A Review of Fin-weight Ratios for Sharks

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Summary

This paper reviews studies on fin weight to carcass weight ratios of various shark species. There is a wide range of reported ratios both within and between species. This may be due to differences in the number and type of fins used in the calculations or in the type of carcass weight used. Variation in fin cutting practices may also lead to differences in calculated ratios. Ideally, species-specific and even fleet-specific ratios should be developed, as well as accepted criteria for calculating fin weight to carcass weight ratios. However, there are practical difficulties in implementing species-specific ratios. In their absence there is a need for current regulations to be tightened and set at precautionary levels.

Introduction

Increased exploitation of shark populations in the past few decades has become an issue of international concern. Data on shark catch, use and discards is lacking, thereby preventing stock assessment. As a result, the status of many of the world's shark populations is unknown. Consequently, few shark populations are managed and many are subject to overfishing. The life history of sharks make them particularly vulnerable to overfishing as they are slow growing, late to mature and exhibit low fecundity (Shivji et al. 2002; Hareide et al. 2007).

Shark finning — the process of removing the fins and discarding the remainder of the shark — has been a common practice in fisheries around the world for decades. Increases in the global demand for shark fin since the early 1980s has intensified the practice (Clarke et al. 2006).

Shark fin is one of the most expensive seafood items. Dried fin can fetch prices around US$230 per kilogram (Rose and McLoughlin 2001). Shark fins are valued for their "ceratotrichia", or "fin needles". These are a type of cartilage that are found in most (but not all) shark fins and are used to make shark fin soup.

Despite the high value of shark fins, shark meat is generally of low commercial value[1]. In addition, shark blood contains urea that is converted to ammonia after the animal dies. Ammonia can impart an off taste in shark meat and is believed to taint other fish stored in close proximity. Shark finning contravenes the Food and Agriculture Organisation of the United Nations' (FAO) *Code of Conduct for Responsible Fisheries* that encourages full utilization of fisheries catch and responsible fisheries practices.

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[1] Targeted shark fisheries exist in some countries (e.g. PNG) or shark is taken as byproduct in other commercial fisheries. In these fisheries, full utilization of the shark (including fins) is encouraged to minimize waste and discards.

This paper reviews fin to weight ratios that are used by a number of countries and Regional Fisheries Management Organisations (RFMOs) as a means of reducing or eliminating the practice of shark finning. The paper assesses the validity of the 5% ratio, the advantages and disadvantages of various finning bans and offers recommendations on how shark finning resolutions may be improved.

Regulations

In response to worldwide concern regarding the impact of increased catch levels on shark populations, FAO members developed an International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks) (FAO, 1999). The IPOA-Sharks has a number of objectives relating to conservation and sustainable use including the need to 'minimise unutilised incidental catches of sharks' and to 'encourage full use of dead sharks'. Shark finning contravenes both of these objectives. The IPOA-Sharks also encourages member countries to develop a National Shark-plan if their vessels target shark or if shark is regularly caught in non-target fisheries. To date, only four of the top 20 shark fishing countries[2] have developed National Shark-plans.

To address the practice of shark finning, several nations have implemented regulations to ban or limit the practice. The United States implemented the Shark Finning Prohibition Act in 2000. The Act states that it is illegal for fishers to possess shark fins without the corresponding carcass. The US National Marine Fisheries Service adopted the 5% fin to carcass weight ratio in the early 1990s. The ratio states that the total weight of fins onboard not exceed 5% of the dressed weight (headed and gutted) of the carcass (or 2% of the whole weight of the shark). The 5% ratio was initially established using data on the wet fin to dressed carcass ratio of 12 sandbar sharks *Carcharhinus plumbeus* (data for other species were not available at the time). Additional fin-weight ratios were calculated for a number of important commercial species using standardized catch data from a number of state and federal databases. Of the 14 species examined, the fin to carcass weight ratio for the sandbar shark was the highest (5.3%) and was significantly higher than the ratios for most other large coastal species. The lowest fin-weight ratio (2.5%) belonged to the silky shark (*Carcharhinus falciformis*) (Baremore et al. 2005).

