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Bonn, Germany, 24-27 September 2012
Agenda Item 11

REPORT ON ASSESSING THE INTRINSIC VULNERABILITY OF HARVESTED SHARKS

(Submitted by the United Kingdom)

1. This information document has been submitted by the United Kingdom in relation to Agenda Item 11.

2. The attached report was commissioned from TRAFFIC by the Joint Nature Conservation Committee to follow up work undertaken earlier (and reported to the CITES Animals Committee http://www.cites.org/common/com/AC/26/E26-08i.pdf).

3. The earlier report sought to identify, by a process of risk assessment, those commercially exploited aquatic organisms, including sharks, which might be at greatest potential risk from over-exploitation and which might then be subject to further scrutiny to determine if they would benefit from measures under CITES or the Convention on Migratory Species to reduce those risks.

4. Subsequently, this work was subject to peer review by expert workshop http://jncc.defra.gov.uk/pdf/453_finalsingle_Addendum.pdf which, amongst various other recommendations on the method taken, suggested that further testing of the method was desirable, ideally on a smaller sub-set of species or in a specific taxonomic group

5. This report provides a report on testing the application of this method further with a specific focus on sharks. It seeks to identify the most important variables in assessing the intrinsic vulnerability of sharks to exploitation as a basis for subsequently examining their risks of exposure to fisheries.

Assessing the intrinsic vulnerability[1] of harvested sharks.

Oldfield, T.E.E., Outhwaite, W., Goodman, G. and Sant, G.

Background

Over-exploitation of fish species has been identified as the dominant direct driver of biodiversity loss in the marine environment (Millennium Ecosystem Assessment, 2005; Polidoro *et al*., 2009). Amongst fish, sharks appear to be particularly vulnerable to the pressures of fishing due to their life-history traits (Stevens *et al*., 2000). Additionally, many shark species are migratory making population estimates and management plans even more challenging (FAO, 1994).The failure of current management strategies used in isolation to protect harvested shark species has led to increasing calls for the application of multilateral environmental agreements (MEAs), such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Convention on the Conservation of Migratory Species of Wild Animals (CMS), to complement existing approaches. A number of shark species have been proposed for listing in the Appendices of these two MEAs and in some cases, despite the CITES proposals receiving a simple majority of support for listing (a two thirds majority is required in CITES), a vocal minority has expressed strong opposition to list commercially exploited aquatic species. Many opposing the use of MEAssimply favour management through existing management systems such asRegional Fisheries Management OrganisationsRegional Fisheries Management Organisations(RFMOs) and non-binding arrangements such as through FAO plans of action.

The Joint Nature Conservation Committee (JNCC) identified[2] the need for a systematic review of commercially exploited fish[3]species in order to identify those species for which additional management measures may make a tangible difference to their conservation and sustainable use (Sant *et al*., 2012). The review approach developed stemmed from one suggested through an FAO appraisal of the suitability of the CITES criteria for listing commercially-exploited aquatic species (Mahon *et al*. 2000), which considered that the risks faced by aquatic species can be characterised in terms of:

- vulnerability: related to the inability (for bio-ecological reasons) of a species to sustain the levels of exploitation that it may be subjected to, this factor could also be called 'bio-ecological risk'.
- value: related to the profitability of the species' exploitation, this factor could also be called 'economic risk'.
- violability: related to the extent to which conventional management measures may be circumvented, this factor could also be called 'compliance risk'.

The assessment process developed drew heavily on the *Ecological Risk Assessment for Effects of Fishing*(ERAEF) approach applied by the Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO) (Hobday *et al*. 2007).

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[1] Vulnerability in this context refers to the definition provided in the 1st bullet point in the Introduction

[2] http://www.jncc.gov.uk/pdf/COMM_07D08.pdf

[3] "Fish' is used here to refer to fish and invertebrate species harvested commercially in marine waters and/or large freshwater bodies. This definition excludes aquatic amphibians, reptiles, birds, mammals and plants.

