



Response to “A United States shark fin ban would undermine sustainable shark fisheries” D.S. Shiffman & R.E. Hueter, Marine Policy 85 (2017) 138–140



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ABSTRACT

The paper entitled “A United States shark fin ban would undermine sustainable shark fisheries” (D.S. Shiffman & R.E. Hueter, Marine Policy 85 (2017) 138–140) argues that *The Shark Fin Trade Elimination Act of 2017* (HR 1456) and its companion bill in the Senate (S 793), now before Congress in the United States of America, would be counterproductive. We demonstrate that the figures used in support of this claim are inappropriately selected, misinterpreted or incorrect, and that therefore the argument cannot stand. In the face of the extreme depletion of shark numbers globally, the paper fails to give an accurate or objective assessment of the situation.

1. Introduction

There is broad understanding that the accessible species of sharks are under great pressure through large scale removal, primarily for their fins for soup [1–5], as stated in the *Shark Fin Trade Elimination Act of 2017*¹ [6]. Populations have been reported to be down to ~10% of 1950 sizes [7,8] and only one third of shark species are considered safe; the most threatened are those accessible to fishing [3]. Several species are protected by CITES regulations [9], and both full and partial bans on shark fishing have been put in place in many countries [10]. There has also been progress in reducing demand, with many establishments and carriers now refusing shark fins [10]. This lucrative trade is associated with much illegal activity (e.g. Refs. [11,12]), including murder [13].

Shark fins are among the most expensive seafood products, “commonly retailing at US\$400 with the most expensive selling for US\$1000 per kg” [14] or “up to” €500 [15] per kg. To supply this trade, intense shark fishing spans all oceans, and the future ecological consequences are largely unknown [1–3,15]. The total declared value of world trade in shark products is close to US\$1 billion per year [16].

The series of laws in place in the United States of America, under the Magnuson-Stevens Act, the Shark Finning Prohibition Act, and the Shark Conservation Act, which require management measures by all Federal fisheries, make the nation a leader in terms of its management of domestic shark fisheries. Shark finning was made illegal in the country in the year 2000. The Shark Conservation Act of 2010

strengthened shark conservation measures, and put more prohibitions against shark finning in place. Since then, several USA States and territories have passed laws prohibiting the possession, sale, trade, or distribution of shark fins [17]. *The Shark Fin Trade Elimination Act of 2017* seeks to take the next step by eradicating the shark fin trade entirely from the shores of this key nation.

It is therefore worrying that the captioned paper [18] has appeared in that it argues for a contrary position, i.e. that not applying a ban is good for shark conservation. We set out reasons for believing that this position is unfounded and ill-argued, and that the report seriously misinterprets the literature.

The paper [18] has as its sole and specific target *The Shark Fin Trade Elimination Act of 2017* [6], a piece of legislation now (at the time of writing) before Congress in the United States of America.¹ The paper [18] states that the proposed law is “misguided”. This contrarian message has been echoed widely by the press, and not just in the US, proclaiming that banning the shark fin trade in this key country is “*bad for sharks*”. This is generating doubt about the wisdom of the Act and, by implication, all other measures to limit trade undertaken elsewhere.

The proposed law [6] is intended to be a vital step that will weaken the global fin trade and improve enforcement of the current American shark finning ban. The findings section states that it will “... put the United States in a stronger position to advocate internationally for abolishing the shark fin trade in other countries” [6]. However, the paper [18] states that *The Shark Fin Trade Elimination Act of 2017* [6] is:

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¹ Now the Shark Fin Sales Elimination Act of 2019 (HR 737).

“... misguided because it would A) undermine decades of progress made towards ensuring sustainable shark fisheries in the United States and around the world, B) likely have a negligible direct effect on global shark mortality, and C) contribute to the misconception that demand for shark fin soup is the only threat facing shark populations worldwide.”

We take these points in turn.

1.1. Sustainability

In the case of reason (A), the paper does not provide scientific evidence of the existence of sustainable shark fisheries around the world, of a USA leadership role in promoting them, or of the successful promotion of any sustainable shark fisheries. For the only such process it identifies, it is claimed that it would

“eliminate about 23% of the ex-vessel value of legally caught sharks, causing economic harm to rule-following fishermen, and undermining progress towards sustainable shark fisheries.”

