8.4
Average				**4.0**		**7.7**
Carcharhinus falciformis	100	F	4.6	5.5	2.6	9.6
	125	M	9	4.4	5.8	6.8
	142	F	14	4.6	8.9	7.3
	143	M	17.6	4.0	10.8	6.5
Average				**4.6**		**7.6**
Carcharhinus melanopterus	114	F	8.2	2.8	5.0	4.6
	118	F	10.4	3.4	6.2	5.7
Average				**3.1**		**5.2**
Carcharhinus sorrah	108	M	6.9	3.0	4.2	4.9
	109	M	6.6	3.2	4.1	5.2
	110	M	7.4	2.8	4.8	4.3
Average				**3.0**		**4.8**

* calculated based on percentage contribution of meat presented in the original table

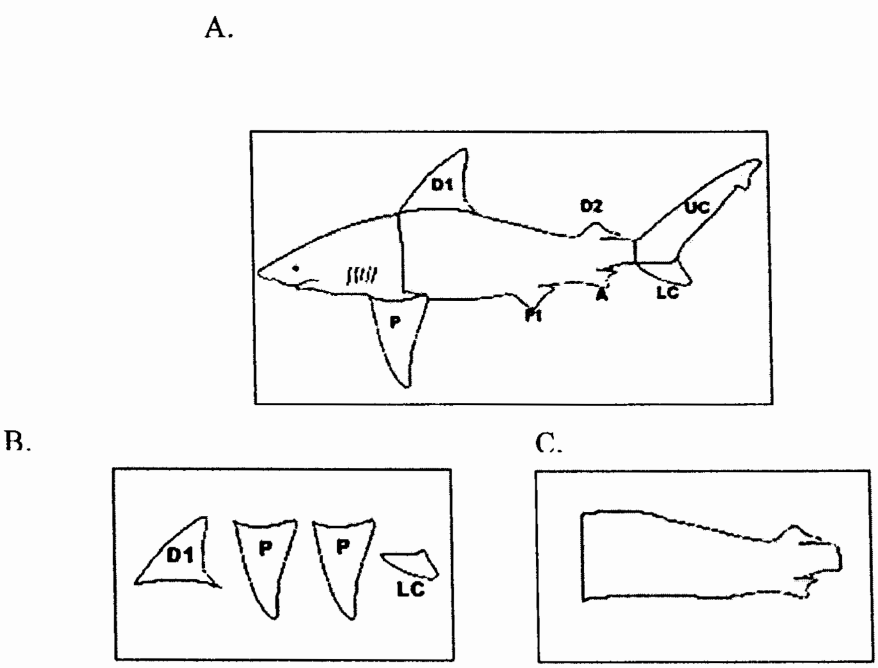

Figure 1. A) Whole shark with fins labeled. This would constitute "whole" or "round" weight, provided the shark had not been gutted. D1 = 1st dorsal; D2 = 2nd dorsal; P = pectoral; P1 = pelvic; A = anal; UC = upper caudal; LC = lower caudal. B) Primary fin set, as defined by US fisheries: 1st dorsal, both pectorals, and the lower lobe of the caudal. C) Logged shark. This would constitute "dressed" weight, provided the shark had been gutted. Adapted from Baremore et al. (in prep).

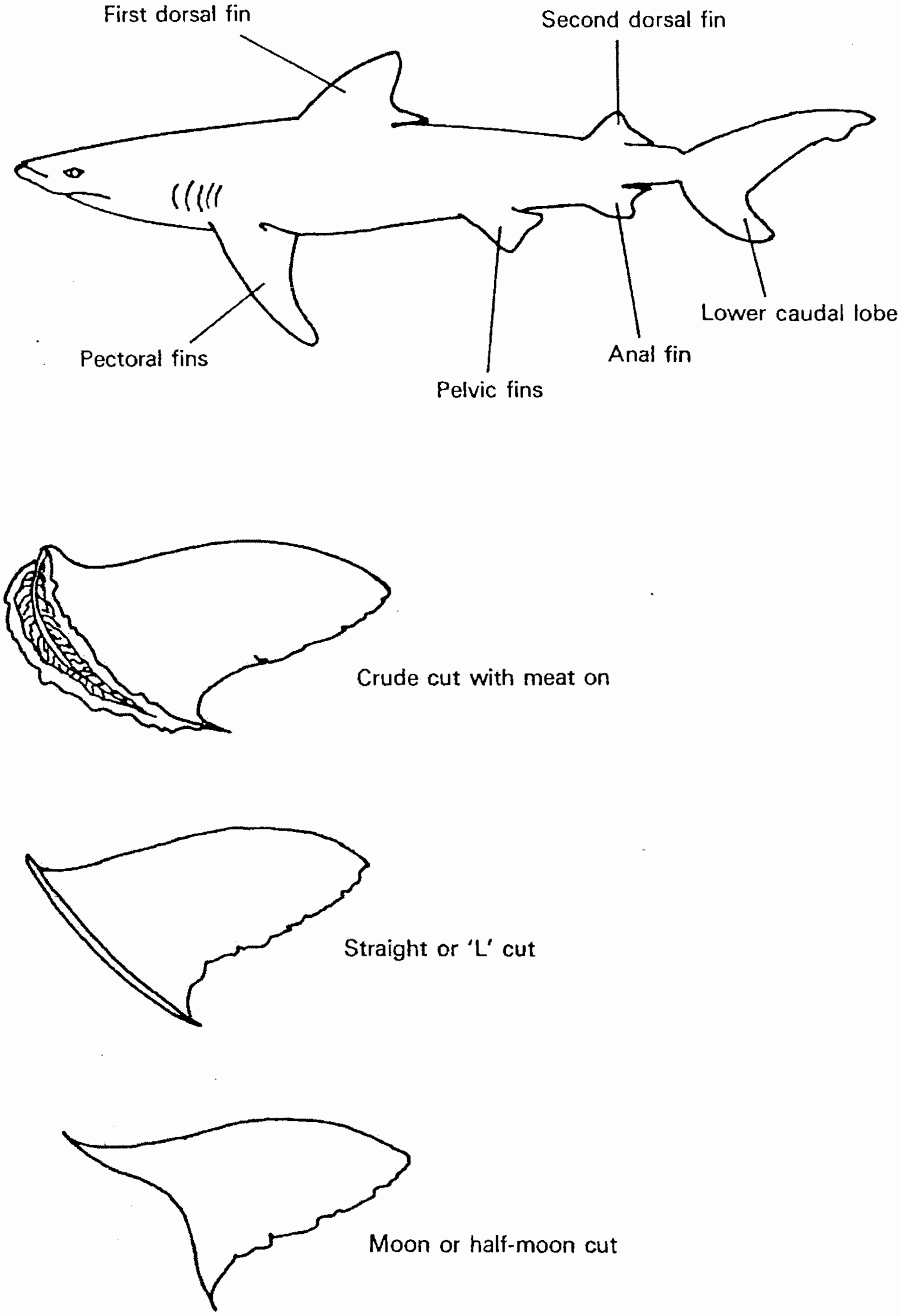

Figure 2. Shark fin nomenclature. Adapted from Anderson and Ahmed (1993).