Subsequently a workshop was held in Aberdeen, September 2011 (Fleming et al., 2012, Sant *et al*., in prep) to discuss the approach with a small group of fisheries and risk assessment experts in order to determine improvements to the approach. A number of recommendations were made for improving the method, including that that the life-history factors used to calculate the intrinsic vulnerability (*Average age at maturity, Average length at maturity, Average maximum age, Average maximum length, Fecundity, Reproductive strategy, Trophic level)* could be reduced in number asthese factors were likely to be highly correlated with one another. The workshop recommended that these factors should be tested to determine the most important and minimal set of factors that could be applied to one taxonomic group. The present study discusses the results of a study to determine the most important factors in determining risk for sharks.

Aims of this study.

- To determine the minimum factors required to assess relative intrinsic risk of exploitation to sharks.
- Evaluate the relative risk of shark species to exploitation

Intrinsic vulnerabilityand fish.

A number of studies have investigated the life history characteristics that make fish species vulnerable. A review of the evidence regarding the influence that life history traits had on fishing mortality was undertaken by Reynolds *et al*., (2005) who found that10 of the 15 studies they examined linked large size with vulnerability. A recent study by Le Quesne and Jennings (2011) suggested that body size (maximum length) was the only life history trait needed to give a reliable measure of sensitivity to fishing mortality, for both commercially-targeted and non-targeted species. If true, this approach would allow for the rapid assessment of species where only body size is known and may improve the statistical robustness of an assessment as body size is a trait that can be 'readily and accurately measured, giving it a practical advantage over other traits' (Reynolds *et al*., 2005).

Other traits (late maturity, longevity, reproductive output, etc.) have also been found to indicate vulnerability in some studies that did not assess body size but these traits are often correlated with maximum body length. Some have assumed that vulnerability was also linked to fecundity (see Dulvy *et al.*, 2003), however, others have found no empirical evidence to suggest that species with high fecundity are more resilient to fishing mortality (Jennings *et al*.,1998; Jennings *et al*., 1999) and some have found that high fecundity correlates with a low recovery potential (Denney *et al*., 2002).

After the completion of IUCN Red List assessments for all scombrids (tunas, bonitosand mackerels) and billfish (swordfish and marlins), Collette*et al.* (2011) found that those species assessed as being 'Threatened' generally had a relatively long generation length and a high market price.

Methods for determining most important factors

From FAO capture production data,sixty one shark species were identified as "harvested" i.e. data were available to species level. Capture data were also available reported to the genus or a higher taxonomic level. This study did not seek to identify the species that were harvested from within thesegroups andit is likely that there are some species in the "other shark species" category used that are harvested. In addition,species known to be harvested but unlikely to appear in the FAO data due to low,but potentially detrimental, levels of catch werenot included. Further investigation could determine which species have not been included in this analysis and the same assessment of vulnerability made.

Data for each factorused in the original scoring system (Hobday *et al*. 2007) were compiled for each shark species from (in order of availability) IUCN's Species Information Service (SIS), FishBase andCSIRO. Factor information was not available for all species (see table 1).

Table 1: Number of species records for each of the vulnerability factors

Factor	Harvested species	Other shark species	All species
Average age at maturity(minimum)	49	266	315
Average length at maturity(minimum)	61	373	434
Average maximum age (maximum)	46	263	309
Average maximumlength(maximum)	61	386	447
Fecundity	47	120	167
Reproductive Strategy	61	145	202
Trophic level	61	205	266

Once available data were collected for all shark species the individual factors were scored following as low, medium or high vulnerability (See table 2).

Table 2: Scoring values for biological factors

Vulnerability score **(1=low, 2= medium, 3=high)**	**Average age at maturity—minimum (years)**	**Average length maturity—minimum (cm)**	**Average age/longevity—maximum (years)**	**Average size—maximum (cm)**	**Fecundity (max. litter size or no. of eggs)**	**Reproductive strategy**	**Trophic level**
1	<5	<40	<10	<100	>2000	Broadcast spawners, or Non-guarders, or Asexual	<2.5
2	5-15	40-200	10-25	100-300	100-2000	Demersal spawners or Brood guarders/guard young	2.5-3.5
3	>15	>200	>25	>300	<100	Live bearers	>3.5

Mann-Whitney U-tests showed that harvested shark species scored more highly for all the *Vulnerability scores*than for the "other shark species", apart from the Fecundity Vulnerability, where every shark species had a score of 3.00 (Table 3).

Table 3: Mean *Vulnerability scores*for harvested and other shark species and whether these values are significantly different.