Since then, a number of countries have implemented shark finning bans including Australia, Canada, Brazil, Costa Rica, South Africa, the European Union and Mexico. These bans differ considerably in their strength. For example, the European Union's Shark Finning Regulation (2003) allows up to 5% of a shark's whole weight to be landed in fins. Applying the 5% ratio to the whole weight rather than the dressed weight weakens this regulation. In 2006, Spain (the biggest supplier of fins in the EU) sought to have the 5% fin ratio increased to 6.5%. According to the World Conservation Union (IUCN), a fin to carcass ratio of 6% whole weight would allow two or more sharks to be finned and discarded for every shark retained. In contrast, some countries, including Australia, South Africa and Costa Rica, require sharks to be landed with fins attached. These regulations, when enforced, eliminate the practice of finning.

Regional Fisheries Management Organisations (RFMOs) have also implemented shark finning bans. In 2004, the International Commission for the Conservation of

[2] Refers to the top 20 shark fishing countries in 2003 as identified in *World Shark Catch, Production and Trade 1990–2003(Traffic Oceania 2006)*

Atlantic Tunas (ICCAT) introduced the first international prohibition on shark finning. Since then, the Inter-American Tropical Tuna Commission (IATTC), the Indian Ocean Tuna Commission (IOTC) and the Western and Central Pacific Fisheries Commission (WCPFC) have adopted similar resolutions. Each of these resolutions state that contracting parties shall require their vessels to not have onboard a weight of shark fins that exceed 5% of the weight of sharks onboard up to the first point of landing. These resolutions do not specify whether the "weight of sharks" onboard refers to dressed or whole weight or whether wet or dry fin weights are to be used (see Appendix I). Only two of the RFMO resolutions require contracting parties to report annually on the implementation of the resolution.

Assessment of the 5% fin-weight ratio

Several studies have reviewed the 5% fin-carcass ratio. Cortés and Neer (2006) assessed the validity of the 5% fin-carcass ratio using a variety of fishery-independent and fishery-dependent data. Table 1 summarises their results as well as additional studies on fin-carcass weight ratios.

There are a number of reasons for the wide range of ratios reported. Firstly, the type of fins used in calculations varies significantly between studies. For example, the NMFS (1993) calculate wet fin weight using the primary fin set — the first dorsal fin, both pectorals and the lower lobe of the caudal fin. Some studies, (e.g. Ariz et al. 2006), include all fins in calculating wet fin weight while in others it is not clear what fins are used (e.g. Mejuto and García Cortés 2004). Calculations that include entire fins sets will result in higher fin-carcass ratios.

The body weight used in calculations also differs among studies. Some studies calculate fin-dressed weight while others report on fin-whole or "round" weight. Differences in the way various fleets prepare and utilize shark may also lead to varying definitions of dressed weight. Most studies reviewed here define dressed weight as trunk weight (i.e. gilled, headed, gutted and all fins removed). Dressed weight, however, is not always clearly defined and may actually vary between fleets. In addition, freezer dehydration may result in a loss of about 1% of the weight of the shark (Johnston et al. 1994). It is assumed that round weight is the same throughout the studies.

The method of fin cutting can also cause considerable differences in reported fin-carcass ratios. There are a number of different techniques for removing fins from sharks. Straight or 'L' cuts have more meat attached to the fin compared to a moon or half moon cuts. In addition, crude cuts often retain a significant quantity of meat and will increase fin-carcass weight ratios. Cortés and Neer (2006) noted Maldivian fin cutting practices include round cuts and imply that more meat is attached to the fin, providing higher fin-dressed weight ratios. These fin cutting techniques may even vary within fleets. For example, Mejuto and García-Cortés (2004) note that fin cutting points show some variability within the Spanish longline fleet.

Table 1 shows considerable variation between species. Fin-dressed (FW:DW) ratios range from 3.6% for porbeagle shark (Campana et al. 1999 cited in Cortés and Neer 2006) to 21.6% for oceanic whitetip (Mejuto and García-Cortés 2004). Different shark species have different morphological characteristics e.g. the size, shape and thickness of fins. For example, caudal morphology varies significantly between species. Mackerel sharks have lunate tails where the upper and lower lobes of the caudal fin are almost equal in size. Most other pelagic sharks have heterocercal tails where the upper lobe is longer than the lower. These differences in the size and shape of fins will result in varying fin-carcass ratios when all fins are used in the calculation. The ratio of wet fin weight to whole body weight may also differ depending on the size of shark. Therefore a size-based relationship may be more appropriate than a ratio.