Whether or not the figure of 23% is accurate, this argument exemplifies the way the shark fin market drives the market for shark meat, not only in the United States but globally [2,19]. Even if the fishery is no longer viable without the elevated profit from the shark fins, the findings section of the Act states that it will have a positive effect on sustainable shark fisheries by providing leadership in facing the crisis of shark depletion. This must take precedence over any such local adjustments in the fish market which might occur.

1.2. The Act states

“The reported bill would not have an adverse economic impact on the Nation.”

Using figures provided by the U.S. Department of Commerce National Oceanic and Atmospheric Administration (NOAA) it finds that total losses would be less than 3 million dollars, which would

“fall well below the annual threshold established in UMRA for private-sector mandates (\$156 million in 2017, adjusted annually for inflation).”

The paper's reference for sustainability [20], in fact identifies no shark fishery serving the shark fin market exclusively that is managed and sustainable. Dent & Clarke [16] established that the global markets for shark meat and fins are essentially separate and that those considered to be sustainably managed include only a few fisheries targeting sharks and rays for meat, mostly in the USA and Australia. Hammerhead, oceanic whitetip, and blue sharks are preferred for shark fin soup whereas dogfish, mako sharks and tope are preferred for meat. Most sharks taken to supply the shark fin market are from nations with a large number of threatened shark species that are neither regulated nor managed [1–5]. Shark fins are fungible and once on the market, fins from more sustainable fisheries have the same value as those of critically endangered sharks [16], and nourish the market to the detriment of shark populations globally.

For a fishery to be sustainable, shark fishing mortality must be equal to or lower than the fishing mortality that produces maximum sustainable yield [20], yet in the case of sharks, those reference points are often not known or are very uncertain. Once separated from the shark, it is difficult to determine from which species any given fin has been taken without expensive DNA analysis [22]. Shark fins are imported from Asia where they have been sourced from many shark hunting nations, most of which do not keep species-specific catch statistics [5,16,22–24]. The global studies done on shark depletion have emphasized the problems inherent in assessing the true situation, providing detailed descriptions of the difficulties on every level [2,3,16,21,22]. Clarke et al. [22,23], found that the shark biomass required to support the fin trade annually exceeds the total catch reported

to the Food and Agriculture Organization of the United Nations (FAO) by three or four times, meaning that many species might be fished beyond the sustainable level [1,22–24]. The inconsistent recording of shark catches, and trade in their products, makes it difficult to produce proper assessments for many species.

For example, it has been reported that the shortfin mako fishery in the North Pacific Ocean is potentially sustainable [20]. But in 2015, the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean analysed shortfin mako stocks using the most complete data available. It found that due to missing information, untested indicators, and conflicts in the available data, the assessment was impossible to make at all [17].

Another example is the spiny dogfish fishery on the Atlantic coast, which is currently considered one of the most notable sustainable shark fisheries in the USA. The meat is sent to Europe and the fins to Asia [17]. An exception has even been made for this species under the Shark Conservation Act (and The Shark Fin Sales Elimination Act of 2019¹), in that finning a certain number of dogfish is permitted under USA law. NOAA was working to expand this fishery, which was considered underutilized [17,25] and thus a possible replacement for such badly depleted fish stocks as the cod [26,27].

Yet, on closer examination, the stock of spiny dogfish in the western Atlantic shows wide fluctuations. It collapsed in the 1990s, and NOAA declared it to be rebuilt in 2010 [28]. Yet globally, the species is listed by the International Union for Conservation of Nature (IUCN) as vulnerable to overfishing, and the spiny dogfish is critically endangered just across the Atlantic Ocean [29]. Dulvy et al. [3] found that the level of threat to sharks is greater than that predicted by fisheries assessments and concluded that local analyses may underestimate the risk of collapse of global stocks. In addition, directed fisheries have been the cause of stock collapse in many species of elasmobranch [24].

