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HONG KONG

WWF SHARKULATOR

Methodology for Converting Bowls of Shark Fin Soup into Live Shark Equivalents | July 2020

ACKNOWLEDGEMENTS

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Front cover photo: Blue shark (*Prionace glauca*)
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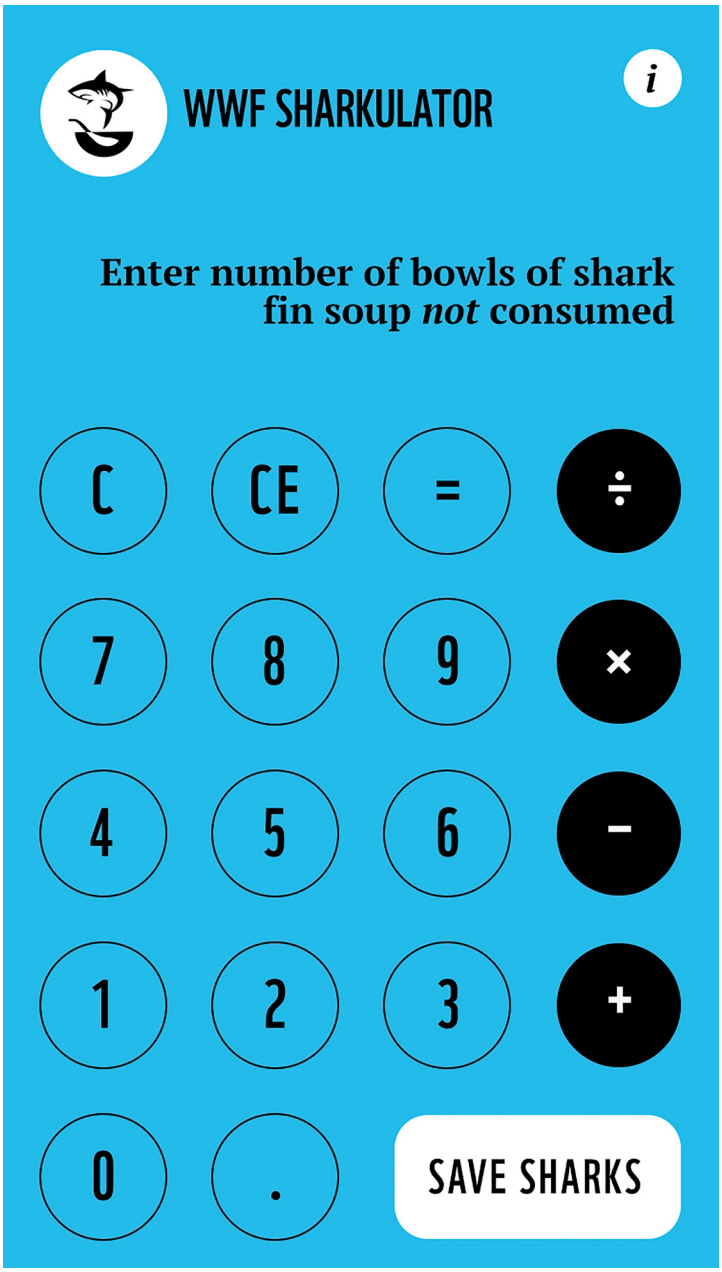
WWF is one of the world's largest and most experienced independent conservation organizations, with over 30 million followers and a global network active in nearly 100 countries. WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which people live in harmony with nature, by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption. WWF-Hong Kong is working to transform Hong Kong into Asia's most sustainable city.

THE SHARKULATOR

While there has long been a desire amongst shark conservationists to calculate how many sharks will be "saved" if demand for shark fin soup is reduced, development of a methodology has been thwarted by the great variability in the shark species, sizes of individuals, types of fin, and the different fin cuts utilized for shark fin soup. There was also a lack of reliable data on the amount of shark fin in a bowl of soup in major end-use markets.



Our newly-developed methodology focuses on producing such an estimate for blue shark (*Prionace glauca*) as it is one of the most abundant shark species and is believed to be the predominant species in the shark fin trade (Clarke et al. 2006; Fields et al. 2018). In the few instances for which blue shark conversion factor data were not available we applied conversion factors for other related species, or in the case of shark fin product data, for sharks as a whole. Therefore, although not all shark fin soup is derived from blue sharks, our results are produced in blue shark equivalents.

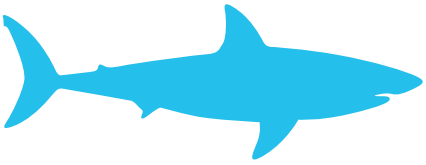
Our estimate is based on product data from Hong Kong, one of the largest consumers of shark fin per capita, where the dish has a long tradition. Artificial shark fin does not appear to play a large part in the shark fin market of Hong Kong, however its usage may be significant in other markets (Dent & Clarke 2015). The methodology does not account for potential mixing of artificial shark fin with real shark fin but it is likely that the range of estimates it produces would nevertheless encompass the true value of sharks represented.

