The Conservation Status of North American, Central American, and Caribbean Chondrichthyans

Edited by
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SHARK Specialist Group
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Acronyms

CITES – Convention on International Trade in Endangered Species of Wild Fauna and Flora

CMS – Convention on the Conservation of Migratory Species of Wild Animals

CPUE – Catch per unit effort

DW – Disc width

EEZ – Exclusive Economic Zone

FAD – Fish aggregating device

FAO – Food and Agriculture Organization of the United Nations

FMP – Fishery Management Plan

HMS – Highly migratory species

IATTC – Inter-American Tropical Tuna Commission

ICCAT – International Commission for the Conservation of Atlantic Tunas

IUCN – International Union for Conservation of Nature

NAFO – Northwest Atlantic Fisheries Organization

NMFS – National Marine Fisheries Service

NOAA – National Oceanic and Atmospheric Administration

NPOA – National Plan of Action for the Conservation and Management of Sharks

RFMO – Regional Fisheries Management Organization

SSC – Species Survival Commission of the IUCN

SSG – Shark Specialist Group of the IUCN SSC

TAC – Total allowable catch

TL – Total length

1 Introduction

Sharks and their relatives, including skates, rays, and chimaeras, are collectively termed chondrichthyan fishes (class Chondrichthyes). The skates and rays are known as batoids (superorder Batoidea) while the batoids and sharks together comprise the elasmobranchs (subclass Elasmobranchii).

The chondrichthyans are a relatively small (~1,150 described species), evolutionarily conservative group that has functioned successfully in diverse marine and aquatic ecosystems for over 400 million years. Despite their evolutionary success, many species are increasingly threatened with overexploitation as a result of their life history traits and the activities of humans.

1.1 The IUCN Species Survival Commission's Shark Specialist Group

The International Union for Conservation of Nature (IUCN) is the world's largest global environmental network. It is a membership union with more than 1,000 government and non-governmental member organizations and almost 11,000 volunteer scientists in more than 160 countries. The Species Survival Commission (SSC) is composed of 7,500 scientists, field researchers, government officials, and conservation leaders. The SSC established the Shark Specialist Group (SSG) in 1991 in response to growing awareness and concern of the severe impact of fisheries on chondrichthyan populations around the world.

1.2 The SSG's Red List Program

One of the SSG's central roles is the preparation of species assessments for the IUCN Red List of Threatened Species. The IUCN Red List is the world's most comprehensive inventory of the global status of plant and animal species. It uses a single standardized set of IUCN Red List Categories and Criteria to evaluate the extinction risk of thousands of species, subspecies and, subpopulations worldwide. Each assessment is supported by detailed documentation, including information on ecology, life history, distribution, habitat, threats, population trends, and conservation measures. The SSG's Red List Program aims to assess the Red List status of all chondrichthyan species.

This report provides a summary of the IUCN Red List assessment for each of the 282 described chondrichthyan species recorded from North American, Central American, and Caribbean waters. The report highlights those species of conservation concern (that is, those that were assessed as Critically Endangered, Endangered, Vulnerable, or Near Threatened) as well as identifying species assessed as Least Concern and Data Deficient. An overview of regional issues as well as management issues is also presented. This report is intended to support the development of research, conservation, and management priorities for the North American, Central American, and Caribbean regions.

2 Subregional Overviews

2.1 Northwest Atlantic

The Northwest Atlantic (NWA) Ocean subregion (often termed the Western North Atlantic, but for consistency with terminology in Red List assessments, Northwest Atlantic is used in this report) extends from the southeastern coast of Greenland at ~40°W longitude to 120°W in the Arctic waters north of Canada and southwards to the northern Gulf of Mexico. The subregion terminates at the United States/Mexico border. It thus includes part of the southeastern coast of Greenland, the eastern coasts of Canada and the U.S., and the U.S. Gulf of Mexico coast. This subregion fully overlaps FAO Major Fishing Area 21 (Northwest Atlantic), the northern and western part of Area 31 (Western Central Atlantic), and the eastern part of Area 18 (Arctic Sea). It therefore should be noted that the Northwest Atlantic subregion as defined here does not match completely the FAO defined region of the same name.

The NWA subregion supports 158 species of chondrichthyans (56.0% of the regional fauna) from 39 families, comprising 24 families of sharks (88 species), 13 families of batoids (66 species), and 2 families of chimaeras (4 species). Within the subregion, diversity increases from north to south. In Canadian Atlantic waters, elasmobranch abundance and diversity are relatively low (Scott and Scott 1988; Kulka and Mowbray 1998; Joyce 1999), with diversity increasing progressively through U.S. waters and into the northern Gulf of Mexico.

Species productivity varies in this subregion with some elasmobranchs exhibiting very slow growth and late maturation whereas others are substantially more productive. For example, the Dusky Shark (*Carcharhinus obscurus*) grows slowly (von Bertalanffy K=0.039/year), possesses a three-year reproductive cycle and reaches maturity at 19 years (Natanson *et al*. 1995; Romine *et al*. 2009). These life history parameters translate to intrinsic rates of population increase (r) of 0.018/year (Romine *et al*. 2009). Conversely, the Atlantic Sharpnose Shark (*Rhizoprionodon terraenovae*) in the Gulf of Mexico grows rapidly (von Bertalanffy K=0.73/year), reaches sexual maturity at two years and reproduces annually (Carlson and Baremore 2003).

In general, overfishing is the primary threat to elasmobranchs in NWA waters. Habitat loss and environmental change can also affect species especially those that have juvenile stages in coastal areas. Coastal habitat degradation and losses of inshore areas are most prominent in the U.S. For example, increases in coastal development, especially in estuarine lagoons and riverine systems, in southern Florida could negatively affect the recovery of Smalltooth Sawfish (*Pristis pectinata*).

Elasmobranch fisheries in the NWA primarily employ trawls, gillnets, and longlines, as well as recreational hook-and-line gear. Many species are also taken incidentally as bycatch in fisheries targeting other species. Meat is generally consumed locally, whereas fins are exported to Asian markets. European demand for meat is a primary driver of U.S. and Canadian fisheries for Spiny Dogfish (*Squalus acanthias*) and skates (family Rajidae). There is a directed fishery for Thorny Skate (*Amblyraja radiata*) on the Grand Banks and a mixed fishery for skates in U.S. waters. Both countries also have substantial recreational fisheries for many species of sharks, especially pelagic species toward the U.S./Canada border, and smaller coastal species toward the southern U.S. Unintended bycatch is also an important sources of elasmobranch mortality in some fisheries, especially those employing trawls and gillnets, from which batoids and dogfish are often discarded dead.

U.S. Atlantic sharks were initially assessed and managed under three categories: large coastal, small coastal, and pelagic, based on known life history, habitat, market value, and fishery characteristics (NMFS 1993). The large coastal grouping included the slow growing, long lived species, whereas the small coastal complex included relatively fast growing and short lived species. Initial stock assessments of these groups indicated that several targeted large coastal shark populations were below the biomass level needed to maintain Maximum Sustainable Yield (MSY) while less exploited small coastal shark populations were assumed to be above the biomass associated with MSY. Subsequently, individual stock assessments for a number of species have found declines of up to 80% from virgin unfished conditions for Dusky Shark (Cortés *et al*. 2006), Porbeagle (*Lamna nasus*) (Campana *et al*. 2001), and Scalloped Hammerhead (*Sphyrna lewini*) (Hayes *et al*. 2009), whereas Blacktip Shark (*C. limbatus*) and Bonnethead Shark (*S. tiburo*) have declined between 20 and 40% from unfished virgin conditions (NMFS 2006).

Population declines for these and other NWA shark and batoid populations were a result of the lack of elasmobranch fishing limits prior to the 1990s. Whereas relatively comprehensive fisheries management is now in place for most NWA elasmobranch species taken regularly by U.S. and Canadian fisheries, rebuilding periods for several species span decades (a century or more for Porbeagle and Dusky Sharks) (NOAA 2011a), bycatch hinders the rebuilding of several prohibited species, and the absence of international limits hampers domestic pelagic shark measures. See the Management Section for details of conservation and management measures relevant to the NWA subregion.

2.2 Western Central Atlantic

The Western Central Atlantic (WCA) Ocean subregion encompasses the Caribbean region south of the United States/Mexico border, and thus includes the southern part of the Gulf of Mexico, extending to the Bahamas in the north and east, the Greater and Lesser Antilles, Central America, and the northern coast of South America eastwards to the Venezuela/Guyana border. This subregion is encompassed by the Caribbean Large Marine Ecosystem (~3.3 million km^2) and FAO Major Fishing Area 31 (Western Central Atlantic), which measures some 14.6 million km^2, although that area extends north, south, and east of the subregion treated here. It therefore should be noted that the Western Central Atlantic subregion as defined here does not match completely the FAO defined region of the same name. This subregion includes and is bordered by 38 sovereign states, including Mexico, the Central American countries of Belize, Guatemala, Honduras, Nicaragua, Costa Rica, and Panama, many Caribbean states, and the South American countries of Colombia and Venezuela (but does not include the U.S. and Bermuda).

The WCA subregion supports 151 species of chondrichthyans (53.5% of the regional fauna) from 35 families, comprising 20 families of sharks (85 species), 13 families of batoids (62 species), and 2 families of chimaeras (4 species).

Shark landings data in the WCA consist of a mixture of data reported to FAO by countries and Contracting and non-Contracting Parties to the International Commission for the Conservation of Atlantic Tunas (ICCAT) and the Western Central Atlantic Fishery Commission (WECAFC), and from localized artisanal landings collected by scientists or fisheries officers. Elasmobranch fisheries in the WCA subregion are generally characterized by limited information on catch-effort and landings, particularly at the genus or species level. Landings reported to FAO are dominated by epipelagic species that include a range of carcharhinid species similar to the Northwest Atlantic subregion. Landings of sharks and rays were estimated at 6,344 metric tons (t) in 2006, a decline from a peak of 11,644 t estimated for 1990 (Sea Around Us Project 2011).

The WCA subregion encompasses several of the most productive and prolific of elasmobranchs, and some of the longest lived species. The Caribbean Sharpnose Shark (*Rhizoprionodon porosus*), similar in size and fecundity to its Atlantic counterpart, the Atlantic Sharpnose Shark (*R. terraenovae*), comprises a large proportion of nearshore shark captures in Belize and anecdotally in the Western Caribbean (Graham 2007). In Venezuela, nearshore captures are dominated by the Blacktip Shark (*Carcharhinus limbatus*) and the Caribbean Reef Shark (*C. perezi*) (Tavares 2009). Offshore captures in Mexico are dominated by the Silky Shark (*C. falciformis*) (Bonfil 2008), and in Venezuela, a decadal dataset (1994–2003) of the longline fisheries recorded (by order of importance) landings of the Blue Shark (*Prionace glauca*), Night Shark (*C. signatus*), Silky Shark, Great Hammerhead (*Sphyrna mokarran*), and the Shortfin Mako (*Isurus oxyrinchus*) (Tavares and Arocha 2008). These large, mostly pelagic species possess relatively slow growth and low intrinsic rates of population increase. The subregion also possesses one of the most iconic, prolific, and long lived elasmobranchs: the highly migratory Whale Shark (*Rhincodon typus*), with 300 pups documented with the capture of one female (Joung *et al.* 1996) and a lifespan that may reach 60–100 years (Pauly 2002).

Overfishing represents the primary threat to chondrichthyans in the WCA, although extensive coastal developments are reportedly damaging critical nursery and pupping grounds. Within the greater Caribbean region, commercial shark fishing first developed in the U.S. Caribbean and expanded to Cuba. After 1945, shark fishing expanded further in the region, in response to a wartime United Nations-sanctioned and U.S.-based demand for shark liver oil (for Vitamin A), leather, meat, and fins (Thompson 1944; AACC 1945; Springer 1950). As early as 1949, Western Atlantic tropical shark fisheries were considered less productive than those in temperate waters (Springer 1950), yet were still considered underdeveloped in countries such as Belize (Dres 1964) and along the Guyana-Panama continental shelf. Shark fisheries in this particular area went on to yield 7,000 t in 1969 (Juhl 1971). Following production of synthetic Vitamin A after World War II, shark fishing in the WCA increased to supply the rising demand for 'white meat' during the Catholic Lenten season as well as the Asian fin market. In Belize, demand for shark fins is documented as far back as 1944 (Thompson 1944). Targeted shark fisheries along the Atlantic coast of Mexico rapidly expanded in the 1970s and 1980s (Bonfil 1997). In Venezuela, peak elasmobranch landings (18,000 t) were recorded annually during 2007–2008 with sharks representing the majority of landings (72%) versus rays (28%) (Tavares and Lopez 2009).

Limited landings data available from shark fisheries throughout the Caribbean has made population estimates and assessments of decline difficult. Anecdotal information derived from a handful of reports, publications (Thorson 1976), and surveys conducted with patriarch fishers (Heyman and Graham 2000a; 2000b; 2000c; 2007) strongly suggests a decline in both abundance and sizes of species, as well as distributional shifts, and the local extinction of some species (Graham 2007). In Belize, fishers reported dramatic declines in shark catches in the late-1980s and early-1990s that mirrors regional trends. Reduced shark catches resulted in a shift to increased targeting of mixed finfish and elasmobranchs (Graham 2007).

Surveys of fishers suggest a local extinction of the two species of sawfish recorded for Belize, the Largetooth Sawfish (*Pristis perotteti*) and the Smalltooth Sawfish (*P. pectinata*), and distributional shifts of other large and less

resilient species. Both sawfishes were formerly abundant in the region and captured for meat, fins, and the curio trade, yet were declining dramatically in the 1970s and 1980s due to overfishing (Thorson 1982); they are no longer encountered throughout several countries in Central America including Belize and Guatemala (Graham 2007). Overexploitation of the Great Hammerhead, Bull Shark (*C. leucas*), and the Lemon Shark (*Negaprion brevirostris*) in coastal waters has shifted distributions of these species to the barrier reef while the Blacktip Shark and the smaller Caribbean Sharpnose Shark have populated the vacated coastal niches and now represent the majority of shark captures in nearshore waters (R.T. Graham unpublished data).

Chapman *et al*. (2009) recently linked fins from the Scalloped Hammerhead (*S. lewini*) sampled in Hong Kong markets with populations occurring in the WCA, confirming that Asian markets are driving forces in the subregion's modern shark fisheries. Evidence of finning (taking the fins and discarding the carcass at sea), however, is lacking and suggests that utilization of the whole shark continues to be the norm.

Modern shark fisheries in the WCA generally operate at the small-scale artisanal and commercial level. Shark fishing occurs most frequently in nearshore coastal waters with occasional large-scale trips to productive banks. The majority of shark fishing boats in the WCA are open skiffs of <8 m long with outboard engines designed for short fishing trips of 1–3 days. A smaller fleet of vessels up to 20 m in length undertake longer trips of 10–15 days (Bonfil 1997; Graham 2007). Shark fishing gears include hook-and-line, gillnets (set and drift), baited large-mesh (14 inch) silk weave nets, longlines, and occasionally harpoons.

Studies on Caribbean shark fisheries, and the spatial ecology and behavior of elasmobranchs are increasing, but tend to be highly site-specific. Research has focused mostly on the more predictable or commonly encountered species in the region, including the Lemon Shark and the Caribbean Reef Shark in the Bahamas (Gruber 1982; 1988; Feldheim *et al*. 2001; Sundström *et al*. 2001; Brooks *et al*. 2011; Maljkovi and Côté 2011), reef-associated sharks (Pikitch *et al*. 2005; Chapman *et al*. 2007) and the Whale Shark in Belize (Heyman *et al*. 2001; Graham *et al*. 2006; Graham and Roberts 2007), the Giant Manta Ray (*Manta birostris*) (Graham *et al*. 2012) and the Whale Shark in Mexico (Graham 2007; de la Parra Venegas *et al*. 2011), and the Blacktip Shark and the Caribbean Reef Shark in Venezuela (Tavares 2008; 2009). Broad regional-scale studies are only recently becoming available such as the compiled observations from recreational divers suggesting very low abundance of sharks throughout the Caribbean with the exception of the Bahamas (Ward-Paige *et al*. 2010).

Elasmobranch-based ecotourism has increased in the WCA despite population declines and has been used to argue for the protection of sharks in specific sites or countries (e.g. Honduras, Mexico, Belize, and the Bahamas). The WCA (FAO Area 31) hosts economic activities focused on shark encounter tourism centered on eight species in at least 18 locations in seven countries (Gallagher and Hammerschlag 2011). Whale Shark tourism in Belize generated over US$3.7 million in 2002 (Graham 2004) and has increased regional advocacy for Whale Shark protection. Yet, tourism has not proven a perfect substitute for shark fishing in many communities due to socio-cultural, educational, infrastructural, and economic barriers that have prevented many fishers from entering into and/or profiting from shark tourism and thereby valuing live sharks.

Due to the large number of sovereign states and diversity of governance and capacities, the WCA subregion is characterized by a patchwork of measures providing variable degrees of management for chondrichthyans. See the Management Section for details of conservation and management measures relevant to the WCA subregion.

2.3 Northeast Pacific

The Northeast Pacific (NEP) Ocean subregion (often termed the Eastern North Pacific, but for consistency with terminology in Red List assessments, referred to as Northeast Pacific in this report) extends from ~65°N, 175°W to ~32°N, 117°W, or from just south of the Bering Strait eastwards along the Eastern Bering Sea continental slope to the Gulf of Alaska, and southwards along the continental landmass of North America to the California, United States/Mexico border. It thus includes Alaska and the western coasts of Canada and the contiguous U.S. (Washington State to California). This area includes most of FAO Major Fishing Area 67 (Northeast Pacific) and the northeastern portion of Area 77 (Eastern Central Pacific) from Cape Mendocino, California (~40°30'N) to the Mexican border. It is important to note that the Northeast Pacific subregion as defined here does not match completely the FAO defined region of the same name. The area encompasses three Large Marine Ecosystems (LME); the Eastern Bering Sea LME, Gulf of Alaska LME, and the California Current LME. The fauna shifts from a boreal cold-temperate regime to a warm-temperate regime in the southern reaches of this subregion; the major change from cold to warm-temperate occurs at Point Conception, California.

The NEP subregion supports 73 species of chondrichthyans (25.9% of the regional fauna) from 32 families, comprising 20 families of sharks (40 species), 10 families of batoids (30 species), and 2 families of chimaeras (3 species). This subregion is one of the world's least diverse in terms of chondrichthyan fauna. The most diverse group of chondrichthyans in the NEP are the skates (from the families Arhynchobatidae and Rajidae) which have at least 19 species represented. The skates, especially in Alaskan waters, are poorly known taxonomically and it is likely that additional species will be described from this subregion. One genus (*Isistius*) and at least three species

(Cookiecutter Shark *I. brasiliensis*, Bull Shark *Carcharhinus leucas*, and Blacktip Shark *C. limbatus*) of tropical and subtropical sharks may occur within this subregion, but have not yet been confirmed as their distribution is uncertain. At least one additional chimaera, tentatively identified as *Hydrolagus* cf. *trolli*, has been observed by remote operated vehicles from very deepwater around seamounts off central and southern California (D.A. Ebert unpublished data).

The life history parameters of NEP chondrichthyans vary within the subregion based on environmental conditions and habitat preferences. Many of the smaller coastal elasmobranchs, for example, smoothhounds (*Mustelus* species), the Round Stingray (*Urobatis halleri*), and some of the larger pelagic species, mature relatively earlier (at six years or less) and grow faster than the larger coastal sharks and deepsea skates which grow very slowly and may not mature until 20 years or more (Yudin and Cailliet 1990; Ebert 2003; Ebert *et al*. 2009; Ainsley *et al*. 2011a). Female North Pacific Spiny Dogfish (*Squalus suckleyi*), a benthopelagic species, do not mature until ~35 years of age and may live for up to 100 years (Ebert 2003). The fecundity is also quite variable among species with some of the mackerel sharks (order Lamniformes) having relatively small litters of only two to four young per reproductive cycle, while for other species, for example, the Bluntnose Sixgill Shark (*Hexanchus griseus*) and the Whale Shark (*Rhincodon typus*), litters of 100 or more young are not uncommon (Ebert 2003).

With the exception of several northern Californian bays and estuaries (Ebert 1986; 1989; 2003; Ebert and Ebert 2005), NEP elasmobranch mating and nursery grounds are not well defined or understood. For offshore, open ocean, and deepsea species in particular, such critical habitats are virtually unknown. This information is needed to protect the habitats that are vital to the life cycle of NEP elasmobranchs.

Fisheries for elasmobranchs along the Pacific coast of North America extend back at least 4,000 years to the region's Indigenous coastal people (Ketchen 1986). Intense, directed elasmobranch fisheries began in the mid-1800s (Ebert 2003) and have since tended to be cyclic, with peaks followed by periods of relative inactivity. From the mid-1800s until the early part of the 20th century, most targeted shark fisheries were driven by demand for liver oil (used as lubricant), while flesh was used (fresh, dried, or salted) for human consumption and fins for soup. Beginning in the mid-1930s, a large and intense fishery targeted the Soupfin Shark (*Galeorhinus galeus*) and other shark species whose livers were high in Vitamin A. The fishery continued until the end of World War II when synthetic Vitamin A became available (Ripley 1946; Ebert 2003).

In 1975, the blockbuster movie *Jaws* awakened the public's fear of sharks. As was the case in many other regions, this fear led to another cycle of increased directed shark fishing in the NEP. The main species targeted were the Blue Shark (*Prionace glauca*), Shortfin Mako (*Isurus oxyrinchus*), thresher sharks (*Alopias* species), Pacific Angel Shark (*Squatina californica*), Soupfin Shark, and the Leopard Shark (*Triakis semifasciata*), as well as other common, mostly coastal, species. Batoids have generally been taken in much smaller numbers than sharks in directed fisheries, and yet fishing for batoids, especially skates, has increased substantially during times of shark fishery decline. An eradication fishery for the Basking Shark (*Cetorhinus maximus*) in Canadian waters between 1945 and 1970 (seen as a nuisance to salmon fisheries) is well documented (McFarlane *et al*. 2009). North Pacific Spiny Dogfish and Bat Rays (*Myliobatis californica*) have also been subjected to such practices in certain locations (Ketchen 1986; Ebert 2003).

The population status of most shark species off the Pacific coast of North America is relatively poorly known. Stock assessments have only been conducted on a few species, most of which are highly migratory (PFMC 2011a). There is relatively little information with respect to biology and population status for all other NEP chondrichthyan species.

Population assessments for the Blue Shark and the North Pacific Spiny Dogfish determined that these populations are not overfished and that populations of thresher sharks and the Pacific Angel Shark are recovering from overfishing. There has been no assessment of the Soupfin Shark population to track growth over the six decades since the end of the fishery.

NEP skates have been the subject of directed fisheries infrequently; they are caught in large numbers incidentally with larger species most frequently retained for market (Ebert *et al*. 2007; 2009; Haas 2008). The life history parameters of Pacific coast skates have only recently been examined in detail (Ebert 2005; Ebert *et al*. 2007; 2008; 2009; Davis *et al*. 2007; Ainsley 2009; Ainsley *et al*. 2011a; 2011b; Maurer 2009; Haas 2011; James 2011; Perez *et al*. 2011; Winton 2011). To date, stock assessments have been conducted for only the Longnose Skate (*Raja rhina*) (Gertseva 2009), while demographic models for an additional 12 skate species are being conducted (D.A. Ebert unpublished data).

Canada and the U.S. have developed management measures for some but not nearly all NEP chondrichthyans. The U.S. Pacific coast states and some Canadian cities have banned the sale of shark fins, although rules, exemptions, and capacity for enforcement vary, and action is too recent for effects to be analyzed. See the Management Section for details of conservation and management measures relevant to the NEP subregion.

2.4 Eastern Central Pacific

The Eastern Central Pacific (ECP) subregion extends west from the northern border of Mexico (~32°N) to 120°W, and then trends south to 5°N. The southern extent of this subregion ranges eastwards of 120°W to 79°52'W before extending in a northeasterly direction to terminate at the southern border of Panama (07°12'N, 77°53'W). The ECP subregion, for the purposes of this report, therefore encompasses the eastern portion of FAO Major Fishing Area 77 (Eastern Central Pacific) that occurs in the northern hemisphere, south of United States waters (Area 77 encompasses a large portion of the central Pacific Ocean, including the Hawaiian Islands; because this report focuses on the coasts and adjacent continental shelf and slope waters of North and Central America only, these parts of Area 77 are not covered). It therefore should be noted that the Eastern Central Pacific subregion as defined here does not match completely the FAO defined region of the same name. The following countries, arranged from north to south, are located in this subregion: Mexico, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, and Panama.

The ECP subregion supports 113 species of chondrichthyans (40.1% of the regional fauna) from 34 families, comprising 20 families of sharks (59 species), 12 families of batoids (51 species), and 2 families of chimaeras (3 species). Among these species, 25.9% have primarily temperate distributions that terminate in northern Mexican waters and 12.5% are restricted to deepwater regions. Considering the relatively high number of families present, the many varied habitats and faunal zones, and a general lack of taxonomic attention, the currently described chondrichthyan fauna probably under-represents the true diversity of this subregion. For example, recent research suggests cryptic speciation (sympatric species that are morphologically indistinct) of the Shovelnose Guitarfish (*Rhinobatos productus*) (Sandoval-Castillo *et al*. 2004) and the California Butterfly Ray (*Gymnura marmorata*) (Smith *et al*. 2009) in the Gulf of California. This phenomenon may be more widespread, as many coastal species that occur in temperate and subtropical waters of the Northeast and Eastern Central Pacific have reported ranges that extend through the tropics to Peru or Chile, but with little supporting evidence (Love *et al*. 2005). In addition, deepwater benthic habitats are relatively unexplored in the subregion and the associated fauna is not well known.

Life history parameters are poorly described for most chondrichthyans in the ECP, with the bulk of the available information originating from Mexican waters. The Blue Shark (*Prionace glauca*) appears to grow more slowly off Baja California Sur (von Bertalanffy K_{male} = 0.10/year; K_{female} = 0.15/year; Blanco-Parra *et al*. 2008) than off central California (Cailliet *et al*. 1983), although female growth rates are substantially greater than those of males in both regions. Differences in growth rates are also reported for Scalloped Hammerheads (*Sphyrna lewini*) sampled off the Central Pacific coast of Mexico (K_{male} = 0.131/year, K_{female} = 0.156/year; Anislado-Tolentino and Robinson-Mendoza 2001) and those sampled a relatively short distance to the south (K_{male} = 0.123/year, K_{female} = 0.100/year; Anislado-Tolentino *et al*. 2008), suggesting little population mixing between regions. By contrast, both sexes of the Shortfin Mako (*Isurus oxyrinchus*) (K = 0.05/year; Ribot-Carballal *et al*. 2005) and the Silky Shark (*Carcharhinus falciformis*) (K = 0.14/year; Sánchez-de Ita *et al*. 2011), exhibit similar growth rates off Baja California Sur that are consistent with those previously reported by Cailliet *et al*. (1983) and Branstetter *et al*. (1987) for populations off central California and in the Gulf of Mexico, respectively.

Growth rate estimates of the Diamond Stingray (*Dasyatis dipterura*) (K_{female} = 0.05/year, K_{male} = 0.10/year), off Baja California Sur are the lowest reported for any batoid of the suborder Myliobatoidei (stingrays) (Smith *et al*. 2007). This species also exhibits late age at maturity and low fecundity, suggesting enhanced vulnerability to overexploitation (Smith *et al*. 2008). Reproductive studies have been published for several batoids in Mexican waters, with litter sizes ranging from one for the Golden Cownose Ray (*Rhinoptera steindachneri*) (Bizzarro *et al*. 2007) and local devil rays (Mobulidae) (Notarbartolo-di-Sciara 1988; Villavicencio-Garayzar 1991), to an estimated maximum of 20 for the Giant Electric Ray (*Narcine entemedor*) (Villavicencio-Garayzar 2000). Different size compositions and sizes at maturity have been noted between Pacific coast and Gulf of California populations of some rays (Bizzarro *et al*. 2007; Márquez-Farías 2007), and may be indicative of variable exploitation histories between regions or cryptic speciation.

Although chondrichthyan landings in the ECP are relatively low, the fauna of this subregion faces several threats. Overfishing, primarily through incidental catch, is currently the primary concern, and shark finning has been a major problem in Costa Rica. In addition, habitat destruction (e.g. the loss of mangrove habitat for shrimp farming) and coastal development are deleterious to small coastal sharks and batoids, as well as to large sharks that use these regions for breeding and nursery functions. In Mexico, these threats, combined with the common practice of targeting elasmobranch aggregations on breeding and pupping grounds, create conditions that severely compromise the sustainability of affected species.

After years of steady increase to a peak of nearly 50,000 t in 2000, chondrichthyan landings in the greater Eastern Central Pacific (corresponding to FAO Area 77) have declined to <40,000 t in recent years (FAO 2011). Annual Mexican chondrichthyan landings averaged 25,421 t during 2005–2009, representing 65.2% of all regional chondrichthyan landings. The combined landings of all other countries averaged 13,556 t, with Costa Rica (5,014 t) and Panama (4,198 t) ranking a distant second and third, followed by China (including Taiwan; 1,676 t) and Japan (1,174 t). Landings are largely unidentified or grouped into general categories in this subregion; however, directed

sampling indicates that Blue Sharks and Silky Sharks are the primary pelagic species taken. Scalloped Hammerheads, small coastal sharks (e.g. smoothhounds *Mustelus* species, Pacific Sharpnose Shark *Rhizoprionodon longurio*), and batoids (especially Shovelnose Guitarfish) are the primary species landed in coastal regions of the Gulf of California. Among Central American countries, Silky Shark is the most important species taken, with the Whitenose Shark (*Nasolamia velox*), Sharpnose Smoothhound (*Mustelus dorsalis*), Blacktip Shark (*C. limbatus*), and the Dusky Shark (*C. obscurus*) also commonly exploited (Rojas *et al.* 2000).

Elasmobranchs in the ECP are caught incidentally in pelagic fisheries for tunas, billfishes, and dolphinfish that use primarily longline and purse seine gear, with gillnets fished in nearshore waters and drift nets commonly used in northwestern Mexico. Trawl gear is used in the hake fishery of the northern Gulf of California, which captures substantial amounts of skate incidentally, and in large-scale shrimp fisheries throughout the Mexican Pacific. These shrimp fisheries represent a major source of mortality to small coastal sharks, batoids, and early life-stages of larger shark species. Recreational fisheries for elasmobranchs are of minor concern in this subregion, although such fisheries are prevalent off the southern tip of Baja California Sur. Meat is typically consumed locally, whereas fins are exported to Asia. In coastal waters, fishing effort is primarily artisanal, whereas large-scale vessels operate on the high seas.

Historic fishery landings are poorly documented in the ECP and therefore the status of most exploited chondrichthyan stocks are unknown. Major declines in populations of many large shark species (e.g. Bull Shark *C. leucas*, Blacktip Shark, Dusky Shark, Tiger Shark *Galeocerdo cuvier*, Scalloped Hammerhead), however, are evident in the Gulf of California (Bizzarro *et al.* 2009) and may be more widespread. Large coastal and pelagic sharks were the historic targets of the fishery, but fishers have switched their focus to more abundant coastal sharks and batoids, suggesting serial depletion of populations. Despite heavy fishing pressure, Pacific Ocean populations of the Blue Shark are generally considered to be currently stable (Nakano and Stevens 2008), although some authors have reported slight (Nakano 1996) or even major (Ward and Myers 2005) declines.

Although chondrichthyan management is seriously inadequate in the ECP, progress has been made in some countries, notably Mexico. See the Management Section for details of conservation and management measures relevant to the ECP subregion.