Factor	Harvested mean *vulnerability score*	Other shark species mean *vulnerability score*	Z value	P
Average age at maturity (minimum)	1.75	1.26	-5.985	< 0.001
Average length at maturity (minimum)	2.11	1.57	-6.885	< 0.001
Average maximum age/ longevity (maximum)	2.48	1.67	-6.473	< 0.001
Average maximum length (maximum)	2.31	1.40	-9.454	< 0.001
Fecundity	3.00	3.00	†	†
Reproductive Strategy	2.98	2.68	-3.850	< 0.001
Trophic level	2.95	2.86	-1.864	0.062
Vulnerability average score	2.00	1.46	-7.461	< 0.001

† *Fecundity Vulnerability scores were all the same and so could not be analysed*

Further analysis using Spearman's Rank tests showed that most of the factorswere highly correlated with each one otherand so there was scope for reducing the number of factorsused in the vulnerability scoring system. Principal component analysis (PCA) was applied to thefactors used in the original scoring system for vulnerabilityto identify which *vulnerability score*s are most similar and which are most different from each other, thereby identifying which factors add the most information when in combination. PCAs can only analyse data for species that have values for each *vulnerability score* and so the analysis was based on 36 species. The fecundityand trophic level scores for this restricted set of speciesall had *vulnerability score*s of three, so these two factors were excluded from the analysis as they would fail to distinguish between the species.

Based on the PCA analysis it appeared that:

a) if the Vulnerability Average score were to bebased on **one** factor then it should be based on **Minimum Age** (based on it having the strongest relationship between PCA band 1 and PCA band 2).

b) if the Vulnerability Average score were to bebased on **two** factors then it should be based on **Minimum Age** and **Reproductive Strategy**.

c) if the Vulnerability Average score were to bebased on **three** factors then it should be based on **Minimum Age**, **Maximum Length**and **Reproductive Strategy**.

Given the strong assertion in literature (Reynolds *et al*., 2005;Le Quesne and Jennings, 2011) that size is amongst the most important characteristics, we considered that a *vulnerability score* based on the three factors of minimum age at maturity, maximum length and reproductive strategy would be most appropriate. However, all but 5 species were live bearers and therefore it was considered thatthe reproductive strategy factor added little to the scoring for these harvested species. The final *vulnerability score* was therefore based on minimum age at maturity and maximum length (see Annex 1). All species of shark have been assessed against the IUCN Red List Categories and Criteria (IUCN, 2001) and each species' Red List category was compared with the final *vulnerability score* (see Figure 1). Although the IUCN Red List assesses risk of extinction of species considering all threats, for harvested species it was considered likely that the main threat comes from harvesting and that, therefore,there is likely to be a close correspondence between the two assessments.

Results

High, medium and low "risk" were defined on the basis of approximately a third of species in each category for the overall score (scoring for the individual factor was based on bands as used in the previous study), therefore, the results should be considered as a relative ranking rather than as high medium or low overall risk (see Annex 1). Annex 1 shows both the *vulnerability scores* according to minimum age at maturity and maximum length and, separately, the ranking of the species based on maximum length alonebecause this was identified by other studies as the single most important factor (Le Quesne and Jennings, 2011). Sixteen species were ranked differently by these two scores, six of which had no data available for the minimum age at maturity. Notably *Centroscymnus coelolepis* (Portuguese dogfish) scored highly when age and length were considered together, due to it having one of the highest minimum ages at maturity, but when size alone was considered it ranked in the lowest group. Two of the larger species *Galeocerdo cuvier*(Tiger Shark) and *Carcharhinus longimanus* (Oceanic Whitetip Shark) ranked highly for size but their relatively low minimum age at maturity reduced them to a medium overall vulnerability category.

Twelve species had no data for the minimum age at maturity. CSIRO's ERAEF takes a precautionary approach where data are not available, automatically assuming the highest level of risk. This may result in 'false positives', which the Aberdeen workshop (Fleming *et al*., 2012; Sant *et al*., in prep) considered to be preferable to 'false negatives'. If we follow the CSIRO approachthe overall vulnerability level of nine of these twelve species would increase (see Precautionary *Vulnerability score* Table 3) if the same bands are retained for high, medium and low, rather than re-dividing into three groups. It may be more appropriate to redefine these bands.