Sharks have high importance ecologically due to radial evolution into new vacant niches in the aftermath of several planet-wide extinctions [30–32]. As a result, they are woven throughout the world's aquatic ecosystems [33,34]. As large animals at the top of the food chain, their removal could cause whole aquatic and oceanic ecosystems to collapse [7]. Further, due to the continuously increasing human population, the pressure upon them is likely to grow more intense as the years pass. For these reasons we think that no large-scale shark fishery will prove sustainable in the long-term, that is to say, any commercial operation beyond that for immediate local consumption. We believe that an international ban on commerce in sharks and their parts, such as that granted to sea turtles, is warranted. Certainly, no species can withstand targeted, mechanized, industrial fishing [33].

1.3. Mortality

The second reason the authors give for opposing the Act [6] is that it would,

“(B) likely have a negligible direct effect on global shark mortality.” [18].

This attempt to establish a difference in importance between direct and indirect effects on shark mortality is irrelevant. The findings section of the Act [6] states that any shark fin in the United States can be from an unsustainable fishery anywhere in the world [16], so its implementation is intended to have the effect of diminishing the fin trade in other countries as well as improving sustainability in shark fisheries globally. The Act is part of a planet-wide response to an acknowledged threat to sharks that recognizes their ecological importance [34]. By weakening the trade and setting a strong example for other countries, it is expected to have a significant effect on shark mortality, both directly and indirectly.

1.4. Misconception

The paper's third reason for opposing the Act [6] is that it will

“C) contribute to the misconception that demand for shark fin soup is the only threat facing shark populations worldwide.” [18]

It is difficult to see how “contributing to a misconception” could be a reason not to ban the shark fin market. Erroneous beliefs and misconceptions do not provide reasons to fail to act on important issues. The fact that the targeted hunt for sharks for their fins is responsible for the drastic depletion in sharks worldwide has been shown many times [1–5,7,14,16,21–23].

The paper [18] mentions the market for shark meat as a separate threat to shark mortality, yet it is actually being driven by ‘fins attached’ regulations applied to the shark fin market and the depletion of fish stocks. The current tendency is towards less discarding of the body of the shark but without a lessening of mortality [21]. The slight decline of the shark fin market which is mentioned [18] has been found to be due to overfishing rather than conservation practices [35]. With about 80% of teleost fisheries either fully- or over-exploited [36], sharks are increasingly being used for meat.

For example, in Costa Rica, and other South and Central American countries, sharks were considered undesirable and were not used for food prior to the 1980s. However, the inflated price of shark fins resulted in sharks from a wide variety of habitats being targeted for their fins alone. The ‘fins attached’ policies obligated fishermen to land fins attached to the bodies. So the shark fin industry's surplus meat was put on the market for domestic consumption, resulting in merchants pushing the meat on local consumers and relying on the use of various other names to sell it. Now Costa Ricans alone are consuming about 2000 tons of shark meat a year [37]. This is a problem with mandating a ‘fins attached’ policy: it does not properly address overfishing [2,19].

Similarly, the market for shark meat is being expanded in the United States through marketing tactics, often under different names. Dogfish meat, for example, has been sold as “rock salmon,” because there has been no market for shark meat as such in the country. On the east coast of the USA, the dogfish fishery is marketing shark meat as a replacement for cod [38,39].

The paper [18] also cites an earlier publication [40] to make the claim that “90% of 102 surveyed members of scientific research societies focusing on sharks and rays” believe that sustainable shark fisheries are not only possible, but are preferred as a strategy over bans. However, the cited paper actually reports that there was only a 21% response to the survey, totalling 102 responses. Of those, just 83% believed that sustainable shark fisheries exist, and 63% strongly agreed or agreed with bans on the sale of shark fins. Indeed, the survey's results seem to be echoed by the proposed Act, which would allow identifiably sustainable shark fisheries to continue but ban the sale of fins.

It may be noted that a letter signed by one hundred and fifty scientists [41] was sent to members of Congress asking for support for the Act [6], which suggests that it actually has wide support among those academics concerned about the plight of sharks.