There is also variation in reported fin-carcass ratios for the same species. For example Ariz et al. (2006) report a FW:DW ratio of 16.05% for oceanic whitetip compared to a FW:DW ratio of 21.55% reported by Mejuto and García-Cortés (2004). As mentioned previously, care must be taken when comparing fin weight ratios from various studies due to potential differences in the types of fins used in the calculation, the fin-cutting technique employed or the size-range analysed. Ariz et al. (2006) report that all fins are used in their calculation of FW:DW. However, Mejuto and García-Cortés note that the first dorsal, both pectoral and caudal fins are used at the very least, but in some cases other fins (e.g. pelvic) may be included in calculations.

There are also considerable differences in the dry to wet fin weight ratio for different species of shark and for different sizes of fin within the same species. These can vary from 20–60%, highlighting the need for regulations to be clear in their definitions (Rose & McLoughlin 2001). Drying fins before landing will result in lower ratios and can hamper species identification (Ariz et al. 2006). Table 2 summarises the effects of different variables on fin-carcass ratios.

Implementing finning bans and alternatives

There are a number of methods for implementing shark finning bans. The most widely used method is the fin-carcass ratio. As discussed earlier, this method does have limitations.

The idea of a maximum number of detached fins per carcass has received some discussion but has not been used to implement any known finning ban (Hareide et al. 2007). Placing a limit on the number of detached fins to be landed with each shark carcass would require a large degree of monitoring, as every fin and carcass would need to be counted. This method could also lead to ‘high grading’ — retaining larger fins from large sharks alongside carcasses from small sharks — and having little effect in reducing finning.

Similarly, imposing a quota or weight limit per trip would allow the removal of shark fins at sea subject to a weight limit e.g. X kilograms of fins per vessel per trip. This approach would allow a precautionary catch level to be established, but not on an individual species basis. This method would be ineffective and contravene the FAO *Code of Conduct for Responsible Fisheries* unless the carcass is required to be landed with the fins. This method could also lead to high grading and would require considerable monitoring and surveillance.

The simplest method of implementing a finning ban is requiring fins to be landed attached to the carcass. This method is used in a number of countries including some Australian states, South Africa (for sharks taken in South African waters), Costa Rica, Oman, El Salvador, Panama (industrial fisheries only) and the EU (except where a special permit is issued) (Hareide et al. 2007). This approach is easy to monitor and enforce and eliminates the need for species-specific fin to carcass weight ratios to be developed. Hareide et al. (2007) note that fins processed onshore can be cut carefully and precisely from fresh, frozen or thawed carcasses, subsequently increasing the value of the finished product. Landing fins attached to the carcass allows more accurate identification of shark species and hence, more precise data collection.

The development of selective fishing gear or mitigation measures to reduce the incidental catch of sharks has not received much attention but is also a potential solution. Since the 1940s, there as been significant research into the development of ‘shark repellents’ to reduce the incidence of shark attacks. These have included electrical, acoustic and chemical deterrents and have had mixed results (Sisneros & Nelson 2001). However, their application as bycatch mitigation measures has not been explored. Changes in fishing gear, such as the use of circle hooks, banning the use of wire leaders, alternative baits and operational parameters (e.g. day vs. night, deep vs. shallow setting) and their effects on catch rates of shark should also be explored.

Discussion

The considerable differences in the type of fin-carcass ratios and the processing methods of various fleets make direct comparisons of the reported fin ratios difficult. The lack of clear definition in the studies, particularly concerning the types of fins used in the calculations, also hampers comparison.

The development of universally-accepted criteria for calculating fin-carcass ratios would allow direct comparison of studies. This could be achieved through agreement of the following:

- A clear definition of dressed weight
- The type of fins to be used in fin weight calculations
- The fin-cutting technique to be used to remove fins from the shark
- At what point fins and sharks are to be weighed

An accepted protocol for calculating fin to weight ratios would also allow global data to be pooled, thereby increasing sample size and providing greater confidence in calculated ratios.

Due to the considerable variation in reported ratios, many studies recommend the development of species-specific fin to body weight ratios. Similarly, fleet specific ratios may be of benefit to address the different processing and utilization methods across the world’s fisheries (Ariz et al. 2006; Cortés and Neer 2006; Mejuto and García-Cortés 2004). This would allow more accurate estimates of total shark catch based on fins only. However, development of species-specific ratios would require accurate identification of shark species and large volumes of data in order to calculate accurate conversion factors. Hareide et al. (2007) note a lack of data for many species and that many conversion factors are based on very small amounts of data.

