Inclusion of Scalloped Hammerhead Shark *Sphyrna lewini* Great Hammerhead Shark *Sphyrna mokarran* and Smooth Hammerhead Shark *Sphyrna zygaena* in Appendix II

Proponents: Brazil, Colombia, Costa Rica, Ecuador, Honduras, Mexico and Denmark (on behalf of the European Union Member States acting in the interest of the European Union)

Summary: The Scalloped Hammerhead *Sphyrna lewini,* Great Hammerhead *S. mokarran* and Smooth Hammerhead *S. zygaena* are the three most widely distributed of the seven currently recognised species of hammerhead shark in the genus *Sphyrna*. *S. lewini* is a circumglobal shark species residing in coastal warm temperate and tropical seas in the Atlantic, Pacific and Indian Oceans between 46°N and 36°S to depths of 1000 m. It is relatively long-lived (possibly living 12ï 32 years) and matures late, with populations in temperate waters evidently maturing later than those in tropical waters; in the north-west Atlantic males mature at six years and females at 15-17, while in the Pacific males and females mature at around four years. It has a relatively small litter size (12ï 41 pups) after an 8-12 month gestation period and has low productivity. Populations are spatially highly structured by age and sex and may exhibit complex migratory patterns. Aggregations of adults form at seamounts and pregnant females are known to move into coastal waters (between 10 and 20 m) to give birth. Generation times have been calculated as between 5.7ï 22 years. *S. mokarran* and *S. zygaena* are much less well known, but it is assumed that their life history parameters and productivity are similar.

The three species, most notably *Sphyrna lewini,* are subject to target and non-target fisheries driven by the international demand for their fins, which are highly valued because of their large size and high fin ray count. International shark trade is not documented at the species level for sharks in the World Customs Organisationõs Harmonized Commodity Description and Coding System (Harmonized System). However, a study has estimated that between 1.3 and 2.7 million sharks of *S. lewini* and *S. zygaena* (in a 2:1 ratio) are taken for the fin trade each year and that all three species account for nearly 6% of identified fins entering Hong Kong markets. A sample of *S. zygaena* fins sourced from the Hong Kong fin market have been shown to be derived from the Indo-Pacific and eastern and western Atlantic Ocean Basins. Hammerhead meat is also traded internationally; however, it is unlikely that the amount is significant when compared to the volume of fins in trade.

All three species generally experience high at-vessel mortality in industrial, artisanal and recreational fisheries. Newborn and juveniles are captured by large- and small-scale fisheries in nursery zones through most of the range.

Trends in stocks are mostly derived from analysis of catch per unit effort (CPUE) information, with some direct stock assessment and landings data. Analysis is hampered because much information is recorded at a generalised level covering either all hammerheads *Sphyrna* spp. or the three species considered here. Such assessments indicate a range of declines in hammerheads in the Northwest Atlantic, Mediterranean, Pacific and Indian Oceans over various time periods, ranging from a 25% decline for 1994ï 2005, indicated in one study in the Northwest Atlantic, to 85% for 1963ï 2000 in the West Pacific Ocean, and 99% in the Mediterranean, from historical baselines. One assessment of the Southwest Atlantic detected no trend. Various assessments, specifically of *S. lewinii,* indicate marked declines in the Northwest Atlantic (ranging from 44% for 1995ï 2005 to 98% for 1972ï 2003), Southwest Atlantic (60ï 90% for 1993ï 2001), East Pacific (71% for 1992ï 2004) and West Indian Ocean (64% for 1978ï 2003). There is little specific information on trends in *S. mokarran* or *S. zygaena.*

Sphyrna lewini is listed globally as Endangered on the IUCN Red List, with two of the five subpopulations listed as Vulnerable and three as Endangered. *S. mokarran* is globally listed as Endangered and *S. zygaena* as Vulnerable.

Species-specific management policies for *Sphyrna lewini* have been implemented in some countries and most Regional Fisheries Management Organisations

and a number of range States have implemented some form of finning regulation; the three proposed species could be benefitting from these wherever they are effectively enforced. *S. lewini* or hammerheads as a complex are listed on various international conventions.
Identification of fins of hammerhead sharks to species level is difficult. However, a guide has been created that may help to distinguish between fins of the three hammerheads proposed here and those of other shark species. Fins from other members of the genus *Sphyrna* apparently do not closely resemble those of the three species proposed here.

Sphyrna lewini is proposed for inclusion in Appendix II under *Resolution Conf. 9.24 (Rev. CoP15)* Annex 2 a. The proposed listing would include an annotation to delay entry into effect of the inclusion by 18 months to enable Parties to resolve related technical and administrative issues. *S. mokarran* and *S. zygaena* are proposed for listing in Appendix II under *Resolution Conf 9.24 (Rev. CoP15)* Annex 2 b criterion A for look-alike reasons.

Analysis: *Sphyrna lewini, S. mokarran* and *S. zygaena* are harvested for the international trade of their valuable fins. *S. lewini* is believed to be the main species in trade, although *S. zygaena* also appears to be traded in large quantities. *S. lewini* has low productivity and is highly vulnerable to exploitation; *S. mokarran* and *S. zygaena* are less well known but are assumed to have similar productivity. Significant declines have been reported in a number of populations of *S. lewini* (and in the three species together), ascribed to over-exploitation. Most of these declines are consistent with the indicative guidelines for inclusion in Appendix II of commercially exploited aquatic species with low productivity suggested in the footnote to Annex 5 of *Resolution 9.24 (Rev. CoP15).* Some reported declines are consistent with guidelines for inclusion in Appendix I.

The fins of the three species resemble each other and are frequently traded together. It would appear that *S. mokarran* and *S. zygaena* meet the criteria for listing in Annex 2 bA of *Resolution Conf. 9.24 (Rev CoP15)* based on the difficulty of distinguishing their fins from those of *S. lewini*. It is possible that one or both species meet the criteria for inclusion in Appendix II under Annex 2 a, although information is lacking in this regard.