Although the paper [18] mentions fisheries' solutions to the shark depletion crisis, it does not mention that many nations that have been hardest hit by shark finning, including, *inter alia*, French Polynesia, Palau, the Bahamas, the Maldives, Fiji, and The Marshall Islands, have declared their territories to be shark sanctuaries in which no shark fishing is permitted [10]. It has indeed been well documented that science cannot be completely independent from the politics of the society in which it is done and therefore fishery politics have always had an influence on shark science and conservation [42].

The paper [18] also states that those species of sharks that have been significantly depleted are being regulated through the Convention on International Trade in Endangered Species (CITES). However, this is not true because such listings are opposed by shark hunting nations due to the high commercial value of the fins [2,19], reflecting the increasing

effort required to obtain them. Protection must be gained one species at a time, and only a few species are currently listed while the shark fin market demands fins from all shark species. Once separated from the shark, it is difficult to determine from which species any given fin has been taken [22], so enforcement is weak. Further, the only protection granted by a CITES listing is the need for a “Non-detrimental” finding before the fins can be exported, but not protection from being fished in the first place. The possibility of getting a “Non-detrimental” finding can also undermine the protection originally intended for the species by the CITES listing.

1.5. USA involvement

The presentation of the USA trade in the captioned paper [18] is markedly at odds with a large amount of independent data. Dent & Clarke state that the USA was (at the time) the seventh-largest shark fishing nation in the world, annually exporting 171 tonnes of shark fins valued at US\$3.4 million [16], which is significantly higher than the US \$1 million figure used by Shiffman & Hueter [18]. Dent & Clarke also established that the USA records trade in dried shark fins only, under just one commodity code with the description “shark fins dried whether or not salted not smoked”, while its exports of raw, frozen shark fins are classified as meat [16]. Other countries record “non-trivial” quantities of frozen fins originating from the USA that are not mentioned in Shiffman & Hueter [18]. The report from Dent & Clarke [16] shows that there are important inconsistencies between the official statistics of the FAO and the USA customs data used by NOAA. Thus, Canada, China, Hong Kong SAR, Indonesia, Malaysia, Singapore and Taiwan Province of China together report importing 71% more shark fin than the USA reports exporting in terms of volume, and 186% more in terms of value. The case is the same for shark fin imports. The value found by summing the amount of shark fin that China, Hong Kong SAR, India, Indonesia, Malaysia, Singapore, Taiwan Province of China, and Thailand report exporting to the USA is over seven times higher than that reported as imports by the USA in terms of volume, and three times greater by value. Thai customs authorities, for example, report prepared or preserved shark fins exported to the USA from 2007 onwards which do not appear in American records. Similarly, Hong Kong SAR trade data reports exports to, and imports from, the USA of frozen shark fins, while the USA only records trade in dried shark fins. Other countries reported exporting 1012 metric tons of shark fins to the USA in 2007. This is 35 times the figure of 28.8 metric tons reported by NOAA. Dulvy et al. established that shark mortality in the Atlantic Ocean in fact “greatly exceeds” FAO official figures [1], while Dent & Clarke stated that the available data “cover only a proportion of what is actually caught and traded” [16].

The captioned paper [18] does not mention these discrepancies and uncertainties, basing its arguments on the figure of only US\$1 million for the value of shark fins exported by the USA. It refers to the “few” shark fin imports as including “fins from nations where finning is already banned, as well as fins legally taken by United States fishermen, exported overseas for processing, and imported back into the United States as dried shark fins”. But this statement is not supported by a reference and is not mentioned by Dent & Clarke [16], so it is impossible to state, one way or another, whether this practice takes place to any significant degree. With unprocessed shark fins being categorized as meat by the USA, such handling and trade may be difficult to trace.

The findings section of the Act states that any shark fin in the country could have come from an unregulated or illegal fishery [6]. The shark fins consumed in the United States are mostly imported from Asia and shark hunting nations do not keep species-specific data. Once cut from the shark, the species of the fin is difficult to determine [16,21–23]. Therefore, the source of any given shark fin in the United States is generally impossible to trace.