3 Methodology

3.1 Geographic Scope of the Report

This report covers chondrichthyan species occurring in the waters of the Atlantic and Pacific Oceans of, and adjacent to, North America, Central America, and the Caribbean. Thus the region covered includes Canada, the USA (including Alaska, but excluding Hawaii), Mexico, Guatemala, Belize, Honduras, El Salvador, Nicaragua, Costa Rica, Panama, Caribbean Colombia, and Venezuela, as well as sovereign states of the Caribbean (encompassing the Greater Antilles and the Lesser Antilles). See the Subregional Overview Sections above for detailed descriptions of the four subregions (Northwest Atlantic, Western Central Atlantic, Northeast Pacific, and Eastern Central Pacific) covered by the report.

3.2 The Red Listing Process

In June 2004, as part of the SSG's Red List Program, chondrichthyan experts convened at Mote Marine Laboratory in Sarasota, Florida, USA with the aim of using the IUCN Red List Categories and Criteria to assess the conservation status of species occurring in the waters of North and Central America (Atlantic and Pacific Oceans). Ocean Conservancy, The Bernice Barbour Foundation, The Curtis and Edith Munson Foundation, The Ocean Foundation, and The Firedoll Foundation sponsored this workshop, with the Center for Shark Research (Mote Marine Laboratory), National Shark Research Consortium, and NOAA National Marine Fisheries Service providing additional support. More than 50 experts from the U.S., Mexico, Canada, Colombia, Panama, Belize, Nicaragua, El Salvador, Guatemala, Costa Rica, and Ecuador participated in the meeting.

The SSG's ongoing Red List Program has since completed Red List assessments for all species occurring in the region, which is the result of a series of SSG-hosted workshops as well as extensive assessment and review by SSG members outside of the workshop environment.

Red List assessment authors assessed all species using the IUCN Red List Categories and Criteria Version 3.1 (IUCN 2001). The Red List Categories (with their abbreviations) are: Extinct (EX), Extinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC), Data Deficient (DD), and Not Evaluated (NE). Classification of species into the threatened categories (Critically Endangered, Endangered, and Vulnerable) applies a set of five quantitative criteria based on biological factors related to extinction risk, including rate of population decline, population size, area of geographic distribution, and degree of population and distribution fragmentation. These IUCN Red List Categories and Criteria are summarized in Appendix II.

3.2.1 Assessing Marine Fishes – Application of the Red List Categories and Criteria

Workshop experts performed assessments with reference to the *Guidelines for Using the IUCN Red List Categories and Criteria* (IUCN Standards and Petitions Subcommittee 2011), which are available on the Red List website (http://www.iucnredlist.org/about/publications-links). Participants assessed species against all of the IUCN Red List Criteria, but Criterion A (population decline) is the most commonly used criterion for chondrichthyans.

The SSG recognizes that some chondrichthyan species are the target of fisheries and therefore may show a decline in population size under a sustainable management regime. Under the IUCN Red List Criteria, such taxa could be assigned a threatened status under Criterion A (declining population). Some concern has been expressed that such a listing might not reflect extinction risk, especially if the decline is a consequence of a management plan designed to achieve a goal such as maximizing the sustainable yield from a fishery. The IUCN Red List Guidelines (IUCN Standards and Petitions Subcommittee 2011) state that such listings should not be problematic in the medium- to long-term. This is because, although a managed population may currently exhibit characteristics consistent with assignment of a threatened category, effective management will result in the population stabilizing at a target level, at which time the decline will end. The taxon would then no longer qualify for a threatened listing and the assessment could be reviewed. If, however, population declines continued, the reason for concern and therefore the threatened listing would still apply (IUCN Standards and Petitions Subcommittee 2011).

3.2.2 The Precautionary Approach

The IUCN Red List Guidelines recommend that assessors adopt a precautionary but realistic approach when applying criteria, and that all reasoning should be explicitly documented (IUCN Standards and Petitions Subcommittee 2011). For example, where a population decline is known to have taken place (e.g. as a result of fisheries), but no management has been applied to change the pressures on the population, it can be assumed the decline is likely to continue in the future. If fisheries are known to be operating, but no information is available on changes in CPUE, data from similar fisheries elsewhere may be used by informed specialists to extrapolate likely population trends. Additionally, where no life history data are available, the demographics of a very closely related species may be applied.

3.2.3 Global, Subpopulation, and Regional Assessments

For all chondrichthyans, status has been assessed at the global level (that is, encompassing all parts of a species' range). An important consideration, however, is the application of the criteria to geographically distinct subpopulations. Many marine species have a markedly disjunct distribution, where there is clearly no possible opportunity for exchange between subpopulations. There may also be no evidence for interchange among well studied subpopulations which breed on different sides of an ocean basin, even though the species carries out extensive migrations. Finally, many species do not migrate at all, but remain close to their place of birth throughout their life cycle. In these conditions, there is minimal interchange between stocks, even when there is apparently little spatial separation.

The IUCN Red List recognizes the separate assessment of geographically distinct populations. These 'subpopulations' are defined as 'geographically or otherwise distinct groups in the [global] population between which there is little demographic or genetic exchange (typically one successful migrant individual or gamete per year or less)' (IUCN 2001). Subpopulation assessments are displayed separately on the IUCN Red List website (linked to their global assessment).

Additionally or alternatively, some species have been assigned a regional Red List category in different areas of their range, indicating that their status varies regionally. When regions are assessed for which the species does not meet the IUCN definition of a 'subpopulation' as above, then this is considered a 'regional' assessment and these are not displayed separately on the IUCN Red List website. They are, however, detailed within the published documentation for the global Red List assessment, and where they are relevant to the North American, Central American, and Caribbean region they are provided in this report.

3.2.4 Review and Consensus Process

The SSG has been appointed by the IUCN Species Survival Commission as the Red List Authority for chondrichthyan assessments. It considers full and open consultation with its membership, through workshops and correspondence, to be essential for the preparation of accurate and robust Red List assessments. Prior to the submission to the IUCN Red List, all species assessments are peer-reviewed by at least two reviewers and then circulated to the entire SSG global network, to ensure thorough and transparent review. Therefore, the resulting assessments are a product of scientific consensus on each species' status, supported by relevant literature and other data sources.

Once assessments have been submitted and accepted onto the IUCN Red List, they are periodically revisited and can be updated as new information becomes available. The IUCN Red List is currently updated annually. Readers are therefore urged to always consult the current IUCN Red List (http://www.iucnredlist.org) to check if species of interest have recently been updated.

3.3 Species Accounts

Species accounts are provided for the 282 species of described chondrichthyans recorded in the North American, Central American, and Caribbean region. Undescribed species (i.e. those not yet formally described by science) are not included. The Red List assessments are in three sections: sharks, batoids, and chimaeras. Within each of these groups, species accounts are provided in phylogenetic order following Compagno (2005).

Each account provides the global Red List assessment for that species, together with any relevant subpopulation or regional Red List assessments (see above). These are assessments covering any part of the North American, Central America, and Caribbean region, and may be for a distinct subpopulation, an ocean region or subregion, or a specific country. For some species there may be additional subpopulation and/or regional assessments from outside of North America, Central America, and the Caribbean, and readers can consult the IUCN Red List website (http://www.iucnredlist.org) if interested in a species' status within another region (but note that for many chondrichthyan species, their status has been assessed solely at the global level).

The IUCN Red List Categories and Criteria (IUCN 2001) are available on the Red List website (http://www.iucnredlist.org/about/publications-links). Appendix II provides a summary of the IUCN Red List Criteria for the threatened categories (Critically Endangered, Endangered, and Vulnerable). Following the Red List assessment category in each species account is the assessor name(s) and the year of official publication on the Red List website. The report spans assessments published from 2000 to 2012. The year of publication may be some time after the completion of the assessment by the SSG. This is particularly the case for assessments published in 2009, many of which were in fact completed during the period 2004–2008. Note that while chondrichthyan assessments originally published on the Red List in 2000 were republished in Fowler *et al*. (2005), their original publication date remains as 2000.

For each species, its occurrence in the four subregions covered by this report is provided under 'regional occurrence'. These subregions are the Northwest Atlantic, Western Central Atlantic, Northeast Pacific, and Eastern Central Pacific. Note that these subregions do not match exactly the FAO Major Fishing Areas of the same names. Instead they represent subregions defined for the purpose of this report, based on both biogeographical and political boundaries. For ease, the two subregions in each of the two ocean basins covered here (Atlantic and Pacific) are separated at the U.S./Mexico border. The four subregions are thus defined as:

Northwest Atlantic: extends from the southeastern coast of Greenland at ~40°W longitude to 120°W in the Arctic waters north of Canada and southwards to the northern Gulf of Mexico. The subregion terminates at the U.S./Mexico border. It thus includes part of the southeastern coast of Greenland, the eastern coasts of Canada and the U.S., and the U.S. Gulf of Mexico coast.

Western Central Atlantic: encompasses the Caribbean region south of the U.S./Mexico border, so thus including the southern part of the Gulf of Mexico, extending to the Bahamas in the north and east, and including the Greater and Lesser Antilles, Central America, and the northern coast of South America eastwards to the Venezuela/Guyana border. This subregion includes and is bordered by 38 sovereign states, including Mexico, the Central American countries of Belize, Guatemala, Honduras, Nicaragua, Costa Rica, and Panama, many Caribbean states, and the South American countries of Colombia and Venezuela (but does not include the U.S. and Bermuda).

Northeast Pacific: extends from ~65°N, 175°W to ~32°N, 117°W, or from just south of the Bering Strait eastwards along the Eastern Bering Sea continental slope to the Gulf of Alaska and southwards along the continental landmass of North America to the California, U.S./Mexico border. It thus includes Alaska and the western coasts of Canada and the contiguous U.S. (Washington State to California).

Eastern Central Pacific: extends west from the northern border of Mexico (~32°N) to 120°W, and then trends south to 5°N. The southern extent of this subregion ranges eastwards of 120°W to 79°52'W before extending in a northeasterly direction to terminate at the southern border of Panama (07°12'N, 77°53'W). The following countries are located in this subregion: Mexico, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, and Panama.

In the case of wider-ranging species, these may also occur in additional regions outside of North America, Central America, and the Caribbean which are not listed in the species accounts.

Where relevant, a note may be provided regarding the taxonomic status of the species. These generally relate to uncertainty over the species' validity or where taxonomic resolution is required within a species-complex.

Finally, the rationale for the species' assessment is provided. This acts as a stand-alone summary of the species' Red List assessment. Citations and references are not provided in chondrichthyan Red List assessment rationales, but each assessment on the Red List website (http://www.iucnredlist.org) provides a full reference list for literature used in the preparation of assessments.

Rationales were taken from the original Red List assessment and therefore reflect the variability in style and content of the many contributors involved (see Appendix III). Rationales have, however, been edited for consistency and formatting.

Information from outside the North American, Central American, and Caribbean region may be contained in the rationales presented here, particularly for wide-ranging species. Such information is retained in the rationales as it provides necessary background and support for reaching the global assessment.

One species occurring in the region, the North Pacific Spiny Dogfish (*Squalus suckleyi*) has not yet been evaluated against the IUCN Red List Categories and Criteria. This is due to the recent resurrection of this species name and its splitting from the more widespread Spiny Dogfish (*S. acanthias*) (Ebert *et al*. 2010). While the status of this species is therefore currently Not Evaluated, an assessment for this species is in preparation at the time of publication.

A 'family synopsis' provides the total number of species from that family within the North American, Central American, and Caribbean region, followed by a summary of those species' Red List status. This summary is at the global level; check the species accounts for additional subpopulation and/or regional assessments for individual species within the region.

The full Red List assessment for each species treated in this report is available by searching by species or common name on the IUCN Red List website (http://www.iucnredlist.org).

4 Results

Of 282 chondrichthyan species (137 sharks, 137 batoids, 8 chimaeras) occurring in the North American, Central American, and Caribbean region, 281 have been assessed on the IUCN Red List of Threatened Species. The Red List status and rationales for each of these is provided in Section 7 of this report and each is listed along with its Red List status in Appendix I. This section provides a summary of the conservation status of chondrichthyans across the entire region and within each of the four subregions (Northwest Atlantic, Western Central Atlantic, Northeast Pacific, and Eastern Central Pacific), as well as discussing threatened, Near Threatened, Least Concern, and Data Deficient species.

4.1 Summary of Status

Table 4.1 presents the number and proportion of North American, Central American, and Caribbean chondrichthyans in each Red List category at the global level (that is, the global status of each species). The single Not Evaluated species which occurs in the region (North Pacific Spiny Dogfish *Squalus suckleyi*) will not be included in further analysis presented in this section, and therefore the total number of species of interest is the 281 that have had their status assessed. Sections 4.2–4.5 detail and discuss status at the global level. Section 4.6 provides subregional analyses and references to additional subpopulation and regional assessments.

Table 4.1 The number and proportion of North American, Central American, and Caribbean chondrichthyans in each Red List category at the global level, as well as the total for the three threatened categories (Critically Endangered, Endangered, Vulnerable).

IUCN Red List category	Global Red List status
Critically Endangered	4 (1.4%)
Endangered	5 (1.8%)
Vulnerable	29 (10.3%)
Total threatened	*38 (13.5%)*
Near Threatened	45 (16.0%)
Least Concern	76 (27.0%)
Data Deficient	122 (43.4%)
Total number of species	**281**

4.2 Threatened Species

Nearly 14% of chondrichthyans occurring in the North American, Central American, and Caribbean region are assessed within one of the three threatened categories (Table 4.1; Figure 4.1). These species face an extremely high risk of extinction in the wild (Critically Endangered; CR; 1.4%), a very high risk of extinction in the wild (Endangered, EN; 1.8%) or a high risk of extinction in the wild (Vulnerable; VU; 10.3%) (IUCN 2001). Sixteen (of 43) chondrichthyan families within the region contain one or more threatened species. Table 4.2 outlines all globally threatened species occurring in the region.

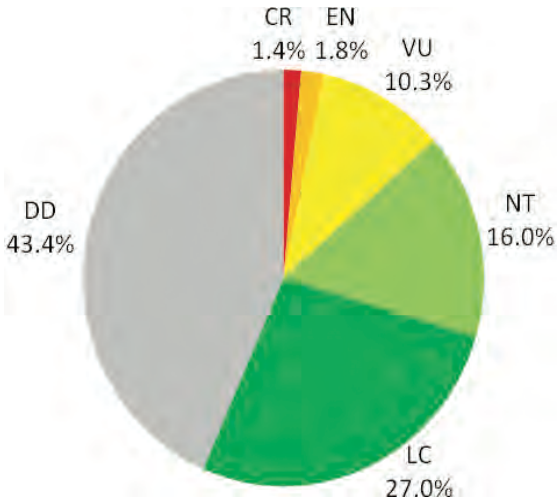

Figure 4.1 Percentage distribution of North American, Central American, and Caribbean chondrichthyans in each Red List category at the global level (CR, Critically Endangered; EN, Endangered; VU, Vulnerable; NT, Near Threatened; LC, Least Concern; DD, Data Deficient).

The four globally CR species in the North American, Central American, and Caribbean region are: the Daggernose Shark (*Isogomphodon oxyrhynchus*), Smalltooth Sawfish (*Pristis pectinata*), Largetooth Sawfish (*P. perotteti*), and the Caribbean Electric Ray (*Narcine bancroftii*) (Table 4.2).

The Daggernose Shark occurs only marginally in the Caribbean region, with a distribution from Venezuela to Brazil. Its CR status is a result of a combination of a low intrinsic population growth rate based on limiting biological characters, and intense fishing pressure in its inshore habitat in Brazil where it has suffered very large declines (>90%) over the past 10 years. Data are lacking for its Caribbean range, although declines are suspected to have occurred across its range, given levels of fishing pressure.

The sawfishes (family Pristidae) have received considerable attention as they are arguably the most imperiled group of fishes worldwide (all seven species in the family have a global CR status). Both the Smalltooth Sawfish and the Largetooth Sawfish have been eliminated from large areas of their former Atlantic ranges and remaining populations are now small and fragmented. Declines are a result of largely unintentional mortality in fisheries, as well as habitat degradation and loss. The Everglades National Park in Florida remains a globally critical center of abundance for the Smalltooth Sawfish. The status of the Largetooth

Sawfish is less well understood, but is considered to be critical throughout its Caribbean, Central American, and South American range. Note that a lack of taxonomic resolution precludes the inclusion in this report of the sawfish that occurs in the Eastern Pacific; this is a member of the 'largetooth sawfish' species-group and has been referred to as *Pristis pristis*.

The Caribbean Electric Ray, despite having a wide Western Atlantic distribution and a very low female age at maturity (two years), has been shown to have undergone significant declines (to 0.5–5% of baseline abundance) in the northern Gulf of Mexico as a result of trawl bycatch mortality. Its global status is based on observed declines in U.S. waters and inferred declines throughout the rest of the species' range.

The five globally EN species in the North American, Central American, and Caribbean region are: the Scalloped Hammerhead (*Sphyrna lewini*), Great Hammerhead (*S. mokarran*), Barndoor Skate (*Dipturus laevis*), Winter Skate (*Leucoraja ocellata*), and the Smooth Skate (*Malacoraja senta*) (Table 4.2).

Hammerheads have been depleted worldwide by coastal as well as pelagic fisheries. All life-stages are vulnerable to targeted and incidental capture as their fins are amongst the most prized in the shark fin market. Declines in Great and Scalloped Hammerheads have been recognized in the Northwest Atlantic and Gulf of Mexico. In the Eastern Pacific, Scalloped Hammerheads are heavily exploited throughout their range and large hammerheads have declined in the Gulf of California and coastal waters off Central America. Continuing fishing pressure from both inshore and offshore fisheries and a relatively low resilience to exploitation threaten populations of large hammerhead species within the North American, Central American, and Caribbean region.

Several skate species form a significant bycatch of multi-species trawl fisheries in U.S. and Canadian Atlantic waters. In the case of the Barndoor Skate, Smooth Skate, and the Winter Skate, this has caused considerable declines over parts of their ranges, resulting in global EN assessments for these three species. The situation with these species is somewhat complex, however, given population structure, varying levels of fishing pressure, and management arrangements. While the Barndoor Skate was reported to have declined by 96 to 99% from the mid-1960s to 1990s in the center of its latitudinal range in U.S. waters, the most recent research on life history characteristics and population dynamics of Barndoor Skates finds a more rapid rebuilding estimate and suggests that the species may be more resilient to exploitation than previously thought (NOAA 2011c). The smaller Smooth and Winter Skates have restricted distributions in the region. The majority of the Smooth Skate population occurs in Canadian waters where scientific survey data shows population declines of 73–91% in some areas. The U.S. portion of the population is more stable, although still affected by mixed fisheries, and listed as Near Threatened (through a regional assessment). Population trends vary in different areas of the Winter Skate's range from Labrador to the Carolinas, but substantial declines (>90%) have occurred in two of the major areas of this species' range off Canada; declines have also occurred off the U.S. Both the Barndoor Skate and the Smooth Skate are in the process of being reassessed for the Red List.

The following families account for the 29 globally VU species in the North American, Central American, and Caribbean region: dogfish sharks (Squalidae; 1 species), gulper sharks (Centrophoridae; 1 species), the Whale Shark (*Rhincodon typus*) (Rhincodontidae; 1 species), sand tiger sharks (Odontaspididae; 2 species); thresher sharks (Alopiidae; 3 species); the Basking Shark (*Cetorhinus maximus*) (Cetorhinidae; 1 species); mackerel sharks (Lamnidae; 4 species); houndsharks (Triakidae; 1 species); requiem sharks (Carcharhinidae; 4 species); hammerhead sharks (Sphyrnidae; 2 species); numbfishes (Narcinidae; 4 species); hardnose skates (Rajidae; 1 species); round stingrays (Urotrygonidae; 2 species); butterfly rays (Gymnuridae; 1 species), and devil rays (Mobulidae; 1 species) (Table 4.2).

Some of these VU species are wide-ranging, for example the Whale Shark and the Basking Shark, whereas others, such as the Reticulate Round Stingray (*Urotrygon reticulata)* and the Stellate Round Stingray (*U. simulatrix)*, are regional endemics (in these cases with extremely localized distributions in nearshore waters of Panama).

Many of the VU sharks are pelagic and oceanic species which have low population increase rates and are subjected to high fishing mortality throughout large parts of their range (for example the thresher and mackerel sharks); their status is discussed in Dulvy *et al.* (2008) and Camhi *et al.* (2009). Although the specific reasons behind each species' VU listing vary, overwhelmingly it is the impacts of commercial and/or artisanal fishing (targeted and/or incidental), and the lack of appropriate management arrangements, that is the cause of their status. Such a generalization is of course not without its caveats, so readers are urged to consult each species account for the 29 VU species to understand the basis of these listings.

Table 4.2 Threatened chondrichthyans of North America, Central America, and the Caribbean. Species are listed by global Red List threatened category (Critically Endangered, Endangered, Vulnerable). Additional subpopulation (subpopn) and regional assessments (regional) of relevance to the region are also provided.

Common name	Species name	Additional subpopulation or regional assessments[1]
Critically Endangered		
Daggernose Shark	*Isogomphodon oxyrhynchus*	
Smalltooth Sawfish	*Pristis pectinata*	
Largetooth Sawfish	*Pristis perotteti*	
Caribbean Electric Ray	*Narcine bancroftii*	
Endangered		
Scalloped Hammerhead	*Sphyrna lewini*	Northwest & Western Central Atlantic (subpopn): EN; Eastern Central & Southeast Pacific (subpopn): EN
Great Hammerhead	*Sphyrna mokarran*	Northwest Atlantic & Gulf of Mexico (regional): EN
Barndoor Skate	*Dipturus laevis*	
Winter Skate	*Leucoraja ocellata*	USA (regional): VU
Smooth Skate	*Malacoraja senta*	Canada (regional): EN; USA (regional): NT
Vulnerable		
Spiny Dogfish	*Squalus acanthias*	Northwest Atlantic (subpopn): EN
Gulper Shark	*Centrophorus granulosus*	Western Atlantic (regional): DD
Whale Shark	*Rhincodon typus*	
Sand Tiger	*Carcharias taurus*	
Smalltooth Sand Tiger	*Odontaspis ferox*	
Pelagic Thresher Shark	*Alopias pelagicus*	
Bigeye Thresher Shark	*Alopias superciliosus*	Northwest & Western Central Atlantic (regional): EN; Eastern Central Pacific (regional): VU
Common Thresher Shark	*Alopias vulpinus*	Northwest & Western Central Atlantic (regional): VU; Eastern Central Pacific (regional): NT
Basking Shark	*Cetorhinus maximus*	North Pacific (subpopn): EN
Great White Shark	*Carcharodon carcharias*	
Shortfin Mako	*Isurus oxyrinchus*	Atlantic (subpopn): VU; Eastern North Pacific (subpopn): NT
Longfin Mako	*Isurus paucus*	
Porbeagle	*Lamna nasus*	Northwest Atlantic (subpopn): EN
Soupfin Shark	*Galeorhinus galeus*	Eastern North Pacific (regional): LC
Oceanic Whitetip Shark	*Carcharhinus longimanus*	Northwest & Western Central Atlantic (regional): CR
Dusky Shark	*Carcharhinus obscurus*	Northwest &Western Central Atlantic (subpopn): EN
Sandbar Shark	*Carcharhinus plumbeus*	
Night Shark	*Carcharhinus signatus*	
Smalleye Hammerhead	*Sphyrna tudes*	
Smooth Hammerhead	*Sphyrna zygaena*	
Colombian Electric Ray	*Diplobatis colombiensis*	
Brownband Numbfish	*Diplobatis guamachensis*	
Target Ray	*Diplobatis ommata*	
Painted Electric Ray	*Diplobatis pictus*	
Thorny Skate	*Amblyraja radiata*	Canada (regional): VU; USA (regional): CR
Reticulate Round Stingray	*Urotrygon reticulata*	
Stellate Round Stingray	*Urotrygon simulatrix*	
Spiny Butterfly Ray	*Gymnura altavela*	USA (regional): LC
Giant Manta Ray	*Manta birostris*	

[1]CR, Critically Endangered; EN, Endangered; VU, Vulnerable; NT, Near Threatened; LC, Least Concern; DD, Data Deficient.

4.3 Near Threatened Species

Sixteen percent of chondrichthyans occurring in the North American, Central American, and Caribbean region are assessed as Near Threatened (NT) (Table 4.1; Figure 4.1). These species do not qualify for a threatened category now, but are close to qualifying for, or are likely to qualify for, a threatened category in the near future (IUCN 2001). Within the region, families with a high proportion of NT species include the cownose rays (Rhinopteridae; both species NT), the whaler sharks (Carcharhinidae; 52% NT), the guitarfishes (Rhinobatidae; 50% NT), and the devil rays (Mobulidae; 50% NT).

As with threatened species, NT species represent further priorities for monitoring, data gathering, and management. New data may show that they in fact qualify for a threatened category and their status should be adjusted accordingly following reassessment if this is the case. In some instances, species have been assessed as NT as a precautionary measure, to highlight concerns for their conservation status, but where quantitative data are lacking to demonstrate the meeting of criteria under a threatened category. The Atlantic Guitarfish (*Rhinobatos lentiginosus*) is one such example, where inferred declines as a result of continuing high levels of exploitation raise concerns for the status of the species, despite the lack of time series data to quantify any declines. Largely unregulated coastal fishing pressure in Mexico, Central America, and the Caribbean (including the historical targeting of reproductive aggregations) are one of the reasons behind NT assessments for a number of guitarfish species. Further data for these, as well as other Data Deficient guitarfishes, may show that a threatened category is warranted. In the case of the Venezuela Skate (*Raja cervigoni*), the species' relatively limited geographic range, intense trawl fisheries operating throughout much of its range and high levels of bycatch, result in a precautionary assessment of NT.

The preponderance of carcharhinid sharks listed as NT highlights the level of concern regarding the status of this family (only 12% of species from this family are considered to be Least Concern). The family Carcharhinidae includes some of the most commercially important (for fins and meat) shark species; intense fishing pressure continues on many populations in the region. Species-specific data for many members of this family throughout the Caribbean and Central America is urgently needed to better inform their status.

A growing market for devil ray products, particularly gill rakers which are used in traditional Chinese medicine, has resulted in increased targeting of these species. In the Gulf of California, these species are targeted and also landed when taken incidentally in gillnet fisheries. A usual fecundity of a single pup per litter results in exceptionally limited reproductive potential, and enhanced susceptibility to population depletion.

4.4 Least Concern Species

Twenty-seven percent of chondrichthyans occurring in the North American, Central American, and Caribbean region are assessed as Least Concern (LC) (Table 4.1; Figure 4.1). These species do not qualify for a threatened category or for NT (IUCN 2001) and are therefore not considered to be at threat of extinction now or in the foreseeable future. Species with widespread distributions and abundant populations are included in this category (IUCN 2001). Within the region, families with a high proportion of LC species include the kitefin sharks (Dalatiidae; 80% LC), the softnose skates (Arhynchobatidae; 69% LC), and the lantern sharks (Etmopteridae; 62% LC). Some other families with low diversity either globally or in the region (1–2 species) are LC, such as the longnose chimaeras (Rhinochimaeridae), the Thornback Ray (*Platyrhinoidis triseriata*) (Platyrhinidae), and the Goblin Shark (*Mitsukurina owstoni*) (Mitsukurinidae).

Many of these groups are characterized by species with small or very small maximum sizes. For example, the four LC dalatiid sharks have maximum sizes of ~27–50 cm TL, encompassing some of the world's smallest shark species. Similarly, *Etmopterus* species are generally small (maximum sizes of 21–75 cm TL in the region). Smaller species are often too small to be the focus of targeted fisheries. Additionally, they are less susceptible to capture in many types of fishing gear in which larger chondrichthyans are regularly taken as bycatch. Intrinsic biological characteristics can also contribute to LC assessments, for example some houndsharks (*Mustelus* species) and sharpnose sharks (*Rhizoprionodon* species), which are small, relatively fast growing and early maturing, and are therefore relatively productive.

In many instances, the above-mentioned families, and other species assessed as LC, are associated with the deepsea (but see discussion in Data Deficient Species Section below). In some cases, species may even be relatively poorly known, but their occurrence outside of the current reach of commercial fisheries provide them with a refuge at depth and thus there are no identifiable threats. As fisheries continue to probe deeper (Morato *et al*. 2006), however, fishing may begin to threaten some species, especially those with restricted ranges. Many assessments highlight the need to carefully monitor and manage the expansion of deepwater fisheries into the range of deepwater LC species.

4.5 Data Deficient Species

Over 43% of chondrichthyans occurring in the North American, Central American, and Caribbean region are assessed as Data Deficient (DD) (Table 4.1; Figure 4.1). There is insufficient information available to make a direct or indirect assessment of the extinction risk for these species (IUCN 2001). In many cases, this is related to a species' rarity, limited geographic distribution and/or limited economic (fisheries) interest, which result in a

reduced capacity to undertake research on the species in order to obtain details on habitat, ecology, distribution, and population. The SSG makes every attempt to place all species into a category other than DD, and this category is used when, despite exploring all possible information, there is no alternative. Within the region, some of the groups with a high proportion of DD species include the catsharks (Scyliorhinidae; 67% DD), particularly the deepwater genus *Apristurus* (83% DD), the Caribbean skate fauna including the legskates (Anacanthobatidae; all 7 species are DD), and the Eastern Central Pacific round stingrays (Urotrygonidae).

The high proportion of DD species in the region highlights how large the information and knowledge gap is, despite this region having exceptional chondrichthyan research capacity. In some instances, species are only known from single specimens (species for which the only available information comes from their original description). For example, the Deepwater Catshark (*Apristurus profundorum*) in the Northwest Atlantic and the Campeche Catshark (*Parmaturus campechiensis*) in the Gulf of Mexico, for which information on distribution and biology is severely lacking. These species are both recorded from >1,000 m depth and underscore previous conclusions that the deepwater chondrichthyan fauna remains particularly poorly known (Cavanagh and Kyne 2005). There are, however, some examples of shallower water species which are known from only a handful of specimens, even from well surveyed areas. The Florida Torpedo Ray (*Torpedo andersoni*) is known from only two specimens taken at 229 m on the upper continental slope on the western edge of the Grand Bahama Bank, and a photographic record of an individual amongst coral at 11 m from Grand Cayman Island.

Taxonomic uncertainty can also result in a DD listing. Some of the regional dogfish fauna (order Squaliformes) is particularly problematic. For example, the taxonomy of the Shortspine Spurdog (*Squalus mitsukurii*) is not fully resolved and this species as currently known most likely represents a species-complex of several taxa; records from the Americas are nominal and may represent distinct species. Gulper sharks (*Centrophorus*) are also in need of systematic clarification as this is one of the least productive groups of chondrichthyans (Kyne and Simpfendorfer 2010), with many species considered globally threatened. While the Gulper Shark (*Centrophorus granulosus*) has been assessed as VU globally, it cannot be assessed beyond DD for the Western Atlantic where records are nominal and may actually represent a distinct species. All *Centrophorus* species nominally recorded in the region require taxonomic resolution and subsequent reassessment.

It goes without saying that information and research are particularly needed for DD species. Future research may show that a threatened classification is appropriate (IUCN 2001). Species placed in the DD category may be overlooked for conservation action, even though their needs might be very great (IUCN Standards and Petitions Subcommittee 2011). Keeping the spotlight on the DD species is a challenge for researchers, conservationists, and policy makers alike.

4.6 Subregional Analysis

Table 4.3 presents the number and proportion of North American, Central American, and Caribbean chondrichthyans in each Red List category at the subregional level (that is, the global status of each species is adjusted by accounting for any relevant subpopulation and/or regional assessments).

The Atlantic chondrichthyan fauna (17.8% of species are threatened) faces an overall higher level of threat than the Pacific fauna (14.4% threatened). The proportion of NT species, however, is higher in the Pacific (20.8%) than in the Atlantic (14.1%). The proportion LC is similar (Atlantic 25.1%; Pacific 28.0%), but there seems to be a slightly better knowledge base in the Pacific which has 36.8% DD, compared to the Atlantic (42.9%).