Table 3: Precautionary *Vulnerability scores* for species with no information available for minimum age at maturity(See Annex 1 for details of the calculation of scores; high risk shown as pink; medium as orange and lowas green)

Scientific Name	Common Name	Red List Status	Min age of maturity *Vulnerability score*	Max size (cms)	Vulnerability ((age and$) size) score	Precautionary *Vulnerability score*	Rank based on Size
Scyliorhinus canicula	Small Spotted	LC	(3)	80	1	2	57
Scyliorhinus stellaris	Nursehound	NT	(3)	150	2	2.5	42
Scymnodon ringens	Knifetooth	DD	(3)	110	2	2.5	51
Centroscyllium fabricii	Black Dogfish	LC	(3)	107	2	2.5	53
Oxynotus centrina	Angular Rough	VU	(3)	150	2	2.5	39
Somniosus microcephalus	Large Sleeper	NT	(3)	640	3	3	3
Etmopterus princeps	Great	DD	(3)	75	1	2	58
Somniosus pacificus	Pacific Sleeper	DD	(3)	440	3	3	8
Pseudocarcharias kamoharai	Crocodile Shark	NT	(3)	110	2	2.5	50
Somniosus rostratus	Little Sleeper	DD	(3)	143	2	2.5	44
Echinorhinus brucus	Bramble Shark	DD	(3)	310	3	3	23
Oxynotus paradoxus	Sailfin	DD	(3)	120	2	2.5	48

In comparing the IUCN Red List and *vulnerability score* (see Figure 1), species that have been assessed by IUCN as Least Concern also had lower *vulnerability scores*. Spearman's Rank correlation showed that there was a correlation between *vulnerability score* and Red List Status (excluding DD species) (correlation coefficient) = 0.342, p = 0.013).

Species for which insufficient information is available to assess the extinction risk against the IUCN Red List Categories and Criteria, and have therefore been assigned a category of Data Deficient, covered the range of *vulnerability scores*. It may therefore be useful to consider those Data Deficient species, for which vulnerability has been scored high,to assess the likely risk from actual fishing pressure and fisheries management.

Equally it would appear that two species *Mustelus schmitti* and *Squatina argentina* that have been assessed by IUCN as Endangered have a relatively low score for intrinsic vulnerability.