In contrast to the portrayal of the USA shark fin trade given by

Shiffman & Hueter [18], it appears that at least several hundred tonnes of shark fins are consumed in the country annually [16], and imports have been rising each year, in spite of the bans in such major centres as California and New York. Ninety-three percent of imports enter the country through the Los Angeles customs district [16], and in 2017 one-third of species traded in the Hong Kong shark fin market, (the central Asian market for fins), were found to be threatened with extinction [5].

2. Conclusion

It is a worrying statement on the priorities of humanity that just one recipe, in just one of the world's cultures, could have such a grave effect, globally, on the status of large wild predators as important as sharks [34,43]. Participation in such a market is an ethical question, not just a commercial one. The Chinese government itself has banned shark fin soup at its official events [44].

Those concerned about healthy shark survival are working towards eliminating the market for their fins through both the education of consumers, and lobbying the companies that support it to stop doing so. The final goal, towards which the proposed legislation, *The Shark Fin Trade Elimination Act of 2017* [6] represents but one important step, is that there will be no significant market demand for shark fins in the future.

Due to the inaccuracy of many of the statements made in the captioned paper [18] we reject its arguments entirely.

Conflicts of interest

The authors declare jointly and severally that none has any financial interest in any aspect of the subject matter of this paper, or its publication, in any regard whatsoever.