Figure 4.2 compares Atlantic subregions and Figure 4.3 compares Pacific subregions. The proportion of threatened species is highest in the Northwest Atlantic (NWA; 19.0%), followed by the Western Central Atlantic (WCA; 18.5%), the Northeast Pacific (NEP; 16.7%), and the Eastern Central Pacific (ECP; 15.2%) (Table 4.3). The trend in NT species is exactly the opposite: highest in the ECP (22.3%), intermediate in the NEP (15.3%) and the WCA (14.6%), and lowest in the NWA (12.7%). The NEP has a high proportion of LC species (45.8%), the NWA is intermediate (30.4%), and both the ECP (22.3%) and the WCA (19.9%) have low relative proportions of LC species. Data deficiency is relatively high in the WCA (47.0%), the ECP (40.2%), and the NWA (38.0%), but considerably lower in the NEP (22.2%).

There are additional CR regional assessments of relevance to the North American, Central American, and Caribbean region for two species: the Oceanic Whitetip Shark (*Carcharhinus longimanus*) for the Northwest and Western Central Atlantic (global assessment: VU), and the Thorny Skate (*Amblyraja radiata*) for the USA (global: VU) (Table 4.4). Large declines blamed on longline fishing have been reported for the Oceanic Whitetip Shark in the Gulf of Mexico, although the exact extent of decline has been debated along with the associated effects from changes in the deployment of longline fishing gear. The Thorny Skate has been reported to be at historic low levels off the U.S. The 2003 prohibition on retaining the species in U.S. fisheries has yet to result in substantial population increase.

Within the North American, Central American, and Caribbean region, there are additional EN assessments for the following subpopulations: Scalloped Hammerhead (*Sphyrna lewini*), Northwest and Western Central Atlantic; Scalloped Hammerhead, Eastern Central and Southeast Pacific (global assessment: EN); Spiny Dogfish (*Squalus*

acanthias), Northwest Atlantic (global: VU); Basking Shark (*Cetorhinus maximus*), North Pacific (global: VU); Porbeagle (*Lamna nasus*), Northwest Atlantic (global: VU), and; Dusky Shark (*Carcharhinus obscurus*), Northwest and Western Central Atlantic (global: VU). Additionally, there are the following EN regional assessments: Great Hammerhead (*S. mokarran*), Northwest Atlantic and Gulf of Mexico (global: EN); Smooth Skate (*Malacoraja senta*), Canada (global: EN), and; Bigeye Thresher Shark (*Alopias superciliosus*), Northwest and Western Central Atlantic (global: VU) (Table 4.4).

The globally VU Spiny Dogfish was classified as EN in the Northwest Atlantic based on information available in 2006. Since that time, there has been much attention to biomass rebuilding (under management) that exceeded expectations; an updated Red List assessment is underway and will consider this recovery, as well as dramatically increased fishing quotas, and declines (resulting from past recruitment failure) predicted for the near future.

Table 4.4 also outlines additional subpopulation and regional VU assessments. Some of these species which have corresponding subpopulation and regional VU assessments are also VU at the global level. In contrast, the Winter Skate (*Leucoraja ocellata*), which is EN globally, is assessed as VU for the U.S. Four species which are not considered to be threatened globally have relevant threatened subpopulation or regional assessments (Table 4.4). These primarily relate to the Northwest Atlantic, elevating these species (three carcharhinid sharks and one skate) from their global NT category to one of VU for the particular subpopulation or region.

Conversely, some species which are considered globally threatened, have additional subpopulation or regional assessments at a lower risk category (Table 4.5). For example, the wide-ranging Spiny Butterfly Ray (*Gymnura altavela*) has declined over parts of its Atlantic range (e.g. the Southwest Atlantic, Mediterranean, and West Africa) and meets the criteria for VU at the global level. In the USA, however, it can be locally abundant, is rarely taken as bycatch, and is not commercially targeted, with surveys showing no trends in catch rates. The absence of significant threats to the species in U.S. waters results in a regional assessment of LC.

Table 4.3 The number and proportion of North American, Central American, and Caribbean chondrichthyans in each Red List category, as well as the total for the three threatened (THR) categories (Critically Endangered, Endangered, Vulnerable) by subregion.

IUCN Red List category[1]	Atlantic	Northwest Atlantic	Western Central Atlantic	Pacific	Northeast Pacific	Eastern Central Pacific
CR	5 (2.6%)	4 (2.5%)	5 (3.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
EN	9 (4.7%)	9 (5.7%)	5 (3.3%)	3 (2.4%)	2 (2.8%)	3 (2.7%)
VU	20 (10.5%)	17 (10.8%)	18 (11.9%)	15 (12.0%)	10 (13.9%)	14 (12.5%)
Total THR	*34 (17.8%)*	*30 (19.0%)*	*28 (18.5%)*	*18 (14.4%)*	*12 (16.7%)*	*17 (15.2%)*
NT	27 (14.1%)	20 (12.7%)	22 (14.6%)	26 (20.8%)	11 (15.3%)	25 (22.3%)
LC	48 (25.1%)	48 (30.4%)	30 (19.9%)	35 (28.0%)	33 (45.8%)	25 (22.3%)
DD	82 (42.9%)	60 (38.0%)	71 (47.0%)	46 (36.8%)	16 (22.2%)	45 (40.2%)
Total no. spp.	191	158	151	125	72	112

[1]CR, Critically Endangered; EN, Endangered; VU, Vulnerable; NT, Near Threatened; LC, Least Concern; DD, Data Deficient.

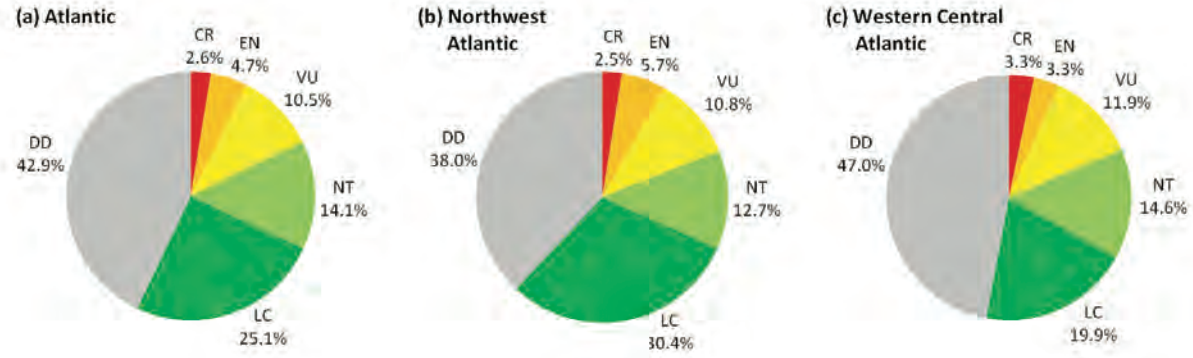

Figure 4.2 Percentage distribution of North American, Central American, and Caribbean chondrichthyans in each Red List category at the subregional level for the (a) Atlantic (whole region); (b) Northwest Atlantic; (c) Western Central Atlantic.

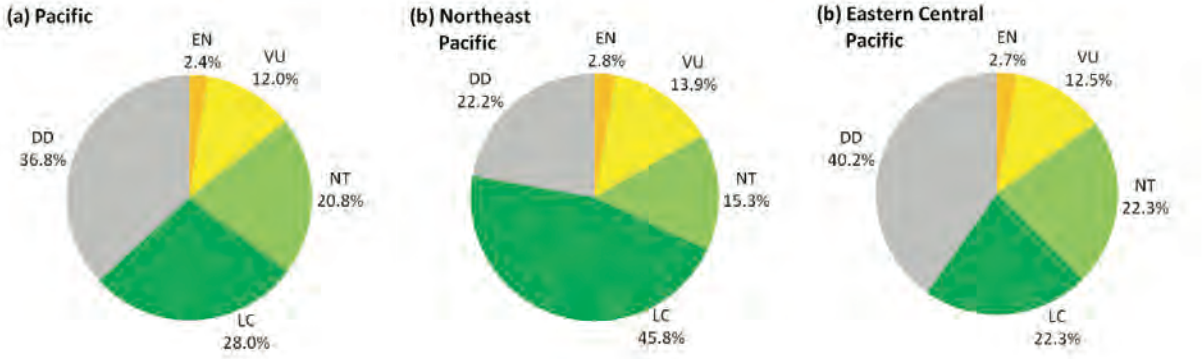

Figure 4.3 Percentage distribution of North and Central American chondrichthyans in each Red List category at the subregional level for the (a) Pacific (whole region); (b) Northeast Pacific; (c) Eastern Central Pacific.

4.7 Future Directions

Evaluating the conservation status of species is a dynamic process. As our knowledge of a species' ecology improves through research, and as new information on catch trends, trade, and threats becomes available, the status of species may need to be reconsidered. Indeed, the IUCN requires that the status of a species be re-evaluated every 10 years. Thus, some assessments presented in this report require updating. One such example is the 2000 assessment for the Big Skate (*Raja binoculata*) which states that the species '... has not been subject to meaningful study'. Since the time of that assessment, researchers have published findings on the species' life history (including reproduction, age, and growth) and movement patterns, while more information on fisheries interactions is now available (see King and McFarlane 2010).

In the process of compiling this report, several species have been flagged as priorities for reassessment, in particular, the Spiny Dogfish, Smooth Skate, and the Barndoor Skate. These and other old assessments (including all originally assessed in 2000) will be revisited as soon as possible, with the three species listed above currently undergoing reassessment. Furthermore, all sawfishes are currently undergoing reassessment.

Obtaining and collating sufficient data to transition species from the DD category into more definitive categories is a special challenge for the SSG. With close to half of North American, Central American, and Caribbean chondrichthyans lacking sufficient information to make a sound status assessment, encouraging improvements to our knowledge base through concerted research is an SSG priority. Although Canada and the U.S. continue to direct research effort towards chondrichthyans, species-specific population assessments are available for very few species. Over the last decade, research capacity has increased in Mexico and in parts of Central America, but overall, the status of fauna in these regions remains poorly known. This highlights the need for further capacity building throughout the region. The continued discovery of new chondrichthyan species within the region, and the resolution of taxonomic issues related to even some of the most well known of species, reinforces that research needs to be not only sustained, but increased in the fundamental field of taxonomy and systematics.

With the SSG recently concluding its 10-year Global Shark Red List Assessment program by completing Red List assessments for all chondrichthyan species (as of 2010;

1,041 species), an important baseline for monitoring the global status of sharks, batoids, and chimaeras has been established. The North American, Central American, and Caribbean region is currently seeing significant improvements in shark and ray management (see Management Section that follows) and, at the same time, significant expansion of fisheries and habitat degradation. The direction in which the status of the region's chondrichthyan fauna is heading therefore remains to be seen. What is clear is that a future with recovered shark and batoid populations and sustainable associated fisheries will require considerable immediate, concerted action across the region's research, conservation, fishing, policy-making, and enforcement communities (see Recommendations Section).

Table 4.4 Additional threatened (Critically Endangered, Endangered, Vulnerable) subpopulation (subpopn) or regional assessment (regional) for North American, Central American, and Caribbean chondrichthyans. The corresponding global assessment is also provided.

Common name	Species name	Additional subpopulation or regional assessments	Global assessment[1]
Critically Endangered			
Oceanic Whitetip Shark	*Carcharhinus longimanus*	Northwest & Western Central Atlantic (regional)	VU
Thorny Skate	*Amblyraja radiata*	USA (regional)	VU
Endangered			
Spiny Dogfish	*Squalus acanthias*	Northwest Atlantic (subpopn)	VU
Bigeye Thresher Shark	*Alopias superciliosus*	Northwest & Western Central Atlantic (regional)	VU
Basking Shark	*Cetorhinus maximus*	North Pacific (subpopn)	VU
Porbeagle	*Lamna nasus*	Northwest Atlantic (subpopn)	VU
Dusky Shark	*Carcharhinus obscurus*	Northwest & Western Central Atlantic (subpopn)	VU
Scalloped Hammerhead	*Sphyrna lewini*	Northwest & Western Central Atlantic (subpopn)	EN
Scalloped Hammerhead	*Sphyrna lewini*	Eastern Central & Southeast Pacific (subpopn)	EN
Great Hammerhead	*Sphyrna mokarran*	Northwest Atlantic & Gulf of Mexico (regional)	EN
Smooth Skate	*Malacoraja senta*	Canada (regional)	EN
Vulnerable			
Bigeye Thresher Shark	*Alopias superciliosus*	Eastern Central Pacific (regional)	VU
Common Thresher Shark	*Alopias vulpinus*	Northwest & Western Central Atlantic (regional)	VU
Shortfin Mako	*Isurus oxyrinchus*	Atlantic (subpopn)	VU
Spinner Shark	*Carcharhinus brevipinna*	Northwest Atlantic (subpopn)	NT
Silky Shark	*Carcharhinus falciformis*	Northwest & Western Central Atlantic (regional)	NT
Silky Shark	*Carcharhinus falciformis*	Eastern Central & Southeast Pacific (regional)	NT
Blacktip Shark	*Carcharhinus limbatus*	Northwest Atlantic (subpopn)	NT
Spinytail Skate	*Bathyraja spinicauda*	Northwest Atlantic (regional)	NT
Thorny Skate	*Amblyraja radiata*	Canada (regional)	VU
Winter Skate	*Leucoraja ocellata*	USA (regional)	EN

[1]EN, Endangered; VU, Vulnerable; NT, Near Threatened.

Table 4.5 Globally threatened chondrichthyans which have a relevant non-threatened (Near Threatened, Least Concern) or Data Deficient subpopulation (subpopn) or regional assessment (regional) for part of the North American, Central American, and Caribbean region. The corresponding global assessment is also provided.

Common name	Species name	Additional subpopulation or regional assessments	Global assessment[1]
Near Threatened			
Common Thresher Shark	*Alopias vulpinus*	Eastern Central Pacific (regional)	VU
Shortfin Mako	*Isurus oxyrinchus*	Eastern North Pacific (subpopn)	VU
Smooth Skate	*Malacoraja senta*	USA (regional)	EN
Least Concern			
Soupfin Shark	*Galeorhinus galeus*	Eastern North Pacific (regional)	VU
Spiny Butterfly Ray	*Gymnura altavela*	USA (regional)	VU
Data Deficient			
Gulper Shark	*Centrophorus granulosus*	Western Atlantic (regional)	VU

[1]EN, Endangered; VU, Vulnerable.

5 Chondrichthyan Management in North America, Central America, and the Caribbean

5.1 International Measures

In response to growing concern about overfishing of sharks, the Food and Agricultural Organization of the United Nations (FAO) adopted an International Plan of Action for the Conservation and Management of Sharks (defined to include all chondrichthyan fishes) in 1999. The Plan called on fishing nations to develop national and regional plans of action that included, *inter alia,* measures to ensure sustainable catches, collection of data, minimization of waste, special protections for threatened species, and the conservation of biodiversity. In 2001, the United States became the first country to produce a National Plan of Action (NPOA) for sharks. Mexico and Canada completed their NPOAs in 2004 and 2007, respectively. The progress of Shark NPOAs can be tracked at: <http://www.fao.org/fishery/ipoa-sharks/npoa/en>.

5.1.1 Regional Fisheries Bodies

The management of multinational fisheries in international waters is the responsibility of Regional Fisheries Management Organizations (RFMOs), most of which have been established to address fisheries for the most valuable bony fish, such as tunas, billfishes, cods, and flatfishes. Countries are expected to ensure that measures to which they agree through RFMOs are implemented, as appropriate, for their waters and for their vessels, although this is often not the case. RFMO competence with respect to chondrichthyans varies; the following section discusses actions with regards to chondrichthyans for the RFMOs most relevant to North American, Central American, and Caribbean countries.

5.1.1.1 ICCAT

International Commission for the Conservation of Atlantic Tunas (ICCAT) Contracting Parties include the U.S., Canada, Mexico, Belize, Venezuela, Trinidad & Tobago, Panama, Barbados, Nicaragua, Guatemala, St. Vincent & the Grenadines, and Honduras (ICCAT 2011a). In 2004, ICCAT became the first RFMO to ban shark finning; the rule sets forth a 5% limit on the fin-to-carcass weight ratio for enforcement. The same binding 'Recommendation' mandates Contracting Parties, and Cooperating non-Contracting Parties, Entities or Fishing Entities (CPCs) to report annual catch (Task I) and catch-effort data (Task II) for sharks, and encourages release of live sharks, full utilization of retained sharks, research to identify ways to make fishing gear more selective, and the identification of shark nursery areas (ICCAT 2004).

A 2005 ICCAT Recommendation called on CPCs to reduce fishing mortality for North Atlantic Shortfin Makos (*Isurus oxyrinchus*) (ICCAT 2005) and a 2007 ICCAT Recommendation reiterated this call and imposed a similar requirement for Porbeagles (*Lamna nasus*) (ICCAT 2007). ICCAT has not, however, adopted any specific limits to ensure such reductions. In 2009, ICCAT adopted a Recommendation prohibiting (for all CPCs except Mexico) the retention, transshipment, landing, storage, and sale of Bigeye Thresher Sharks (*Alopias superciliosus*), based on an ecological risk assessment (ERA) that indicated this species was the most vulnerable to ICCAT fisheries (ICCAT 2009). In 2010, Mexico ended its exception to the ICCAT Bigeye Thresher Shark measure, and ICCAT adopted the same prohibitions for Oceanic Whitetip Sharks (*Carcharhinus longimanus*) (ICCAT 2010a). A 2010 ICCAT prohibition on retaining hammerhead sharks (family Sphyrnidae with the exception of the Bonnethead Shark *Sphyrna tiburo*) included exemptions for developing CPCs, while encouraging those countries to report data and to prevent increased catches and international trade in hammerheads (ICCAT 2010b). Also in 2010, after the failure of several U.S. and European Union initiatives to set ICCAT Shortfin Mako catch limits, ICCAT CPCs agreed that Shortfin Makos would become a prohibited species in 2013 for CPCs not reporting catch data on the species (ICCAT 2010c). In 2011, prompted by an updated ERA that ranked the Silky Shark (*C. falciformis*) as the most vulnerable shark species with respect to ICCAT fisheries, ICCAT Parties adopted a Recommendation prohibiting the retention, transshipment, and landing (but not sale) of Silky Sharks; the measure exempts developing countries with the same conditions set forth in the hammerhead measure along with new requirements with respect to reporting and improving shark data. The Silky Shark Recommendation will be reviewed in 2013 based on additional, more detailed management advice from ICCAT scientists (ICCAT 2011b).

5.1.1.2 NAFO

Northwest Atlantic Fisheries Organization (NAFO) Contracting Parties include Canada, Cuba, and the U.S. In 2004, NAFO set the world's first international quota for an elasmobranch by establishing a TAC limit for skates (primarily the Thorny Skate *Amblyraja radiata*) for 2005. Since 2008, the NAFO Scientific Council has advised halving the skate quota. NAFO Parties slightly reduced the 2010 skate TAC and, in 2011, agreed on a 2012 skate TAC at just halfway toward the level advised by scientists. In 2005, NAFO banned finning, underscored data reporting requirements, and encouraged live release and shark research with text nearly identical to that adopted by ICCAT (NAFO 2011).

5.1.1.3 IATTC

Members of the Inter-American Tropical Tuna Commission (IATTC) include the U.S., Canada, Belize, Nicaragua, Panama, Guatemala, Colombia, Costa Rica, El Salvador, Mexico, and Venezuela (IATTC 2011a). In 2005, IATTC adopted a binding Resolution banning shark finning

modeled after the 2004 ICCAT Recommendation. The Resolution also encourages Shark NPOAs, full utilization, release of live, incidentally caught sharks, and research into gear selectivity and key shark habitats (IATTC 2005). In 2011, IATTC Parties adopted a prohibition on retaining onboard, transshipping, landing, storing, selling, or offering for sale, Oceanic Whitetip Sharks (IATTC 2011b).

5.1.2 Wildlife Treaties

5.1.2.1 CITES

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) provides a legal framework to monitor and control the international trade in species that are overexploited by such trade; it is one of the most effective agreements in regulating natural resource use (Fowler and Cavanagh 2005). Animals and plants threatened with extinction may be listed in Appendix I, essentially banning international trade in these species or their parts. Appendix II is reserved for species that could become threatened if trade is not controlled; trade in these species is closely monitored and allowed only after exporting countries provide evidence that such trade is not detrimental to populations of the species in the wild. In 2011, 175 countries were Party to CITES, including all Caribbean, North American, and Central American countries except for Haiti (CITES 2011a).

The first shark species listed under CITES – Whale Shark (*Rhincodon typus*) and Basking Shark (*Cetorhinus maximus*) – were added to Appendix II at the Conference of the Parties (CoP) in 2002, whereas Great White Sharks (*Carcharodon carcharias*) were listed on Appendix II at the 2004 CoP. All but one species of sawfish (family Pristidae) were listed on Appendix I in 2007 (Freshwater Sawfish *Pristis microdon* was listed in Appendix II) (CITES 2011b). Initiatives to list Spiny Dogfish (*Squalus acanthias*) and Porbeagle under Appendix II failed at the CoPs in 2007 and 2010. Updated proposals for those two species and new proposals to list the Oceanic Whitetip Shark, Scalloped Hammerhead (*Sphyrna lewini*), Great Hammerhead (*S. mokarran*), and the Smooth Hammerhead (*S. zygaena*) on CITES Appendix II were defeated at the 2010 CoP.

5.1.2.2 CMS

The Convention on the Conservation of Migratory Species of Wild Animals (CMS), adopted in 1979 and entered into force in November 1983, was formulated to protect animals that inhabit international waters and/or that migrate across national boundaries. As of November 2011, CMS has 116 Parties including Antigua and Barbuda, Jamaica, Cuba, Costa Rica, Honduras, and Panama (CMS 2011a). Migratory species that are at risk of extinction in all or part of their ranges can be listed on Appendix I and should be conferred strict protection. Migratory species with an unfavorable conservation status may be listed on Appendix II. Species can be listed on both Appendices. All range states, whether or not they are members of CMS, are encouraged to enter into agreements for the conservation and management of Appendix II species that would benefit from international cooperation.

Currently, eight chondrichthyans are listed on the CMS Appendices. The Whale Shark was listed in 1999 on Appendix II; the Great White Shark and the Basking Shark were listed on Appendices I and II in 2002 and 2005, respectively. The Shortfin Mako, Longfin Mako (*I. paucus*), Porbeagle, and northern hemisphere populations of Spiny Dogfish were added to Appendix II in 2008 (Camhi *et al*. 2009). Parties agreed to include the Giant Manta Ray (*Manta birostris*) under Appendices I and II in 2011 while Norway suggested adding the Reef Manta Ray (*M. alfredi*) at the next CoP in 2014 because of similarities between the two species.

In 2010, CMS Parties finalized a non-binding Memorandum of Understanding (MoU) for Migratory Sharks, particularly the seven listed species. As of December 2011, the MoU has 24 signatories, including Costa Rica and the U.S. (a participating non-Party) (CMS 2011b); an accompanying Action Plan is still in development.

5.2 National Domestic Measures

5.2.1 Canada

Canada banned shark finning in 1994 and imposed a 5% fin-to-dressed-carcass weight ratio limit to enforce it. Fins may not be stored aboard the vessel after associated carcasses are sold, traded, or bartered and must be weighed and monitored at the time of landing (Fowler and Séret 2010). Canadian fisheries, particularly those of the Pacific, are characterized by exceptionally high levels of at sea observer/video camera coverage and dockside monitoring, often funded by the fishing industry (DFO 2007).

Canada implemented an Atlantic shark FMP in 1995, which included Porbeagle (*Lamna nasus*), Blue Shark (*Prionace glauca*), and Shortfin Mako (*Isurus oxyrinchus*), and has amended measures several times since. Associated fishery managers expressly give priority to 'the needs of traditional bycatch fisheries', including swordfish and tuna longline fleets and groundfish fixed gear fleets, when determining when and how to close directed fisheries. Canadian Atlantic recreational shark fisheries are catch and release only, except for authorized derbies. Blue Sharks dominate these catches (DFO 2007).

A TAC limit (divided into directed and incidental catches) for Canadian Porbeagle was established in 2002 and reduced in 2006, and Porbeagle mating grounds have also been closed to shark fishing. Canada instituted a 'non-restrictive catch guideline' for Blue Sharks taken in directed longline, handline, and, rod and reel fisheries in 1995. The 2007 Canadian National Plan of Action for Sharks (DFO 2007) notes declines in abundance of Shortfin Makos (taken as bycatch in pelagic longline fisheries for swordfish and tuna) but calls only for continued monitoring of catches, despite 2005 and 2007 ICCAT agreements to reduce fishing mortality on the population.

Catches of skates, Spiny Dogfish (*Squalus acanthias*), and, in some cases, larger sharks are limited under various Canadian Atlantic groundfish FMPs. A Spiny Dogfish quota based on landings was established in 2002. Population assessment to determine sustainable fishing limits is ongoing. Declining catches from a regional fishery for mainly Winter Skates (*Leucoraja ocellata*) that began in the 1990s were limited in 2002 and ended in 2006. Canada has been allocated 16.67% of the international TAC for Thorny Skate (*Amblyraja radiata*) set under NAFO, which in 2011 was still substantially higher than scientists recommend. These species and others taken as bycatch in otter trawls (e.g. Smooth Skate *Malacoraja senta*, Little Skate *L. erinacea*, Barndoor Skate *Dipturus laevis*, Spinytail Skate *Bathyraja spinicauda*, Round Skate *Rajella fyllae*, and other species) are subject to restrictions on mesh size, fishing area, vessel size, and amount of gear under Canadian Atlantic groundfish FMPs. Incidental shark landings are limited (up to 10% of the total catch or 500 kg per trip) in some Canadian Atlantic groundfish fisheries (DFO 2007).

Canada's Pacific fisheries for North Pacific Spiny Dogfish (*Squalus suckleyi*) and skates are also managed under regional groundfish FMPs. Since the mid-2000s, North Pacific Spiny Dogfish have been subject to an annual TAC which was established based on landings rather than population assessment, but appears to be sustainable. TACs for Big Skate (*Raja binoculata*) and Longnose Skate (*R. rhina*), as well as skate species complexes, are set annually, but do not apply to all fishing areas. There is a management framework for Canadian fisheries in the Arctic, but currently no specific limits on the chondrichthyans taken in fisheries there, which include Greenland Shark (*Somniosus microcephalus*), Arctic Skate (*Amblyraja hyperborea*), and Thorny Skate (DFO 2007).

Canada granted legal protection under the Species At Risk Act to Pacific Basking Sharks (*Cetorhinus maximus*) in 2010 and to the Bluntnose Sixgill Shark (*Hexanchus griseus*), the Soupfin Shark (*Galeorhinus galeus*), and Atlantic Great White Sharks (*Carcharodon carcharias*) in 2011 (DFO 2011).

5.2.2 United States

The U.S. banned shark finning as part of a 1993 Federal FMP for Atlantic sharks. After considering various enforcement methods, fishery managers chose a wet-fin-to-dressed-carcass weight ratio of 5% as a limit based largely on Sandbar Sharks (*Carcharhinus plumbeus*). The Shark Finning Prohibition Act of 2000 led to regulations that outlawed finning for the U.S. Pacific and relied on the same ratio for enforcement (NOAA 2002). In 2008, NMFS amended the Atlantic finning regulations to require that all sharks be landed with their fins still attached, thereby improving capacity for enforcement as well as species-specific catch data collection. In early-2011, the U.S. Shark Conservation Act mandated that U.S. Pacific fishers also end at sea shark fin removal, while creating a possible exception to the 'fins attached' rule for one species of smoothhound (Dusky Smoothhound *Mustelus canis*) in the Atlantic; associated language suggests application out to roughly 50 miles from shore and a fin-to-carcass ratio of 12%. It is not clear how or when NMFS will complete their interpretation of this text and issue implementing regulations.

U.S. Federal Atlantic shark management measures were established in 1993 (NMFS 1993) and consolidated in 1996 into an Atlantic Highly Migratory Species (HMS) FMP. Sandbar Shark, Silky Shark (*C. falciformis*), Tiger Shark (*Galeocerdo cuvier*), Blacktip Shark (*C. limbatus*), Spinner Shark (*C. brevipinna*), Bull Shark (*C. leucas*), Lemon Shark (*Negaprion brevirostris*), Nurse Shark (*Ginglymostoma cirratum*), Scalloped Hammerhead (*Sphyrna lewini*), Great Hammerhead (*S. mokarran*), and Smooth Hammerhead (*S. zygaena*) are managed under a large coastal species commercial quota. A quota is also set for the small coastal species complex: Finetooth Shark (*C. isodon*), Atlantic Sharpnose Shark (*Rhizoprionodon terraenovae*), Blacknose Shark (*C. acronotus*), and Bonnethead Shark (*S. tiburo*). Oceanic Whitetip Shark (*C. longimanus*), Shortfin Mako, and Common Thresher Shark (*Alopias vulpinus*) are grouped under a pelagic category quota while Porbeagle and Blue Sharks have their own species-specific quotas. Commercial trip limits also apply. Recreational shark catch is limited through bag limits and minimum sizes.

Beginning in 1997, retention and possession of the following 19 depleted and/or poorly understood shark species has been prohibited for both commercial and recreational fisheries: Atlantic Angel Shark (*Squatina dumeril*), Basking Shark, Sand Tiger (*Carcharias taurus*), Bigeye Sand Tiger (*Odontaspis noronhai*), Bigeye Sixgill Shark (*Hexanchus nakamurai*), Bluntnose Sixgill Shark, Bigeye Thresher Shark (*Alopias superciliosus*), Bignose Shark (*Carcharhinus altimus*), Whale Shark (*Rhincodon typus*), Caribbean Reef Shark (*C. perezi*), Caribbean Sharpnose Shark (*Rhizoprionodon porosus*), Sharpnose Sevengill Shark (*Heptranchias perlo*), Dusky Shark (*C. obscurus*), Galapagos Shark (*C. galapagensis*), Smalltail Shark (*C. porosus*), Longfin Mako (*I. paucus*), Copper Shark (*C. brachyurus*), Great White Shark, and Night Shark (*C. signatus*). In addition, recreational fishers are prohibited from retaining Silky Sharks based on their similarity to Dusky Sharks. A recent plan amendment prohibits take of Sandbar Sharks outside a tightly controlled experimental fishery.

From January through July, a large area off North Carolina is closed to bottom longline fishing, primarily to protect Dusky Sharks. Commercial fishers are required to attend shark species identification workshops and to carry specific gear to facilitate safe handling and release of prohibited species (NMFS 2003). Federal catch limits for Atlantic smoothhound sharks (Dusky Smoothhound and Narrowfin Smoothhound *M. norrisi*) under this FMP were due to take effect in mid-2012, but have recently been delayed due in

part to the recent Shark Conservation Act of 2010 requiring 'NMFS to re-evaluate its shark management measures' (NOAA 2011b).

A FMP for Spiny Dogfish fisheries in the U.S. Atlantic was implemented in 2000 (MAFMC 1999). The plan established commercial fishing quotas and possession limits (aimed at preventing targeted fishing on mature females). Federal quotas have been steadily and substantially increased in recent years, but have not exceeded scientific advice.

The U.S. began managing fisheries for Atlantic skates (Barndoor Skate, Clearnose Skate *Raja eglanteria*, Little Skate, Rosette Skate *Leucoraja garmani*, Smooth Skate, Winter Skate, and Thorny Skate) in 2003 (NEFMC 2003). The Northeast skate FMP includes catch reporting requirements, a TAC, possession limits, and prohibitions on possession of Barndoor Skate and Thorny Skate in U.S. Atlantic fisheries as well as Smooth Skates from the Gulf of Maine. Roughly two-thirds of the TAC is allotted to the skate wing fishery while the remaining third is allocated for skates used as bait (NEFMC 2011). The Northeast skate TAC was increased in late-2011 by 56% based on new scientific information (NOAA 2011d).