Where fin to carcass weight ratios are to be used, the associated resolutions and regulations require more detail. For example, a number of RFMOs have implemented finning bans that state contracting parties ‘shall require their vessels to not have onboard fins that total more than 5% of the weight of sharks onboard up to the first point of landing’. These resolutions, however, do not specify whether the weight of fins refers to wet or dry fin weight or whether the ‘weight of sharks onboard’ refers to whole weight or dressed weight. Considering the variability in processing methods across fleets, if the ‘weight of sharks onboard’ is to be dressed weight, this will also require clear definition. There is also no reference to a ‘corresponding carcass’. This suggests that the fins of two or more sharks may be retained for each carcass on board, as long as the weight of fins is no more than 5% of the weight of sharks onboard.

Other finning bans, including the US Shark Finning Prohibition Act, require fins to be landed with the 'corresponding carcass'. Matching fins to the corresponding carcass poses difficulties, particularly if a number of species are retained, as the distinguishing morphological characteristics (head, tail and fins) are usually removed. Drying fins can also hamper identification (Ariz et al. 2006). A possible solution is the use of genetic identification techniques. A number of studies have reported on the successful development and use of species-specific primers for the identification of shark body parts, including dried fins (Shivji et al. 2002; Clarke 2003).

In order for finning bans to be effective, they must be properly enforced. This may be achieved through onboard observer programs, port monitoring and verification of catch records. The level of enforcement activity will depend on the type of finning regulation imposed. For example, requiring fins to be landed attached to the shark carcass may only require a port inspection of catch. The use of species-specific fin to carcass weight ratios may require onboard observers to ensure accurate species identification and compliance.

In the absence of a clear, scientifically-robust fin to carcass weight ratio, an alternative approach to reducing wastage and shark finning is to prohibit the removal of fins from the carcass prior to landing.

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Appendix I

Regional Fisheries Management Organisation (RFMO) Resolutions relating to shark finning

International Commission for the Conservation of Atlantic Tunas (ICCAT)
Recommendation by ICCAT concerning the conservation of sharks caught in association with fisheries managed by ICCAT — 2004-10

Adopted at the 14th Special Meeting, 15–21 November 2004, New Orleans, USA

3. *CPCs shall require their vessels to not have onboard fins that total more than 5% of the weight of sharks onboard, up to the first point of landing. CPCs that currently do not require fins and carcasses to be offloaded together at the point of first landing shall take the necessary measures to ensure compliance with the 5% ratio through certification, monitoring by an observer, or other appropriate measures.*

Indian Ocean Tuna Commission (IOTC)
Resolution concerning the conservation of sharks caught in association with fisheries managed by IOTC — Resolution 05/05

Adopted at the 9th Session, 30 May – 3 June 2005, Victoria, Seychelles

4. *CPCs shall require their vessels to not have onboard fins that total more than 5% of the weight of sharks onboard, up to the first point of landing. CPCs that currently do not require fins and carcasses to be offloaded together at the point of first landing shall take the necessary measures to ensure compliance with the 5% ratio through certification, monitoring by an observer, or other appropriate measures.*

Inter-American Tropical Tuna Commission (IATTC)
Resolution on the conservation of sharks caught in association with fisheries in the eastern Pacific Ocean — Resolution C-05-03

Adopted at the 73rd meeting, 20–24 June 2005, Lanzarote, Spain

4. *CPCs shall require their vessels to have onboard fins that total no more than 5% of the weight of sharks onboard, up to the first point of landing. CPCs that currently do not require fins and carcasses to be offloaded together at the point of first landing shall take the necessary measures to ensure compliance with the 5% ratio through certification, monitoring by an observer or other appropriate measures.*

Western and Central Pacific Fisheries Commission (WCPFC)
Conservation and Management measure for sharks in the Western and Central Pacific Ocean — Conservation and Management Measure 2006-05

Adopted at the Third Regular Session, 11–15 December 2006, Apia, Samoa

7. *CCMs shall require their vessels to have on board fins that total no more than 5% of the weight of sharks onboard, up to the first point of landing. CCMs that currently do not require fins and carcasses to be offloaded together at the point of first landing*

shall take the necessary measures to ensure compliance with the 5% ratio through certification, monitoring by an observer, or other appropriate measures. CCMs may alternatively require that their vessels land sharks with fins attached to the carcass or that fins not be landed without the corresponding carcass.