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References

- [1] N.K. Dulvy, J.K. Baum, S. Clarke, L.J.V. Compagno, E. Cortés, A. Domingo, S. Fordham, S.A. Fowler, M.P. Francis, C. Gibson, J. Martínez, J.A. Musick, A. Soldo, J.D. Stevens, S. Valenti, You can swim but you can't hide: the global status and conservation of oceanic pelagic sharks and rays, *Aquat. Conserv. Mar. Freshw. Ecosyst.* 18 (2008) 459–482, <https://doi.org/10.1002/aqc.975>.
- [2] B. Worm, B. Davis, L. Kettner, A.W.-P. Christine, D. Chapman, M.R. Heithaus, S.T. Kessel, S.H. Gruber, Global catches, exploitation rates, and rebuilding options for sharks, *Mar. Pol.* 40 (2013) 194–204.
- [3] N.K. Dulvy, S.L. Fowler, J.A. Musick, R.D. Cavanagh, P.M. Kyne, L.R. Harrison, J.K. Carlson, L.N. Davidson, S.V. Fordham, M.P. Francis, C.M. Pollock, C.A. Simpfendorfer, G.H. Burgess, K.E. Carpenter, L.J. Compagno, D.A. Ebert, C. Gibson, M.R. Heupel, S.R. Livingstone, J.C. Sanciangco, J.D. Stevens, S. Valenti, W.T. White, Extinction risk and conservation of the world's sharks and rays, *eLife* 3 (2014) e00590.
- [4] D. Bradley, S. Gaines, Extinction Risk: counting the cost of overfishing on sharks and rays, *eLife* 3 (2014) e02199.
- [5] A.T. Fields, G.A. Fischer, S.K.H. Shea, H. Zhang, D.L. Abercrombie, K.A. Feldheim, E.A. Babcock, D.D. Chapman, Species composition of the international shark fin trade assessed through a retail-market survey in Hong Kong, *Conserv. Biol.* (2017) 1523–1739.
- [6] www.congress.gov/bill/115th-congress/senate-bill/793, Accessed date: 15 October 2018.
- [7] R.A. Myers, B. Worm, Rapid worldwide depletion of predatory fish communities, *Nature* 423 (2003) 6937.
- [8] R. Myers, Pew Global Shark Assessment, Pew Institute for Ocean Science, 2008, www.oceanconservation.org/projects/sharks/pew_global.shtml, Accessed date: 2 February 2018.
- [9] CITES, History of CITES Listing of Sharks (Elasmobranchii), (2017) www.cites.org/eng/prog/shark/history.php, Accessed date: 2 February 2018.
- [10] Animal Welfare Institute (AWI), (2017) awionline.org/content/international-shark-finning-bans-and-policies, Accessed date: 2 February 2018.
- [11] P. Gastrow, Triad Societies and Chinese Organised Crime in South Africa, Occasional Paper 48 Institute for Security Studies, 2001, oldsite.issafrica.org/uploads/paper48.pdf, Accessed date: 2 February 2018.
- [12] various: gangstersinc.ning.com/profiles/blogs/chinese-organised-crime-and-africa, Accessed date: 2 February 2018; www.scmp.com/news/hong-kong/health-environment/article/2076500/more-banned-shark-fins-discovered-hong-kong-cargo; www.info.gov.hk/gia/general/201703/06/P2017030600602.htm; www.info.gov.hk/gia/general/201712/29/P2017122900999.htm; www.info.gov.hk/gia/general/201709/18/P2017091801098.htm.
- [13] G. York, "Shark Soup" the Globe and Mail, August 27 (2003) www.theglobeandmail.com/news/world/shark-soup/article1012780/, Accessed date: 22 October 2018.
- [14] L. Buckley, The End of the Line: Global Threats to Sharks, (2007) Oceana/WildAidOceana.org/reports/end-line-global-threats-sharks, Accessed date: 2 February 2018.
- [15] N.R. Hareide, J. Carlson, M. Clarke, S. Clarke, J. Ellis, S. Fordham, S. Fowler, M. Pinho, C. Raymakers, F. Serena, B. Seret, S. Polti, European Shark Fisheries: A Preliminary Investigation into Fisheries, Conversion Factors, Trade Products, Markets and Management Measures, European Elasmobranch Association, 2007, <https://www.issuelab.org/resources/9182/9182.pdf>, Accessed date: 22 October 2018.
- [16] F. Dent, S.C. Clarke, State of the Global Market for Shark Products (Technical Paper 590), United Nations Food and Agriculture Organization Fisheries and Aquaculture, 2015.
- [17] Shark Finning Report to Congress, October 24, 2017 NOAA Fisheries, National Oceanic and Atmospheric Administration, (2016) repository.library.noaa.gov/view/noaa/17060/noaa_17060_DS1.pdf, Accessed date: 16 October 2018.
- [18] D.S. Shiffman, R.E. Hueter, A United States shark fin ban would undermine sustainable shark fisheries, *Mar. Pol.* 85 (2017) 138–140.
- [19] R. Arauz, pers comm. (2018).
- [20] C.A. Simpfendorfer, N.K. Dulvy, Bright spots of sustainable shark fishing, *Curr. Biol.* 27 (2017) R97–R98.
- [21] S.C. Clarke, E.J. Milner-Gulland, T. Bjørndal, Social, economic, and regulatory drivers of the shark fin trade marine resource economics, *Mar. Res. Found.* 22 (3) (2007) 305–327.
- [22] S. Clarke, J.E. Magnusson, D.L. Abercrombie, M. McAllister, M.S. Shivji, Identification of shark species composition, and proportion in the Hong Kong shark fin market based on molecular genetics and trade records, *Conserv. Biol.* 20 (2006) 201–211.
- [23] Shelley C. Clarke, Murdoch K. McAllister, Eleanor J. Milner-Gulland, Graeme Kirkwood, G. Catherine, J. Michielsens, David Agnew, Ellen K. Pikitch, Hideki Nakano, Shivji Mahmood, Global estimates of shark catches using trade records from commercial markets, *Ecol. Lett.* 9 (10) (2006) 1115–1126.
- [24] J.A. Musick, Musick, S. Sharks, *FAO Fisheries and Aquaculture Reviews and Studies*, FAO, Rome, 2011, p. 13.
- [25] https://www.greateratlantic.fisheries.noaa.gov/stories/2016/august/12/spiny_dogfish_trip_limit_increased.html.
- [26] NOAA, Fish Stock Sustainability Index: First Quarter 2013, Available at: (2013), pp. 1–45 web.archive.org/web/20170712111354/http://www.nmfs.noaa.gov/sfa/fisheries_eco/status_of_fisheries/archive/2013/first/q1_2013_stock_status_tables.pdf, Accessed date: 21 October 2018.
- [27] T. Witkin, S.T. Dissanayake, L. McClenachan, Opportunities and barriers for fisheries diversification: consumer choice in New England, Aug 1, *Fish. Res.* 168 (2015) 56–62.
- [28] https://www.greateratlantic.fisheries.noaa.gov/nero/hotnews/press_release/2010/news/NR1018/.
- [29] S. Fordham, S.L. Fowler, R.P. Coelho, K. Goldman, M.P. Francis, "Squalus acanthias". IUCN Red List of Threatened Species, e.T91209505A2898271. doi:10.2305/IUCN.UK.2016-1.RLTS.T91209505A2898271.en IUCN, 2016, Accessed date: 23 December 2017.
- [30] G. Guinot, L. Cavin, 'Fish' (Actinopterygii and Elasmobranchii) diversification patterns through deep time, *Biol. Rev.* 91 (2016) 950–981.
- [31] J. Kriwet, M.J. Benton, Neoselachian (chondrichthyes, Elasmobranchii) diversity across the cretaceous-tertiary boundary, *Palaeogeogr. Palaeoclimatol. Palaeoecol.* 214 (2004) 181–194.
- [32] J. Kriwet, W. Kiessling, S. Klug, Diversification trajectories and evolutionary life-history traits in early sharks and batoids, *Proc. R. Soc. B* 276 (2009) 945–951.
- [33] O.J. Luiz, A.J. Edwards, Extinction of a shark population in the Archipelago of Saint Paul's Rocks (equatorial Atlantic) inferred from the historical record, *Biol. Conserv.* 144 (2011) 2873–2881.
- [34] H. Bornatowski, A.F. Navia, R.R. Braga, V. Abilhoa, M.F.M. Corrêa, Ecological importance of sharks and rays in a structural foodweb analysis in southern Brazil, *ICES J. Mar. Sci.* 71 (7) (2014) 1586–1592.
- [35] L.N.K. Davidson, M.A. Krawchuk, N.K. Dulvy, Why have global shark and ray landings declined: improved management or overfishing? *Fish. Fish.* 17 (2016) 438–458.
- [36] United Nations, Resumed Review Conference on the Agreement Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, DPI/2556 D United Nations Department of Public Information, 2010, www.un.org.