Smalltooth Sawfish (*Pristis pectinata*) and Largetooth Sawfish (*P. perotteti*) have been afforded the highest level of Federal protection through listing under the U.S. Endangered Species Act, in 2003 and 2011, respectively; catch and harm of these species is illegal. NMFS published a comprehensive recovery plan and designated critical habitat for Smalltooth Sawfish in 2009; the plan outlines specific steps for reducing fishing impacts, protecting key habitats, educating the public, and encouraging research; NMFS has also issued guidelines for the safe release of incidentally caught sawfish (NMFS 2009).

A 2004 HMS FMP for the U.S. Pacific sets non-restrictive 'harvest guidelines' for the Common Thresher Shark, Shortfin Mako, Blue Shark, Bigeye Thresher Shark, and Pelagic Thresher Shark (*Alopias pelagicus*), and bans the retention of Great White Shark, Basking Shark, and Megamouth Shark (*Megachasma pelagios*) (PFMC 2011a). Leopard Shark (*Triakis semifasciata*), Soupfin Shark, North Pacific Spiny Dogfish, Big Skate, California Skate (*Raja inornata*), Longnose Skate, and Spotted Ratfish (*Hydrolagus colliei*) are covered by the Pacific Coast Groundfish FMP and thereby benefit from area restrictions, seasonal closures, gear restrictions, and catch limits set primarily for the region's rockfish and flatfish (PFMC 2011b).

The North Pacific Fishery Management Council (NPFMC) includes sharks under the 'other species' category in the Gulf of Alaska Groundfish FMP to which a TAC is applied (NPFMC 2011). Directed fishing for skates is prohibited under this FMP; Big Skates and Longnose Skates are managed as single species-groups throughout the Gulf under separate TACs for Western, Central, and Eastern regions. The remaining skates (genus *Bathyraja*) are managed as a Gulf-wide species complex as 'other skates' (Ormseth and Matta 2010). The Bering Sea/Aleutian Island Groundfish FMP covers Pacific Sleeper Shark (*Somniosus pacificus*), Salmon Shark (*Lamna ditropis*), North Pacific Spiny Dogfish, as well as skates under an annually set TAC for species-assemblages (NPFMC 2010).

5.2.3. U.S. Caribbean Territories

Fishers in Puerto Rico and the U.S. Virgin Islands are subject to shark conservation measures, such as species-specific protections and the 'fins attached' requirement, set forth in the U.S. Atlantic HMS FMP.

5.2.4 Mexico

The Mexican Government finalized the Official Norm for Responsible Shark and Ray Fisheries in 2006 and adopted it in 2007. The Regulation established catch reporting requirements, restrictions on fishing gears and areas, and provisions for observer programs. Shark finning was prohibited, especially for vessels >10.5 m, but enforcement standards are not clear: fins cannot be landed unless the bodies are onboard (Fowler and Séret 2010). The Regulation also banned the take of Basking Shark, Whale Shark, and Great White Sharks as well as sawfishes (*Pristis* species) and devil rays (Giant Manta Ray and *Mobula* species) (Sosa-Nishizaki *et al*. 2008; Camhi *et al*. 2009; O. Sosa-Nishizaki pers. comm. 2011). In mid-2011, Mexico announced several 2–4 month area closures for the spring of 2012, intended to protect sharks during the pupping season.

5.2.5 Central America and Other Caribbean Countries

Due to the large number of sovereign states and differences in governance capacity, chondrichthyan fisheries management in Central America and the rest of the Caribbean region is a patchwork of largely inconsistent measures with many gaps where even the most basic measures are lacking. Where regulations exist, lack of effective enforcement remains an ongoing issue.

Building on 2004 initiatives, the Organization of the Fisheries and Aquaculture Sector of the Central American Isthmus (OSPESCA) has recently begun to address this situation through adoption of a Regional Plan of Action for sharks, although funding for implementation is lacking.

In November 2011, OSPESCA approved a common regional finning regulation (effective January 2012) for eight member countries from the Central American Integration System (SICA) (Belize, Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua, and Panama) which requires sharks to be landed with their fins still naturally attached for vessels fishing in SICA countries and those fishing in international waters flying a SICA country flag. SICA country trade of fins separated from shark bodies must be accompanied by a document from the country of origin certifying that they are not the

product of finning. The Regulation also requires national legislation to guarantee the integral use of 'sustainably captured' sharks (OSPESCA 2011).

Implementation of these rules, as well as associated illegal and unregulated activities, remain particular concerns for this region, particularly in Nicaragua. Shark fins are reportedly often transported across borders for sale in the countries where enforcement is most lacking.

See section on U.S. Caribbean Territories for information on Puerto Rico and U.S. Virgin Islands shark conservation measures.

5.2.5.1 Bahamas

The Bahamas banned longline fishing in 1993. In 2011, the Bahamas banned commercial shark fishing, sale, and trade. A limited number of sharks from incidental and artisanal catches may be kept and consumed. Permits can be granted for retention and export of sharks for scientific and educational purposes. Sport fishing for sharks is limited to catch and release.

5.2.5.2 Belize

Belize has banned the use of nets and longlines in its 13 marine protected areas (7.2% of territorial seas), as well as banning the use of trawlers throughout its waters (although there are continued incursions from Guatemalan shrimp trawlers into Belize's southern waters). The Whale Shark was protected nationally in 2003. In 2011, Belize protected Nurse Sharks; prohibited the take, sale, possession, and export of shark meat and fins from August–October; mandated the use of circle hooks; established a six inch minimum mesh size; and, required that sharks be landed with their fins 'at least partially attached.' There are also further requirements for shark fishing, export licenses, and catch reporting.

5.2.5.3 Costa Rica

Costa Rica banned finning in 2001. After years of debates and policy changes with respect to enforcement of the ban, Costa Rica reinstated a requirement that shark fins remain attached (in a natural way) in 2006 (Fowler and Séret 2010). Representatives from Costa Rica have promoted this best practice at international meetings, including those of the United Nations General Assembly and the FAO Committee on Fisheries.

5.2.5.4 El Salvador

El Salvador's 2006 shark finning prohibition requires that sharks be landed with at least 25% of each fin still attached to the body in the natural way. Sale and/or export of fins are prohibited without the corresponding body. Anyone wishing to land sharks must provide 48 hours notice of the expected arrival date and landing location. Sharks can only be landed at authorized sites (Fowler and Séret 2010).

5.2.5.5 Guatemala

Guatemala enacts a month-long seasonal closure on shark and ray fishing along its Caribbean coast that varies annually based on fisher consensus on the timing of closure.

5.2.5.6 Honduras

Honduras protected the Whale Shark in 1998. In 2010, Honduras established a moratorium on shark fishing (catch, commercialization, and export of sharks and shark products) for the Pacific and Caribbean Sea (Fowler and Séret 2010).

5.2.5.7 Nicaragua

Since 2004, Nicaragua has prohibited vessels from having fins onboard vessels (without bodies) and/or landing fins with a weight in excess of 5% of the total weight of the sharks. Those who wish to export fins are required to prove that the meat has been sold (Fowler and Séret 2010).

5.2.5.8 Panama

Panama banned finning in 2006. 'Industrial' fishers must land sharks with the fins naturally attached (partial cuts up to 75% detachment are allowed) while 'artisanal' fishers may land the fins separately as long as the weight of the fins is no more than 5% of the whole weight of sharks. A certificate of origin is required to trade fins (Fowler and Séret 2010). In 2010, Panama began restricting the use of longlines by boats >5 tons in coastal waters.

5.2.5.9 Colombia

Finning and transshipping of fins at sea was banned in Colombian waters in 2007. Fins must be attached to the body at the point of landing. Permits are required for transporting fins (Fowler and Séret 2010).

5.2.5.10 Venezuela

In 2012, Venezuela declared several shark conservation measures, including a ban on shark finning (sharks must be landed with fins attached). Maximum export of fins is established at 7 t/year. Fishing of sharks only (batoids and chimaeras are excluded) is prohibited throughout Los Roques and Las Aves archipelagos with the exception of a maximal bycatch quota of five sharks per landing and per artisanal fishing boat permitted only for fishers residing in the archipelagos. In accordance with ICCAT obligations, all fishing, sale, possession, and export of Bigeye Thresher Sharks and Oceanic Whitetip Sharks is prohibited, and the industrial fleet is prohibited from fishing Silky Sharks and all hammerhead species; export of these species' and their products is also banned. Possession of shark products while stored or transshipped must be accompanied by a certificate of origin.

6 Recommendations

The Governments of countries in North America, Central America, and those bordering the Caribbean Sea are urged to:

- Require the collection and accessibility of species-specific chondrichthyan fisheries data, including discards;
- Ensure prompt and accurate reporting of chondrichthyan landings to relevant national and international authorities;
- Assess population status and safe fishing levels for chondrichthyan populations through stock assessments, ecological risk assessments, and/or IUCN Red List information, with priority given to heavily fished, un-assessed populations;
- Implement chondrichthyan catch limits in accordance with scientific advice; when sustainable catch levels are uncertain, implement fishing limits based on the precautionary approach;
- Fully protect chondrichthyan species classified by IUCN as Critically Endangered or Endangered;
- Strictly enforce chondrichthyan fishing and protection measures, and impose meaningful penalties for violations;
- Significantly increase observer coverage and monitoring in fisheries taking significant amounts of chondrichthyans as bycatch;
- Increase monitoring and protective management measures of threatened chondrichthyans;
- Strengthen finning bans, if applicable, by requiring all sharks taken in all fisheries be landed with their fins still naturally attached;
- Promote research on gear modifications, fishing methods, and habitat identification aimed at mitigating chondrichthyan bycatch and discard mortality;
- Encourage cooperative programs to identify and promote viable, sustainable economic alternatives to shark fishing;
- Develop and adopt bilateral fishery management agreements for shared chondrichthyan stocks;
- Propose and work to secure science-based chondrichthyan conservation measures at RFMOs;
- Sign and engage in implementation of the Migratory Sharks MoU agreed under the CMS;
- Ensure full implementation and enforcement of CITES chondrichthyan listings; and,
- Propose and support the listing of additional threatened chondrichthyan species under CITES and CMS.

7 Species Accounts

A summary of the Red List status of all species in the following section is provided in Appendix I (in alphabetical order within the groups: sharks, batoids, and chimaeras). The full Red List assessment for each species is available by searching by species or common name on the IUCN Red List website (http://www.iucnredlist.org).

Information from outside the North American, Central American, and Caribbean region may be contained in the rationales presented below, particularly for wide-ranging species. Such information is retained in the rationales as it provides necessary background and support for reaching the global assessment.

See the Methodology Section for further details on the content of species accounts.

7.1 Sharks

ORDER	**HEXANCHIFORMES**
FAMILY	**CHLAMYDOSELACHIDAE**
	Family synopsis: *1 species (NT)*

Frilled Shark
Chlamydoselachus anguineus Garman, 1884

Red List Assessment: **Global: Near Threatened** (Paul, L.J. & Fowler, S.L. 2003).

Regional Occurrence: Northwest Atlantic; Northeast Pacific.

Rationale: The Frilled Shark (*Chlamydoselachus anguineus*) is a generally rare to uncommon deepwater species, with a few localities where it is taken more commonly as bycatch in several fisheries. Not an important target species, but a regular though small bycatch in many bottom trawl, midwater trawl, deep-set longline, and deep-set gillnet fisheries. As bycatch, this species is variously either used for meat, fishmeal, or discarded. Occasionally kept in aquaria (Japan). There is some concern that expansion of deepwater fishing effort (geographically and bathymetrically) will increase the levels of bycatch. Although little is known of its life history, this deepwater species is likely to have very little resilience to depletion as a result of even non-targeted exploitation. It is classified as Near Threatened due to concern that it may meet the Vulnerable A2d+3d+4d criteria.

ORDER	**HEXANCHIFORMES**
FAMILY	**HEXANCHIDAE**
	Family synopsis: *4 species (2 NT; 2 DD)*

Sharpnose Sevengill Shark
Heptranchias perlo (Bonnaterre, 1788)

Red List Assessment: **Global: Near Threatened** (Paul, L.J. & Fowler, S.L. 2003).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Sharpnose Sevengill Shark (*Heptranchias perlo*) is a wide-ranging, but relatively uncommon species where it occurs. Its center of abundance may be at outer shelf, slope, and oceanic seamounts where commercial fisheries for other target species are likely to develop. It is likely to have a low intrinsic rate of increase, and poor resilience to depletion. This species is of minor commercial importance, but bycatch in bottom trawl and longline fisheries may have caused population declines where deepwater fisheries have been underway for several decades.

Increased deepwater fishing effort in many regions is likely to affect populations in the future. The species is assessed as Near Threatened due to concern that it may meet the Vulnerable A2d+3d+4d criteria.

Bluntnose Sixgill Shark

Hexanchus griseus (Bonnaterre, 1788)

Red List Assessment: **Global: Near Threatened** (Cook, S.F. & Compagno, L.J.V. 2000).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Northeast Pacific; Eastern Central Pacific.

Rationale: The Bluntnose Sixgill Shark (*Hexanchus griseus*) is wide-ranging, although patchily distributed, in boreal, temperate, and tropical seas. It is a deep-benthic, littoral, and semi-pelagic shark; it is not known to be epipelagic. Young are often found close inshore, adults often in deeper water, although adults and sub-adults are known to enter shallow water in bays with adjacent deepwater canyons. In tropical areas it tends not to penetrate coastal waters. Largely caught as a bycatch of other fisheries, this is also a valuable food and sports fish that appears very vulnerable to overfishing and unable to sustain intensive, targeted fisheries for long periods. Some regional populations have been severely depleted, e.g. in the Northeast Pacific. However, population and fisheries data are lacking from many regions.

Bigeye Sixgill Shark

Hexanchus nakamurai (Teng, 1962)

Red List Assessment: **Global: Data Deficient** (Ebert, D.A., Serena, F. & Mancusi, C. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Bigeye Sixgill Shark (*Hexanchus nakamurai*) is a little known, moderately large (to 180 cm TL), primarily deepwater cow shark with a patchy distribution in tropical and warm-temperate waters in the Northeast and Western Atlantic, the Mediterranean Sea, the Northwest, Western Central and Southwest Pacific, and the Indian Ocean. It is probably mesopelagic to benthic in shelf and slope waters in depths of 90–621 m with possible excursions to the surface. This species has often been misidentified as the larger Bluntnose Sixgill Shark (*H. griseus*), leading to confusion and poor knowledge of its distribution and no knowledge of any population trends. It is uncommonly taken by bottom trawl and longline gear and is of relatively small importance to fisheries. Due to insufficient information this species cannot be assessed beyond Data Deficient at present. Species-specific catch data are required to better define the distribution, population trends (if any) and threats to the species.

Broadnose Sevengill Shark

Notorynchus cepedianus (Peron, 1807)

Red List Assessment: **Global: Data Deficient; Eastern Pacific subpopulation: Near Threatened** (Compagno, L.J.V. 2000).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: Although wide-ranging and moderately common (where not heavily exploited), the Broadnose Sevengill Shark (*Notorynchus cepedianus*) is restricted to a limited inshore depth range in heavily fished temperate waters and is exposed to intensive inshore fisheries over most of its range. The central Californian stock in the San Francisco Bay area is thought to have been depleted in the early-1980s, but lack of fisheries data elsewhere make it impossible to determine whether this pattern of depletion definitely operates throughout its range.

ORDER	**SQUALIFORMES**
FAMILY	**ECHINORHINIDAE**
	Family synopsis: *2 species (1 NT; 1 DD)*

Bramble Shark

Echinorhinus brucus (Bonnaterre, 1788)

Red List Assessment: **Global: Data Deficient** (Paul, L.J. 2003).

Regional Occurrence: Northwest Atlantic.

Rationale: The Bramble Shark (*Echinorhinus brucus*) is an apparently rare deepwater shark, recorded sporadically and usually singly at widely dispersed localities. It may be present at greater depths than are commercially fished, but this is only speculative. It reaches a large size, and although very little is known of its life history, it is likely to be a slow growing, late maturing species of low overall productivity. In the Northeast Atlantic, there is published qualitative information on a decline in this species over recent decades. At present there is inadequate information to assess the conservation status of this species, however, since it is a known (albeit infrequent) component of fisheries bycatch with probable limiting life history characteristics and likely rare status, the species may well meet the criteria for a threatened category as more information becomes available.

Prickly Shark

Echinorhinus cookei Pietschmann, 1928

Red List Assessment: **Global: Near Threatened** (Paul, L.J. 2003).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Prickly Shark (*Echinorhinus cookei*) is a rare deepwater shark, known only from the Pacific Ocean. It may be present and more widely dispersed at greater depths than are presently fished, but this is only speculative. It appears to be vulnerable to deepwater trawling and line fishing and, as these fishing activities increase, there is potential for ongoing reduction of what may be a small fragmented population with low resilience to fisheries.

ORDER	**SQUALIFORMES**
FAMILY	**SQUALIDAE**
	Family synopsis: *5 species (1 VU; 3 DD; 1 NE)*

Roughskin Spurdog

Cirrhigaleus asper (Merrett, 1973)

Red List Assessment: **Global: Data Deficient** (Herndon, A.P. & Burgess, G.H. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Roughskin Spurdog (*Cirrhigaleus asper*) is a widespread dogfish of the outer continental shelves and upper and insular slopes at depths of 73–600 m. The presently known disjunct range in many ocean regions suggests that it is more widely distributed than currently recorded. Relatively common where it occurs off the Atlantic coast of the U.S., but reported as rare to uncommon elsewhere. Reaches a maximum size of 118 cm TL and produces a relatively large litter size of 18–22 pups, but probably has a long gestation period like that of other squalid and deepwater sharks. Probably occurs as a bycatch in various demersal trawl and line fisheries throughout its range, although details are lacking and this species cannot be assessed beyond Data Deficient at the present time. Where taken, catches require monitoring, particularly as deepwater fisheries expand worldwide.

Spiny Dogfish

Squalus acanthias Linnaeus, 1758

Red List Assessment: **Global: Vulnerable A2bd+3bd+4bd; Northwest Atlantic subpopulation: Endangered A2bd+4bd** (Fordham, S.V., Fowler, S.L., Coelho, R., Goldman, K.J. & Francis, M. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic. Note: The name *Squalus suckleyi* has recently been resurrected for what was previously referred to as *S. acanthias* in the North Pacific. *Squalus acanthias* has been flagged for priority reassessment and is currently undergoing revision. The following rationale is a slightly modified version of the original rationale published in 2006 in order to update the species' situation, but it does not encompass all new information which will have a bearing on the species' Red List status. Information pertaining to the North Pacific (and hence to *S. suckleyi*) has been removed from the rationale below; a separate assessment for *S. suckleyi* is in preparation.

Rationale: The Spiny Dogfish (*Squalus acanthias*) is a small demersal shark of temperate continental shelf seas worldwide. Management is in place in only a few range states and in only a limited part of the range of highly migratory stocks. Although naturally abundant, this is one of the more vulnerable species of shark to overexploitation by fisheries because of its late maturity, low reproductive capacity, longevity, long generation time (25+ years) and hence a very low intrinsic rate of population increase. Population segregation and an aggregating habit make mature (usually pregnant) females highly vulnerable to fisheries even when stocks are seriously depleted. This aggregating habit also means that CPUE is not an adequate indicator of stock status; high CPUE can be maintained even when populations are severely depleted. Some targeted Spiny Dogfish fisheries have been documented for over 100 years. Fisheries stock assessments report a decline in total biomass of >95% from baseline in the Northeast Atlantic, where catch-effort is effectively unlimited. Mediterranean and Black Sea stocks are also unmanaged, with a >60% decline reported in a Black Sea stock assessment for 1981 to 1992. There has been a decline in biomass of mature females of 75% in just 10 years in the Northwest Atlantic, where U.S. Federal efforts to manage the stock are hampered by high bycatch, continued exploitation in Canadian Atlantic waters, and regular defiance of scientific advice by U.S. Atlantic states. European demand continues to fuel markets around the world. Unregulated and expanding target and bycatch fisheries take Spiny Dogfish in South America (Europe reports imports from this region), where population declines are reported. New Zealand manages the species, which is taken in target and bycatch fisheries, through its Quota Management System. There is only limited fishing pressure in Australia and South Africa, with most catches discarded.

Cuban Dogfish

Squalus cubensis Howell-Rivero, 1936

Red List Assessment: **Global: Data Deficient** (Monzini, J. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: This warm-temperate and tropical dogfish of the continental shelf and uppermost slopes schools on or near the bottom at depths of 60–380 m. The Cuban Dogfish (*Squalus cubensis*) ranges from the east coast of the U.S., through parts of the Caribbean, to southern Brazil and Argentina. It reaches a maximum size of 110 cm TL and produces ~10 young per litter. Separate catch statistics are not reported for this species and nothing is known of its population size or structure. The little information available just refers to the Cuban Dogfish as bycatch of artisanal and commercial fisheries in the Caribbean. It is mainly caught in the northern Gulf of Mexico, although details are lacking, and this species cannot be assessed beyond Data Deficient at this time. Where taken, catches require monitoring, particularly as deepwater fisheries expand worldwide.

Shortspine Spurdog

Squalus mitsukurii Jordan & Snyder, *in* Jordan & Fowler, 1903

Red List Assessment: **Global: Data Deficient** (Cavanagh, R.D., Lisney, T.J. & White, W.T. 2007).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic. Note: The taxonomy of the '*S. mitsukurii*' species-group is poorly resolved. Records from the Americas are nominal and may represent distinct species.

Rationale: The distribution of Shortspine Spurdog (*Squalus mitsukurii*) is only approximately known and recent revision of the genus in the Indo-Australian region resulted in the resurrection of two species and a new description, previously considered conspecific with the Shortspine Spurdog. Further investigation from around the world will likely result in more taxa being recognized. Due to taxonomic uncertainty (and lack of quantitative data from elsewhere), this species is currently Data Deficient globally. However, deepwater demersal trawl fisheries are expanding in other parts of its possible range, and with the observed declines in similar species where they are heavily fished, together with the knowledge that its biology is similar to other deepwater shark species, the Shortspine Spurdog is not sufficiently fecund to withstand continued exploitation pressure.

North Pacific Spiny Dogfish

Squalus suckleyi (Girard, 1854)

Red List Assessment: **Not Evaluated** (Assessment in preparation 2012).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific. Note: The name *Squalus suckleyi* has recently been resurrected for what was previously referred to as *S. acanthias* in the North Pacific.

ORDER	**SQUALIFORMES**
FAMILY	**CENTROPHORIDAE**
	Family synopsis: *5 species (1 VU; 2 NT; 1 LC; 1 DD)*

Needle Dogfish

Centrophorus acus Garman, 1906

Red List Assessment: **Global: Near Threatened; Western Atlantic subpopulation: Data Deficient** (Horodysky, A.Z. & Burgess, G.H. 2006).

Regional Occurrence: Northwest Atlantic. Note: The taxonomy of the genus *Centrophorus* is poorly resolved. Records of *C. acus* from the Western Atlantic are nominal and may represent a distinct species.

Rationale: The Needle Dogfish (*Centrophorus acus*) is a poorly known deepwater shark with a limited distribution in the Western Pacific around parts of Japan, Taiwan, and the Philippines. It is also nominally recorded from the Western Atlantic and the relationship between these forms needs taxonomic resolution when more specimens are available. Few adult specimens of this large (to at least 161 cm TL) *Centrophorus* species have been collected. This shark has a potentially low fecundity (based on examination of mature females) and late maturation (females possibly mature >20 years based on dorsal spine examination). Around Japan and Taiwan this species is taken both in targeted deepwater fisheries for squalene (liver) oil and as bycatch in demersal trawl, longline, dropline, and gillnet fisheries. Specific information on catches is not available. The species' biological attributes, together with its limited distribution, make it highly susceptible to population depletion as with other deepwater dogfish with similar life history strategies. The vulnerability of *Centrophorus* species to population depletion from localized fishing has been well documented off the east coast of Australia where trawl fishing has depleted the stocks of several species. As such, the Needle Dogfish is assessed as Near Threatened globally and there is an urgent need for appraisal of catches of this species where it is landed in Japan and Taiwan, and for the development of appropriate management given the apparent limited life history characteristics of the species. The (nominal) Western Atlantic subpopulation is assessed as Data Deficient due to complete lack of information at this time.

Gulper Shark

Centrophorus granulosus (Bloch & Schneider, 1801)

Red List Assessment: **Global: Vulnerable A2abd+3d+4d; Western Atlantic (regional assessment): Data Deficient** (Guallart, J., Serena, F., Mancusi, C., Casper, B.M., Burgess, G.H., Ebert, D.A., Clarke, M.W. & Stenberg, C. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic. Note: The taxonomy of the genus *Centrophorus* is poorly resolved. Records of *C. granulosus* from the Western Atlantic are nominal and may represent a distinct species.

Rationale: The Gulper Shark (*Centrophorus granulosus*) is a rare deepwater dogfish with a widespread global distribution, inhabiting the upper continental slopes and outer continental shelf area. Believed to have the lowest reproductive potential of all elasmobranch species; its reproductive biology is characterized by a late onset of maturity (12–16 years in females), only one pup per litter and a two-year gestation period with occasional resting periods. This makes it extremely vulnerable to overexploitation and population depletion. Despite a lack of data for certain regions within its geographic range, this species is globally assessed as Vulnerable on the basis of its limiting life history traits and the global increase in unmanaged fishing effort to exploit deeper waters. This species is extremely rare in the Mediterranean, which in combination with the documented localized depletion subsequent to brief targeted fishing efforts and the species' inherent vulnerability to exploitation even in moderate numbers though bycatch, leads to an assessment of Vulnerable in this region. A decline of 80 to 95% from baseline has been estimated for the Northeast Atlantic population. Due to the low level of recruitment (resulting from a low fecundity and low reproductive output), this species is assessed as Critically Endangered within the Northeast Atlantic. Elsewhere, taxonomic issues, in combination with a paucity of data have hampered this species' assessment and as a result it cannot be assessed beyond Data Deficient for the Western Atlantic. There is an urgent call for further research on a global level, but in particular to collect further data for these aforementioned areas. Monitoring of the extent to which this species is affected by bycatch is also required. The taxonomic issues relating to this species need to be resolved and *Centrophorus* species examined to determine the proper identification of the species involved within these regions.

Taiwan Gulper Shark

Centrophorus niaukang Teng, 1959

Red List Assessment: **Global: Near Threatened** (Fowler, S.L. 2003).

Regional Occurrence: Northwest Atlantic. Note: The taxonomy of the genus *Centrophorus* is poorly resolved. Records of *C. niaukang* from the Western Atlantic may represent a distinct species.

Rationale: Deepwater gulper sharks are highly vulnerable to population depletion through fisheries bycatch because of their slow life histories. The Taiwan Gulper Shark (*Centrophorus niaukang*) is very widely, but patchily distributed worldwide. Records are sparse and it is probably not abundant. The virtually complete absence of data on extent of occurrence, population size, or any indicator of population trend might be considered to warrant a Data Deficient assessment, but a Near Threatened assessment reflects widespread concern that bycatch of this biologically highly vulnerable species has been occurring, and will continue to occur, in deepwater fisheries, possibly through a significant proportion of this species' range.

Mosaic Gulper Shark

Centrophorus tessellatus Garman, 1906

Red List Assessment: **Global: Data Deficient** (Herndon, A.P. & Burgess, G.H. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic. Note: The taxonomy of the genus *Centrophorus* is poorly resolved. Records of *C. tessellatus* from the Western Atlantic are nominal and may represent a distinct species.

Rationale: The Mosaic Gulper Shark (*Centrophorus tessellatus*) is an apparently rare deepwater shark of uncertain validity. The holotype was recorded from off southeastern Honshu, Japan and provisional records exist in depths of 260–732 m from the Western Atlantic, Western Indian, and parts of the Pacific. These may represent a single valid, seemingly wide-ranging species, or alternatively distinct species (as is believed to be case in the Western Atlantic), or records of other described species. Until these taxonomic issues are resolved, despite potential threats from deepwater fisheries, the Mosaic Gulper Shark cannot be assessed beyond Data Deficient.

Arrowhead Dogfish

Deania profundorum (Smith & Radcliffe, 1912)

Red List Assessment: **Global: Least Concern** (Ebert, D.A., McCormack, C. & Samiengo, B. 2009).

Regional Occurrence: Northwest Atlantic.

Rationale: The Arrowhead Dogfish (*Deania profundorum*) is a moderate-sized (to 104 cm but mostly around 80 cm TL) dogfish found on or near the bottom at depths of 275–1,785 m on the upper continental and insular slopes. It is often found in huge aggregations, possibly increasing the threat of overfishing where fisheries occur. There is little information on the catch of this species but deepwater fisheries operate over much of its range (e.g. Canary Islands, the Azores, off Namibia, and in the Gulf of Mexico). This species is taken on longlines off the Canary Islands and utilized for liver oil and meat. It may also be taken by an experimental deepsea tanglenet fishery off Namibia, where identification of the *Deania* species being caught is uncertain. Observations suggest they may be more common in the deeper end of their bathymetric range. There are no known deepwater fisheries currently operating where the species occurs off South Africa and the Philippines and these areas may provide a refuge from fishing pressure. Given this species' relatively wide geographic and bathymetric range and the absence of data to suggest significant declines, this species is assessed as Least Concern. Expanding fisheries should be monitored as they move into deeper water.

ORDER **SQUALIFORMES**

FAMILY **ETMOPTERIDAE**

Family synopsis: *13 species (8 LC; 5 DD)*

Black Dogfish

Centroscyllium fabricii (Reinhardt, 1825)

Red List Assessment: **Global: Least Concern** (Ebert, D.A., Crozier, P., Blasdale, T. & McCormack, C. 2009).

Regional Occurrence: Northwest Atlantic.

Rationale: The Black Dogfish (*Centroscyllium fabricii*) is a relatively small (to at least 90 cm TL) deepwater, schooling shark of the outer continental shelf and slope found at depths of 180–2,250 m (mostly below 275 m). The species has a widespread but discontinuous distribution in the temperate Atlantic Ocean (tropical records are uncertain). The species' wide depth distribution affords it refuge from fishing pressure in many parts of its range, where deepwater fisheries are less developed. Recent population trends in parts of the Northwest Atlantic appear stable. Given stable population trends in the Northwest Atlantic and the species' relatively wide depth and geographic range, there is no reason to suspect that the global population has declined by a figure approaching 30% and the species is assessed as Least Concern. However, deepwater fisheries are more developed and have a long history of operation across this species' range in the Northeast Atlantic, where it is taken as bycatch. Significant fishing pressure throughout much of the species' geographic and depth range in the Northeast Atlantic warrant a regional assessment of Near Threatened in this region, on the basis of suspected continuing declines approaching 30% (close to meeting Vulnerable A4bd).

Combtooth Dogfish

Centroscyllium nigrum Garman, 1899

Red List Assessment: **Global: Data Deficient** (Acuña, E. 2004).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Combtooth Dogfish (*Centroscyllium nigrum*) is a poorly known deepwater shark from the Central and Eastern Pacific in depths of 250–1,250 m. Taxonomic resolution is required as specimens from southern Chile to the Strait of Magellan may represent a separate species. This species is associated with both soft sand and mud bottoms, but it may also feed off the bottom. Little is known of its biology. Grows to ~50 cm TL, and is aplacental viviparous with litters of at least seven. This species is captured in small numbers as bycatch in the Chilean deep sea shrimp fishery, and in sablefish traps in California, where it is not utilized. In Californian waters they do not appear to occur in large concentrations, as do other members of the genus in the Atlantic Ocean (such as the Black Dogfish *C. fabricii*). Bycatch numbers need to be monitored. At present there is insufficient information available to access the species beyond Data Deficient.