Supporting Statement (SS)	Additional information
Range	
Sphyrna lewini is a circumglobal shark species residing in coastal warm temperate and tropical seas in the Atlantic, Pacific, and Indian Oceans between 46°N and 36°S to depths of 1000 m. In the western Atlantic Ocean, this shark is found from south of New Jersey (USA) to Brazil, including the Gulf of Mexico and the Caribbean Sea; in the eastern Atlantic it is distributed from the Mediterranean Sea to Namibia. A range extension of the species to the central Mediterranean off southern Italy has been recently documented. Distribution in the Indo-Pacific Ocean includes South Africa and the Red Sea, throughout the Indian Ocean, and from Japan to New Caledonia, Hawaii (US), and Tahiti; it is found on both east and west coasts of India, with higher abundance along the east coast. *S. lewini* is found in the eastern Pacific Ocean from the coast of southern California to Ecuador and perhaps as far south as Peru. In Australia, *S. lewini* may be found off the north-western, northern, and eastern Australia coast. It is found in the following FAO Fishing Areas: 21, 31, 34, 41, 47, 51, 57, 61, 71, 77, and 87. *S. mokarran* occurs circumglobally between 45°N - 37°S at depths to 300 m. In India they are found on both the southeast and southwest coasts. They are coastal-pelagic and can be found close inshore as well as far offshore. They can be bottom-oriented	

Supporting Statement (SS)	Additional information
in depths of 1-80 m. It is found in the following FAO Fishing Areas: 21, 27, 31, 34, 37, 41, 47, 51, 57, 71, 77, 81, 87. *S. zygaena* is a circumglobal coastal-pelagic and semi-oceanic species that occurs in temperate and tropical seas between 59°N - 55°S. They occur from the surface to 200 m, but are most common to depths to 20 m. They can be found both inshore and well offshore. It is found in the following FAO Fishing Areas: 21, 31, 27, 34, 37, 41, 47, 51, 57, 61, 71, 77, 81, 87. Range States	
S. lewini Also in central Mediterranean off southern Italy.	S. lewini *Angola; Anguilla; Antigua and Barbuda; Aruba; Australia; Bahamas; Bahrain; Barbados; Belize; Benin; Brazil; Cameroon; Cape Verde; Cayman Islands; China; Colombia; Congo; Costa Rica; Côte d'Ivoire; Cuba; Djibouti; Dominica; Dominican Republic; Ecuador; Egypt; El Salvador; Equatorial Guinea; Eritrea; French Guiana; Gabon; Gambia; Ghana; Grenada; Guadeloupe; Guinea; Guinea-Bissau; Guyana; Haiti; Honduras; India; Indonesia; Iran, Islamic Republic of; Iraq; Jamaica; Japan; Kuwait; Liberia; Maldives; Mauritania; Mexico; Myanmar; Namibia; New Caledonia; Nicaragua; Nigeria; Oman; Pakistan; Panama; Philippines; Puerto Rico; Qatar; Saint Kitts and Nevis; Saint Lucia; Saint Vincent and the Grenadines; Sao Tomé and Principe; Saudi Arabia; Senegal; Sierra Leone; South Africa; Suriname; Taiwan, Province of China; Thailand; Togo; Trinidad and Tobago; United Arab Emirates; USA; Uruguay; Venezuela; Viet Nam; Yemen (Baum* et al., *2007).* *Madagascar (Doukakis* et al., *2011).*
S. mokarran	S. mokarran *Algeria; Anguilla; Antigua and Barbuda; Aruba; Australia; Bahamas; Bangladesh; Belize; Brazil; British Indian Ocean Territory; Cambodia; Cape Verde; Cayman Islands; China; Colombia; Costa Rica; Cuba; Curaçao; Djibouti; Dominica; Dominican Republic; Ecuador; Egypt; El Salvador; Eritrea; France; French Guiana; French Polynesia; French Southern Territories (the); Grenada; Guadeloupe; Guatemala; Guyana; Haiti; Honduras; Hong Kong; India; Indonesia; Iran, Islamic Republic of; Iraq; Israel; Jamaica; Japan; Jordan; Kenya; Kuwait; Libya; Macao; Madagascar; Malaysia; Martinique; Mauritius; Micronesia, Federated States of; Montserrat; Morocco; Mozambique; Myanmar; Netherlands Antilles; Oman; Pakistan; Palau; Panama; Philippines; Pitcairn; Puerto Rico; Qatar; Saint Barthélemy; Saint Kitts and Nevis; Saint Lucia; Saint Martin; Saint Vincent and the Grenadines; Saudi Arabia; Senegal; Seychelles; Somalia; South Africa; Spain; Sri Lanka; Sudan; Suriname; Taiwan, Province of China; Tanzania, United Republic of; Trinidad and Tobago; Tunisia; Turks and Caicos Islands; United Arab Emirates; USA; Venezuela; Viet Nam; Yemen (*Denham et al., 2007*).*

Supporting Statement (SS)	Additional information
S. zygaena Also in central Mediterranean off southern Italy.	S. zygaena *Albania; Algeria; Argentina; Australia; Bahrain; Belgium; Bosnia and Herzegovina; Brazil; Canada; Chile; China; Croatia; Cyprus; Denmark; Egypt; Estonia; Finland; Germany; Greece; Greenland; Iceland; India; Iran, Islamic Republic of; Iraq; Ireland; Israel; Italy; Japan; Korea, Democratic People's Republic of; Korea, Republic of; Kuwait; Latvia; Lebanon; Libya; Lithuania; Madagascar; Mexico; Montenegro; Morocco; Mozambique; Namibia; Netherlands; New Zealand; Norway; Oman; Pakistan; Peru; Poland; Portugal; Qatar; Russian Federation; Saudi Arabia; Slovenia; South Africa; Spain; Sweden; Syrian Arab Republic; Tunisia; Turkey; United Arab Emirates; UK; USA; Uruguay; Western Sahara (Casper* et al., *2005).*
IUCN Global Category	
S. lewini Globally: EN. Western Atlantic: EN.	S. lewini *Globally: EN A2bd+4bd (version 3.1, assessed 2007).* *Eastern Central and Southeast Pacific subpopulation: EN A4bd (version 3.1, assessed 2007).* *Eastern Central Atlantic subpopulation: VU A4bd (version 3.1, assessed 2007).* *Northwest and Western Central Atlantic subpopulation: EN A2bd+4bd (version 3.1, assessed 2007).* *Southwest Atlantic subpopulation: VU A4bd (version 3.1, assessed 2007).* *Western Indian Ocean subpopulation: EN A4bd (version 3.1, assessed 2007).*
S. mokarran Globally: EN.	S. mokarran *(version 3.1, assessed 2007)* *Globally: EN A2bd+4bd version 3.1.*
S. zygaena Globally: VU.	S. zygaena *(version 3.1, assessed 2005)* *Globally: VU A2bd+3bd+4bd version 3.1.*

Biological and trade criteria for inclusion in Appendix II (Res. Conf. 9.24 (Rev. CoP15) Annex 2 a)

A) Trade regulation needed to prevent future inclusion in Appendix I

Supporting Statement (SS)	Additional information
S. lewini *S. lewini* is inherently sensitive because it is long-lived, matures late, has a relatively small litter size and has a low intrinsic rate of increase. Overall estimates of the intrinsic rate of increase for *S. lewini* (r~0.08-0.105 yr^{-1}) indicate that populations are vulnerable to depletion and will be slow to recover from over-exploitation based on FAO's low productivity category (<0.14 yr^{-1}). More recent studies have calculated productivity rates for the south Atlantic Ocean (0.121 yr^{-1}) and north Atlantic (0.096 yr^{-1}) (the full Ecological Risk Assessment (ERA) analysis	S. lewini *The full Ecological Risk Assessment analysis from the September 2012 species group meeting of ICCAT can be found here-- http://www.iccat.int/Documents/Meetings/Docs/2012_SHK_ASS_ENG.pdf. The values remain the same as those documented in the SS.* S. lewini *was found to have a high intrinsic vulnerability score (2.5/3) in a vulnerability assessment of 61 shark species (Oldfield* et al., *2012).*