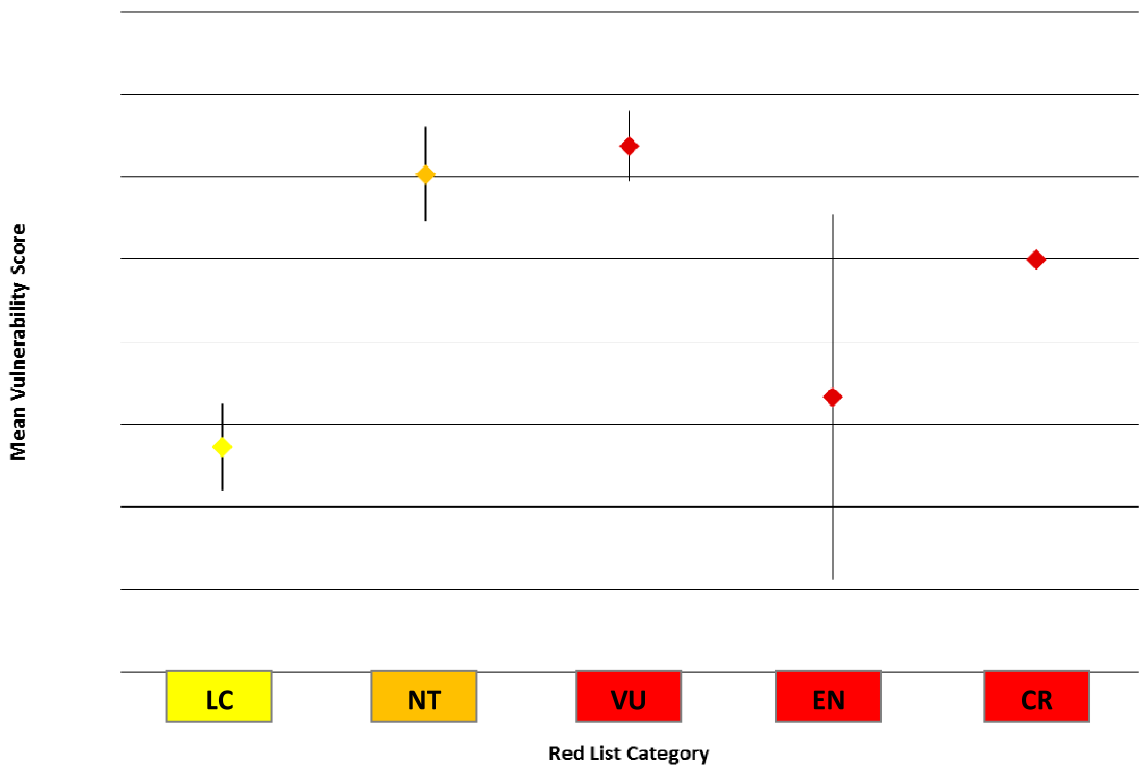

Figure 1: Mean *vulnerability score* for each IUCN Red List category (excluding DD species) with S.E.does not use the Precautionary v*ulnerability score* discussed above

Discussion

It would appear that for sharks,a measurement of vulnerability based on average age at maturity and maximum length has produced a useful approach to ranking the relative intrinsic vulnerability of species to harvestingand forms a good basis for investigating overall risk taking into account harvest pressure and management. Sixteen of the 61 species would have ranked differently for overall risk if size alone were considered, including the Portuguese dogfish, which was the only species to differ by two vulnerability categories but it is a small shark that is late to mature. Furthermore, where data were unavailable for age at maturity, taking a precautionary approach is likely to lead to false positives, which would then receive more detailed attention at a later stage in any risk assessment process; this was seen as preferable to potentially missing high risk species at this stage. Likewise this approach could be applied to species that are known to be harvested but did not appear in the species specific FAO catch data.

Intrinsic vulnerability and IUCN Red List Status

That fact that all species of sharks have been assessed by IUCN for the Red List gives us a good opportunity to compare our assessment of intrinsic vulnerability with an assessment of risk of extinction taking into account population status and trends. There was a positive correlation between the IUCN Red List Status and the *Vulnerability score*suggesting that our first stage of risk assessment is fairly effective. One might have expected the Critically Endangered and Endangered species to have higher *vulnerability score*s, however, the Red List assessment takes into account the actual impact of harvesting and other threats that may be impacting the extinction riskof the species. For instance the Critically Endangered *Squatina squatina* Angel Shark is temperate-water bottom-dwelling angel shark of the European and North African continental shelves (Morey et al., 2006) which is particularly susceptible from birth onwards to bycatch in the benthic trawls, set nets and bottom longlines operating through most of its range and habitat. This level of overlap of fishing pressure and range would be evaluated in a next stage testing “Exposure risk”. Similarly the Endangered *Mustelus schmitti* is subject to intensive fishing in its entire area of distribution, including heavy pressure on its nursery grounds (Massa et al., 2006). However, as a relatively small shark maturing early the species’ *vulnerability score* was relatively low compared to other shark species which, if only medium and high shark species were subject to Exposure risk analyses in a next stage, would mean this species might be over looked. *Squatina argentina*is endemic to the Southwest Atlantic occurring from southern Brazil through Uruguay. Its nocturnal habits make it vulnerable to bottom gillnets which were introduced on the shelf and slope off southern Brazil at that time (Vooren & Chiaramonte, 2006). Again this endangered shark was ranked in the lowest third of the sharks for vulnerability and would not typically have been subject to the next stages of risk assessment. This indicates that rather than using a relative scoring system (dividing the group into three approximately equal bands) a threshold should be set above which all species should be considered in the next stages.

A high number of Near Threatened species scored in the highest third for vulnerability, some of which such as *Prionace glauca*have high levels of catch reported (almost 44,000 tonnes according to FAO data andan estimated 20 million individuals annually (Stevens, 2006)). At present it appears that this highly migratory species is widespread and abundantbut the *vulnerability score* might indicate that it could become threatened if harvest is not managed.

Given that the harvest of many of the species in international trade is from the high seas and many of the species in international trade are migratory, cooperation between countries is likely to be necessary in order to ensure that harvests are managed at sustainable levels.