Table 1 Summary of shark fin ratio studies

Species examined	Fishery	Sample Size	Mean ratio	Range	Fin weight definition	Other weight definition	Reference
Sandbar shark (*Carcharhinus plumbeus*)	Commercial shark fishery of northwest Atlantic	n = 12	FW:DW 5.07%	–	FW — wet fin weight of primary fin set	DW — headed, gutted and all fins removed	NMFS (1993) cited by Shark Specialist Group (2003)
		n = 36	FW:RW 2.46%	–		RW — round or whole weight of the shark	
21 shark species	Commercial shark fishery of northwest Atlantic	n = 64	FW:DW 3.65% (weighted average)	–	FW — wet fin weight of primary fin set	DW — headed, gutted and all fins removed	NMFS (1993) cited by Shark Specialist Group (2003)
29 shark species	US Atlantic and Gulf of Mexico coastal bottom-longline directed shark fishery 1994-2002 (data unavailable for 1998 and 2000-01)	n = 27 000	FW: DW 4.9%	4.4 – 5.3% annually	FW — Wet weight of primary fin set (first dorsal, both pectorals and lower lobe of caudal fin)	DW — headed, gutted and all fins removed	Cortés and Neer (2006)
Unknown	Commercial shark fisher off Florida	n = 15	FW1:DW 5.8%	4.5 – 6.5%	FW1 — wet fin weight of all fins	DW — headed, gutted and all fins removed	Cortés and Neer (2006)
		n = 15	FW2:DW 4.5%	2.3 – 6.2%	FW2 — wet fin weight of primary fin set		
Porbeagle shark (*Lamna nasus*)	Canadian Research Program	n = 703	FW:DW 3.6%	1.1 – 7.2%	FW — wet weight of primary fin set	DW— headed, gutted and all fins removed	Campana et al. 1999 cited in Cortés and Neer (2006)

		n = 619	FW:RW 2.2%	0.7 – 4.1%		RW — round or whole weight of shark	
Blue shark (*Prionace glauca*)	Portuguese longline swordfish fishery Oct 2003 – May 2004		FW:RW 6.6% n = 99	–	FW — wet fin weight of all fins (1st and 2nd dorsal, both pectorals, anal, pelvic and entire caudal)	RW — round or whole weight of the shark	(Neves dos Santos & Garcia 2005)
Blue shark (*Prionace glauca*)	Spanish surface longline fishery	n = 736	FW:DW 14.72%	5.79 – 30%	FW — wet fin weight not clear exactly what fins are used. First dorsal, both pectoral and caudal fins at the least but in some cases other fins (e.g. pelvic) are included	DW — headed, gutted and all fins removed	Mejuto and García-Cortés (2004)
		n = 184	FW:RW 6.53%	4.63 – 10%		RW — round or whole weight of shark	
Blue shark (*Prionace glauca*)	Spanish longliners Indian Ocean	n = 466	FW:DW 14.9%	–	FW — wet fin weight consisting of all fins (including the whole tail)	DW — whole weight minus head, fins, viscera and skin	Ariz et al. (2006)
Blue shark (*Prionace glauca*)	Chinese longliners in Eastern Pacific Ocean	n = 16	FW:RW 5.35%	4.21 – 6.67%	FW — first dorsal fin, both pectorals and caudal fin (assume entire caudal fin). No indication whether wet or dry fin weight.	RW — no definition of round weight	(Dai, Xu & Sonng 2006)
Blue shark (*Prionace glauca*)	Commercial shark fishery of northwest Atlantic	n = 8	FW:DW 3.74	–	FW — wet fin weight of primary fin set	DW — headed, gutted and all fins removed	NMFS (1993) cited by Shark Specialist Group (2003)
		n = 52	FW:RW 2.06%	–		RW — round or whole weight of shark	

Silky shark (*Carcharhinus falciformis*)	Spanish longliners Indian Ocean	n = 8	FW:DW 11.16%	–	FW — wet fin weight consisting of all fins (including the whole tail)	DW — whole weight minus head, fins, viscera and skin	Ariz et al. (2006)
Silky shark (*Carcharhinus falciformis*)	Chinese longliners in Eastern Pacific Ocean	n = 2	FW:RW 4.84%	–	FW — first dorsal fin, both pectorals and caudal fin (assume entire caudal fin). No indication whether wet or dry fin weight.	RW — no definition of round weight	Dai et al. (2006)
Silky shark (*Carcharhinus falciformis*)	Spanish surface longline fishery	n = 11	FW:DW 11.09%	10 – 12.73%	FW — wet fin weight — not clear exactly what fins are used. First dorsal, both pectoral and caudal fins at the least but in some cases other fins (e.g. pelvic) are included	DW — headed, gutted and all fins removed	Mejuto and García-Cortés (2004)
		n = 2	FW:RW 6.5%	0.33 – 7.67%		RW — round or whole weight of shark	
Oceanic whitetip shark (*Carcharhinus longimanus*)	Spanish longliners Indian Ocean	n = 20	FW:DW 16.05%	–	FW — wet fin weight consisting of all fins (including the whole tail)	DW — whole weight minus head, fins, viscera and skin	Ariz et al. (2006)
Oceanic whitetip shark (*Carcharhinus longimanus*)	Chinese longliners in Eastern Pacific Ocean	n = 7	FW:RW 7.03%	6.02 – 9.29	FW — first dorsal fin, both pectorals and caudal fin (assume entire caudal fin). No indication whether wet or dry fin weight.	RW — no definition of round weight	Dai et al. (2006)
Oceanic whitetip (*Carcharhinus longimanus*)	Spanish surface longline fishery	n = 39	FW:DW 21.55%	9.3 – 31.43%	FW — wet fin weight not clear exactly what fins are used. First dorsal, both pectoral and caudal fins at the	DW — headed, gutted and all fins removed	Mejuto and García-Cortés (2004)