Supporting Statement (SS)	Additional information
will be completed and presented as an International Commission on the Conservation of Atlantic Tuna Standing Committee on Research and Statistics (ICCAT SCRS) document at the September 2012 species group meeting of ICCAT). It has been stated that *S. lewini* has among the lowest productivity when compared to 26 other species of sharks; and other studies have found *S. lewini* to be 8th out of 11 species or 6th (south Atlantic) and 9th (north Atlantic) out of 20 stocks/16 species.	
Longevity is estimated to be 12.5 years in the east Pacific, 14 years in the west Pacific, and 31.5 years in the north-west Atlantic. Another study calculated that, off the east coast of Australia, the oldest male was 21.5 and female was 15 years.	*The information presented in the proposal on longevity of this species is confused. Longevity (years) is presented here in more detail from the original and additional papers for clarity:* *SW Atlantic (Kotas* et al., *2011)* *29.5 (m), 31.5 (f)* *E Pacific (Anislado-Tolentino and Robinson-Mendoza 2001)* *11 (m), 12.5 (f)* *W Pacific (Chen* et al., *1990)* *10.6 (m), 14 (f)* *Australia (Harry* et al., *2011)* *21 (m)* *North West Atlantic and Gulf of Mexico (Piercy* et al., *2007)* *30.5 (both m and f)* *The longevity of* S. lewini *has yet to be validated and the current estimates are confounded by likely methodological differences between studies and interspecific geographical differences. Earlier studies in the east and west Pacific estimated longevity to be 12.5-14 years, although more recent studies in the Atlantic and west Pacific have suggested the species is longer lived, to at least 30 years (Harry* in litt.*, 2012)*
Age at maturity has been calculated at 6 years for males and 15-17 years for females in the north-west Atlantic and was found to differ significantly between male sharks caught in tropical waters (5.7 years) and those caught in temperate waters (8.9 years) in Australia.	*Age at maturity (years) is presented here in more detail from the original papers for clarity:* *Australia (Harry* et al., *2011)* *5.7 (tropical m), 8.9 (temperate m), >12 (f)* *W Pacific (Chen* et al., *1990)* *3.8 (m), 4.1 (f)* *NW Atlantic (Piercy pers. comm.)* *6 (m), 15-17 (f)*
Generation time has been determined at 16.7 years (Atlantic) and 5.7 years (Pacific) though the much higher population growth rate (low generation time) in the Pacific may be due to the growth information used in the model, rather than real differences. However, the proposal indicates an overall generation time of 20 years in Annex 1.	*Generation period is greater than 15 years in the Gulf of Mexico (Baum* et al., *2007), therefore three generation lengths is at least 45 years.* *The full ICCAT ERA analysis indicates that the generation time = 21.6 years.*
Reproductive cycle analysis from all studies indicates an 8-12 month gestation period followed by a one-year resting period. A few studies have examined life history parameters for *S.lewini*. In the north-western Atlantic Ocean, *S. lewini* appear	*Chen* et al. *(1988) indicated that reproduction was likely annual in* S. lewini. *Also, Capape (1998), Hazin* et al. *(2001), De Bruyn* et al. *(2005) and White* et al. *(2008) reported that oocytes were well developed in pregnant females, potentially indicating*

Supporting Statement (SS)	Additional information
to grow more slowly and have smaller asymptotic sizes than conspecifics in the eastern and western Pacific Ocean. Average litter size ranges from 12 to 41 pups and in comparison with other hammerhead species, *S. lewini* in Mexico has low to intermediate fertility levels. Furthermore, pregnant females come in to the birth zone (10-20 m depth) where they pup and a number of coastal areas have been identified as important to juveniles and sub-adults. Recent studies indicate that the Northwest Atlantic, Caribbean Sea, and Southwest Atlantic populations of this species are genetically distinct from each other, as are the Eastern Central Atlantic and Indo-Pacific populations.	*annual reproduction. Despite evidence that* S. lewini *may reproduce annually, most studies have been based on small sample sizes so it is not possible to establish this conclusively. Indeed, it should be noted that most large sharks (including the congeneric* S. mokarran*) have a resting year between pregnancies, so an annual cycle in* S. lewini *would be unusual (Harry* in litt.*, 2012).*
<u>*S. mokarran*</u> Litter sizes: 13-42 Reproduces every other year. Age at maturity: 8 years from one study	<u>S. mokarran</u> *ICCAT ERA (September 2012) – In the North Atlantic Productivity = 0.070 yr^{-1}; Generation time = 27.1.*
<u>*S. zygaena*</u> Litter size: 30-40 Gestation period: 10-11 months Maximum age: approximately 18 years from one study	<u>S. zygaena</u> *Productivity: 0.110 yr^{-1} and ranked 8^{th} out of 11 species in terms of vulnerability (Cortes* et al.*, 2009).* *ICCAT ERA (September 2012) –In the North Atlantic Productivity = 0.225 yr^{-1} and Generation time = 13.4 years.* Sphyrna zygaena *was found to have a high intrinsic vulnerability score (2.5/3) in a vulnerability assessment of 61 shark species (Oldfield* et al.*, 2012).*
A) Small wild populations	*A) Small wild populations*
<u>*S. lewini*</u> Few population assessments are available for *S. lewini*. In the northwest Atlantic Ocean, an assessment using two surplus production models has been conducted. Population size in 1981 was estimated to be between 142 000 and 169 000 sharks, but decreased to about 24 000 sharks in 2005.	
C) Decline in number of wild individuals It appears that a number of directed and by-catch fisheries are occurring in newborn and juvenile habitat, where they are sensitive to even the simplest fishing methods; a number of fisheries catch exclusively juveniles.	*C) Decline in number of wild individuals*
<u>*S. lewini*</u> Estimates of decline of *S. lewini* are given in the table below.	<u>*S. lewini*</u>

Supporting Statement (SS)	Additional information

Sphyrna lewini

Year	Location	Data	Trend
1972-2003	NW Atlantic Ocean	CPUE	98% decline*
1992-2003	NW Atlantic Ocean	CPUE	89% decline*
1994-2005	NW Atlantic Ocean	CPUE	56% increase*
1995-2005	NW Atlantic Ocean	CPUE	44% decline*
1981-2005	NW Atlantic Ocean	Stock assessment	83-85% decline*
1993-2001	SW Atlantic Ocean	Landings or CPUE	60-90% decline
1992-2004	E Pacific Ocean	Sightings	71% decline*
1978-2003	W Indian Ocean	CPUE	64% decline*

*Indicates the data has undergone a statistical standardisation to correct for factors unrelated to abundance

Further detail with less explicit trend information are described below.