The next stages

No attempt has been made in this analysis to combine the intrinsic vulnerability risk with an assessment of the risks from the exposure of the species to fishing. The next stage of the revised risk analysis would look at the exposure of each species to harvest, i.e. direct harvest pressure and the overlap of harvest area with the range of a species, as well as the management risk i.e. what measures are in place, their enforcement and their adequacy.The matrix for assessing the current Exposure risk will be designed in such a way as to guide the management recommendations that would reduce the risk of over harvest. This would include assessing whether measures available through MEAs such as CITES or CMS could be beneficial or complementary to current management regimes.

Acknowledgements

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Annex 1:*Vulnerability scores* for harvested shark species.

Scientific Name	Common Name	Migratory (Y=migratory, ?=possibly migratory)	FAO Average catch per year 2000-2008 (tonnes)	Red List Status	Age of maturity (Years)	*Age vulnerability score*	Max length (cms)	*Length vulnerability score*	*Vulnerability* (age and size) score[4]	Rank based on Size[5]
Alopias pelagicus	Pelagic Thresher	Y	824.3	VU	7.5	2	330	3	2.5	21
Alopias superciliosus	Bigeye thresher shark	Y	187.9	VU	11	2	461	3	2.5	7
Alopias vulpinus	Common Thresher Shark	Y	458.4	VU	5.5	2	494	3	2.5	5
Carcharhinus brachyurus	Bronze Whaler	Y	29.3	NT	17.75	3	350	3	3	17
Carcharhinus falciformis	Silky Shark	Y	5574.3	NT	8.125	2	330	3	2.5	20
Carcharhinus leucas	Bull Shark	Y	1.3	NT	13	2	400	3	2.5	10
Carcharhinus limbatus	Common Blacktip Shark	Y	296.1	NT	2.1	1	275	2	1.5	26
Carcharhinus longimanus	Oceanic Whitetip Shark	Y	238.7	VU	4.8	1	396	3	2	13
Carcharhinus obscurus	Dusky Shark	Y	10.3	VU	19.8	3	360	3	3	16
Carcharhinus plumbeus	Sandbar shark	Y	53.4	VU	11.75	2	250	2	2	27
Carcharhinus porosus	Smalltail Shark	Y	83.6	DD	7.4	2	150	2	2	41
Carcharhinus sorrah	Spottail Shark	Y	11212.6	NT	2.5	1	160	2	1.5	37
Carcharias taurus	Sand Tiger	Y	3.3	VU	3.8	1	320	3	2	22
*Carcharodon carcharias**#	Great White Shark	Y	1.7	VU	11	2	640	3	2.5	4
Centrophorus granulosus	Gulper Shark	Y	348.3	VU	11.5	2	160	2	2	34
Centrophorus lusitanicus	Lowfin Gulper Shark		60.3	VU	11.5	2	160	2	2	35
Centrophorus squamosus	Deepwater Spiny Dogfish	Y	1741.6	VU	14.6	2	164	2	2	33
Centroscyllium fabricii	Black Dogfish	?	78.3	LC	-	-	107	2	2	53
Centroscymnus coelolepis	Portuguese dogfish	?	2465.2	NT	18	3	120	2	2.5	47
Cephaloscyllium isabellum	Draughtboard Shark		33.6	LC	2.7	1	100	2	1.5	56
*Cetorhinus maximus**	Basking shark	Y	224.3	VU	16	3	900	3	3	1
Dalatias licha	Kitefin Shark	?	822.2	NT	6	2	182	2	2	30
Deania calcea	Shovelnose Spiny Dogfish		223.2	LC	14	2	120	2	2	49

* Listed in CITES Appendices,# listed in CMS Appendices.