Blurred Smooth Lanternshark

Etmopterus bigelowi Shirai & Tachikawa, 1993

Red List Assessment: **Global: Least Concern** (Horodysky, A.Z. & Burgess, G.H. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Blurred Smooth Lanternshark (*Etmopterus bigelowi*) is a widespread, relatively small (to at least 67 cm TL) lanternshark recorded from various localities in the Atlantic, Indian, and Pacific Oceans. It is probably far more widely distributed than is presently known. Found at depths of 163 m to at least 1,000 m, as well as near the surface in open waters of 110–700 m depth. Its biology is virtually unknown and it is not targeted but is probably a discarded bycatch in some deepwater fishing activities. Given its very wide geographical and bathymetrical distribution and apparent lack of significant threats, it is considered here to be Least Concern; however, like many deepwater chondrichthyan species, more information on biology, ecology, and importance in fisheries are required. It is particularly important to assess regional bycatch levels of this species, particularly as global deepwater fisheries continue to expand.

Lined Lanternshark

Etmopterus bullisi Bigelow & Schroeder, 1957

Red List Assessment: **Global: Data Deficient** (Horodysky, A.Z. & Burgess, G.H. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Lined Lanternshark (*Etmopterus bullisi*) is a very poorly known etmopterid recorded from the east coast of the U.S. (North Carolina south to Florida), Cuba, and a few other locations in the Caribbean Sea. It is known from depths of 275–824 m (mostly below 350 m) on or near the bottom. Adults have not been collected and the largest specimen known is 26 cm TL. Virtually nothing is known of the species' biology. It is taken irregularly as discarded bycatch in deepwater demersal fisheries; however, specific information is not available. Given that so little is known about the species, and although no immediate threats are apparent, it cannot be assessed beyond Data Deficient at this time.

Cylindrical Lanternshark

Etmopterus carteri Springer & Burgess, 1985

Red List Assessment: **Global: Data Deficient** (Cavanagh, R.D. 2006).

Regional Occurrence: Western Central Atlantic.

Rationale: The Cylindrical Lanternshark (*Etmopterus carteri*) is a poorly known and apparently rare deepwater species recorded only from the Caribbean coast of Colombia on the upper continental slope at depths of 283–356 m. Substantial exploratory trawling in the southern Caribbean Sea caught only a limited number of specimens. Biology is essentially unknown. No information is available on interactions with fisheries, although it is likely to be infrequently encountered due to its rarity and very small size (maximum size 21 cm TL). Its restricted geographic and bathymetric range, as presently known, may be cause for concern if it is being taken as bycatch in any fisheries. However, insufficient information is presently available to assess the species beyond Data Deficient.

Broadband Lanternshark

Etmopterus gracilispinis Krefft, 1968

Red List Assessment: **Global: Least Concern** (Burgess, G.H., Amorim, A.F., Mancini, P. & Gonzalez, P. 2007).

Regional Occurrence: Northwest Atlantic.

Rationale: The Broadband Lanternshark (*Etmopterus gracilispinis*) is a small lanternshark (to at least 33 cm TL) inhabiting the outer continental shelf and upper to middle slopes at depths of 100–1,000 m. Also epipelagic and mesopelagic at depths of 70–480 m over waters of 2,240 m off Argentina and off South Africa. It has a widespread but disjunct distribution in the Western Atlantic and off southern Africa. In the Western Atlantic, it is known from off the U.S., Suriname, southern Brazil, Uruguay, and Argentina. Like most other lanternsharks, biology and ecology is poorly known. Some mortality from pelagic and deepwater fisheries is likely to occur across the species' range, for example the species is a rare bycatch in Santos longliners off southern Brazil, and in deepwater fisheries off the U.S. However, this mortality is of no immediate threat to the viability of the species given the limited catches in these fisheries, and the widespread benthic, epibenthic, epipelagic, and mesopelagic occurrence of the species. As such, the species is assessed as Least Concern. As with other deepwater species though, any future expansion of deepwater fisheries within its range should be closely monitored.

Caribbean Lanternshark

Etmopterus hillianus (Poey, 1861)

Red List Assessment: **Global: Least Concern** (Herndon, A.P. & Burgess, G.H. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Caribbean Lanternshark (*Etmopterus hillianus*) is a small (probably to ~28 cm TL) deepwater shark with a range centered in the Western Central Atlantic from Virginia to Florida (USA), the Bahamas, Cuba, Bermuda, Hispaniola, and the northern Lesser Antilles. Found on the upper continental and insular slopes at depths of 311–695 m. This species is easily confused with the West Indian Lanternshark (*E. robinsi*) and little is known of its biology, although it is reported to have a small litter size of 4–5 young. It is irregularly taken as discarded bycatch in deepwater demersal fisheries; however, this is not known to be a considerable catch. Similar to other lanternsharks for which no significant threats are apparent, this species is currently considered to be Least Concern, although like many deepwater chondrichthyan species, more information on biology, ecology, and fisheries are required. All deepwater fisheries in its range need to be carefully monitored and managed particularly as global deepwater fisheries continue to expand with the potential to negatively affect this species.

Dwarf Lanternshark

Etmopterus perryi Springer & Burgess, 1985

Red List Assessment: **Global: Data Deficient** (Leandro, L. 2006).

Regional Occurrence: Western Central Atlantic.

Rationale: The Dwarf Lanternshark (*Etmopterus perryi*) is a poorly known deepwater shark restricted to the upper continental slope off the Caribbean coast of Colombia and Venezuela in depths of 283–439 m. Little is known of its biology and information on interactions with fisheries are limited, but it is probably rarely encountered due to its very small size (to 21 cm TL). Its restricted geographic and bathymetric range, as presently known, together with its reported low fecundity (litter size of 2–3) may be cause for concern if it is being taken as bycatch in any fisheries. However, insufficient information is presently available to assess the species beyond Data Deficient.

Great Lanternshark

Etmopterus princeps Collett, 1904

Red List Assessment: **Global: Data Deficient** (Herndon, A.P. & Burgess, G.H. 2006).

Regional Occurrence: Northwest Atlantic.

Rationale: The Great Lanternshark (*Etmopterus princeps*) is a relatively small (to 75 cm TL), deepwater (350–4,500 m) lanternshark occurring in the Eastern Central and North Atlantic (rarely found north of U.S. slope waters). Biology is essentially unknown. This species is subjected to bycatch fishing mortality by deepwater trawlers over much of its range and may be under considerable fishing pressure but specific information is not available. It could prove to be Near Threatened on the basis of reductions in population size; however, given that so little is known about the species, and the overall lack of fisheries information, it cannot be assessed beyond Data Deficient at this time. Like many deepwater chondrichthyan species, more information on biology, ecology, and importance in fisheries are required. Deepwater fisheries in the region need to be carefully monitored and managed.

Smooth Lanternshark

Etmopterus pusillus (Lowe, 1839)

Red List Assessment: **Global: Least Concern** (Coelho, R., Tanaka, S. & Compagno, L.J.V. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Smooth Lanternshark (*Etmopterus pusillus*) is a deepwater lanternshark that occurs in the Atlantic, Pacific, and Indian Oceans, found on or near the bottom of continental and insular slopes at depths of 150–1,000 m, and possibly down to almost 2,000 m. The species is also oceanic in the Central South Atlantic, and is found from the surface to 708 m depth over deepwater. Although the Smooth Lanternshark is of little interest to global fisheries, it is a bycatch of bottom trawls operating in the Eastern Atlantic and off Japan, fixed bottom nets and line gear. It is discarded by fisheries off southern Portugal, but is probably utilized elsewhere in the Eastern Atlantic. In the Northeast Atlantic, although captures are still high and stable, very little is known about the biology and distribution of this deepwater species. More studies on this species' biology are needed; particularly considering that many deepwater squaloids have life characteristics that can make them especially vulnerable to depletion in fisheries. However, there is no evidence to suggest that this species has declined or faces significant threats. Furthermore, it has a widespread geographic and bathymetric distribution and is therefore considered Least Concern at present. Expanding deepwater fisheries should be monitored and bycatch levels should be quantified to ensure that this species is not significantly affected.

West Indian Lanternshark

Etmopterus robinsi Schofield & Burgess, 1997

Red List Assessment: **Global: Least Concern** (Herndon, A.P. & Burgess, G.H. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The West Indian Lanternshark (*Etmopterus robinsi*) is a small (probably to ~34 cm TL) deepwater shark with a range centered in the Western Central Atlantic, including Florida, Cuba, Nicaragua, Hispaniola (Haiti and Dominican Republic), the northern Lesser Antilles, and San Andrés Archipelago. It is found on the upper continental and insular slopes at depths of 412–787 m. It it irregularly taken as discarded bycatch in deepwater demersal fisheries, however, this is not known to be a considerable catch. Similar to other lanternsharks for which no significant threats are apparent, this species is currently considered to be of Least Concern, although like many deepwater chondrichthyan species, more information on biology, ecology, and fisheries are required. All deepwater fisheries in its range need to be carefully monitored and managed particularly as global deepwater fisheries continue to expand with the potential to negatively affect this species.

Fringefin Lanternshark

Etmopterus schultzi Bigelow, Schroeder & Springer, 1953

Red List Assessment: **Global: Least Concern** (Herndon, A.P., Horodysky, A.Z. & Burgess, G.H. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Fringefin Lanternshark (*Etmopterus schultzi*) is a small (to ~30 cm TL) deepwater shark with a relatively wide range in the Gulf of Mexico and Caribbean Sea found on the upper continental slopes at depths of 220–915 m. It is the most common species of *Etmopterus* in the northern Gulf of Mexico. Like other etmopterids, little is known of its biology. It it irregularly taken as discarded bycatch in deepwater demersal fisheries, however, this is not known to be a considerable catch. Similar to other lanternsharks for which no significant threats are apparent, this species is currently considered to be of Least Concern, although like many deepwater chondrichthyan species, more information on biology, ecology, and fisheries are required. All deepwater fisheries in its range need to be carefully monitored and managed particularly as global deepwater fisheries continue to expand with the potential to negatively affect this species.

Green Lanternshark

Etmopterus virens Bigelow, Schroeder & Springer, 1953

Red List Assessment: **Global: Least Concern** (Horodysky, A.Z. & Burgess, G.H. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Green Lanternshark (*Etmopterus virens*) is a small (to ~26 cm TL) bathydemersal shark endemic to the Western Atlantic in the Gulf of Mexico and Caribbean Sea. A relatively common species of the upper continental slope at depths of 196–915 m. Little is known of its biology and it is irregularly taken as discarded bycatch in deepwater demersal fisheries, however, this is not known to be a considerable catch. Similar to other lanternsharks for which no significant threats are apparent, this species is currently considered to be of Least Concern, although like many deepwater chondrichthyan species, more information on biology, ecology, and fisheries are required. All deepwater fisheries in its range need to be carefully monitored and managed particularly as global deepwater fisheries continue to expand with the potential to negatively affect this species.

ORDER **SQUALIFORMES**

FAMILY **SOMNIOSIDAE**

Family synopsis: *5 species (2 NT; 1 LC; 2 DD)*

Portuguese Dogfish

Centroscymnus coelolepis Bocage & Capello, 1864

Red List Assessment: **Global: Near Threatened** (Stevens, J.D. & Correia, J.P.S. 2003).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Portuguese Dogfish (*Centroscymnus coelolepis*) is mainly a bycatch species taken by trawl and hook, although with some limited targeting for its flesh and oil. Catches in Australia have been increasing in the last few years with relaxation of mercury laws and fishers looking for non-quota species in the South East Trawl Fishery. However, appropriate data on biomass or trends in abundance are lacking. The productivity of this species is likely to be low (although age estimates and annual fecundity are currently unknown) and further increases in catches should be viewed with concern. This species is of much lower abundance than the Birdbeak Dogfish (*Deania calcea*) or the Longnose Velvet Dogfish (*Centroselachus crepidater*) and, although the quantitative data on populations are lacking, its lower abundance, demersal habits (not appearing to range into midwater) and suspected low productivity warrant a Near Threatened assessment.

Roughskin Dogfish

Centroscymnus owstoni Garman, 1906

Red List Assessment: **Global: Least Concern** (Paul, L.J. 2003).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Roughskin Dogfish (*Centroscymnus owstoni*) is a moderately common deepwater shark within its known geographic range, and which may extend deeper than is currently recognized. Although captured in some quantity in some deepwater trawl fisheries, it is taken mainly as bycatch, and presumably from only part of its known range. However, if the population is mobile and migrates into exploited fishing grounds from other parts of its range, if (as with other deepwater sharks) it becomes more frequently targeted, and if it proves to have the life history characteristics (low fecundity, slow growth, and high longevity) typical of better known squaloids, the assessment may have to move into a higher category. However, the species is currently still moderately common over its wide southern Australian and New Zealand range and a Near Threatened assessment is not justified at this time.

Greenland Shark

Somniosus microcephalus (Bloch & Schneider, 1801)

Red List Assessment: **Global: Near Threatened** (Kyne, P.M., Sherrill-Mix, S.A. & Burgess, G.H. 2006).

Regional Occurrence: Northwest Atlantic.

Rationale: The Greenland Shark (*Somniosus microcephalus*) is a large dogfish of the Arctic and North Atlantic, inhabiting inshore zones to continental shelves and slopes usually in depths of 0–1,200 m (one individual recorded at 2,200 m). Maximum size is uncertain but reaches at least 640 cm TL, possibly to 730 cm TL, with most adults 244–427 cm TL. This appears to be an extremely long lived and slow growing elasmobranch with limited reproductive capacity. Historically it was targeted for its liver oil in Norway, Iceland, and Greenland with catches reaching 32,000 sharks per year in the 1910s in Greenland alone. These fisheries may have had a significant impact on this species, but the rate of historical decline is unknown. Presently taken as bycatch in trawl, gillnet, and trap fisheries, as well as in Arctic artisanal fisheries. Its

population dynamics and biology are not well understood but its large size and slow growth rate suggest it is vulnerable to fishing pressure. This shark is listed as Near Threatened on the basis of possible population declines and limiting life history characteristics. There is a need to examine historical data and monitor current bycatch levels.

Pacific Sleeper Shark

Somniosus pacificus Bigelow & Schroeder, 1944

Red List Assessment: **Global: Data Deficient** (Ebert, D.A., Goldman, K.J. & Orlov, A.M. 2009).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Pacific Sleeper Shark (*Somniosus pacificus*) is a deepwater sleeper shark, relatively common in the North Pacific. Records from the southern hemisphere are most likely the Southern Sleeper Shark (*Somniosus antarcticus*). In the northern part of its distribution it ranges into shallower water, but at lower latitudes it becomes strictly deepwater, extending down to at least 2,000 m depth in the extreme southern end of its range. The species is taken as bycatch by bottom trawl fisheries in the western Bering Sea, and by longline fisheries for Sablefish (*Anoplopoma fimbria*) and Pacific Halibut (*Hippoglossus stenolepis*) in the Eastern North Pacific, and is generally discarded. Biomass estimates are increasing in the western Bering Sea and Gulf of Alaska, and have decreased in other areas in the Eastern Pacific. Greater depths that are not currently fished may provide some refuge for adult Pacific Sleeper Sharks. The lack of life history data (e.g. growth rates and fecundity) and robust population assessment information provide justification for a Data Deficient listing.

Velvet Dogfish

Zameus squamulosus (Günther, 1877)

Red List Assessment: **Global: Data Deficient** (Burgess, G.H. & Chin, A. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Velvet Dogfish (*Zameus squamulosus*) is a widespread but sporadically distributed deepwater dogfish recorded from most regions, with the present exception of the Eastern Pacific. It is benthic on the continental and insular slopes at depths of 550–1,450 m; also epipelagic and oceanic off Brazil. The presently known disjunct range in many ocean regions suggests that it is more widely distributed than currently recorded. It reaches a maximum size of 69 cm TL, but little is known of its biology. Taken as bycatch in various deepwater fisheries including by trawl, longline, and set net, but species-specific information is not available. However, it should be recognized that deepwater squaloids are vulnerable to population collapse from overfishing (directed or bycatch) due to their limited life history characteristics and as such catches of this and other species require monitoring, particularly as deepwater fisheries expand worldwide. Due to a lack of information, this species cannot be assessed beyond Data Deficient at the present time.

ORDER **SQUALIFORMES**

FAMILY **OXYNOTIDAE**

Family synopsis: *1 species (DD)*

Caribbean Roughshark

Oxynotus caribbaeus Cervigon, 1961

Red List Assessment: **Global: Data Deficient** (Leandro, L. 2004).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Caribbean Roughshark (*Oxynotus caribbaeus*) is a rare, small, deepwater benthic shark recorded from the Gulf of Mexico and Venezuela on the upper continental slope at depths of 402–457 m. It attains a maximum size of at least 49 cm TL, but virtually nothing is known about its biology. This species is not known to be of interest to fisheries at present. There is insufficient information available to assess the species beyond Data Deficient.

ORDER	**SQUALIFORMES**
FAMILY	**DALATIIDAE**
	Family synopsis: *5 species (1 NT; 4 LC)*

Kitefin Shark

Dalatias licha (Bonnaterre, 1788)

Red List Assessment: **Global: Near Threatened** (Blasdale, T., Serena, F., Mancusi, C., Guallart, J. & Ungaro, N. 2009).

Regional Occurrence: Northwest Atlantic.

Rationale: The Kitefin Shark (*Dalatias licha*) is a moderate-sized deepwater shark that is unevenly distributed on continental and insular shelves and slopes in warm-temperate and tropical areas at depths of 37–1,800 m in the North and Central Atlantic, Western Indian, and Western and Central Pacific. This species is taken in deepwater longline and gillnet fisheries in the Northeast Atlantic. A comparison between recent Scottish trawl surveys and UK Ministry of Agriculture, Fisheries and Food surveys in the 1970s shows a 94% decline in catch rate to the west of the British Isles, however, this value must be treated with caution as it is likely that other species may have been misidentified as the Kitefin Shark in the 1970s and this species is at the edge of its range in this area. Directed handline and gillnet fisheries for the Kitefin Shark began off the Azores in the 1970s. Portuguese landings in this fishery increased rapidly to 896 t in 1991 and then decreased steadily to <46 t from 1998 onwards. The EU DELASS (Development of Elasmobranch Assessments) project considered this stock depleted. Given the evidence for declines in this region and the species' limiting life history characteristics it is assessed as Vulnerable in the Northeast Atlantic. Records of yields from the Portuguese/Azores Kitefin Shark fishery suggest that targeted fisheries are capable of reducing populations quite rapidly. The life history of this species is expected to result in a slow recovery after depletion. The species occurs within the range of fisheries in many areas of its range, where it is taken as bycatch. An increasing trend for fisheries to move into deeper water on continental shelves and slopes suggests that fishing pressure on this species will likely increase. The life history characteristics of this species (i.e. slow growth, relatively large size at maturity etc.) make it vulnerable to rapid declines should pressure increase throughout its range. Globally, this species is assessed as Near Threatened due to concern that it may meet the category Vulnerable A4bd in the future, given continued and increasing deepwater fishing pressure and its limited life history characteristics.

Pygmy Shark

Euprotomicrus bispinatus (Quoy & Gaimard, 1824)

Red List Assessment: **Global: Least Concern** (Burgess, G.H. 2006).

Regional Occurrence: Northeast Pacific.

Rationale: The Pygmy Shark (*Euprotomicrus bispinatus*) is a tiny oceanic shark (one of the smallest shark species in the world, reaching 26.5 cm TL). Widespread, it has been recorded from numerous oceanic locations in the Pacific, Indian, and Atlantic Oceans. Little is known of its biology although it is reported to have a fecundity of eight pups per litter. Its small size and epipelagic/mesopelagic habitat precludes it from capture in most fisheries and as such there are no apparent threats to the species. Given this, and its widespread distribution, it is assessed as Least Concern.

Cookiecutter Shark

Isistius brasiliensis (Quoy & Gaimard, 1824)

Red List Assessment: **Global: Least Concern** (Stevens, J.D. 2003).

Regional Occurrence: Western Central Atlantic; Eastern Central Pacific.

Rationale: The Cookiecutter Shark (*Isistius brasiliensis*) is widespread but with patchy distribution records. It is too small (up to ~50 cm TL) to be regularly taken by fisheries and although it is occasionally caught by pelagic longlines, and sometimes in midwater trawls and plankton nets, there are no significant threats to this species.

Largetooth Cookiecutter Shark

Isistius plutodus Garrick & Springer, 1964

Red List Assessment: **Global: Least Concern** (Kyne, P.M., Gerber, L. & Sherrill-Mix, S.A. 2006).

Regional Occurrence: Northwest Atlantic.

Rationale: The Largetooth Cookiecutter Shark (*Isistius plutodus*) is a rare epibenthic and epipelagic shark known from 10 specimens. It is possibly circumglobal but at present recorded from scattered locations in the Pacific and Atlantic Oceans with all specimens collected close to land (in contrast to its congener the Cookiecutter Shark *I. brasiliensis*). Largest recorded specimen just over 42 cm TL, but very little is known of the biology of this facultative ectoparasite. It is probably an irregular bycatch of trawl (benthic and pelagic) and longline fisheries (taken by hook or attached to its captured prey). Although little is known about this species it is probably widely distributed with no significant threats apparent and is thus assessed as Least Concern.

Spined Pygmy Shark

Squaliolus laticaudus Smith & Radcliffe, 1912

Red List Assessment: **Global: Least Concern** (Kyne, P.M. & Burgess, G.H. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Spined Pygmy Shark (*Squaliolus laticaudus*) is one of the world's smallest sharks reaching a maximum size of 27.5 cm TL. Oceanic, with a widespread warm-temperate and tropical distribution, occurring near land masses generally over continental slopes and avoiding central ocean basins. Little is known of its biology but it is known to undertake diel vertical migrations from depth (~500 m) to ~200 m probably related to prey movements. An absence of identifiable threats (irregularly taken by fisheries due to its small size) and its widespread distribution justifies an assessment of Least Concern.

ORDER	**SQUATINIFORMES**
FAMILY	**SQUATINIDAE**
	Family synopsis: *2 species (1 NT; 1 DD)*

Pacific Angel Shark

Squatina californica Ayres, 1859

Red List Assessment: **Global: Near Threatened** (Cailliet, G.M. 2000).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific. Note: the following rationale is a slightly modified version of the original rationale published in 2000 in order to update the species' situation, but it does not encompass all new information which will have a bearing on the species' Red List status.

Rationale: This once abundant Eastern Pacific coastal shark is relatively slow growing, late maturing, and moderately fecund, reaching maturity at ~13 years and producing up to 10 pups per year. Because of its rather limited geographical range and life history, resident stocks of the Pacific Angel Shark (*Squatina californica*) may be particularly vulnerable to heavy localized fishing pressure. Commercial catch data in recent decades demonstrated a peak, followed by an almost complete collapse in the central California gillnet fishery for California Halibut (*Paralichthys californicus*). This was largely a result of an inshore gillnet ban (rather than a collapse of the population). The status of this species needs to be readdressed.

Atlantic Angel Shark

Squatina dumeril Lesueur, 1818

Red List Assessment: **Global: Data Deficient** (Heupel, M.R. & Carlson, J.K. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Atlantic Angel Shark (*Squatina dumeril*) is found in the Western Atlantic in depths to 1,290 m, but is seasonally recorded in shallower regions. This species is not known to be targeted or utilized, but is taken in trawl fisheries as accidental bycatch, although no specific data are available. There is currently no information available on the life history of this species (beyond a limited description of its reproductive biology) and its full distribution is not defined, therefore it is listed as Data Deficient until more information is available. Studies are currently underway and this assessment should be reviewed in the near future.

ORDER **PRISTIOPHORIFORMES**

FAMILY **PRISTIOPHORIDAE**

Family synopsis: *1 species (DD)*

Bahamas Sawshark

Pristiophorus schroederi Springer & Bullis, 1960

Red List Assessment: **Global: Data Deficient** (Heupel, M.R. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Bahamas Sawshark (*Pristiophorus schroederi*) is a poorly known deepwater endemic sawshark. It has been recorded from a small number of specimens from two small areas on the Bahamian insular slope, between Cuba, Florida, and the Bahamas in depths of 438–641 m. It reaches at least 81 cm TL, but there is currently no information available on the biology of this species and its full distribution is not well defined. Given the lack of available information on this species, it cannot be assessed beyond Data Deficient at this time. More information is sought regarding the potential impacts of deepwater fisheries within its range, which, given its endemism and possible narrow distribution, could lead to this species being assessed as Near Threatened or higher in the future.

ORDER **HETERODONTIFORMES**

FAMILY **HETERODONTIDAE**

Family synopsis: *2 species (DD)*

Horn Shark

Heterodontus francisci (Girard, 1854)

Red List Assessment: **Global: Data Deficient** (Carlisle, A.B. 2006).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Horn Shark (*Heterodontus francisci*) is a benthic shark, endemic to warm-temperate to subtropical waters on the Pacific continental shelf off Mexico and the U.S., and probably off Ecuador and Peru. This shark occurs from the intertidal zone to a depth of 152 m, although is most common at 2–11 m, moving offshore in the winter to waters >30 m. The species exhibits a high degree of segregation corresponding to its life history, with adults occurring shallower than juveniles. Horn sharks have a small home range and exhibit long-term site fidelity. They are hardy species and can survive capture if returned to the water; however, catches in Mexico are sometimes left to die on beaches. They are of no commercial value, although they are taken as bycatch (primarily off Mexico). If the gillnet fishery in Mexico expands significantly in the future, the population could potentially face problems, however, insufficient information is available at present to assess the Horn Shark beyond Data Deficient. It could well be Least Concern in U.S. waters where its capture in fisheries is extremely rare with no other apparent threats.

Mexican Hornshark

Heterodontus mexicanus Taylor & Castro-Aguirre, 1972

Red List Assessment: **Global: Data Deficient** (Villavicencio-Garayzar, C. 2006).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Mexican Hornshark (*Heterodontus mexicanus*) is a small (to 70 cm TL) inshore hornshark of rocky and sandy habitats and coral reefs. It is endemic to the Eastern Pacific with a disjunct distribution in the Gulf of California and Mexican Pacific to Guatemala, Colombia, and Panama, and probably Ecuador and Peru. It is not known whether these areas support different subpopulations of the species. The Mexican Hornshark is not of commercial value, but is taken as bycatch in bottom gillnets and shrimp trawling operations in the Gulf of California and Mexican coastal lagoons. Catches are discarded or sometimes retained for human consumption or fishmeal. Hornsharks are hardy species and can survive capture if returned to the water; however, catches in Mexico are often left to die on beaches. Eggs are laid in rocky areas unlikely to be affected by fisheries. Insufficient information is available at present to assess the species beyond Data Deficient; however, the species is of potential concern due to its restricted disjunct distribution and artisanal and industrial fishing pressure.

ORDER	**ORECTOLOBIFORMES**
FAMILY	**GINGLYMOSTOMATIDAE**
	Family synopsis: *1 species (DD)*

Nurse Shark

Ginglymostoma cirratum (Bonnaterre, 1788)

Red List Assessment: **Global: Data Deficient; Western Atlantic subpopulation: Near Threatened; USA and Bahamas (regional assessment): Least Concern** (Rosa, R.S., Castro, A.L.F., Furtado, M., Monzini, J. & Grubbs, R.D. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Eastern Central Pacific.

Rationale: ***Global:*** Despite its wide distribution in the tropical Atlantic and Eastern Pacific, virtually nothing is known about the migratory behavior and connectivity (gene flow) between populations of the Nurse Shark (*Ginglymostoma cirratum*). Preliminary studies on its biology indicate a strong site fidelity, which renders this shark vulnerable to local extinction from overexploitation. There is recent qualitative evidence of population declines in several areas as well as decline and fragmentation of geographic range size. The species is extremely vulnerable to coastal fisheries, being incidentally and deliberately captured both in gillnets and longlines. It is an easy target of spearfishing due to its sedentary and docile behavior, being prized in competitions for its large body size. The nurse shark is also vulnerable to indirect coastal impacts, particularly in reef areas, which constitute its main habitat. Due to the lack of data from its range in the Eastern

Pacific and Eastern Atlantic, and a need for further investigation on this species in these areas, the species is currently assessed as Data Deficient globally.

Western Atlantic subpopulation: Extreme population reduction (and in some cases localized extinction) of the species from the southern portion of its range in the Western Atlantic has been reported. The impact of coastal fisheries is the primary cause of the observed decline of Nurse Sharks along the Brazilian coast. Recently it became a target of commercial aquarium fisheries in Brazil. The species was assessed as Vulnerable in Brazil by a commission of the Brazilian Society for the Study of Elasmobranchs (SBEEL) in 2002, following the application of the IUCN Red List Criteria. Its inclusion in the Official List of Endangered Animals in Brazil as a Vulnerable species was recommended to the Brazilian Ministry of the Environment in 2003. The species occurs in some marine parks in Brazil, however, effective management, including policing of these areas is essential. Similar declines are inferred across its range in South America, given heavy fishing pressure on the coastal zone in this region, and although more information is certainly required, the Nurse Shark is assessed as Vulnerable off South America due both to observed and inferred declines from heavy coastal fisheries and habitat destruction. For Central America, information is more limited, though coastal fisheries are known to be intense in many areas, as is habitat destruction. Nurse Sharks are actively targeted for fins and meat by artisanal fishers in Panama with lines and gillnets; juveniles are also collected for the aquarium trade. Fished by artisanal fishers for its skin and meat along the Colombian coast with nets and lines, the Colombian Government is in fact considering a ban on the Nurse Shark fishery together with an extensive habitat protection campaign. Nurse Sharks are managed as part of the large coastal species complex in the Atlantic and Gulf of Mexico waters of the U.S. They represent only ~2% of the sharks captured in the directed bottom longline fishery. They are of very low economic value in the U.S. and are rarely retained with very high post-capture survivorship. In addition, a fishery-independent survey in Bimini, Bahamas suggested an increase in Nurse Shark CPUE between 1995 and 2004. The species is therefore assessed as Least Concern in the U.S. Atlantic and the Bahamas. The overall assessment for the Western Atlantic subpopulation is therefore Near Threatened. This is based on its Vulnerable status off South America, the likelihood of threats to the species throughout many areas of Central America and the Caribbean, and its Least Concern status off the U.S. and the Bahamas.

ORDER	**ORECTOLOBIFORMES**
FAMILY	**RHINCODONTIDAE**
	Family synopsis: *1 species (VU)*

Whale Shark

Rhincodon typus Smith, 1828

Red List Assessment: **Global: Vulnerable A2bd+3d** (Norman, B. 2000).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Northeast Pacific; Eastern Central Pacific.

Rationale: The Whale Shark (*Rhincodon typus*) is a cosmopolitan tropical and warm-temperate species and is the world's largest living fish. Its life history is poorly understood, but it is known to be highly fecund and to migrate extremely large distances. Populations appear to have been depleted by harpoon fisheries in Southeast Asia and perhaps incidental capture in other fisheries. High value in international trade, a slow life history, highly migratory nature, and normally low abundance make this species vulnerable to commercial fishing. Dive tourism involving this species has recently developed in a number of locations around the world, demonstrating that it is far more valuable alive than fished.

ORDER **LAMNIFORMES**

FAMILY **ODONTASPIDIDAE**

Family synopsis: *3 species (2 VU; 1 DD)*

Sand Tiger

Carcharias taurus Rafinesque, 1810

Red List Assessment: **Global: Vulnerable A2ab+3d** (Pollard, D. & Smith, A. 2000).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Sand Tiger (*Carcharias taurus*) is a large, coastal shark with a disjunct distribution, occurring in most subtropical and warm-temperate oceans, except for the Eastern Pacific. It has a very slow life history and produces only two large pups per litter. As a result, annual rates of population increase are very low, greatly reducing its ability to sustain fishing pressure. Populations in several locations have been severely depleted by commercial fishing, spearfishing, and protective beach meshing, requiring the introduction of specific management measures.

Smalltooth Sand Tiger

Odontaspis ferox (Risso, 1810)

Red List Assessment: **Global: Vulnerable A2bd+4bd** (Pollard, D., Gordon, I., Williams, S., Flaherty, A., Fergusson, I.K., Dicken, M. & Graham, K.J. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Northeast Pacific; Eastern Central Pacific.