Pacific Ocean

In the Mexican Pacific Ocean, the catch per unit effort (CPUE) of the longline fishing fleet (100 fish hooks) for *S. lewini* showed a declining trend of 0.19 in 1987 to 0.03 in 1999. In the Gulf of Tehuantepec the captures of *S. lewini* declined from the maximum of 300 t in 1997 to a few tonnes in 2006. From 2008 to 2010, the annual catch of *S. lewini* in the south zone of the Mexican Pacific showed a declining trend.

Catch of S. lewini in Costa Rica shows a decrease of 60% in the relative abundance between 1991 and 2001.

In Colombia, although there are capture data for *S. lewini* in industrial and artisanal fisheries, there is no information on CPUE; nevertheless, it is evident that the majority of captured individuals (74%) are captured below the maturity size (200 cm LT). There has also been a decrease of juveniles seen in the shrimp trawling fishery between 1995 and 2004, and no reports of the species in 2007.

The incidental catches of Hammerhead Sharks (*S. lewini*) by tuna vessels which use purse seine nets in the East Pacific show a declining trend from a peak of 1009

Pacific Ocean

A 62% decline in landings of S. lewini *is reported from the Southern Mexico Pacific Coast (Soriana* et al.*, 2006, as cited and TRAFFIC 2010).*

The 60% reduction cited in the SS is for pelagic sharks in general. Standardised catch rates were not presented and the reduction is only based on two widely spaced data points. Changes in fishing operations between these time periods were not taken into account (Arauz et al.*, 2004; Clarke* in litt.*, 2012).*

Supporting Statement (SS)	Additional information
specimens in 2002 to 247 specimens in 2011. Data from 1996-2006 from mesh net and drumline fisheries in north-eastern Australia from the Queensland Shark Control Program were analysed and a significant decline in *S. lewini* female total length was found but an increase in CPUE. Large catches of newborn *S. lewini* by prawn trawlers on the Tugela Bank, South Africa, have been reported ranging from an estimated 3288 sharks in 1989 to 1742 sharks in 1992. *S. mokarran* From 2000-2002 *S. mokarran* comprised 0.75% of total shark landings at Cochin Fisheries Harbour, India. However, from 2007-2011 very few were landed. There has been a suspected decline of at least 80% in the past 25 years for populations of *S. mokarran* off West Africa. The incidental catches of *S. mokarran* by tuna vessels which use purse seine nets in the East Pacific peaked at 189 in 2003 and declined to 21 in 2011. *S. zygaena* During 2000-2002, *S. zygaena* formed 0.36% of the total shark landings at Cochin Fisheries Harbour, India, but during 2007-2011, only stray numbers were landed. In New Zealand, there is some anecdotal evidence from game fishers that large adults may be less abundant than they used to be, but juveniles and sub-adults are still abundant around the northern North Island. The incidental catches of *S. zygaena* by tuna vessels which use purse seine nets in the East Pacific peaked at 1205 in 2004 and declined to 436 in 2011. Species Complex Given the difficulties in differentiating the species, *S. lewini, S. mokarran*, and *S. zygaena,* and the amalgamation of catch records, estimates of trends in abundance are listed below for hammerheads as a complex either for the three proposed species or for *Sphyrna* spp.	*Species Complex*

Supporting Statement (SS)	Additional information

Sphyrna complex (*S. lewini, S. mokarran,* and *S. zygaena*)

Year	Location	Data	Trend
1981-2005	NW Atlantic Ocean	Stock assessment	72% decline*
1978-2007	SW Atlantic Ocean	CPUE	None/Stable
1898-1922 1950-2006 1978-1999 1827-2000	Mediterranean Sea	CPUE	99% decline*

*Indicates the data have undergone a statistical standardisation to correct for factors unrelated to abundance

Sphyrna spp. (Hammerhead sharks)

Year	Location	Data	Trend
1992-2005	NW Atlantic Ocean	CPUE	76% decline*
1994-2005	NW Atlantic Ocean	CPUE	25% decline*
1983-1984 and 1991-1995	NW Atlantic Ocean	CPUE	66% decline
2004-2006	E Pacific Ocean	Landings	51% decline
1963-2007	W Pacific Ocean	CPUE	85% decline
1997-1998 and 2004-2005	E Indian Ocean	CPUE	50-75% decline

*Indicates the data have undergone a statistical standardisation to correct for factors unrelated to abundance

Atlantic Ocean

Although there is evidence of declines in the northwest Atlantic (1983-1984 and 1991-1995; 66% decline), time series analysis conducted since 1995 has suggested that the northwest Atlantic population may be stabilized but at a very low level.
In the eastern Atlantic Ocean, data indicating trends in abundance are generally not available. However, it has been suggested that similar population trends for hammerheads (grouped) documented in the northwest Atlantic could be expected in the northeast and eastern central Atlantic. This is because longline fleets in these areas exert comparable fishing effort, and effort is seen to shift from western to eastern Atlantic waters.

Off the Belize coast, hammerheads have declined dramatically in the past ten years

Atlantic Ocean

The previous CITES proposal (CoP15 Prop. 15) cited Carlson et al. *(2005) regarding a time series analysis conducted since 1995 that suggested that the Northwest Atlantic population may be stabilised but at a very low level. However, Carlson* et al. *(2005) also suggest that these populations may have possibly "increased from mid-1990s levels" but this text was omitted from the proposal.*

Supporting Statement (SS)	Additional information
as a result of over-exploitation, leading to a halt in the Belize-based shark fishery. However, the pressure is still sustained by fishers entering Belizean waters from Guatemala. In the southwest Atlantic Ocean off Brazil, data from fisheries targeting hammerhead sharks indicate bottom gillnet CPUE declined by 80% from 2000-2008. The targeted hammerhead fishery was abandoned after 2008 because the species had become rare. However, nominal CPUE from commercial fishing logbook data of the hammerhead shark complex caught by the Brazilian tuna longline fleet from 1978-2007 indicated a relatively stable trend (in table above) and this indicated that declines may be more severe in coastal areas where *S. lewini* are more common. In the southeast of Brazil the catch statistics include *S. lewini* and *S. zygaena* into the category of ñhammerhead sharksò, of which about 80% are *S. lewini*. CPUE reductions (kg/trip) of 96% and 93% were observed for this ñcategoryò from bottom gillnet and longline vessels, respectively, in the State of Santa Catarina, south of Brazil. Industrial landings of the hammerhead shark complex (mainly *S. lewini* and *S. zygaena*) in the State of Santa Catarina, south of Brazil, were of 6.7 t in 1989, coming to a peak of 570 t in 1994, due to the fast development of net fishing. Later a decrease occurred to 202 t in 1998, 353 t in 2002 and 381 t in 2005. Lastly, in 2008, production reached only 44 t without ever recovering any more to the levels of 1994. Observations of landings at the industrial fisheries in the port of Rio Grande (Rio Grande do Sul State) between June 2002 and July 2003, found that *S. zygaena* occurred in 25% of the landings of the gillnet fleet and 9% of the seines. However, the CPUE of the hammerhead sharks caught in gillnets diminished drastically, declining from 0.37 t per trip in 2000 to 0.13 t per trip in 2002. Utilising analysis of covariance models and generalised linear models applied to gill-net fishing along the south coasts of Brazil, a decline of over 80% in catch and CPUE of the hammerhead sharks complex was found during the period of 1995 to 2005.	
Pacific Ocean In Mexico, populations, catches and landings of various shark populations have diminished; shark catches indicate a sustained decline in the last ten years. The general trend of production of sharks in the states of Sinaloa and Sonora oscillates, with a clear negative trend. In Sonora, a maximum of 7000 t were caught in 1980, declining to 3000 t in 2000, while in Sinaloa a maximum of 5000 t were caught in	***Pacific Ocean*** *Many of the countries with the highest landings of sharks and rays currently and historically are nations in the Indian Ocean and Indo-Pacific region and while this area has the least available data, it is also an area where declines may have been particularly high (Harry* in litt., *2012.).*