As a quantitative methodology like ours will introduce uncertainty at every step, we aim to convert from bowls of shark

fin soup to whole shark equivalents using the fewest possible number of steps and the best-informed conversion factors. At each step we apply an average or midpoint conversion factor as well as low and high values (see Table 1). Carrying this approach consistently through the calculation, e.g. always applying either the mid, low or high value at each step, will tend to exaggerate the range between the lowest and highest values produced but it avoids complex probabilistic equations and provides a range that should include the true value.

The intention of the calculator is to provide science-based conversion estimates, primarily for public communications around shark fin demand reduction, and potentially for monitoring of impact, rather than for management or regulatory purposes where a higher degree of accuracy may be required. As better data become available, incorporating those into the conversion process may allow for increased accuracy and representativeness of the conversion estimates, and thus an expanded range of application.

Details of the six-step calculation process are provided on the next page.



BLUE SHARK

the predominant species in the shark fin trade

HONG KONG

one of the largest consumers of shark fin per capita

CALCULATION STEPS – FROM SHARK FIN SOUP TO A LIVE SHARK EQUIVALENT

1. Estimate the number of bowls of shark fin soup (not consumed).

This can be estimated as a single value or a range.

2. Convert the number of bowls of soup to the weight of wet fin needles represented.

This conversion is accomplished by applying conversion factors from original research by WWF (2011) in Hong Kong examining the cooked (wet) fin needle content of hotel/restaurant dine-in shark fin soup bowls (n=15 from 5 establishments). The average value over all samples was 31.26g per bowl; a 95% confidence interval of 24.40 to 38.12g was computed from the raw data.

3. Convert the weight of wet fin needles to an equivalent dried processed fin weight.

This step once again applies original research by WWF in Hong Kong involving the purchase of dried blue shark fin needles for cooking in ten different restaurants to determine pre- and post-cooking weights (WWF 2011). The average cooking hydration factor (i.e. proportional increase in weight) was 2.37. Using the reported mean, standard deviation and sample size to compute the standard error of the mean, a 95% confidence interval of 1.94 to 2.80 was constructed.

4. Convert dried processed fin weight to dried unprocessed fin weight.

This step applies shark fin processing yields determined by Al-Qasmi (1994) for a variety of requiem (Carcharhinid) sharks. Assuming that fins used in the shark fin trade would likely be a mix of approximately half pectoral fins, and one-quarter each of dorsal and lower caudal fins, we computed a weighted average yield of 68.4% (i.e. the weight of the four dried processed fins is 68.4% of the dried unprocessed fins, after taking into account the differing yields for each fin type). The endpoints of 95% confidence intervals for each fin type were used to compute a low (54.5%) and high (82.2%) weighted average for the processing yield.

5. Convert dried unprocessed fin weight to whole shark weight.

This step applies a study of dried fin weight to whole weight in blue sharks (NMFS 1993) which found that the ratio is 0.6:100 (dried fins weigh 0.6% (<1%) of whole shark wet weight). A measure of variability is not given in the NMFS (1993) study but applying the standard deviation from a similar study (Semba et al. (2016)) gives a 95% confidence interval for the ratio of 0.425 to 0.774. This step also converts from fin weight in g to whole shark weight in kg.

6. Convert whole shark weight to number of live shark equivalents.

A study of blue sharks in the Atlantic and Indian Oceans provides lengths and weights for over 470,000 blue sharks from 1966-2014 (Coelho et al. 2017) and represents the most comprehensive data available to date for blue shark length-weight relationships. Blue shark sizes vary by sex and area but overall the average size appears to be approximately 160cm (with most individuals falling within the range of 120cm-200cm). This equates to an average weight of 27kg (range of 10-56kg) using the Coelho et al. (2017) length-weight conversion factors. The sizes of blue shark caught and used in the fin trade may vary considerably, so while the figures we draw from Coelho et al. (2017) are meant to represent a global average, catches from a particular fishery may be substantially larger or smaller than this average. Such data, if available and substituted for the global averages used here, could provide a more appropriate estimate for specific countries and fisheries.

TABLE 1. RANGE OF SHARKULATOR OUTPUTS - EXAMPLES

This methodology produces a range of estimates – sample outputs can be seen below. WWF Sharkulator web app displays midpoint values only.

NUMBER OF BOWLS OF SHARK FIN SOUP NOT CONSUMED	LIVE BLUE SHARK EQUIVALENTS		
	LOWER VALUE	MIDPOINT	UPPER VALUE
10	0	1	8
50	1	6	42
100	2	12	85
200	5	24	170
250	6	30	212
300	7	36	254
400	10	48	339
500	12	60	424
750	18	89	636
1,000	24	119	848

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103,528 MT

103,528 mt of blue shark was harvested in 2017, making it the most heavily fished shark in the world.

100M

Up to 100 million sharks and rays are caught every year – whether on purpose or by accident (as bycatch).

>1,200

There are over 1,200 species of sharks and rays around the world.

90%

World's four largest importers of shark fin – Hong Kong, Malaysia, China, and Singapore – accounted for 90% of average annual global imports during 2000-2016.

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