Rationale: Despite its extensive, almost worldwide, distribution, Smalltooth Sand Tiger (*Odontaspis ferox*) populations and occurrences are fragmented and the species may be naturally rare. This species is morphologically very similar to the Sand Tiger (*Carcharias taurus*), although it is larger and bulkier and is presumed to have a very low reproductive capacity, similar to that of the Sand Tiger (producing only two pups every two years). This likely very low reproductive capacity makes it potentially susceptible to local extinction, even at seemingly small capture rates. Although probably not specifically targeted, there are commercial landings of the species taken in bottom trawls, set nets, and line gear in many areas including the Mediterranean Sea, Japan, and occasionally Australia (although it is now protected in New South Wales). It is generally found in deeper water (down to 880 m depth), but recent observations of small aggregations in shallow water in a number of areas (Mediterranean Sea and Eastern Pacific) suggests that the species may be more vulnerable to fishing pressure than previously assumed, and potentially susceptible to coastal habitat impacts, similar to the Sand Tiger. Demersal trawl fisheries in Australia and New Zealand are operating in areas of possible and known occurrence. Fishery-independent surveys indicate a decline of over 50% in catches off the east coast of Australia (hence a Vulnerable assessment in those waters), probably the result of commercial fishing operations off New South Wales. Similar declines are presumed to have occurred in other parts of its range affected by fisheries. Given the species' likely very low reproductive capacity, intensive fishing pressure throughout its bathymetric range in the Mediterranean Sea, and an absence of management measures there, the decline of the Smalltooth Sand Tiger in this region is suspected to match or even exceed that seen in Australia, warranting a regional assessment of Endangered. There are very few records from subequatorial Africa, where the species is currently assessed as Data Deficient. Globally, a precautionary assessment of Vulnerable is considered appropriate, as a result of documented and suspected declines, the species' apparent rarity, presumed very low fecundity and high vulnerability to exploitation, and continued bycatch in fisheries.

Bigeye Sand Tiger

Odontaspis noronhai (Maul, 1955)

Red List Assessment: **Global: Data Deficient** (Amorim, A.F., Arfelli, C.A. & Fagundes, L. 2000).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Bigeye Sand Tiger (*Odontaspis noronhai*) is a rare pelagic deepwater shark that is sparsely but widely distributed in tropical and warm-temperate waters, apparently an inhabitant of continental and insular slopes. It is so infrequently recorded that its biology and population status is unknown. Its life cycle and biology is likely to be similar to that of the Sand Tiger (*Carcharias taurus*), which has been found to be particularly vulnerable to fisheries, although the Bigeye Sand Tiger matures at an even larger size.

ORDER	**LAMNIFORMES**
FAMILY	**PSEUDOCARCHARIIDAE**
	Family synopsis: *1 species (NT)*

Crocodile Shark

Pseudocarcharias kamoharai (Matsubara, 1936)

Red List Assessment: **Global: Near Threatened** (Compagno, L.J.V. & Musick, J.A. 2000).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Crocodile Shark (*Pseudocarcharias kamoharai*) is a small, uncommon, pelagic, oceanic shark which is circumtropical in distribution. This species is vulnerable as bycatch in pelagic longline fisheries, which are expanding worldwide. Thus, because of its small litter size and probable demography, this species may be threatened in the near future, although there are no CPUE records available to indicate trends in population size.

ORDER	**LAMNIFORMES**
FAMILY	**MITSUKURINIDAE**
	Family synopsis: *1 species (LC)*

Goblin Shark

Mitsukurina owstoni Jordan, 1898

Red List Assessment: **Global: Least Concern** (Duffy, C.A.J., Ebert, D.A. & Stenberg, C. 2004).

Regional Occurrence: Northwest Atlantic; Northeast Pacific.

Rationale: The Goblin Shark (*Mitsukurina owstoni*) is assessed as Least Concern because although apparently rare, it is widespread in the Atlantic, Indian, and Pacific Oceans and is only infrequently taken in deepwater fisheries. It has a sporadic distribution with most records from the Northwest Pacific (Japan, Taiwan) on the upper continental slope. It may also be mesopelagic. It is likely to be found in more locations than previously known as deepwater surveys are undertaken in other regions or as deepwater fisheries expand globally. It is taken in deep bottom-set gillnet, bottom longline, and trawl fisheries, and rarely in surface drift nets. It is also entangled in deepwater fishing gear. Recorded from depths of ~30 m (occasional) to >1,000 m with reported landings of adults being rare, suggesting most of the adult population is unavailable to existing deepwater fisheries.

ORDER	**LAMNIFORMES**
FAMILY	**MEGACHASMIDAE**
	Family synopsis: *1 species (DD)*

Megamouth Shark

Megachasma pelagios Taylor, Compagno & Struhsaker, 1983

Red List Assessment: **Global: Data Deficient** (Compagno, L.J.V. 2000).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Megamouth Shark (*Megachasma pelagios*) is a very large pelagic filter-feeding shark and was perhaps the most spectacular discovery of a new shark in the 20th century. Specimens are very seldom reported, thus the shark is apparently very rare throughout its range, yet likely to be increasingly taken as bycatch in oceanic and offshore littoral fisheries. At the time of writing (2000) it was known from <20 specimens, though its distribution is thought to be circumtropical and wide-ranging. The coloration, composition of its liver oil, and catch records of the Megamouth Shark are suggestive of epipelagic rather than deepwater habitat.

ORDER	**LAMNIFORMES**
FAMILY	**ALOPIIDAE**
	Family synopsis: *3 species (VU)*

Pelagic Thresher Shark

Alopias pelagicus Nakamura, 1935

Red List Assessment: **Global: Vulnerable A2d+4d** (Reardon, M.B., Márquez-Farías, J.F., Trejo, T. & Clarke, S.C. 2009).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: All members of the genus *Alopias*, the thresher sharks, are listed as Vulnerable globally because of their declining populations. These downward trends are the result of a combination of slow life history characteristics, hence low capacity to recover from moderate levels of exploitation, and high levels of largely unmanaged and unreported mortality in target and bycatch fisheries. The Pelagic Thresher Shark (*Alopias pelagicus*) is a large, wide-ranging Indo-Pacific pelagic shark, apparently highly migratory, with low fecundity (two pups per litter), and a low (2–4%) annual rate of population increase. This species is especially vulnerable to fisheries exploitation (target and bycatch) because its epipelagic habitat occurs within the range of many largely unregulated and under-reported gillnet and longline fisheries, in which it is readily caught. Although this species is reportedly relatively common in some coastal localities, current levels of exploitation in some areas are considered to be unsustainable. Overall, it is considered highly likely that serious depletion of the global population has occurred.

Bigeye Thresher Shark

Alopias superciliosus (Lowe, 1839)

Red List Assessment: **Global: Vulnerable A2bd; Northwest and Western Central Atlantic (regional assessment): Endangered A2bd; Eastern Central Pacific (regional assessment): Vulnerable A2bd** (Amorim, A.F., Baum, J.K., Cailliet, G.M., Clò, S., Clarke, S.C., Fergusson, I.K., Gonzalez, M., Macías, D., Mancini, P., Mancusi, C., Myers, R.A., Reardon, M.B., Trejo, T., Vacchi, M. & Valenti, S.V. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Northeast Pacific; Eastern Central Pacific.

Rationale: ***Global:*** All members of the genus *Alopias*, the thresher sharks, are listed as Vulnerable globally because of their declining populations. These downward trends are the result of a combination

of slow life history characteristics, hence low capacity to recover from moderate levels of exploitation, and high levels of largely unmanaged and unreported mortality in target and bycatch fisheries. The Bigeye Thresher Shark (*Alopias superciliosus*) apparently is a highly migratory, oceanic and coastal species found virtually circumglobally in tropical and temperate seas. It has low fecundity (2–4 pups per litter) and an exceptionally low (0.002) potential annual rate of population increase, compared with other thresher sharks. This species is especially vulnerable to fisheries exploitation (target and bycatch) as its epipelagic habitat occurs within the range of many largely unregulated gillnet and longline fisheries in which it is readily caught, and it has been fished throughout its range. Significant reductions in thresher CPUE have been reported in pelagic longline fisheries in the Northwest Atlantic and the tropical Eastern Pacific, and declines are also suspected to have occurred in other areas. Although data are lacking for many parts of its range, it is evident that this Vulnerable species, with such low productivity, faces major threats throughout most of its range, where fishing pressure is unlikely to cease or decrease anytime in the immediate future. However, this may underestimate the extent of global decline and there is an urgent need for global review of all available data throughout its range.

In addition to the Vulnerable global assessment, a number of regional assessments have also been designated for the Bigeye Thresher Shark including: Endangered A2bd in the Northwest and Western Central Atlantic; and, Vulnerable A2bd in the Eastern Central Pacific.

Northwest and Western Central Atlantic (regional assessment): Estimates of trends in abundance from standardized catch rate indices of the U.S. pelagic longline fishery suggest that this species has likely undergone a decline in abundance in this region. Thresher sharks are generally recorded by genus by observers as well as in logbooks, which includes both Common Thresher Shark (*Alopias vulpinus*) and Bigeye Thresher Shark in this region, of which the Bigeye Thresher Shark is the more common. The area covered by the analyses, ranging from the equator to ~50°N, encompasses the confirmed range of threshers in this region. Estimates of the decline based on logbook and observer records of combined thresher sharks from 1986–2005 range from 50–80%. Fishing pressure on thresher sharks began over two decades prior to the start of this time series, thus the estimated declines are not from virgin biomass. Bigeye Thresher Shark is more biologically vulnerable and has a lower rate of intrinsic population increase than the Common Thresher Shark, with which it is grouped in the logbook and observer datasets. Given this species' intrinsic vulnerability and that fishing pressure on thresher sharks began over two decades prior to the start of these longline time series, the combined analyses may underestimate the decline in Bigeye Thresher Shark and it is assessed as Endangered A2bd in this region.

Eastern Central Pacific (regional assessment): Pelagic fleets operating in this region are known to take Bigeye Thresher Shark. It is a known bycatch of the purse seine fishery operating in the Eastern Pacific. Trends in abundance and biomass of thresher sharks combined in the tropical Eastern Pacific were estimated by comparison of pelagic longline research surveys in the 1950s with recent data (1990s) collected by observers on pelagic longline fishing vessels, standardized to account for differences in depth and soak time. This analysis was not species-specific but estimated a decline in abundance of 83% and a decline in biomass to ~5% of virgin levels. Given the apparent decline in combined thresher abundance in this region, continued fishing pressure from pelagic fleets and this species' vulnerable life history characteristics, it is assessed as Vulnerable A2bd in the Eastern Central Pacific.

Common Thresher Shark

Alopias vulpinus (Bonnaterre, 1788)

Red List Assessment: **Global: Vulnerable A2bd+3bd+4bd; Northwest and Western Central Atlantic (regional assessment): Vulnerable A2bd; Eastern Central Pacific (regional assessment): Near Threatened** (Goldman, K.J., Baum, J.K., Cailliet, G.M., Cortés, E., Kohin, S., Macías, D., Megalofonou, P., Perez, M., Soldo, A. & Trejo, T. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Northeast Pacific; Eastern Central Pacific.

Rationale: ***Global:*** All members of the genus *Alopias*, the thresher sharks, are listed as Vulnerable globally because of their declining populations. These downward trends are the result of a combination of slow life history characteristics, hence low capacity to recover from moderate levels of

exploitation, and high levels of largely unmanaged and unreported mortality in target and bycatch fisheries. The Common Thresher Shark (*Alopias vulpinus*) is virtually circumglobal, with a noted tolerance for cold waters. This species is especially vulnerable to fisheries exploitation (target and bycatch) because its epipelagic habitat occurs within the range of many largely unregulated and under-reported gillnet and longline fisheries, in which it is readily caught. It is an important economic species in many areas and is valued highly for its meat and large fins. Its life history characteristics (2–4 pups per litter; 8–14 year generation period) and high value in both target and bycatch fisheries make it vulnerable to rapid depletion. Serious declines have occurred where this species has been heavily fished, for example in the 1980s Eastern Central Pacific drift gillnet fishery, where reported landings collapsed to 27% of peak levels between 1982 and the late-1980s. Analyses of pelagic longline CPUE data from logbook reports covering the species' entire range in the Northwest and Western Central Atlantic vary according to the time period, but suggest thresher shark stocks declined by 63–80% during 1986–2000. There is evidence that thresher sharks are being increasingly targeted by pelagic fisheries for swordfish and tuna (e.g. in the Mediterranean Sea) in attempts to sustain catches, and exploitation is increasing in these areas. The high value of the species and its exploitation by unmanaged fisheries combined with its biological vulnerability, indicate that at least some, if not most, subpopulations in other parts of the world are likely to be equally, or more seriously at risk than those for which data are available and, unlike the Californian stock, are not the subject of management, enabling stocks to rebuild.

In addition to the Vulnerable global assessment, a number of regional assessments have also been designated for the Common Thresher Shark including: Vulnerable A2bd in the Northwest and Western Central Atlantic; and, Near Threatened in the Eastern Central Pacific.

Northwest and Western Central Atlantic (regional assessment): Estimates of trends in abundance from standardized catch rate indices of the U.S. pelagic longline fishery suggest that this species has likely undergone a decline in abundance in this region. Thresher sharks are generally recorded by genus by observers as well as in logbooks, which includes both Common Thresher Shark and Bigeye Thresher Shark (*A. superciliosus*) in this region, of which Common Thresher Shark is the less common. The area covered by the analyses, ranging from the equator to ~50°N, encompasses the confirmed range of threshers in this region. Estimates of the decline based on logbook and observer records of combined thresher sharks from 1986–2005 range from 50–80%. Fishing pressure on thresher sharks began over two decades prior to the start of this time series, thus the estimated declines are not from virgin biomass. Furthermore, the sample size in the latter observer analysis was also very small compared with the logbook analyses which both showed declines. Given the apparent decline in abundance in this region and high fishing pressure from pelagic fleets, this species is assessed as Vulnerable A2bd in the Northwest and Western Central Atlantic.

Eastern Central Pacific (regional assessment): Reported landings in the drift gillnet fishery for this species that developed off the west coast of the U.S. in the late-1970s, collapsed from a peak of 1,089.5 t in 1982 to <300 t by the late-1980s (decline of ~70%). This fishery was effectively eliminated by restrictions on the use of gillnets by 1990, and the population began to slowly recover to just below 50% of the initial subpopulation size. The Common Thresher Shark is still caught as bycatch or as a secondary target, although to a far lesser extent, of the swordfish gillnet fishery. It is clear that this species' status depends on adequate management measures, and would otherwise be at risk of overfishing. All this considered, the species is assessed as Near Threatened in this region based on significant population declines, which are now managed in U.S. waters.

ORDER	**LAMNIFORMES**
FAMILY	**CETORHINIDAE**
	Family synopsis: *1 species (VU)*

Basking Shark

Cetorhinus maximus (Gunnerus, 1765)

Red List Assessment: **Global: Vulnerable A2ad+3d; North Pacific subpopulation: Endangered A2ad** (Fowler, S.L. 2000).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Northeast Pacific; Eastern Central Pacific.

Rationale: The Basking Shark (*Cetorhinus maximus*) is a very large, filter-feeding, cold-water pelagic species that is migratory and widely distributed, but only regularly seen in a few favored coastal locations and probably never abundant. Most documented fisheries have been characterized by marked, long-lasting declines in landings after the removal of hundreds to low thousands of individuals. Its fins are among the most valuable in international trade. Basking Sharks are legally protected in some territorial waters and listed in CITES Appendix II. As a result of its slow growth rate, lengthy maturation time, long gestation period, probable low fecundity, and probable small size of existing populations, this species is considered to be extremely vulnerable to overfishing. The global status of the Basking Shark is assessed as Vulnerable, with the North Pacific and Northeast Atlantic stocks, which have been subjected to target fisheries, assessed as Endangered. These assessments are based primarily on past records of rapidly declining local populations of Basking Sharks as a result of short-term fisheries exploitation and very slow population recovery rates.

ORDER	**LAMNIFORMES**
FAMILY	**LAMNIDAE**
	Family synopsis: *5 species (4 VU; 1 LC)*

Great White Shark

Carcharodon carcharias (Linnaeus, 1758)

Red List Assessment: **Global: Vulnerable A2cd+3cd** (Fergusson, I.K., Compagno, L.J.V. & Marks, M. 2000).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Northeast Pacific; Eastern Central Pacific.

Rationale: Despite the high profile media attention that the Great White Shark (*Carcharodon carcharias*) receives, relatively little is known about its biology. It appears to be fairly uncommon compared to other widely distributed species, being most frequently reported from South Africa, Australia, California, and the northeast U.S. World catches of Great White Sharks from all causes are difficult to estimate, though it is known to have a relatively low intrinsic rebound potential. Threats to the species include targeted commercial and sport fisheries for jaws, fins, game records and for aquarium display, protective beach meshing, media-fanned persecution campaigns to kill Great White Sharks after a biting incident occurs, and degradation of inshore habitats used as pupping and nursery grounds.

Shortfin Mako

Isurus oxyrinchus Rafinesque, 1810

Red List Assessment: **Global: Vulnerable A2abd+3bd+4abd; Atlantic subpopulation: Vulnerable A2bd+3bd+4bd; Eastern North Pacific subpopulation: Near Threatened** (Cailliet, G.M., Cavanagh, R.D., Kulka, D.W., Stevens, J.D., Soldo, A., Clò, S., Macías, D., Baum, J.K., Kohin, S., Duarte, A., Holtzhausen, H.A., Acuña, E., Amorim, A.F. & Domingo, A. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Northeast Pacific; Eastern Central Pacific.

Rationale:

Global: The Shortfin Mako (*Isurus oxyrinchus*) is an important target species, a bycatch in tuna and billfish longline and driftnet fisheries, particularly in high seas fisheries, and is an important coastal recreational species. Most catches are inadequately recorded and underestimated and landings data do not reflect numbers finned and discarded at sea. Various analyses suggest that this species may have undergone significant declines in abundance over various parts of its range. A global assessment of Vulnerable is considered appropriate for this species on the basis of estimated and inferred declines, inadequate management resulting in continuing (if not increasing) fishing pressure, the high value of its meat and fins, and vulnerable life history characteristics. Although it is difficult to accurately assess the conservation status of this shark because it is migratory and caught in numerous poorly monitored fisheries worldwide, it is reasonable to assume that decreases may be occurring in those areas for which there is limited or no data.

Atlantic subpopulation: In the North Atlantic, Shortfin Mako have likely undergone a decline in abundance (estimates based on logbook records ranging between 33 and 50%; demographic modeling suggesting a decline between 20 and 80%). In the Northeast Atlantic, landings data are not available for some countries, but the species is taken as a bycatch of the pelagic fishery. The area around the Strait of Gibraltar is thought to be a nursery area; most specimens caught there are juveniles. This area is heavily fished by the swordfish longline fleet. European Union vessels fishing for small pelagic species off the west coast of Africa are also known to take unquantified elasmobranch bycatch, including Shortfin Mako. In the Southwest Atlantic, Shortfin Mako is caught as bycatch in the pelagic longline fishery targeting mainly swordfish and tuna. Logbooks and landing data presented by Brazil and Uruguay at ICCAT's Sharks Sub-committee meeting in July 2007, show a decreasing trend in the CPUE values since 2003. Given the apparent decline in abundance in the North Atlantic, the trends of the CPUE values in the Southwest Atlantic and high fishing pressure from pelagic fleets throughout the Atlantic, this species is assessed as Vulnerable in the Atlantic.

Eastern North Pacific subpopulation: Analysis of longline survey data of mainly juvenile individuals off southern California suggests that the Shortfin Mako CPUE may be declining slightly. However, recent tagging and tracking data show that it is also highly migratory, both vertically and horizontally, thus making accurate or precise population estimates difficult. There is no evidence to suggest that the Eastern North Pacific subpopulation has been sufficiently depleted to warrant Vulnerable status at the present time, and this subpopulation is considered Near Threatened as a precautionary measure.

Longfin Mako

Isurus paucus Guitart Manday, 1966

Red List Assessment: **Global: Vulnerable A2bd+3d+4bd** (Reardon, M.B., Gerber, L. & Cavanagh, R.D. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Northeast Pacific.

Rationale:

The Longfin Mako (*Isurus paucus*) is a widely distributed but rarely encountered oceanic tropical shark. This species is known to be caught as bycatch in tropical pelagic longline fisheries for tuna, swordfish, and sharks and in other oceanic fisheries, which operate throughout its range, but at much lower ratios than the smaller, more fecund Shortfin Mako (*I. oxyrinchus*). Catches are inadequately monitored and underestimated due to common misidentification with Shortfin Makos and because landings do not reflect numbers of individuals finned and discarded at sea. The Shortfin Mako may have undergone significant documented declines in the North and South Atlantic and faces high fishing pressures throughout its epipelagic habitat from commercial longline fleets. Since Longfin Makos are often caught in the same fishing gear, populations are considered also likely to have declined. In addition to the inferred declines, this is a species of conservation concern due to its apparent rarity, large maximum size (>4 m TL), low fecundity (2–8 pups per litter), and continued bycatch in intensive oceanic fisheries. A global assessment of Vulnerable is considered appropriate for this species as a precautionary measure. A vast improvement in the collection of data is required and effective conservation of this species will require international agreements.

Salmon Shark

Lamna ditropis Hubbs & Follett, 1947

Red List Assessment: **Global: Least Concern** (Goldman, K.J., Kohin, S., Cailliet, G.M. & Musick, J.A. 2009).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Salmon Shark (*Lamna ditropis*) occurs in the North Pacific and its population appears to be stable and at relatively high levels of abundance. Currently there is no directed fishery in the Northeast Pacific, apart from a small sport fishery for the species in Alaska. Bycatch in the Northeast and Eastern Central Pacific appears to be at low levels and is not increasing at this point in time. Additionally, with the current ban on commercial fishing in Alaska State waters and fairly conservative sport fishing limits, it appears that the population is stable. In the Northwest Pacific, a small directed fishery still exists, but typically takes no more than ~5,000 animals per year. Bycatch in the Eastern and Western Central Pacific has been significantly reduced since the elimination of the drift gillnet fishery and the population appears to have rebounded to its former levels. In addition, the most recent demographic analysis supports the contention that Salmon Shark populations in the Northeast and Northwest Pacific are stable at this time and it is assessed as Least Concern. Nevertheless, there are very little data on catch in other fisheries, discards, and potential finning from the major pelagic fisheries in the North Pacific. Bycatch in U.S. State and Federal waters should be documented in order to foster responsible management and catch records should be obtained from the Northwest and Central Pacific.

Porbeagle

Lamna nasus (Bonnaterre, 1788)

Red List Assessment: **Global: Vulnerable A2bd+3d+4bd; Northwest Atlantic subpopulation: Endangered A1abd** (Stevens, J.D., Fowler, S.L., Soldo, A., McCord, M.E., Baum, J.K., Acuña, E., Domingo, A. & Francis, M. 2006).

Regional Occurrence: Northwest Atlantic.

Rationale: The Porbeagle (*Lamna nasus*) is a wide-ranging, coastal and oceanic shark, but with apparently little exchange between adjacent populations. Low reproductive capacity and high commercial value (in target and incidental fisheries) of mature and immature age classes makes this species highly vulnerable to overexploitation and population depletion. This depletion, despite variations in availability of data and degree of depletion between the northern and southern hemispheres, is considered to meet Vulnerable criteria globally. The Northeast and Northwest Atlantic populations have both been seriously overexploited by directed longline fisheries. Collapse of the Northeast Atlantic population led to intensive target fishing in the well documented Northwest Atlantic fishery in the 1960s, with most of the virgin biomass removed in just six years. Renewed target fishing in the 1990s led to a further population decline to ~11–17% of virgin biomass within the three generation period for this species. Recently improved management in the Northwest Atlantic should now help stocks to recover, however, the Northeast Atlantic population has been subjected to unrestricted fishing pressure ever since its earlier crash. Data are lacking, but stock depletion is considered to be much greater than in the Northwest Atlantic. Longline tuna and swordfish fleets in the southern hemisphere take a significant partially-utilized bycatch. Only limited trend data are available, including over 90% declines in landings by the Uruguayan longline fleet in the Southwest Atlantic.

ORDER **CARCHARHINIFORMES**

FAMILY **SCYLIORHINIDAE**

Family synopsis: *27 species (9 LC; 18 DD)*

Brown Catshark

Apristurus brunneus (Gilbert, 1892)

Red List Assessment: **Global: Data Deficient** (Huveneers, C. & Duffy, C.A.J. 2004).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Brown Catshark (*Apristurus brunneus*) is a little known deepwater shark from the outer continental shelf and upper slope, known from depths of 33–950 m in the Eastern Pacific. Reaches a maximum size of 68 cm TL and is oviparous with the incubation period of eggs possibly one year. Although the Brown Catshark is reported to be a relatively common bycatch in deepwater trawl fisheries, insufficient catch and biological information is available to assess this species beyond Data Deficient. Species-specific monitoring of catches should be undertaken.

Hoary Catshark

Apristurus canutus Springer & Heemstra, *in* Springer, 1979

Red List Assessment: **Global: Data Deficient** (Leandro, L. & Kyne, P.M. 2007).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Hoary Catshark (*Apristurus canutus*) is a little known deepwater catshark recorded from 521–915 m on the insular slopes of the Caribbean. There are several disjunct records from the Straits of Florida, Leeward Islands off Antigua and Anguilla, Netherlands Antilles, Colombia, and Venezuela. This species reaches 45.5 cm TL, but nothing is known of its biology. It is not presently of any interest to fisheries. Further research is required to determine its exact distribution, biology, and habitat.

Longnose Catshark

Apristurus kampae Taylor, 1972

Red List Assessment: **Global: Data Deficient** (Duffy, C.A.J. & Huveneers, C. 2004).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Longnose Catshark (*Apristurus kampae*) is a poorly known deepwater catshark recorded from the Eastern Pacific off central California to the Gulf of California. Records from the Galapagos Islands may represent the closely related Panama Ghost Catshark (*A. stenseni*) or another undescribed species. The biology and distribution of the Longnose Catshark is poorly known due to confusion with other *Apristurus* species and its deepwater habitat (upper continental slope down to 1,888 m depth). Maximum reported size is 58.4 cm TL. It is taken incidentally as bycatch in deepwater trawls and sablefish traps off California. Insufficient information is available to assess the species beyond Data Deficient.

Iceland Catshark

Apristurus laurussonii (Saemundsson, 1922)

Red List Assessment: **Global: Data Deficient** (Duffy, C.A.J. & Huveneers, C. 2007).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: An apparently common deepwater catshark on the continental slope in parts of the North and Central Atlantic at depths of 560–2,060 m. The Iceland Catshark (*Apristurus laurussonii*) together with the Smallfin Catshark (*A. parvipinnis*) are reported to be the commonest *Apristurus* species in the Gulf of Mexico. Maximum size recorded is around 72 cm TL. Although reported to be a relatively common bycatch in several deepwater trawl fisheries, insufficient catch and biological information is available to assess this species beyond Data Deficient at present.

Ghost Catshark

Apristurus manis (Springer, 1979)

Red List Assessment: **Global: Least Concern** (Ebert, D.A. 2004).

Regional Occurrence: Northwest Atlantic.

Rationale: The Ghost Catshark (*Apristurus manis*) is a little known deepwater catshark which is occasionally taken by research vessels surveying the North Atlantic continental slope region at depths of 1,000–2,000 m, and in southern Africa is known from only a few specimens caught in very deepwater off Cape Town, South Africa. Future expansion of deepwater fisheries could pose a threat to this poorly known species, however, at present much of its range is below the depth of fishing activities (>1,500 m) and it is considered to be Least Concern.

Black Roughscale Catshark

Apristurus melanoasper Iglésias, Nakaya & Stehmann, 2004

Red List Assessment: **Global: Data Deficient** (McCormack C. & Iglésias, S. 2009).

Regional Occurrence: Northwest Atlantic.

Rationale: The Black Roughscale Catshark (*Apristurus melanoasper*) is a recently described deepwater catshark, found on the slope of the North Atlantic at 512–1,520 m but generally deeper than 1,000 m. It is reported from off France, Ireland, the British Isles, and the northern U.S. The maximum recorded size for this species is 76.1 cm TL, but virtually nothing is known of its biology. The Black Roughscale Catshark is an uncommon bycatch of commercial deepwater trawlers. Although its relatively wide depth range may afford the species some refuge from fishing pressure, there is a continuing trend for deepwater fishing activities in the Northeast Atlantic. This is a poorly known species and it cannot be assessed beyond Data Deficient without further information on catch levels and population trends.

Smalleye Catshark

Apristurus microps (Gilchrist, 1922)

Red List Assessment: **Global: Least Concern** (Ebert, D.A. 2004).

Regional Occurrence: Northwest Atlantic.

Rationale: The Smalleye Catshark (*Apristurus microps*) is known from occasional captures in deepsea exploratory trawls (in 700–1,200 m), becoming most abundant >800 m. It is known to occur to 2,000 m or more. In southern Africa, there are currently no deepsea trawl fisheries. In the North Atlantic, this species is possibly caught as a bycatch in deepwater trawl fisheries, but these could be other *Apristurus* species. A careful examination of the North Atlantic form should be compared to southern African forms. Future expansion of deepwater fisheries could pose a threat to this poorly known species, however, at present much of its range is below the depth of fishing activities and it is considered to be Least Concern.

Largenose Catshark

Apristurus nasutus de Buen, 1959

Red List Assessment: **Global: Data Deficient** (Huveneers, C., Duffy, C.A.J. & Acuña, E. 2004).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Largenose Catshark (*Apristurus nasutus*) is a poorly known deepwater catshark of the continental slope off Panama and South America in the Eastern Pacific (nominal records from the Atlantic are probably a misidentification). It reaches a maximum size of 59 cm TL, but nothing is known of its biology. It is taken incidentally in small numbers in the Chilean deepsea shrimp (*Heterocarpus reedi*) fishery. Information on interactions with fisheries is not available from other countries in its range. Insufficient information is available to assess the species beyond Data Deficient at this time.

Smallfin Catshark

Apristurus parvipinnis Springer & Heemstra, *in* Springer, 1979

Red List Assessment: **Global: Data Deficient** (Huveneers, C. & Duffy, C.A.J. 2004).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: An apparently common deepwater catshark on the upper continental slope in the Western Atlantic at depths of 636–1,115 m. The Smallfin Catshark (*Apristurus parvipinnis*) together with the Iceland Catshark (*A. laurussonii*) are reported to be the commonest *Apristurus* species in the Gulf of Mexico. Maximum recorded size is around 52 cm TL. Although the Smallfin Catshark is reported to be a relatively common bycatch in deepwater trawl fisheries in the Gulf of Mexico, insufficient catch and biological information are available to assess this species beyond Data Deficient.

Deepwater Catshark

Apristurus profundorum (Goode & Bean, 1896)

Red List Assessment: **Global: Data Deficient** (Huveneers, C. & Duffy, C.A.J. 2004).

Regional Occurrence: Northwest Atlantic.

Rationale: The Deepwater Catshark (*Apristurus profundorum*) is known with certainty only from the holotype, a 51 cm TL adolescent male caught off Delaware Bay in the Northwest Atlantic at 1,492 m depth. Nominal Deepwater Catshark from off Mauritania is possibly Ghost Catshark (*A. manis*). Adults of this species are probably relatively large compared to congeners given the size at adolescence. Little is known about the species and confusion with the Ghost Catshark needs to be resolved. Given its recorded depth of capture, it is not likely to be taken in any fisheries. However, there is insufficient information available to assess the species beyond Data Deficient.

Broadgill Catshark

Apristurus riveri Bigelow & Schroeder, 1944

Red List Assessment: **Global: Data Deficient** (Leandro, L. & Kyne, P.M. 2007).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Broadgill Catshark (*Apristurus riveri*) is an uncommon and poorly known deepwater catshark recorded from 732–1,461 m in the Western Atlantic where it is known from the northern Gulf of Mexico, Cuba, Dominican Republic, Mexico, Honduras, Panama, Colombia, and Venezuela. It reaches 46 cm TL, but nothing is known of its biology. This species is of no interest to fisheries at present and there is insufficient information available to assess it beyond Data Deficient at this time.