Supporting Statement (SS)	Additional information
1980, declining to 1500 t in 2000. In Ecuador, catch records for combined *S. lewini*, *S. mokarran*, and *S. zygaena* indicated a peak in landings of approximately 1000 t in 1996, followed by a decline through 2001.	
Indian Ocean For the Indian Ocean, there is a lack of available data, no quantitative stock assessment, and no fishery indicators for *S.lewini.* As a result, the stock status is highly uncertain. Often taken in a range of fisheries in the Indian Ocean, *S. lewini* are vulnerable to these fisheries, particularly the gillnet fishery. Inshore fisheries often exploit the pups found in the shallow coastal nursery grounds. If current fishing effort is maintained or increased, further declines in biomass and productivity will occur.	**Indian Ocean** *Dudley and Simpfendorfer (2006) found that the CPUE of* S. lewini *in the KwaZulu Natal bather protection programme decreased significantly over a 25-year period.*
B) Regulation of trade required to ensure that harvest from the wild is not reducing population to level where survival might be threatened by continued harvest or other influences	
Catches of sphyrnids have been reported in the FAO statistics, but only the S.lewini and *S. zygaena* are reported as individual species; most of the catch is reported at the family level, and many countries have only recently begun reporting data. Catches of *S. lewini* are often amalgamated as *Sphyrna spp.* with *S. zygaena*. Despite their distinctive head morphology, hammerheads are largely underreported; discrepancies are evident when compared to trade statistics. The FAO database reports hammerheads in three categories: "Hammerhead Sharks," "Smooth Hammerhead," and "Scalloped Hammerhead." Reported worldwide landings for 2000-2010 increased between 2000 and 2002, decreased about 20% in 2003 and 2004, and then doubled from 2004 to 2005 to over 3750 t. An upward trend continued to a peak of 5486 t in 2007 and then decreased slightly through 2009 to 4900 t 2010 was a record year.	
<u>Trade</u> *S. lewini* are subject to target and non-target fisheries driven by the international demand for their high value fins. They are highly valued because of the fin size and high fin ray count. International shark trade information is not documented at species level for sharks in the Harmonized Commodity Description and Coding System (Harmonized System); therefore, specific information about overall quantities or value of imports or exports is not available. International trade of *S. lewini* products is unregulated. However, using commercial data on traded weights and sizes of fins, the Chinese category for Hammerhead Shark fins, coupled with DNA and Bayesian statistical analysis to account for missing records, a study has estimated that between 1.3 and	*<u>Trade</u>*

Supporting Statement (SS)	Additional information
2.7 million sharks of *S. lewini* and *S. zygaena*, equivalent to a biomass of 49 000ï 90 000 t, are taken for the fin trade each year.	
An assessment of the Hong Kong shark fin market has revealed that various Chinese market categories contain fins from hammerhead species (*S. lewini* and *S. zygaena* in an approximately 2:1 ratio, respectively). It has been reported that traders stated that hammerhead fins were one of the most valuable fin types on the market ï between USD88/kg and USD135/kg for unprocessed fins in 2003. More recently, hammerhead fins from the European Union (EU) sold to Asian ports for 27.50 ú/kg (~ USD100/lb) (2010). Together, *S. lewini, S. mokarran,* and *S. zygaena* account for nearly 6% of the identified fins entering the Hong Kong shark fin market. News reports from May 2012 report that DNA tests of shark fins in Taiwan POC by the Fisheries Agency identified Scalloped Hammerhead fins in Taiwanese fish markets. Mitochondrial control region (mtCR) sequences have been used to trace the broad geographical origin of 62 Hong Kong market-derived *S. lewini* fins; of these fins, 21% were derived from the western Atlantic. A sample of *S. zygaena* fins sourced from the Hong Kong shark fin market have been shown to derive from the Indo-Pacific and eastern and western Atlantic Ocean basins.	*The 2:1 ratio is specifically for the category "Chun chi" (Clarke in litt., 2012.), not "various Chinese market categories":*
Hammerhead flesh is used for meat in some regions, most particularly in Europe, with northern Italy and France as the major consuming countries and Spain as the worldôs largest exporter of shark meat. Imports of hammerhead meat from the Seychelles to Germany have been noted. Although trade information is not documented to species, it has been indicated that hammerhead shark meat was a favoured imported species for meat in countries like Spain and Japan and that Uruguay indicated exports of hammerhead meat to Brazil, Spain, Germany, Netherlands and Israel. However, while the current volume of traded meat and other products specific to hammerheads is unknown, it is likely that this amount is insignificant when compared to the volume of fins in trade.	*Hammerhead meat is also consumed in Mexico and many parts of Latin America (Sosa-Nishizaki* in litt., *2012).* *Hammerhead products were imported in to the USA between 2000 and 2012 (LEMIS Database 2012). The major items are documented here:* S. lewini: *1008 bones (possibly jaws) and 1900 teeth for commercial purposes* S. mokkaran*: six items and 1215 kg bones (possibly jaws) and 179 teeth, mainly for commercial purposes, and 3000 items for personal medicinal use* S. zygaena: *49 862 teeth and 3237 bones (possibly jaws) for commercial purposes*

Inclusion in Appendix II to improve control of other listed species

A) Specimens in trade resemble those of species listed in Appendix II under Res. Conf. 9.24 (Rev. CoP15) Annex 2 a or listed in Appendix I

Two of the species proposed for inclusion in Appendix II have been proposed on the basis of look-alike issues: *S. mokarran* (Great Hammerhead) and *S. zygaena* (Smooth Hammerhead) because their fins are morphologically similar to *S. lewini* and may be difficult to distinguish in trade.	*A large volume of fins (over half by weight) traded in unstudied and often non-specific categories could not be characterised (Clarke* et al., *2006, as cited in IUCN and TRAFFIC 2010), indicating that much of the trade consists of relatively indistinct fins. It is also unknown how the other* Sphyrna *spp. and* Eusphyrna *spp. are categorised in the markets and how to tell them apart (Clarke* in litt.*, 2012.).*
While identification of hammerhead sharks by species may be difficult, the distinction between hammerheads and other shark species, including the fins can be done. Fin traders in the Hong Kong market are able to identify hammerhead fins from other	*Although professional fin processors and traders may be able to sort visually many fins to species, this does not occur until late in the trade chain and certainly occurs after Customs would be officially required to identify fins to species (Sant, 2009, as*