- [un.org/depts/los/reference_files/ifp.pdf](#) , Accessed date: 2 February 2018.
- [37] I.F. Porcher, Randall Arauz: the War for Sharks, X-Ray Magazine vol. 87, (2018), pp. 71–73 <https://xray-mag.com/content/randall-arauz-war-sharks> , Accessed date: 14 February 2019.
- [38] Boston Newsmagazine, Cod Is Dead—Is Dogfish the Answer? (2016) www.bostonmagazine.com/restaurants/2016/08/14/dogfish/ , Accessed date: 20 October 2018.
- [39] Christian Science Monitor, Can Dogfish Save Cape Cod Fisheries? (2018) www.csmonitor.com/Environment/2018/0820/Can-dogfish-save-Cape-Cod-fisheries , Accessed date: 20 October 2018.
- [40] D.S. Shiffman, N. Hammerschlag, Preferred conservation policies of shark researchers, *Conserv. Biol.* 30 (2016) 805–815.
- [41] Oceana, (2017) usa.oceana.org/sites/default/files/usfintradeban_scientistletter_final.pdf , Accessed date: 21 October 2018.
- [42] J. Castro, The origins and rise of shark biology in the 20th century, *Mar. Fish. Rev.* 78 (2017) 14–33.
- [43] R.W. Stein, C.G. Mull, T.S. Kuhn, N.C. Aschliman, L.N.K. Davidson, J.B. Joy, G.J. Smith, N.K. Dulvy, A.O. Mooers, Global priorities for conserving the evolutionary history of sharks, rays and chimaeras, *Nat. Ecol. Evol.* 2 (2018) 288–298.
- [44] New York Times, China Says No More Shark Fin Soup at State Banquets, (2012) www.nytimes.com/2012/07/04/world/asia/china-says-no-more-shark-fin-soup-at-state-banquets.html , Accessed date: 22 October 2018.