					least but in some cases other fins (e.g. pelvic) are included		
		n = 7	FW:RW 9.6%	7.92 – 11.67%		RW — round or whole weight of shark	
Tiger shark (*Galeocerdo cuvier*)	Spanish surface longline fishery	n = 1	FW:DW 8.33%	–	FW — wet fin weight not clear exactly what fins are used. First dorsal, both pectoral and caudal fins at the least but in some cases other fins (e.g. pelvic) are included	DW — headed, gutted and all fins removed	Mejuto and García-Cortés (2004)
Tiger shark (*Galeocerdo cuvier*)	Commercial shark fishery of northwest Atlantic	n = 3	FW:DW 2.9%	–	FW — wet fin weight of primary fin set	DW — headed, gutted and all fins removed	NMFS (1993) cited by Shark Specialist Group (2003)
		n = 17	FW:RW 1.27%	–		RW — round or whole weight of shark	
Shortfin mako (*Isurus oxyrinchus*)	Spanish longliners Indian Ocean	n = 113	FW:DW 6.26%	–	FW — wet fin weight consisting of all fins (including the whole tail)	DW — whole weight minus head, fins, viscera and skin	Ariz et al. (2006)
Shortfin mako (*Isurus oxyrinchus*)	Spanish surface longline fishery	n = 101	FW:DW 5.81%	3 – 7.89%	FW — wet fin weight not clear exactly what fins are used. First dorsal, both pectoral and caudal fins at the least but in some cases other fins (e.g. pelvic) are included	DW — headed, gutted and all fins removed	Mejuto and García-Cortés (2004)

Shortfin mako (*Isurus oxyrinchus*)	Commercial shark fishery of northwest Atlantic	n = 5	FW:DW 4.22%	–	FW — wet fin weight of primary fin set	DW — headed, gutted and all fins removed	NMFS (1993) cited by Shark Specialist Group (2003)
		n = 28	FW:RW 1.68%	–		RW — round or whole weight of the shark	
Longfin mako (*Isurus paucus*)	Spanish surface longline fishery	n = 3	FW:DW 7.22%	6.54 – 10%	FW — wet fin weight not clear exactly what fins are used. First dorsal, both pectoral and caudal fins at the least but in some cases other fins (e.g. pelvic) are included	DW — headed, gutted and all fins removed	Mejuto and García-Cortés (2004)
Smooth hammerhead (*Sphyrna zygaena*)	Spanish surface longline fishery	n = 4	FW:DW 8.38%	6.91 – 10%	FW — wet fin weight not clear exactly what fins are used. First dorsal, both pectoral and caudal fins at the least but in some cases other fins (e.g. pelvic) are included	DW — headed, gutted and all fins removed	Mejuto and García-Cortés (2004)

Abbreviations:

FW — fin weight DW — dressed weight RW — round (or whole) weight

Table 2 Effect of different variables on fin to carcass weight ratios

	Effect on ratio	
Variable	**Negative effect on ratio**	**Positive effect on ratio**
Individual size of shark	Large sharks have relatively small fins	Small sharks have relatively large fins
Species	Species with small fins e.g. crocodile shark	Species with large fins e.g. sandbar shark
Carcass weight	Round or whole weight	Dressed weight
Dressing procedure	Less processing e.g. headed and gutted only	More processing e.g. headed, gutted, all fins removed, belly flap removed etc.
Fins used	More fins used e.g. all fins	Fewer fins used e.g. primary fin set