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shark fins sorting *S. lewini* and *S. zygaena* fins together and *S. mokarran* fins separately from other shark fins. It was demonstrated that fins from ñchun chiò were 96% accurately identified as *S. lewini* or *S. zygaena* shark fins, and fins from ñgu pianò were 86% accurately identified as *S. mokarran* fins by fin traders. The majority of the hammerhead fins that were misidentified were found to be of another species of hammerhead, demonstrating that fin traders are able to differentiate between hammerhead fins and other shark species, but not always to the species level.	*cited in IUCN and TRAFFIC 2010). Also, it may not be possible to distinguish these fins from other* Sphyrna *spp. and* Eusphyrna *spp. (Clarke* in litt.*, 2012.).*
An assessment of the Hong Kong shark fin market has revealed that various Chinese market categories contain fins from hammerhead species (*S. lewini* and *S. zygaena* in an approximately 2:1 ratio, respectively) and together, *S. lewini, S. mokarran,* and *S. zygaena* account for nearly 6% of the identified fins entering the Hong Kong shark fin market.	*The 2:1 ratio is specifically for the category "Chun chi" (Clarke,* in litt.*, 2012), not "various Chinese market categories":*
According to a fin identification guide (provided in the proposal), hammerhead fins can be distinguished from other shark fins as they have a uniform light brown colour and the fin is considered ñtallò. To further confirm identity, a PCR-based assay has been published for hammerhead sharks and DNA tests are also available. Additionally, because of the difficulty in identification of some hammerhead species, catches of *S. lewini* are often amalgamated with *S. mokarran* and *S. zygaena*. A cryptic lineage of Scalloped Hammerheads has been identified and is likely to have entered trade as well since it is sympatric with *S. lewini* in the western Atlantic. As fins in trade, *S. mokarran* and *S. zygaena* fins are morphologically similar to *S. lewini*. Fins from all three species are thin and falcate with the dorsal fin height longer than its base.	*The previous CITES proposal (CoP15 Prop. 15) for hammerheads included two additional species—the Sandbar Shark* Carcharhinus plumbeus *and the Dusky Shark* Carcharhinus obscurus*—as additions to Appendix II on the basis of look-alike issues. These have not been included in the present proposal. The previous proposal stated that as fins in trade, hammerhead fins, along with those of* C. plumbeus *and* C. obscurus*, were morphologically similar to those of* S. lewini*. It was also shown* C. plumbeus *and* C. obscurus *experienced declines from unexploited levels of 64-71% and at least 80%, respectively.*

Other information

Threats

S. lewini The principal threat to adults, juveniles and neonates is from over-exploitation in by-catch and target fisheries, as well as at-vessel mortality in industrial, artisanal and recreational fisheries. This threat is widespread throughout Exclusive Economic Zones (EEZs) and in multinational fisheries on the high seas This species is highly desired for the shark fin trade because of the fin size and high fin ray count. *S. lewini* is a preferred species for production of leather and liver oil. There is utilisation of jaws and teeth as marine curiosities. In some countries, shark fins are	

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retained for local consumption. Other types of *S. lewini* products, including skin, liver oil, cartilage, and teeth, are not traded in large quantities or are not separately recorded in trade statistics. Habitat degradation and pollution affect coastal ecosystems that juvenile *S. lewini* sharks occupy during early life stages. However, the effects of these changes and their ultimate impact on populations of *S. lewini* are currently unknown. <u>*S. mokarran*</u> There is a regular directed fishery for *S. mokarran* in India. Meat is used for human consumption fresh, frozen, dried, salted or smoked. The liver is used for oil, the fins for soup, the hide for leather, and the carcass for fish meal. Fins have very high market demand. <u>*S. zygaena*</u> *Sphyrna zygaena* is caught with pelagic longlines and gillnets. It is utilised fresh and dried/salted/smoked for consumption; the liver oil is used for vitamin extraction, the fins for the oriental fin trade, offal for fishmeal, and the hide for leather. Hide, fins and cartilage are exported. <u>Species complex</u> Hammerhead sharks have been documented in illegal, unreported, and unregulated (IUU) fishing activities including 120 longline vessels in the Western Indian Ocean, Brazil, northern Australia, the Galapagos, Colombia, Palau, and the Marshall Islands (not an exhaustive list). Furthermore, an assessment on illegal hammerhead shark fishing (non-declared nor regulated) extracted from the available literature found *Sphyrna* spp. and Silky Shark *Carcharhinus falciformis* to be the most frequently cited species taken in illegal fishing. Although hammerhead meat is considered unpalatable because of high urea concentrations, some harvest for meat, usually for local consumption (Mexico, Mozambique, Philippines, Seychelles, Spain, Sri Lanka, Taiwan POC, China , Tanzania, and Uruguay). The aggregating behaviour of hammerheads makes them very vulnerable to capture.	
<u>Conservation, management and legislation</u>	
<u>National</u> Fins attached/total weight of shark fins landed or found onboard to not exceed 5% of total weight of shark carcasses: Australia; Brazil (*S. lewini* and *S. zygaena* listed	

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specifically) ï all operating vessels in Brazilian waters; Canada; Cape Verde; Chile; Colombia (*S. lewini*) ï in Colombian waters; Costa Rica; Ecuador; Egypt; El Salvador; European Union; French Polynesia; Honduras (all sharks); Israel; Japan; Mexico; Morocco; Namibia; Nicaragua; Oman; Palau; Panama; Seychelles; South Africa; Taiwan POC; Venezuela; US. An increasing number of States have prohibited shark fishing in their waters but the benefit of these prohibitions has not been established. Additional Policies US ï quotas, limited entry, time area closures and recreational bag limits for all three species US ï stock assessment of *S. lewini* in 2011 has a 2 year deadline to implement a rebuilding plan to end overfishing US ï prohibit retention of all three species caught in association with ICCAT fisheries US ï catch of hammerhead sharks is prohibited in US Atlantic pelagic longline fishery US ï quota for other US Atlantic fisheries catching hammerheads US ï Endangered Species Act listing is currently being considered Ecuador ï prohibits fin export from Ecuador but implication is that there is not illegal trade via Peru and Colombia EU ï prohibits catch of hammerhead sharks throughout the ICCAT convention area Brazil ï Minimum size policy for *S. lewini* and *S. zygaena* Morocco ï logbook requirements, prohibition on oil extraction Spain ï prohibition on capture of *S. lewini* Mexico ï utilisation of *S. lewini* is regulated Mexico ï prohibition on gillnets from vessels of medium and high height from fishing for hammerheads in Mexican waters Senegal ï a size limit for the Scalloped hammerhead shark (*Sphyrna lewini*) is being proposed <u>International</u> Hammerheads are listed in Annex I of UNCLOS *Sphyrna lewini* has been included in Appendix III of CITES by Costa Rica, entering into force in September 25 of 2012. Prohibited to retain onboard, tranship, land, store, sell or offer for sale any part of whole carcass of any hammerhead shark within family Sphyrnidae within the fisheries covered by the Convention area of ICCAT (except *S. tiburo*). Developing coastal States are exempt from this prohibition but they are to ensure that hammerhead sharks do not enter into international trade.	*Mexico—prohibition on gillnets from vessels of medium and large size from fishing for all sharks in Mexican waters (Sosa-Nishizaki* in litt.*, 2012).*