Panama Ghost Catshark

Apristurus stenseni (Springer, 1979)

Red List Assessment: **Global: Data Deficient** (Leandro, L. 2004).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Panama Ghost Catshark (*Apristurus stenseni*) is a poorly known deepwater catshark recorded from 915–975 m in the Eastern Central Pacific where it is known only from Panama. It reaches at least 23 cm TL, but nothing is known of its biology. This species is of no interest to fisheries at present. It is presently known to have a very narrow geographical and bathymetrical range. Further surveys may prove it to be more widely distributed than presently known.

Swellshark

Cephaloscyllium ventriosum (Garman, 1880)

Red List Assessment: **Global: Least Concern** (Villavicencio-Garayzar, C. 2006).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Swellshark (*Cephaloscyllium ventriosum*) is a little known nocturnal benthic and epibenthic catshark with a disjunct distribution in the Eastern Pacific, from California to southern Mexico, and off central Chile. Recorded inshore to 457 m depth, but most common at 5–40 m. Oviparous, but annual egg production is unknown. While little information is available on the species, it faces no major threats. It is not targeted commercially and its habitat of rocky reefs affords it general protection from fishing activities (i.e. bycatch of trawling). It is occasionally caught by recreational anglers and divers. *Cephaloscyllium* species are generally hardy with high survival rates if discarded. They are popular in the marine aquarium trade and an effort should be made to determine the extent to which this species enters that trade. Globally, the species is assessed as Least Concern, but is considered Data Deficient for the Chilean subpopulation where no information is available.

Lollipop Catshark

Cephalurus cephalus (Gilbert, 1892)

Red List Assessment: **Global: Data Deficient** (Valenti, S.V. 2009).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Lollipop Catshark (*Cephalurus cephalus*) is a little known small shark found on or near the bottom at depths of 155–927 m off southern Baja California and the Gulf of California, Mexico. This species reaches a maximum of 28 cm TL. It may be taken as bycatch of trawl fisheries operating within its range, but no specific information is available. Its depth range may extend beyond the range of current fisheries offering some refuge from fishing pressure. Insufficient information is currently available to assess this species beyond Data Deficient.

Antilles Catshark

Galeus antillensis Springer, 1979

Red List Assessment: **Global: Data Deficient** (Heupel, M.R. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Antilles Catshark (*Galeus antillensis*) is a member of the Western Atlantic *Galeus arae* species-complex. Information for this species is currently limited but it appears to have a relatively restricted distribution in the Western Atlantic (Florida Straits, Hispaniola, Puerto Rico, and the Lesser Antilles). Its distribution may not be completely documented due in part to confusion with its congeners. This species is found in depths of 293–695 m and reaches a maximum size

of ~46 cm TL, but virtually nothing is known of its biology. Very little information is available on fisheries that may take this species as bycatch and no catch data are available. At present there is not enough information on catches, biology, or population to assess the species beyond Data Deficient. The limited distribution of this species may make it vulnerable to depletion and therefore any catches require monitoring.

Roughtail Catshark

Galeus arae (Nichols, 1927)

Red List Assessment: **Global: Least Concern** (Heupel, M.R. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Roughtail Catshark (*Galeus arae*) is a member of the Western Atlantic *Galeus arae* species-complex. Information for this species is currently limited and its distribution may not be completely documented due in part to confusion with its congeners. Known from separate northern (southeast USA, northern Gulf of Mexico, and Cuba to Yucatán) and southern (Honduras, Nicaragua, and Costa Rica) populations. Recorded from depths of 36–732 m in the north and 338–631 m in the south, and reaches a maximum size of ~33 cm TL, but virtually nothing is known of its biology. No information is available on the capture of this species; however, it may be taken as bycatch in trawl fisheries operating in the northern portion of its range, where it occurs at shallower depths. Given that the majority of the species' bathymetric distribution is thought to extend beyond the depths of fishing operations throughout most of its range, the species is assessed as Least Concern. Monitoring of fisheries as they expand into deeper waters will be required.

Longfin Sawtail Catshark

Galeus cadenati Springer, 1966

Red List Assessment: **Global: Data Deficient** (Heupel, M.R. 2009).

Regional Occurrence: Western Central Atlantic.

Rationale: The Longfin Sawtail Catshark (*Galeus cadenati*) is a member of the Western Atlantic *Galeus arae* species-complex. Information for this species is currently limited but it appears to have a restricted distribution in the Western Central Atlantic off Panama and Colombia at depths of 431–549 m. Its distribution may not be completely documented due in part to confusion with its congeners. It reaches a maximum size of 34.5 cm TL, but virtually nothing is known of its biology. This species is a potential bycatch of demersal shrimp trawl fisheries, but very little information is available on fisheries operating within its bathymetric range at present. Insufficient information is available to assess this species beyond Data Deficient at this time. Monitoring of fishing pressure within this species' apparently limited geographic and bathymetric range is required. Research is also needed on its life history parameters, abundance, range, and capture in fisheries (if any).

Peppered Catshark

Galeus piperatus Springer & Wagner, 1966

Red List Assessment: **Global: Least Concern** (Heupel, M.R. 2006).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Peppered Catshark (*Galeus piperatus*) is a common catshark with a restricted distribution in the northern Gulf of California in depths of 130–1,326 m. This is a small oviparous shark reaching a maximum size of 36 cm TL. This shark is not targeted nor generally caught as bycatch in fisheries (although it has been found to be part of the bycatch in hake surveys in the Gulf of California). Despite its limited geographic range, in the absence of any identifiable threats to its population, the Peppered Catshark is assessed as Least Concern. Future expansion of deepwater demersal trawling in the Gulf of California will require monitoring.

Springer's Sawtail Catshark

Galeus springeri Konstantinou & Cozzi, 1998

Red List Assessment: **Global: Data Deficient** (Heupel, M.R. 2009).

Regional Occurrence: Western Central Atlantic.

Rationale: Springer's Sawtail Catshark (*Galeus springeri*) is a member of the Western Atlantic *Galeus arae* species-complex. Information for this species is currently limited but it appears to have a relatively restricted distribution in the Western Central Atlantic (Cuba, Jamaica, Hispaniola, Puerto Rico, and the Lesser Antilles). Its distribution may not be completely documented due in part to confusion with its congeners. This species is found in depths of 457–699 m and reaches a maximum size of at least 48 cm TL, but virtually nothing is known of its biology. It is a potential bycatch of demersal trawl fisheries, but very little information is available on fisheries operating within its bathymetric range at present. Insufficient information is available to assess this species beyond Data Deficient at this time. Monitoring of fishing pressure within this species' apparently limited geographic and bathymetric range is required. Research is also needed on its life history parameters, abundance, range, and capture in fisheries (if any).

Campeche Catshark

Parmaturus campechiensis Springer, 1979

Red List Assessment: **Global: Data Deficient** (Burgess, G.H. & Chin, A. 2006).

Regional Occurrence: Western Central Atlantic.

Rationale: The Campeche Catshark (*Parmaturus campechiensis*) is known only from the holotype, a 15.7 cm TL immature female from the northwestern Bay of Campeche in the Gulf of Mexico. The specimen was collected at 1,057 m, a depth beyond current and probably future fishing pressure in the region. Given there is only one specimen, this species cannot be assessed beyond Data Deficient at this time.

Filetail Catshark

Parmaturus xaniurus (Gilbert, 1892)

Red List Assessment: **Global: Data Deficient** (Flammang, B.E., Ebert, D.A. & Cailliet, G.M. 2006).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Filetail Catshark (*Parmaturus xaniurus*) is an Eastern Pacific endemic deepwater catshark ranging from Oregon, USA, to the Gulf of California, Mexico. Adults are epibenthic and found near areas of rocky vertical relief over soft mud bottoms on the outer continental shelf and upper slope at depths of 91–1,251 m, juveniles are mesopelagic, found ~500 m off the bottom in waters over 1,000 m deep. This species reaches a maximum size of 60 cm TL. An oviparous species, females deposit eggcases throughout the year with concentrated reproductive output July through September. There is no information available on the age and growth, longevity, fecundity, abundance, or mortality of this species. It is not targeted by commercial fisheries or utilized for human consumption, but is known to be incidental catch in longline and bottom trawl fisheries, although no specific data are available. Lack of further information precludes assessment of the Filetail Catshark beyond Data Deficient at this time.

Narrowtail Catshark

Schroederichthys maculatus Springer, 1966

Red List Assessment: **Global: Least Concern** (Burgess, G.H., Perez, M. & Chin, A. 2009).

Regional Occurrence: Western Central Atlantic.

Rationale: The Narrowtail Catshark (*Schroederichthys maculatus*) is a little known catshark endemic to the Caribbean Sea with a restricted range off Honduras, Nicaragua, and Colombia. It inhabits the outer continental shelf and upper slope at depths of 190–410 m. It reaches a known maximum size of 35 cm TL, but biology is poorly known. Despite its restricted geographic range, no trawl fisheries are currently known to operate at the depths at which this species occurs. As such, the species is assessed as Least Concern. If demersal trawl fisheries expand into this species' range in the future, this assessment should be revisited.

Boa Catshark

Scyliorhinus boa Goode & Bean, 1896

Red List Assessment: **Global: Least Concern** (Burgess, G.H., Caldas, J.P. & Chin, A. 2009).

Regional Occurrence: Western Central Atlantic.

Rationale: The Boa Catshark (*Scyliorhinus boa*) is a small, poorly known deepwater catshark of the continental and insular slopes in the Caribbean at depths of 329–676 m. It reaches a maximum size of at least 54 cm TL, but little is known of the species' biology. Despite its restricted geographic range, no trawl fisheries are currently known to operate at the depths at which this species occurs. As such, the species is assessed as Least Concern. If demersal trawl fisheries expand into this species' range in the future, this assessment should be revisited.

Whitesaddled Catshark

Scyliorhinus hesperius Springer, 1966

Red List Assessment: **Global: Data Deficient** (Leandro, L. 2004).

Regional Occurrence: Western Central Atlantic.

Rationale: The Whitesaddled Catshark (*Scyliorhinus hesperius*) is an uncommon deepwater tropical catshark recorded from 274–457 m in the Western Central Atlantic where it is restricted to the continental slopes off Honduras, Colombia, and Panama. It reaches at least 47 cm TL, but nothing is known of its biology. It is of no interest to fisheries at present and adults may occupy habitat unfavorable to trawling. Insufficient information is available to assess the species beyond Data Deficient at this time.

Blotched Catshark

Scyliorhinus meadi Springer, 1966

Red List Assessment: **Global: Data Deficient** (Sherrill-Mix, S.A. & Burgess, G.H. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Blotched Catshark (*Scyliorhinus meadi*) is a poorly known rare deepwater catshark occurring in the Western Atlantic from the U.S. southeastern Atlantic coast to Santaren Channel between Cuba and Bahamas Bank, the Cayman Trench (Jamaica), and Mexico (Gulf of Mexico and northern Yucatán Peninsula). It has been recorded from the upper continental slope at depths of 329–548 m but is infrequently captured and adults have not yet been observed. Given the lack of available information, this species is assessed as Data Deficient.

Chain Catshark

Scyliorhinus retifer (Garman, 1881)

Red List Assessment: **Global: Least Concern** (Sherrill-Mix, S.A., Myers, R.A. & Burgess, G.H. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Chain Catshark (*Scyliorhinus retifer*) is a common benthic catshark of the continental shelf and slope of parts of the Northwest and Western Central Atlantic. Its occurrence appears to be patchy and irregular, with adults preferring rough ground, which is difficult to trawl thus providing refuge areas for the species. In the north of its range the species prefers the outer continental shelf, but in the south is generally found below 450 m. The northern population of this species appears to be increasing. This catshark is caught occasionally in bottom longline grouper/snapper fisheries and deepwater trawls, and is collected for the aquarium trade. These impacts are considered minimal given the species' widespread distribution, fecundity (oviparous with high laying rates documented in captivity), and the untrawlable habitat of adults. As such, the Chain Catshark is assessed as Least Concern.

Dwarf Catshark

Scyliorhinus torrei Howell-Rivero, 1936

Red List Assessment: **Global: Least Concern** (Sherrill-Mix, S.A. & Burgess, G.H. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: Little is known about this deepwater catshark. The population and biology of the Dwarf Catshark (*Scyliorhinus torrei*) is poorly understood. It has only been caught off southern Florida (USA), Cuba, and the Bahamas. Since this shark is only rarely caught, it is being placed in the Least Concern category. If fishing pressure increases, this status should immediately be reassessed due to the small range of this species.

ORDER	**CARCHARHINIFORMES**
FAMILY	**PROSCYLLIIDAE**
	Family synopsis: *1 species (DD)*

Cuban Ribbontail Catshark

Eridacnis barbouri (Bigelow & Schroeder, 1944)

Red List Assessment: **Global: Data Deficient** (Ormond, C.G.A. & Burgess, G.H. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Cuban Ribbontail Catshark (*Eridacnis barbouri*) is a small (to 34 cm TL) benthic deepwater shark with a restricted range in the Western Atlantic. Occurring on the continental and insular slopes at depths of 430–613 m, this species is known only from the Florida Straits and off the north coast of Cuba. It has a low fecundity of two young per litter, but little information is available on its biology. The Cuban Ribbontail Catshark's restricted geographical and bathymetrical distribution and its low fecundity could make it vulnerable to depletion. There is no information available from the region concerning interactions of this species with fisheries, and there is no information to suggest that trawl fisheries currently operate within its bathymetric distribution. At present insufficient information is available to assess this species beyond Data Deficient. Fisheries within the region should be carefully monitored and this assessment should be revisited as further information becomes available.

ORDER **CARCHARHINIFORMES**

FAMILY **PSEUDOTRIAKIDAE**

Family synopsis: *1 species (DD)*

False Catshark

Pseudotriakis microdon Capello, 1868

Red List Assessment: **Global: Data Deficient** (Kyne, P.M., Yano, K. & White, W.T. 2004).

Regional Occurrence: Northwest Atlantic.

Rationale: A wide-ranging but sporadically captured, large, deepwater shark with most records from the northern hemisphere (it appears rarer in the southern hemisphere). The False Catshark (*Pseudotriakis microdon*) may be cosmopolitan, but as yet has not been recorded from the South Atlantic or Eastern Pacific. It primarily inhabits the continental and insular slopes at depths of 200–1,890 m, but also occasionally occurs on the continental shelf. It reaches a maximum size of 296 cm TL and displays a modified form of oophagy, the first confirmed oophagous species outside the Lamniformes. Fecundity is low (typically two embryos per litter), and this, combined with an estimated long gestation period and presumed slow growth rate may place populations at risk of localized depletion if the species becomes more regularly caught. At present it is of no interest to fisheries but is taken sporadically as bycatch in deepwater longline and trawl fisheries. Deepwater fisheries are generally expanding globally, and given the biology of this species, bycatch of this rare fish may be of concern for any localized populations in areas where fishing may be concentrated, such as deepwater reefs or seamounts. However, since there is no available information on population trends, and because of the overall lack on information concerning biology (particularly age, growth rates, and gestation) the species is assessed as Data Deficient.

ORDER **CARCHARHINIFORMES**

FAMILY **TRIAKIDAE**

Family synopsis: *12 species (1 VU; 1 NT; 5 LC; 5 DD)*

Soupfin Shark

Galeorhinus galeus (Linnaeus, 1758)

Red List Assessment: **Global: Vulnerable A2bd+3d+4bd; Eastern North Pacific (regional assessment): Least Concern** (Walker, T.I., Cavanagh, R.D., Stevens, J.D., Carlisle, A.B., Chiaramonte, G.E., Domingo, A., Ebert, D.A., Mancusi, C., Massa, A., McCord, M.E., Morey, G., Paul, L.J., Serena, F. & Vooren, C.M. 2006).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: ***Global:*** A widespread mainly coastal and bottom-associated shark of temperate areas which has been fished in all parts of its distribution. In the 2000 IUCN Red List, the Soupfin Shark (*Galeorhinus galeus*) was listed as Vulnerable globally and Conservation Dependent in Australasia. This updated assessment retains the original Vulnerable global assessment (with updated criteria) and presents new regional assessments of this species as Critically Endangered in the Southwest Atlantic, Vulnerable in Australia and South Africa, Near Threatened in New Zealand, and Least Concern in the Eastern North Pacific. Further research, monitoring and assessment of status are required for this species in the Northeast Atlantic and Mediterranean, Eastern Central Atlantic, and Eastern South Pacific where it is currently considered Data Deficient.

Eastern North Pacific (regional assessment): The Soupfin Shark was the mainstay of the shark fishery 'boom' between 1936 and 1944, when over 24 million pounds were landed. The fishery ended abruptly in 1946 with the development of synthetic vitamin A. Since 1977, the fishery has averaged between 150,000 and 250,000 pounds dressed weight landed annually. Since no studies on this species have taken place in over 50 years in this region, it is unknown whether stocks off California have attained the size of those exploited before World War II.

However, while it appeared that the adult stock might have collapsed at that time, there would have been large stocks of juveniles to allow for a population recovery. Since the 1940s there has been no economic incentive to target it and these sharks are now mostly taken at low levels as a bycatch to other commercial species and by recreational anglers. Although there has been no stock assessment for several decades, fishing mortality can be expected to be low, landings have been relatively stable, and given the lack of a concentrated fishery at this time, this species is listed as Least Concern for the Eastern North Pacific. However, if fishing pressure increases it will be necessary to re-evaluate this assessment.

Whitefin Smoothhound

Mustelus albipinnis Castro-Aguirre, Antuna-Mendiola, González-Acosta & de la Cruz-Agüero, 2005

Red List Assessment: **Global: Data Deficient** (Cronin, E.S. 2009).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Whitefin Smoothhound (*Mustelus albipinnis*) is a recently described, medium-sized (to 118 cm TL) smoothhound occurring at 100–281 m depth in the Gulf of California and off southwest Baja California, and is probably more widely distributed in the Eastern Pacific. *Mustelus* species represent a large part of the artisanal elasmobranch fishery catch in some parts of the Gulf of California and this species is known to be caught seasonally by trawler vessels targeting hake, which operate at depths at which the Whitefin Smoothhound occurs. However, the lack of catch data and information on its distribution and abundance means that this species is assessed as Data Deficient at present. Additional information on the biology, range and capture in fisheries is required for future reassessment.

Gray Smoothhound

Mustelus californicus Gill, 1864

Red List Assessment: **Global: Least Concern** (Pérez-Jiménez, J.C. & Carlisle, A.B. 2009).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Gray Smoothhound (*Mustelus californicus*) is a common demersal shark found from Cape Mendocino, northern California to Mazatlán in the southeastern Gulf of California in the Eastern Pacific. It usually occurs in shallow waters, from 8 m depth, but has been found offshore to depths of 265 m. This species is viviparous, with a yolk sac placenta. It is taken as bycatch in California and is both a target and bycatch of trawl and gillnet fisheries off Mexico. Despite continued fishing pressure there is no evidence to suggest this species has declined. This is a relatively fast growing shark, with relatively short longevity (~9 years), early age at first maturity (2–3 years for females), and moderate fecundity (3–16 pups per litter), and is therefore considered to have a high capacity for recovery from fishing pressure compared to other sharks. These life history characteristics, combined with no evidence to suggest the species has declined, result in an assessment of Least Concern. Given that fishing pressure is continuing, catch levels need to be quantified and catch and population trends should be monitored carefully.

Dusky Smoothhound

Mustelus canis (Mitchell, 1815)

Red List Assessment: **Global: Near Threatened** (Conrath, C. 2000).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Dusky Smoothhound (*Mustelus canis*) is a demersal coastal shark found in many areas of the Western Atlantic. An abundant species seasonally in many areas of the Northwest Atlantic, in recent years they have become commercially important in this region. Recent rapid increases in directed gillnet fishing has caused a decline in some stocks of large females. There is currently no management plan or protection for this species (but see Management Section of this report).

Sharpnose Smoothhound

Mustelus dorsalis Gill, 1864

Red List Assessment: **Global: Data Deficient** (Leandro, L. 2004).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Sharpnose Smoothhound (*Mustelus dorsalis*) is an uncommon, inshore, tropical triakid from the Eastern Pacific, known from southern Mexico through Central America to Ecuador on the continental shelves. It reaches a maximum size of 64 cm TL, is viviparous with a small litter size (four young) but little else is known of its biology. It is probably taken by inshore fisheries throughout its range along with other triakid species; however, data are not available. Although it is a small species (therefore presumably relatively fast growing), it has a low fecundity and is uncommon compared with other houndsharks. Population studies and catch monitoring needs to be undertaken.

Brown Smoothhound

Mustelus henlei (Gill, 1863)

Red List Assessment: **Global: Least Concern** (Pérez-Jiménez, J.C. & Carlisle, A.B. 2009).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Brown Smoothhound (*Mustelus henlei*) is a small common to abundant shark occurring from Coos Bay, Oregon, USA, to the Gulf of California, Mexico, in the Northeast and Eastern Central Pacific, and from Ecuador to Peru in the Southeast Pacific. It is found from the intertidal region to 278 m depth and is very common in enclosed shallow muddy bays. Although the species is heavily fished in areas of the Gulf of California, there is apparently no evidence to indicate that the population has undergone significant decline. The species is not commercially fished off California, but is taken as bycatch and by recreational anglers (but not in significant numbers). It is not thought that the species is being overfished off the U.S. This is a fast growing species, with low longevity, early age at first maturity, and a relatively high fecundity, giving it a high capacity for recovery from fishing pressure. These life history characteristics combined with the fact that there have been no suspected, observed, or inferred declines in catches or populations in any region for Brown Smoothhound justify an assessment of Least Concern at present.

Smalleye Smoothhound

Mustelus higmani Springer & Lowe, 1963

Red List Assessment: **Global: Least Concern** (Faria, V. & Furtado, M. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Smalleye Smoothhound (*Mustelus higmani*) is a small (to 64 cm TL) and presumably fast growing widespread smoothhound. It is locally common to abundant where it occurs in the tropical Western Atlantic (northern Gulf of Mexico to Brazil). It is probably taken as bycatch in coastal fisheries throughout its range, although at this stage information is only available from Brazil. In Brazil, it is taken as bycatch in shrimp trawl and gillnet fisheries, marketed in some regions (although at low value), and discarded in others. Although taken in numerous fisheries, it is considered to be Least Concern due to its widespread distribution, productive biology (for a chondrichthyan) and common to abundant status. Information is lacking from other parts of its range, but the situation elsewhere is thought to be similar to Brazil (which comprises the greater part of its distribution). However, further research is required and monitoring of catches in all parts of its range is necessary.

Sicklefin Smoothhound

Mustelus lunulatus Jordan & Gilbert, 1883

Red List Assessment: **Global: Least Concern** (Pérez Jiménez, J.C., Ruíz, C. & Carlisle, A.B. 2009).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Sicklefin Smoothhound (*Mustelus lunulatus*) is a demersal shark, found from southern California to Panama in the Eastern Pacific. It occurs at depths of 9–144 m, but most often at <100 m. It is taken as bycatch in trawl and gillnet fisheries and despite continuing fishing pressure, there is no evidence to suggest that this species has declined. It is a relatively fast growing, moderately fecund shark and, in the absence of any evidence to suggest significant declines, it is assessed as Least Concern. Given that fishing pressure is continuing, catch levels need to be quantified to species level and catch and population trends should be assessed and monitored carefully.

Venezuelan Dwarf Smoothhound

Mustelus minicanis Heemstra, 1997

Red List Assessment: **Global: Data Deficient** (Leandro, L. & Caldas, J.P. 2006).

Regional Occurrence: Western Central Atlantic.

Rationale: The Venezuelan Dwarf Smoothhound (*Mustelus minicanis*) is known from only nine specimens taken from a restricted area in the Caribbean Sea off Colombia and Venezuela at depths of 71–183 m. This species is possibly rare or uncommon and little is known of its biology. It is a small species (to 57 cm TL) with a low fecundity (one pregnant female had five fetuses). Limited shrimp trawl fishery bycatch studies in the La Guajira area (Colombia) failed to record this species. However, it is likely that the Venezuelan Dwarf Smoothhound is taken (irregularly) by this fishery and also by longline fisheries in the area. Although it is a small species (and therefore presumably relatively fast growing) it has low fecundity, a very narrow known range, and is uncommon compared with other houndsharks. Consequently, population studies and catch monitoring need to be undertaken. Despite potential cause for concern, this species is assessed as Data Deficient based on the limited information available.

Narrowfin Smoothhound

Mustelus norrisi Springer, 1940

Red List Assessment: **Global: Data Deficient** (Jones, L.M., Kyne, P.M. & Carlisle, A.B. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Narrowfin Smoothhound (*Mustelus norrisi*) is commonly found inshore on sandy/muddy bottoms usually at depths shallower than 55 m, but has been recorded down to 84 m. It has a patchy distribution in the Western Atlantic in U.S. waters, the Caribbean coast of South America, and southern Brazil; it is apparently common where it occurs. It is believed that it is migratory in the Gulf of Mexico, moving to inshore shallower waters in the winter and offshore in the summer. Little is known of this species' population status, although it is taken in unknown numbers in trawl fisheries in the Gulf of Mexico and possibly off the east coast of the U.S. Given its inshore occurrence, it is also likely to be taken in fisheries where it occurs in South America (Colombia, Venezuela, and southern Brazil; all areas that receive relatively intensive coastal and shelf fishing pressure, and where declines in *Mustelus* species have been documented). Preliminary research indicates that the Narrowfin Smoothhound may not be distinct from the Dusky Smoothhound (*M. canis*), and ongoing work may change its taxonomic status. For this reason it is listed as Data Deficient. However, while its taxonomic status is uncertain, and while little information is available on this species, as known it has a moderate fecundity, is targeted by small commercial fisheries throughout its range, and it occurs in waters where it is vulnerable to being caught as bycatch. All of these factors indicate that this species could be

vulnerable to overexploitation (as documented in other *Mustelus* species in parts of its range). Further research should verify its taxonomic status, but there is a need to determine population trends and catch status where it occurs.

Gulf of Mexico Smoothhound

Mustelus sinusmexicanus Heemstra, 1997

Red List Assessment: **Global: Data Deficient** (Carlisle, A.B. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Gulf of Mexico Smoothhound (*Mustelus sinusmexicanus*) is a recently described shark endemic to the Gulf of Mexico, found on offshore continental shelves and uppermost slopes at depths of 36–229 m, with most records at 42–91 m. Very little is known about the biology and ecology of this species. It has a litter size of eight and a maximum size of ~140 cm TL. Interest to fisheries is limited. It is a probable bycatch of offshore line and trawl fisheries for sharks, bony fishes, and crustaceans. Basic research is required on this newly described species to learn more about its biology, ecology, and population dynamics. It cannot be assessed beyond Data Deficient at the present time.

Leopard Shark

Triakis semifasciata Girard, 1854

Red List Assessment: **Global: Least Concern** (Carlisle, A.B. & Smith, S.E. 2009).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Leopard Shark (*Triakis semifasciata*) is one of the most common nearshore sharks along the Pacific coast of North America, ranging from Oregon, USA, to Mazatlán, Mexico, including the Gulf of California. It is commonly found in bays and estuaries, but also occurs along the open coast and offshore islands, usually at shallower depths but at times down to 91 m. In California, where nearly all of the U.S. catch is taken, the Leopard Shark is taken primarily by recreational anglers. The species has also been captured for the cold-water aquarium trade and is highly prized for its distinctive markings and hardiness. Because of its rather limited geographical range and evidence of only limited exchange among regional stocks, resident stocks near large population centers may be particularly vulnerable to heavy localized fishing pressure. However, this species does not appear to be at risk judging by the combined landings in relation to previously calculated estimates of fishing mortality (mean F=0.084) and exploitation rates (mean E=0.075). Additionally, current conservation and regulatory actions enacted by the State of California appear to have reduced these rates and have contributed significantly toward protecting this species from excessive catches in recent years. Little is known of the biology and full extent of harvest of this species in Mexican waters, but it is estimated that <1% of the Pacific Ocean catch off Baja California under the category of 'small sharks' is comprised of this species. As a result of the success of the conservation measures taken in the U.S. and the lack of a significant fishery in Mexican waters, this species has been classified as Least Concern. However, because it is endemic to this region, is subjected to fishing/bycatch pressures (albeit regulated in the U.S.), and has been shown to be susceptible to overfishing due to its life history characteristics (slow growing, long lived, late maturing, low productivity), it is important to continue managing and monitoring the species to ensure the health of the population.

ORDER **CARCHARHINIFORMES**

FAMILY **CARCHARHINIDAE**

Family synopsis: *26 species (1 CR; 4 VU; 13 NT; 3 LC; 5 DD)*

Blacknose Shark

Carcharhinus acronotus (Poey, 1860)

Red List Assessment: **Global: Near Threatened** (Morgan, A., Carlson, J.K., Kyne, P.M. & Lessa, R. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Blacknose Shark (*Carcharhinus acronotus*) is an abundant inshore and shelf whaler shark with a wide distribution in the Western Atlantic from the southern U.S., through the Gulf of Mexico and the Caribbean, to southern Brazil. This tropical and warm-temperate shark is found at depths of 18–64 m and is fished in large numbers in parts of its range. It is caught in both the large and small coastal directed shark fisheries along the U.S. Atlantic coast and is probably a target and bycatch in coastal fisheries throughout the rest of its range. It suffers considerable mortality as bycatch in U.S. shrimp trawl fisheries causing the stock to be currently overfished. Shrimp trawl fisheries are intense in inshore waters throughout the Gulf of Mexico and on the Caribbean coast of South America. No information is available on catches or population trends for Blacknose Shark in this area, but it is possible that it is also declining there. However, analyses of data from northern and northeastern Brazil indicate that there is no evidence of population decline there, and large, mature adults are still present in catches. While the U.S. population has declined, most of the decline has occurred since 2000 (less than one generation) and management actions will be required to rebuild the stock. This species is assessed as Near Threatened globally, reflecting continuing declines observed in the U.S. Atlantic and apparently stable populations off northern Brazil. No species-specific data or information is currently available from the Caribbean Sea, and assessment of catches and population trends in this area is a priority. With further information from this region, the species may qualify for a threatened category (Vulnerable A2bd+4bd). Population trends should continue to be monitored and efforts should be made to collect data throughout the rest of the species' South American range.

Silvertip Shark

Carcharhinus albimarginatus (Rüppell, 1837)

Red List Assessment: **Global: Near Threatened** (Pillans, R., Medina, E. & Dulvy, N.K. 2009).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Silvertip Shark (*Carcharhinus albimarginatus*) has a wide but fragmented distribution throughout the tropical Indian and Pacific Oceans (reports in the Western Central Atlantic are as yet unconfirmed). It is a large, slow growing whaler shark, which appears to be relatively site-specific, possibly with limited dispersion. This species is subjected to bycatch in high seas fisheries and in artisanal longline, gillnet, and trawl fisheries throughout its range, and the number of pelagic sharks landed by fishing fleets in all oceans has become increasingly important in recent years. The meat, teeth, and jaws are sold locally and fins, skin, and cartilage are exported. Few data are available, however, there is evidence to suggest that Indonesian fisheries have eliminated local populations of this species from Scott Reef in northern Australia and declines are suspected elsewhere. This species' site-specificity, fragmented populations and life history characteristics indicate that even remote populations are highly vulnerable to target shark fisheries. This information, combined with actual and potential levels of exploitation throughout its range, result in a global assessment of Near Threatened, based on suspected overall population declines approaching 30% (close to meeting the criteria Vulnerable A2bd+4bd). More information is needed on the status of separate populations throughout its range.

Bignose Shark

Carcharhinus altimus (Springer, 1950)

Red List Assessment: **Global: Data Deficient; Northwest Atlantic (regional assessment): Near Threatened** (Pillans, R., Amorim, A.F., Mancini, P., Gonzalez, M. & Anderson, C. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Eastern Central Pacific.