[4]**High= 3 to 2.50, Medium = <2.50 to 2.00, Low = < 2.00.**

[5]**High= ≥320, Medium<320≥150, Low = <150**

Scientific Name	Common Name	Migratory (Y=migratory, ?=possibly migratory)	FAO Average catch per year 2000-2008 (tonnes)	Red List Status	Age of maturity (Years)	*Age vulnerability score*	Max length (cms)	*Length vulnerability score*	*Vulnerability* (age and size) score[4]	Rank based on Size[5]
Echinorhinus brucus	Bramble Shark	?	0.8	DD	-	-	310	3	3	23
Etmopterus princeps	Great Lanternshark		2.2	DD	-	-	75	1	1	58
Etmopterus spinax	Velvet Belly Lanternshark	?	11.2	LC	5	2	60	1	1.5	61
Galeocerdo cuvier	Tiger Shark	Y	46.1	NT	2.9	1	750	3	2	2
Galeorhinus galeus	Whithound	Y	4815.9	VU	3.4	1	193	2	1.5	28
Galeus melastomus	Blackmouth Catshark		212.8	LC	2.5	1	105	2	1.5	54
Galeus murinus	Mouse Catshark		0.6	LC	1.9	1	70	1	1	59
Ginglymostoma cirratum	Nurse Shark	?	177.1	DD	3.7	1	308	3	2	24
Hexanchus griseus	Bluntnose Sixgill Shark	Y	9.4	NT	11	2	482	3	2.5	6
Isurus oxyrinchus#	Shortfin Mako	Y	7093.3	VU	13	2	400	3	2.5	11
Isurus paucus#	Longfin Mako	Y	2.4	VU	5.2	2	417	3	2.5	9
Lamna nasus#	Porbeagle shark	Y	928.7	VU	8.8	2	350	3	2.5	18
Mustelus asterias	Starry Smoothhound	Y	8.9	LC	2	1	150	2	1.5	43
Mustelus canis	Dusky Smoothhound	Y	367.9	NT	14.6	2	150	2	2	40
Mustelus henlei	Brown Smoothhound	?	3.4	LC	2.75	1	100	2	1.5	55
Mustelus lenticulatus	Spotted Smoothhound	?	1426.8	LC	2.6	-	125	2	2	46
Mustelus mustelus	Common Smoothhound	?	166.4	VU	9.925	2	173	2	2	31
Mustelus schmitti	Narrownose Smoothhound	Y	9374.9	EN	2.7	1	69.5	1	1	60
Negaprion brevirostris	Lemon Shark	Y	0.1	NT	12.5	2	368	3	2.5	15
Notorynchus cepedianus	Broadnose sevengill shark	Y	6.4	DD	10.25	2	300	2	2	25
Oxynotus centrina	Angular Rough Shark		73.2	VU	-	-	150	2	2	39
Oxynotus paradoxus	Sailfin Roughshark	?	0.4	DD	-	-	120	2	2	48
Prionace glauca	Blue Shark	Y	43958.6	NT	5.5	2	380	3	2.5	14
Pseudocarcharias kamoharai	Crocodile Shark	Y	1.6	NT	-	-	110	2	2	50
Rhizoprionodon terraenovae	Atlantic Sharpnose Shark	Y	76.3	LC	3.175	1	110	2	1.5	52
Scyliorhinus canicula	Small Spotted Catshark		6086.4	LC	-	-	80	1	1	57
Scyliorhinus stellaris	Nursehound		372.7	NT	-	-	150	2	2	42
Scymnodon ringens	Knifetooth Dogfish		83.1	DD	-	-	110	2	2	51

Scientific Name	Common Name	Migratory (Y=migratory, ?=possibly migratory)	FAO Average catch per year 2000-2008 (tonnes)	Red List Status	Age of maturity (Years)	*Age vulnerability score*	Max length (cms)	*Length vulnerability score*	*Vulnerability* (age and size) score[4]	Rank based on Size[5]
Somniosus microcephalus	Large Sleeper Shark	Y	52.0	NT	-	-	640	3	3	3
Somniosus pacificus	Pacific Sleeper Shark	Y	2.0	DD	-	-	440	3	3	8
Somniosus rostratus	Little Sleeper Shark		1.1	DD	-	-	143	2	2	44
Sphyrna lewini	Scalloped Hammerhead	Y	378.1	EN	7.15	2	343	3	2.5	19
Sphyrna zygaena	Smooth hammerhead	Y	179.4	VU	6.3	2	400	3	2.5	12
Squalus acanthias[#]	Piked Dogfish	Y	21849.7	VU	5.6	2	160	2	2	36
Squatina argentina	Argentine Angel Shark		4119.7	EN	4.8	1	170	2	1.5	32
Squatina californica	South Pacific Angel Shark	?	603.9	NT	13	2	152	2	2	38
Squatina squatina	Angel Shark	Y	25.1	CR	7.1	2	183	2	2	29
Triakis megalopterus	Spotted Gully Shark		0.7	NT	4.5	1	142	2	1.5	45