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Many RFMOs have adopted finning bans which require full utilisation of captured sharks and encourage the live release of incidentally caught sharks though enforcement varies. Eight member countries of the Central American Integration System (SICA; Belize, Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua and Panama) prohibit shark finning. This applies to domestic and foreign vessels that catch and land sharks in SICA countries, but also to vessels fishing in international waters that fly the flag of a SICA country. Members can only permit landing sharks when fins are still naturally attached to the whole body or to a portion of the shark body.	<u>*International*</u> *While prohibitions on finning have recently been established by a number RFMOs, the effectiveness of these prohibitions to reduce shark catch has not been definitively demonstrated and a number of loopholes can remain that allow nations to continue this practice. For example, in the WCPFC (Clarke* et al., *2012), coastal nations are allowed to establish their own alternative measures in their EEZ, and implementation of the prohibition is the responsibility of the coastal state: of all 32 WCPFC members, only half had confirmed full implementation of the finning prohibition and few were able to provide information on the degree of compliance. Furthermore, in the WCPFC there is evidence that even if a prohibition was fully implemented it would not actually lead to a reduction in catch.* *Alternatively, some RFMOs have established prohibitions on the retention of sharks. While these measures "are likely to reduce shark mortality to a greater extent than finning prohibitions, gear-retrieval practices can have a large effect on shark mortality…It would therefore not be correct to assume that no retention will result in no mortality" (Clarke* et al., *2012).*
<u>Captive Breeding/Artificial Propagation</u>	
<u>Other comments</u>	
The recent observation in the western North and South Atlantic Oceans of a rare hammerhead shark closely related to but evolutionary distinct from *S. lewini* suggests that this new lineage had been previously combined in catch data and assessments with *S. lewini* - as a result, populations may be lower than previously reported. Adult aggregations of *S. lewini* are common at seamounts, especially near the Galapagos, Malpelo, Cocos, and Revillagigedo Islands, and in past times within the	*Hammerheads are known to suffer high mortality from capture. Estimated online mortality of* S. lewini *in the North Atlantic was 91.4% (Morgan and Burgess, 2007, as cited in IUCN and TRAFFIC 2010). Therefore mandates for live release are not likely to be sufficient to offset captures to conserve hammerhead populations (Camhi* et al., *2009, as cited in previous proposal analysis).* *Populations of hammerhead sharks are, like populations of many other species of shark, highly structured spatially by both size and sex. Indeed, for* S. lewini *in*

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Gulf of California. In the nursery zones (<10 m) south and southeast of Brazil the aggregating newborn are intensively fished through coast gillnets, prawn trawls and pair trawls, as well as recreational capture. Males are found to disperse long distances, but female *S. lewini* show no evidence of trans-oceanic movement, instead displaying site fidelity to certain coastlines or nursery areas. As a result, males help to facilitate gene flow but females define the mitochondrial lineage for *S.lewini*, which has been found to be discrete with a traceable point of origin. Thus, females are critical to sustaining or rebuilding the *S. lewini* populations. Consequently, recovery is dependent on the reduction of fishing pressure on these female sharks. Furthermore, a highly female-biased harvest has been found in the Great Barrier Reef of Australia of *S. mokarran*. Female-biased harvest likely exacerbates the status of the species there.	*particular, males, females and juveniles have often been observed to reside in entirely different areas. This has made it difficult to document the complex life cycles of these species, whose behaviour may involve migrations between discrete nursery habitats and pelagic or meso-pelagic habitats spanning multiple government jurisdictions. For instance, within a single Australian net fishery in northern Australia Harry* et al. *(2011) documented a strongly male biased sex-ratio for* S. lewini *but a strongly female biased sex ratio was observed for* S. mokarran. *In nearby Indonesia, where* S. lewini *forms a genetically-contiguous stock with northern Australia, females were also five times more likely to be caught than males (White* et al.*, 2008).*
A fin guide exists for the identification of the fins in trade.	*However, some species that are potential look-alike species are not covered in the fin guide (Clarke,* in litt., *2012.).*

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References:

Anislado-Tolentino, V. and Robinson-Mendoza, C. (2001). Age and growth for the scalloped hammerhead shark, *Sphyrna lewini* (Griffith and Smith, 1834) along the Central Pacific coast of Mexico. *Ciencias Marinas* 27:501ï 520.

Arauz, R., Cohen, Y., Ballestero, J., Bolaños, A. and Pérez, M. (2004). Decline of Shark Populations in the Exclusive Economic Zone of Costa Rica. *International Symposium on Marine Biological Indicators for Fisheries Management.* UNESCO, FAO. Paris, France. March, 2004.

Baum, J., Clarke, S., Domingo, A., Ducrocq, M., Lamónaca, A.F., Gaibor, N., Graham, R., Jorgensen, S., Kotas, J.E., Medina, E., Martinez-Ortiz, J., Monzini Taccone di Sitizano, J., Morales, M.R., Navarro, S.S., Pérez-Jiménez, J.C., Ruiz, C., Smith, W., Valenti, S.V. and Vooren, C.M. (2007). *Sphyrna lewini*. In: IUCN (2012). *IUCN Red List of Threatened Species.* Version 2012.2. <www.iucnredlist.org>. Viewed on 01 November 2012.

Camhi, M.D., Valenti, S.V., Fordham, S.V., Fowler, S.L. and Gibson, C. (2009). *The Conservation Status of Pelagic Sharks and Rays: Report of the IUCN Shark Specialist Group Pelagic Shark Red List Workshop*. IUCN Species Survival Commission Shark Specialist Group. Newbury, UK. x + 78 pp.

Capape, C., Diop, M., and N'Dao, M. (1998). Record of four pregnant females of the scalloped hammerhead, *Sphyrna lewini* (Sphyrnidae) in Senegalese waters. *Cybium* 22, 89-93.

Carlson, J.K., Baremore, I.E. and Bethea, D.M. (2005). The direct shark gillnet fishery, catch and bycatch 2004. National Marine Fisheries Service, Southeast Fisheries Science Center, PCB-05-01. Panama City, FL.

Casper, B.M., Domingo, A., Gaibor, N., Heupel, M.R., Kotas, E., Lamónaca, A.F., Pérez-Jimenez, J.C., Simpfendorfer, C., Smith, W.D., Stevens, J.D., Soldo, A. and Vooren, C.M. (2005). *Sphyrna zygaena*. In: IUCN (2012). *IUCN Red List of Threatened Species*. Version 2012.2. <www.iucnredlist.org>. Viewed on 01 November 2012.

Chen, C.T., Leu, T.C. and Joung, S.J. (1988). Notes on reproduction in the scalloped hammerhead, *Sphyrna lewini*, in northeastern Taiwan waters. *Fishery Bulletin* 86(2): 389-393.

Chen, G.C., Leu, T., Joung, S. and Lo. N.C.H. (1990). Age and growth of the Scalloped Hammerhead, S. lewini, in northeastern Taiwan waters*. California Wild* (formerly known as *Pacific Science*) 44(2):156ï 170.

Clarke, S.C., Magnussen, J.E., Abercrombie, D.L., McAllister, M.K. and Shivji, M.S. (2006). Identification of shark species composition and proportion in the Hong Kong shark fin market based on molecular genetics and trade records. *Conservation Biology* 20:201ï 211.

Clarke, S.C., Harley, S.J., Hoyle, S.D. and Rice, J.S. (2012). Population trends in Pacific Ocean sharks and the utility of regulations on shark finning. *Conservation Biology*, DOI: 10.1111/j.1523-1739.2012.01943.x

Clarke, S (2012). In litt. to the IUCN/TRAFFIC Analyses Team, Cambridge, UK.

Cortés, E., Arocha, F., Beerkircher, L., Carvalho, F., Domingo, A., Heupel, M., Holtzhausen, H., Neves, M., Ribera, M., and Simpfendorfer, C. (2009). Ecological Risk Assessment of pelagic sharks caught in Atlantic pelagic longline fisheries. *Aquatic Living Resources* 3:25-342.

de Bruyn, P., Dudley, S.F.J., Cliff, G. and Smale, M.J. (2005). Sharks caught in the protective gill nets off KwaZulu-Natal, South Africa. 11. The scalloped hammerhead shark *Sphyrna lewini* (Griffith and Smith). *African Journal of Marine Science* 27(3): 517-528.

Denham, J., Stevens, J., Simpfendorfer, C.A., Heupel, M.R., Cliff, G., Morgan, A., Graham, R., Ducrocq, M., Dulvy, N.D, Seisay, M., Asber, M., Valenti, S.V., Litvinov, F., Martins, P., Lemine Ould Sidi, M., Tous, P. and Bucal, D. (2007). *Sphyrna mokarran*. In: IUCN (2012). *IUCN Red List of Threatened Species*. Version 2012.2. <www.iucnredlist.org>. Viewed on 01 November 2012.

Doukakis, P., Hanner, R., Shivji, M., Bartholomew, C., Chapamn, D., Wong, E. and Amato, G. (2011). Applying genetic techniques to study remote shark fisheries in northeastern Madagascar. *Mitochondrial DNA*, 22(S1): 15-20.

Dudley, S.F.J. and Simpfendorfer, C.A. (2006). Population status of 14 shark species caught in the protective gillnets off KwaZulu-Natal beaches, South Africa, 1978-2003. *Marine and Freshwater Research* 57(2): 225-240.

Harry, A.V., Macbeth, W.G., Gutteridge, A.N. and Simpfendorfer, C.A. (2011). The life histories of endangered hammerhead sharks (Carcharhiniformes, Sphyrnidae) from the east coast of Australia. *Journal of Fish Biology* 78:2026-2051.

Harry, A.V., Tobin, A.J., Simpfendorfer, C.A., Welch, D.J., Mapleston, A., White, J., Williams, A.J., and Stapley, J. (2011). Evaluating catch and mitigating risk in a multi-species, tropical, inshore shark fishery within the Great Barrier Reef World Heritage Area. *Marine and Freshwater Research* 62: 710-721.

Harry, A. (2012). In litt. to the IUCN/TRAFFIC Analyses Team, Cambridge, UK

Hazin, F., Fischer, A. and Broadhurst, M. (2001). Aspects of reproductive biology of the scalloped hammerhead shark, *Sphyrna lewini*, off northeastern Brazil. *Environmental Biology of Fishes* 61(2): 151-159.

ICCAT (2012). Report from the 2012 Shortfin mako stock assessment and ecological risk assessment meeting. Olhao, Portugal.

IUCN and TRAFFIC (2010). *IUCN/TRAFFIC Analyses of the Proposals to Amend the CITES Appendices*. Prepared by IUCN Species Programme, SSC and TRAFFIC for the Fifteenth Meeting of the Conference of the Parties to CITES. IUCN, the International Union for Conservation of Nature, Gland, Switzerland.

Kotas, J.E., Mastrochirico, V. and Petrere, M. (2011). Age and growth of the Scalloped Hammerhead shark, *Sphyrna lewini*, from the southern Brazilian coast. *Brazilian Journal of Biology* 71:755-761.

Morgan, A. and Burgess, G.H. (2007). At-vessel fishing mortality for six species of sharks caught in the northwest Atlantic and Gulf of Mexico. Gulf and Caribbean Research 19(2):1-7.

Oldfield, T.E.E., Outhwaite, W., Goodman, G. and Sant. G. (2012). Assessing the intrinsic vulnerability of harvested sharks. Draft JNCC report provided as an Information Document to CITES (the Convention on International Trade in Wild Species of Fauna and Flora) Animals Committee. http://www.cites.org/common/com/AC/26/E26-09i.pdf

Piercy, A.N., Carlson, J.K., Sulikowski, J.A. and Burgess, G. (2007). Age and growth of the scalloped hammerhead shark, S. lewini, in the north-west Atlantic Ocean and Gulf of Mexico. *Marine and Freshwater Research* 58: 34-40.

Piercy, A.N. (2012). pers. comm. to the IUCN/TRAFFIC Analyses Team, Cambridge, UK.

Sant, G. (2009). *In litt*. to IUCN/TRAFFIC Analyses Team, Cambridge, UK.

Soriano-Velásquez, S.R., Acal-Sánchez, D.E., Castillo-Géniz, J.L., Vázquez-Gómez, N.Y. and Ramírez-Santiago, C.E. (2006). *Tiburón del Golfo de Tehuantepec,* Pp.323ï 360. In: Arreguín-Sanchez, F., Beléndez-Moreno, L.F., Méndez Gómez-Humarán, I., Solana-Sansores, R., and Rangel-Dávalos (Eds). Sustentabilidad y Pesca Responsable en México. Instituto Nacional de la Pesca, SAGARPA, Mexico.

Sosa- Nishizaki, O. (2012). In litt. to the IUCN/TRAFFIC Analyses Team, Cambridge, UK.

White, W.T., Bartron, C. and Potter, I.C. (2008). Catch composition and reproductive biology of *Sphyrna lewini* (Griffith & Smith) (Carcharhiniformes, Sphyrnidae) in Indonesian Waters. *Journal of Fish Biology* 72: 1675-1689.