Rationale: The Bignose Shark (*Carcharhinus altimus*) is a deepwater, diurnally migrating (12–430 m) whaler shark which probably has a circumglobal distribution on the continental shelf edge in tropical and warm seas, although records are patchy. There are no target fisheries for this species, although it is taken as bycatch in deep-set pelagic longlines including widespread tuna longline fisheries, and occasionally in bottom trawls. Reported catches are small, but shark bycatch in longline fisheries is not reported fully throughout the species' range and cannot be used to assess mortality or population trends. It is closely related to the Sandbar Shark (*C. plumbeus*), which it may often be mistaken for (by both fishers and biologists), and which has been heavily depleted by fishing pressure in the Northwest Atlantic. Although no specific data are available for Bignose Shark, it is suspected that this species has also been affected by longline fisheries operating in this region, warranting an assessment of Near Threatened in the Northwest Atlantic based on a suspected decline. Fishing pressure is also high in Southeast Asia, where this species is utilized whole. Its presence is also confirmed in the Hong Kong fin trade. The Bignose Shark is taken in bottom trawls in the Western Indian Ocean, probably by line or gillnet off India and in nearshore pelagic longlines around the Maldives. Catch rates reported by fishers in the Maldives have declined significantly in recent years. In Australia, this species is not commercially fished, where it is assessed as Least Concern. At present there is insufficient information to assess this species beyond Data Deficient globally. However, given that it may have similarly vulnerable life history characteristics to the related Sandbar Shark, evidence for declines in some regions and high fishing pressure in large parts of its range, its status is of concern and data collection and precautionary adaptive collaborative management should be a priority.

Copper Shark

Carcharhinus brachyurus (Günther, 1870)

Red List Assessment: **Global: Near Threatened; Eastern Pacific (regional assessment): Data Deficient** (Duffy, C.A.J. & Gordon, I. 2003).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Copper Shark (*Carcharhinus brachyurus*) is a large coastal shark with low productivity. Although widespread, regional populations appear to be discrete, and movement of individuals between them is thought infrequent or absent. Furthermore, it does not appear to be naturally abundant anywhere. The Copper Shark is assessed as Vulnerable in East Asia due to intensive fisheries and the apparent widespread collapse of fisheries for large coastal sharks. Coastal multi-species fisheries in the region are likely to continue to depress the population by taking pregnant females and juveniles. Coastal nursery areas in this region are also at risk from development and pollution. Catches appear to be stable in Australia. In New Zealand, although there may have been some reduction in population size due to fishing, the Copper Shark is apparently still common throughout its range. Management of this species in New Zealand, Australia, and South Africa is simplified by having most, if not all of the population resident within each nation's EEZ, and the species is assessed as Least Concern in these regions. However, it is assessed as Data Deficient in the Eastern Pacific, where there is no information and where it appears to be uncommon or rare. Throughout its range, it is known to be exploited by fisheries, but landings are grouped together with other *Carcharhinus* species, meaning any population declines are likely to go unnoticed, and its coastal nursery areas are potentially vulnerable to development and pollution. This, together with life history characteristics that make it especially vulnerable to overfishing has led to the global assessment of the Copper Shark as Near Threatened. The situation must be monitored as this species could soon qualify for a threatened category on the basis of population declines due to fisheries exploitation.

Spinner Shark

Carcharhinus brevipinna (Müller & Henle, 1839)

Red List Assessment: **Global: Near Threatened; Northwest Atlantic subpopulation: Vulnerable A1bd+2d** (Burgess, G.H. 2000).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Spinner Shark (*Carcharhinus brevipinna*) is an active, schooling species that often leaps spinning out of the water. This common coastal-pelagic warm-temperate and tropical shark is frequently captured in recreational and commercial fisheries. It is a species that frequents nearshore waters as adults and has inshore nursery areas, making it highly vulnerable to fishing pressure and human-induced habitat alteration.

Silky Shark

Carcharhinus falciformis (Bibron, *in* Müller & Henle, 1839)

Red List Assessment: **Global: Near Threatened; Northwest and Western Central Atlantic (regional assessment): Vulnerable A2bd+4bd; Eastern Central and Southeast Pacific (regional assessment): Vulnerable A2bd+4bd** (Bonfil, R., Amorim, A.F., Anderson, C., Arauz, R., Baum, J.K., Clarke, S.C., Graham, R.T., Gonzalez, M., Jolón, M., Kyne, P.M., Mancini, P., Márquez-Farías, J.F., Ruíz, C. & Smith, W.D. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Eastern Central Pacific.

Rationale: ***Global:*** This oceanic and coastal-pelagic shark is circumglobal in tropical waters, where it dominates as a target species or bycatch in certain pelagic fisheries, particularly purse seines on drifting FADs. The Silky Shark (*Carcharhinus falciformis*) has a generation period of 11 years and is significantly less resilient to fisheries than Blue Shark (*Prionace glauca*). It is vulnerable to a wide variety of pelagic fisheries, and is taken in large numbers, but there are no population estimates and most catches are unreported. It is highly associated with seamounts and is the dominant shark in tuna purse seine fisheries on drifting FADs, where declining catch rates have been recorded in the Eastern Pacific. Silky Shark ranks among the three most important sharks in the global shark fin trade, with between half a million and one and a half million Silky Sharks traded annually. Estimates of trends in abundance from standardized catch rate indices for *Carcharhinus* species combined in the Northwest Atlantic range from non-significant trends, to a decline of 85% over 19 years. Species-specific trends for Silky Sharks are difficult to estimate because of difficulties distinguishing it from other carcharhinid sharks. Declines are also inferred in other areas, and Silky Sharks are known to be particularly important in pelagic fisheries in the Indian Ocean. Globally, this species is assessed as Near Threatened, and may prove to meet the criteria for Vulnerable A2bd+3bd+4bd in the future.

In addition to the Near Threatened global assessment, a number of regional assessments have also been designated for the Silky Shark including: Vulnerable A2bd+4bd in the Northwest and Western Central Atlantic; and, Vulnerable A2bd+4bd in the Eastern Central and Southeast Pacific.

Northwest and Western Central Atlantic (regional assessment): Silky Sharks are taken as a target or bycatch of both commercial and artisanal pelagic fisheries in this region, including in the U.S. commercial shark bottom longline and the pelagic longline fishery, targeted artisanal longline fisheries off Venezuela, and recreational fisheries. This regional assessment is based on several estimates of trends in abundance of both Silky Shark and *Carcharhinus* species combined from standardized catch rate indices, which estimate declines of 46–91% over different areas and time periods. Given the apparent decline in abundance in the Northwest and Western Central Atlantic, and high fishing pressure from pelagic fleets throughout, this species is assessed as Vulnerable A2bd+4bd in this region.

Eastern Central and Southeast Pacific (regional assessment): Silky Sharks are taken in pelagic commercial fisheries and also artisanal fisheries in this region and fishing pressure from longline and purse seine fisheries targeting tunas and swordfish is high. Silky Sharks are the most commonly caught species of shark in the purse seine fishery for tunas in the Eastern Pacific. Preliminary estimates of relative abundance trends for large Silky Sharks derived from

purse seine fisheries in this region show decreasing trends over the period 1993–2004 for each of three types of purse seine sets (~65%). According to IATTC, it is not known whether these decreasing trends are due to fishing, changes in the environment, or other processes, however, these results were also consistent with a separate descriptive study of Silky Shark bycatch rates in dolphin sets. This descriptive analysis showed a decrease in the probability of obtaining sets with bycatch greater than or equal to each of the three threshold levels over the same period. In addition, a study of the tropical Central Pacific (which overlapped FAO areas, but mainly included the Eastern Central Pacific) estimated a decline in abundance of ~90% and in biomass >90%. A comparison of standardized catch rates of pelagic sharks caught off Costa Rica from 1991 to 2000 (of which Silky Sharks comprised 60–70%) also showed a decreasing trend (~60%). Given the trends described above and continued fishing pressure from pelagic fleets in this region, this species is assessed as Vulnerable A2bd+4bd there.

Galapagos Shark

Carcharhinus galapagensis (Snodgrass & Heller, 1905)

Red List Assessment: **Global: Near Threatened** (Bennett, M.B., Gordon, I. & Kyne, P.M. 2003).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Eastern Central Pacific.

Rationale: The Galapagos Shark (*Carcharhinus galapagensis*) has a widespread, but patchy distribution, occurring at many widely separated island and some coastal sites in the Pacific, Atlantic, and Indian Oceans. It is classified globally as Near Threatened (just failing to meet Vulnerable A2acd, and likely to be A3d in the near future) because populations at many of these sites may be subjected to high levels of fishing pressure (tuna longline fisheries, targeted dropline fishing, recreational/tourism-based angling). There is considerable potential to cause severe local declines in the number of mature individuals. Evidence of such reductions/local extinctions exists for this species around Central America (Pacific and Atlantic Oceans). As the species has a limited intrinsic rebound potential, and there are no data on recruitment to isolated sites, such local depletions could lead to loss of populations at specific localities. Continued fishing pressures throughout its range will result in further declines and populations require monitoring.

Finetooth Shark

Carcharhinus isodon (Valenciennes, *in* Müller & Henle, 1839)

Red List Assessment: **Global: Least Concern; U.S. Atlantic and Gulf of Mexico subpopulation: Least Concern** (Carlson, J.K., Kyne, P.M. & Valenti, S.V. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Finetooth Shark (*Carcharhinus isodon*) is a coastal species occurring in shallow waters from the intertidal to depths of ~20 m. It is predominantly distributed in U.S. waters in the Western Atlantic and the northern Gulf of Mexico where it is locally common. In South America, it is reported from São Paulo to Santa Catarina States in southern Brazil, Trinidad, and Guyana. Stock assessments for the Finetooth Shark in U.S. Atlantic waters and the Gulf of Mexico indicate that the current status of the population is above maximum sustainable yield and no overfishing is occurring, therefore this population is assessed as Least Concern. This species is apparently rare throughout its reported range off South America, and virtually no information is available from this region. This rarity, together with its shallow inshore occurrence in a region which faces heavy coastal fishing pressure raises concern for the species' threat status in South America, particularly as significant declines have been documented in other elasmobranchs that occur in coastal waters of Brazil. However, due to infrequent records and a total lack of information on the species' full distribution and catches in fisheries, it is not possible to assess this population beyond Data Deficient at present. Further research is urgently required into the species' full distribution, catch levels, impact of fisheries and population trends off South America. Available information suggests that the majority of total global population occurs in the U.S. Atlantic and Gulf of Mexico; thus the species is currently listed as Least Concern globally. With further information on the South American population of this species, this assessment may need to be revisited.

Bull Shark

Carcharhinus leucas (Valenciennes, *in* Müller & Henle, 1839)

Red List Assessment: **Global: Near Threatened** (Simpfendorfer, C.A. & Burgess, G.H. 2000).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Eastern Central Pacific.

Rationale: The Bull Shark (*Carcharhinus leucas*) is a common tropical and subtropical species that occurs in marine, estuarine and fresh waters. It regularly penetrates long distances up large rivers. It is caught in fisheries throughout its range, but it is rarely a target species. Its occurrence in estuarine and freshwater areas makes it more vulnerable to human impacts and habitat modification.

Blacktip Shark

Carcharhinus limbatus (Valenciennes, *in* Müller & Henle, 1839)

Red List Assessment: **Global: Near Threatened; Northwest Atlantic subpopulation: Vulnerable A1bcd+2cd** (Burgess, G.H. & Branstetter, S. 2000).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Eastern Central Pacific.

Rationale: The Blacktip Shark (*Carcharhinus limbatus*) is a modest-sized species that is frequently captured in commercial and recreational fisheries. Its meat is well regarded and its fins are highly marketable. The Blacktip Shark is widespread in warm-temperate, subtropical, and tropical waters throughout the world. It frequents inshore waters as adults and has inshore nursery areas, making it highly vulnerable to fishing pressure and human-induced habitat alteration.

Oceanic Whitetip Shark

Carcharhinus longimanus (Poey, 1861)

Red List Assessment: **Global: Vulnerable A2ad+3d+4ad; Northwest and Western Central Atlantic (regional assessment): Critically Endangered A2bd+3bd+4bd** (Baum, J.K., Medina, E., Musick, J.A. & Smale, M.J. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Northeast Pacific; Eastern Central Pacific.

Rationale: ***Global:*** The Oceanic Whitetip Shark (*Carcharhinus longimanus*) is a formerly widespread and abundant large oceanic shark subjected to fishing pressure virtually throughout its range. It is caught in large numbers as a bycatch in pelagic fisheries, with pelagic longlines, probably pelagic gillnets and handlines, and occasionally pelagic and even bottom trawls. Catches, particularly in international waters, are inadequately monitored. Its large fins are highly prized in international trade although the carcass is often discarded. Fishery pressure is likely to persist if not increase in the future. Outside of the areas detailed below, this species is under similar fishing pressure from multiple pelagic fisheries and there are no data to suggest that declines have not also occurred in these areas, given there are similar fisheries throughout the range. As such, a precautionary global assessment of Vulnerable is considered appropriate for the Oceanic Whitetip Shark. Efforts are underway to improve the collection of data from some regions and effective conservation and management of this species will require international agreements.

Northwest and Western Central Atlantic (regional assessment): The Oceanic Whitetip Shark is assessed as Critically Endangered in the Northwest and Western Central Atlantic because of the enormous declines that have been reported. Two estimates of trends in abundance from standardized catch rate indices were made from independent datasets. An analysis of the U.S. pelagic longline logbook data between 1992 and 2000, which covers the Northwest and Western Central Atlantic regions, estimated declines of 70%. An analysis of the Gulf of Mexico, which used data from U.S. pelagic longline surveys in the mid-1950s and U.S. pelagic longline observer data in the late-1990s, estimated a decline of 99.3% over this 40 year time period or 98% over three generations (30 years). However, changes in fishing gear and practices over

this time period were not fully taken into account in the latter analysis, and there is currently debate as to whether or not these changes may have resulted in an under- or overestimation of the magnitude of these declines.

Dusky Shark

Carcharhinus obscurus (Lesueur, 1818)

Red List Assessment: **Global: Vulnerable A2bd; Northwest and Western Central Atlantic subpopulation: Endangered A1bd** (Musick, J.A., Grubbs, R.D., Baum, J.K. & Cortés, E. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Northeast Pacific; Eastern Central Pacific.

Rationale: ***Global:*** The Dusky Shark (*Carcharhinus obscurus*) is a large wide-ranging coastal and pelagic warm-water species, which is among the slowest growing and latest maturing of known sharks and which bears small litters after a long gestation period. Its very low intrinsic rate of increase renders this species among the most vulnerable of vertebrates (including the great whales and sea turtles) to depletion by fisheries. Unfortunately, the Dusky Shark is difficult to manage or protect because it is taken with other more productive sharks in mixed species fisheries, and has a high mortality rate when taken as bycatch. This species' fins are highly valued. Time series data are available from the Northwest and Western Central Atlantic, where catch rates have declined. Management requiring all individuals captured in the U.S. longline fishery to be released was introduced in 2000, however, while this may have led to an increase in the numbers of juvenile sharks, adults still appear to be declining. A recent stock assessment of the fishery off southwestern Australia estimated that CPUE of this species declined by >75% from the early-1970s to 2004. Additional management measures were then introduced to this fishery in 2006. Given the very high intrinsic vulnerability of this species to depletion, significant estimated declines in several areas of its range, and inferred declines in highly fished areas from which data are not available, the Dusky Shark is assessed as Vulnerable globally.

Northwest and Western Central Atlantic subpopulation: The initial decline in the Dusky Shark in this area was caused by a targeted recreational fishery that developed in the late-1970s and by bycatch in the pelagic swordfish longline fishery. This was followed by rapid expansion on the U.S. directed commercial shark fishery in the late-1980s. The species was protected in U.S. Atlantic waters in 2000 as a result of declines in abundance. Although this management action may have led to an increase in the numbers of juvenile Dusky Sharks, adults still appear to be declining. A stock assessment which analyzed catch data and multiple fisheries-independent and fisheries-dependent time series datasets led to estimated declines in dusky shark abundance of 62–92% between 1974 and 2003. Other analyses based on long-term survey data from off North Carolina, observer data from the U.S. Atlantic pelagic longline fishery and data from U.S. pelagic longline research surveys and observer data from the Gulf of Mexico estimated declines of between 70 and 98.8% over periods of 13–40 years. Given the decline in abundance in this region, the Dusky Shark is assessed as Endangered in the Northwest and Western Central Atlantic.

Caribbean Reef Shark

Carcharhinus perezi (Poey, 1876)

Red List Assessment: **Global: Near Threatened** (Rosa, R.S., Mancini, P., Caldas, J.P. & Graham, R.T. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Caribbean Reef Shark (*Carcharhinus perezi*) is a widespread, and in some areas abundant, reef dwelling shark found in the Western Atlantic from North Carolina, USA, throughout the Caribbean (where it is the most common reef shark) south to Brazil. This is a large (to 295 cm TL) inshore shark with low productivity (biennial reproductive cycle with gestation ~1 year and litters of 3–6). It is taken as bycatch in artisanal and commercial fisheries throughout its range and there is demand for trade in its meat and fins. Little data are available, but in some parts of its range intense inshore fisheries exist and there is strong evidence indicating declines (e.g. off Belize and Cuba) together with the continued exploitation of this species in some

marine reserves due to lack of enforcement. However, this species is protected in some areas (e.g. Florida and the Bahamas where it is a major attraction to the ecotourism diving industry). Although further information on interactions with fisheries is required before its status can be more accurately determined, at the present time this species is assessed as Near Threatened and may well be shown to meet the criteria for Vulnerable in the future, based on overall population declines.

Sandbar Shark

Carcharhinus plumbeus (Nardo, 1827)

Red List Assessment: **Global: Vulnerable A2bd+4bd** (Musick, J.A., Stevens, J.D., Baum, J.K., Bradai, M., Clò, S., Fergusson, I.K., Grubbs, R.D., Soldo, A., Vacchi, M. & Vooren, C.M. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: This large coastal species is widespread in subtropical and warm-temperate waters around the world. Tagging and age and growth studies show that Sandbar Sharks (*Carcharhinus plumbeus*) are long lived, with low fecundity and are consequently very vulnerable to overfishing. This species is an important component of shark fisheries in most areas where it occurs and has been overfished in the Northwest and Western Central Atlantic and Mediterranean Sea. Population declines are suspected to have occurred off southern Brazil and in the Northwest Pacific. Off Australia, biomass has also decreased to ~35% of pre-fishery levels as a result of fishing off Western Australia, although management is in place to prevent further declines there. In Hawaiian waters, the species is common and not fished. Given the high intrinsic vulnerability of this species to depletion, significant declines estimated and suspected in several areas of its range, and inferred declines in highly fished areas from which data are not available, the Sandbar Shark is assessed as Vulnerable globally. In the Northwest and Western Central Atlantic, the Sandbar Shark is taken in recreational and commercial fisheries along the southern Atlantic coast of the U.S. and in the Gulf of Mexico, which have expanded rapidly during the last >20 years. Sandbar Shark stocks were reduced by 85–90% in just 10 years because of overexploitation and only continued to support a fishery because of the very large size of the original stock. Adult females became very uncommon and the average size of individuals has declined by ~70% of the average size in 1975. Although management was introduced in 1993 and the biomass of the species was reported to have increased by 2002, a recent assessment estimated that the stock is still only 35–47% of virgin biomass and 26–43% of virgin mature abundance in numbers. Newly available analyses of survey data also estimate significant declines (of between 84% and 97% over time periods of 13–41 years). The Sandbar Shark is listed as a prohibited species on the U.S. FMP for Atlantic sharks. All this considered, the Sandbar Shark is assessed as Vulnerable globally based on significant population declines throughout its Northwest and Western Central Atlantic range due to target and bycatch exploitation by fisheries, which although now managed in U.S. waters, is not the case elsewhere in the region.

Smalltail Shark

Carcharhinus porosus (Ranzani, 1839)

Red List Assessment: **Global: Data Deficient** (Lessa, R., Almeida, Z., Santana, F.M., Siu, S. & Perez, M. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Eastern Central Pacific. Note: the synonym *Carcharhinus cerdale* may prove to be valid for what has been referred to as *C. porosus* in the Eastern Pacific.

Rationale: This small (<150 cm TL) shark occurs in the Western Atlantic (Gulf of Mexico to southern Brazil) and Eastern Pacific (Gulf of California to Peru). It is apparently data deficient throughout much of its range. For example, although it is a known bycatch component of artisanal gillnet fisheries in Central America, there are no data on catch or effort for this species. Information on the Smalltail Shark (*Carcharhinus porosus*) in the Gulf of Mexico and much of its range down to Brazil is scarce. Considered rare in the south of Brazil, but detailed information is available for the population in the north (considered to be the center of abundance for this

species) where it was previously common, particularly off the Maranhão coast. The Smalltail Shark is a bycatch in gillnet fisheries directed at Spanish Mackerel (*Scomberomorus brasiliensis*) and declines in abundance have been observed off the Maranhão coast when comparing the catches from the 1980s to the present. Previously an important component of the catch (43% of the elasmobranch catch, with 88% of these comprising juveniles), the Smalltail Shark was recently recorded as a much lower component (17%) of the catch by the same gear. Increasing directed fishing effort by artisanal fisheries is considered to be the primary reason for this species' decline. Furthermore, the species has an early age of recruitment to the fishery and an apparent low fecundity. Given the increasing fishing pressure, and evidence of decline in the main part of its distribution, its vulnerability and overall lack of management, this species is considered to be Vulnerable in Brazil. Close monitoring of catches is necessary and there is concern that the species could become more threatened if conservation and management measures are not urgently addressed. Information is required from elsewhere in its range to complete the picture.

Night Shark

Carcharhinus signatus (Poey, 1868)

Red List Assessment: **Global: Vulnerable A2abd+3bd+4abd** (Santana, F.M., Lessa, R. & Carlson, J.K. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: Concern for the status of the Night Shark (*Carcharhinus signatus*) off South America arises from uncontrolled fishing effort on the species and from its comparatively low biological productivity. Under intense fishing pressure off parts of Brazil, the Night Shark is a target species (for fins and meat) regularly caught in commercial fisheries on seamounts off northeastern Brazil where the species aggregates. The Night Shark is the most important elasmobranch species in the seamount area where it makes up 90% of catches from over shallow banks. Estimates of age composition indicated that 89.2% of individuals were below the age at 50% maturity. Demographic analysis indicates declines due to fishing mortality rate and early recruitment to the fishery. It is likely that there are no significant natural refuges for the species and that there is little or no exchange with other populations of the Night Shark. Formerly common in Caribbean fisheries, this species is now apparently rare. Historically, Night Sharks comprised a significant proportion of the artisanal Cuban shark fishery, making up to 60–75% of the catch from 1937 to 1941. However, beginning in the 1970s with the development of the swordfish fishery, anecdotal evidence has indicated a substantial decline in the abundance of this species. Night Sharks comprised 26.1% of the shark catch in the pelagic U.S. longline fishery from 1981 to 1983, but observer data showed this to decline to 0.3% and 3.3% of the shark catch in 1993 and 1994, respectively. Furthermore, photographic evidence from marlin tournaments in south Florida in the 1970s show that large Night Sharks were caught daily, but today they are rarely captured. However, recent trends in catch rates from the pelagic logbook data indicate that the trend has stabilized since 1992. The FMP for Atlantic tunas, swordfish, and sharks currently lists the Night Shark as a prohibited species and recent time/area closures should help to reduce any further increases in bycatch. All this considered, the Night Shark is assessed as Vulnerable globally based on significant population declines throughout its Western Atlantic range due to target and bycatch exploitation by fisheries, which although now managed in U.S. waters, is not the case elsewhere in the region. There is currently no available information from the Eastern Atlantic distribution of the Night Shark off West Africa, and until further research occurs in this region, the species cannot be assessed beyond Data Deficient for this part of its range, although coastal fisheries in the region are known to be intense and its apparent disjunct distribution could easily lead to localized depletions.

Tiger Shark

Galeocerdo cuvier (Peron & Lesueur, *in* Lesueur, 1822)

Red List Assessment: **Global: Near Threatened** (Simpfendorfer, C.A. 2000).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Northeast Pacific; Eastern Central Pacific.

Rationale: This large (>550 cm TL) shark is common worldwide in tropical and warm-temperate coastal waters. It is a relatively fast growing and fecund species. The Tiger Shark (*Galeocerdo cuvier*) is caught regularly in target and non-target fisheries. There is evidence of declines for several populations where they have been heavily fished, but in general they do not face a high risk of extinction. However, continued demand, especially for fins, may result in further declines in the future.

Daggernose Shark

Isogomphodon oxyrhynchus (Müller & Henle, 1839)

Red List Assessment: **Global: Critically Endangered A2ad+3d+4ad** (Lessa, R., Charvet-Almeida, P., Santana, F.M. & Almeida, Z., 2006).

Regional Occurrence: Western Central Atlantic.

Rationale: The Daggernose Shark (*Isogomphodon oxyrhynchus*) is an inshore tropical species which is endemic to coastal waters of northern South America with a restricted distribution from Venezuela to Brazil. Studies on the Daggernose Shark's biology, ecology, and fisheries have been carried out only in parts of its area of occurrence. It has limiting biological parameters (fecundity 2–8 pups; gestation 12 months; reproductive cycle possibly biennial) and a resultant low intrinsic population growth rate, making it highly susceptible to declines. The species is caught incidentally in floating gillnet artisanal fisheries. Recruitment to fisheries occurs about two years after maturity, limiting reproductive potential. In Brazil, fishing pressure in its habitat continues to increase. Recent demographic analyses suggest that the population has been decreasing at 18.4% per year with very large declines (>90%) resulting over the past 10 years. Although data are currently lacking for Venezuela, Trinidad, Guyana, Suriname, and French Guiana, it is highly likely that similar declines have also occurred there given that the species is taken primarily in artisanal fisheries. Such fishing pressure is intense across its range, will continue to increase into the future and the species' restricted movements may limit re-colonization to depleted areas. These factors, together with limited distribution, life history traits and dramatic population declines, result in the Daggernose Shark being considered a Critically Endangered species for which urgent conservation and management action is required.

Whitenose Shark

Nasolamia velox (Gilbert, *in* Jordan & Evermann, 1898)

Red List Assessment: **Global: Data Deficient** (Ruíz, C., Arauz, R., Pérez-Jiménez, J.C., Castillo-Geniz, J.L. & Soriano-Velásquez, S. 2009).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Whitenose Shark (*Nasolamia velox*) is an uncommon to rare shark of the Eastern Pacific found from Mexico, through Central America to Colombia, Ecuador, and Peru in South America. Primarily it is an inshore species at depths of <24 m, but also found offshore to depths of 192 m. This species is taken by longline and gillnets in inshore fisheries and in some regions directed shark fishing is increasing. Destructive trawling practices, water pollution, and coastal sedimentation may also threaten the coastal nursery grounds of this species. No data are available on population trends and little is known of the life history of this species (although fecundity is low: 5–6 pups per litter). It is assessed as Data Deficient as a result of insufficient information and research is required on biology, population trends, and capture in fisheries.

Lemon Shark

Negaprion brevirostris (Poey, 1868)

Red List Assessment: **Global: Near Threatened** (Sundström, L.F. 2000).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Eastern Central Pacific.

Rationale: The Lemon Shark (*Negaprion brevirostris*) is a large coastal shark that is common in the Atlantic Ocean along the coasts of the U.S. to Brazil and possibly in some areas on the West African coast, as well as in the Pacific from Baja California, Mexico, to Ecuador. Young sharks are highly site-attached but adults may undertake long migrations, possibly to deeper waters at the onset of winter. The species is caught both in commercial and recreational fisheries, but no management plans are implemented.

Blue Shark

Prionace glauca (Linnaeus, 1758)

Red List Assessment: **Global: Near Threatened** (Stevens, J.D. 2000).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Northeast Pacific; Eastern Central Pacific.

Rationale: This abundant pelagic and oceanic shark is widespread in temperate and tropical waters. It is relatively fast growing and fecund, maturing in 4–6 years and producing average litters of 35 pups. The Blue Shark (*Prionace glauca*) is taken in large numbers (an estimated 20 million individuals annually), mainly as bycatch, but there are no population estimates and many catches are unreported. The few fishery assessments carried out suggest relatively little population decline. There is concern over the removal of such large numbers of this likely keystone predator from the oceanic ecosystem.

Brazilian Sharpnose Shark

Rhizoprionodon lalandii (Müller & Henle, 1839)

Red List Assessment: **Global: Data Deficient** (Rosa, R.S., Gadig, O.B.F., Motta, F.S. & Namora, R.C. 2004).

Regional Occurrence: Western Central Atlantic.

Rationale: The Brazilian Sharpnose Shark (*Rhizoprionodon lalandii*) is a tropical inshore species widely distributed in the Western Atlantic from Panama to southern Brazil. It is common in parts of its distribution. Current population trends through much of its range are uncertain because of a lack of records. It is therefore assessed as Data Deficient, although quantitative data on catches and abundance may in future demonstrate this species to be threatened in many parts of its range where intensive coastal fisheries are occurring. Other human factors, particularly water pollution, probably impact this species and its habitat in heavily populated areas. The species is known to be decreasing through overfishing in northern Brazil. It used to be one of the most abundant elasmobranchs in coastal fisheries in Maranhão, but nowadays is rarely seen there. Increased mortality of all age classes in coastal fisheries, such as occurs off São Paulo, likely threatens heavily exploited populations of this species. The large proportion of neonates and juveniles in catches here further compromises recruitment to the adult population. The species is therefore assessed as Vulnerable in Brazil (although the acquisition of quantitative data may show it to be at a higher level of threat) due to continuing intensive coastal fishing throughout its range.

Pacific Sharpnose Shark

Rhizoprionodon longurio (Jordan & Gilbert, 1882)

Red List Assessment: **Global: Data Deficient** (Smith, W.D., Márquez-Farías, J.F. & Pérez-Jiménez, J.C. 2009).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Pacific Sharpnose Shark (*Rhizoprionodon longurio*) is distributed in the Eastern Pacific from California, USA, through Central America to Peru in South America. It occurs from the intertidal to at least 27 m depth over sand and mud bottoms. This species is locally abundant and seasonally important in inshore artisanal fisheries, for example in Mexico, during the winter and spring months. In summer and autumn, it is thought to move into deeper waters and possibly to the central Gulf of California. It is taken as bycatch in trawl and other artisanal fisheries using gillnets, longlines, or traps in inshore waters. It is also captured in directed artisanal fisheries for elasmobranchs throughout the Gulf of California and Mexican Pacific using bottom-set gillnets and longlines. There is some anecdotal evidence for declines in some artisanal fisheries landings of this species, and further investigation is required to determine the impact of fisheries on populations of this species throughout its range. There is insufficient information available to assess this species beyond Data Deficient at present. Assessment of catches throughout its range and further research on its life history parameters is a priority, to determine population trends and vulnerability to depletion.

Caribbean Sharpnose Shark

Rhizoprionodon porosus (Poey, 1861)

Red List Assessment: **Global: Least Concern** (Lessa, R., Montealegre-Quijano, S., Santana, F.M. & Monzini, J. 2006).

Regional Occurrence: Western Central Atlantic.

Rationale: The Caribbean Sharpnose Shark (*Rhizoprionodon porosus*) is widespread in the Western Central and Southwest Atlantic from Central America, the Caribbean, and South America to Uruguay. It is considered a common to abundant species, mostly in coastal areas and around islands on shallow sandy substrates. It has, however, been found in offshore waters to a depth of 500 m with one exceptional record far offshore near the surface in water 6,036 m deep. The species reaches a maximum size of ~110 cm TL and biological information for the species is available mainly from Brazil, where it is abundant along the northern and northeastern coasts. The Caribbean Sharpnose Shark is fast growing, reaching maturity at a young age (~2 years) and reproduces annually, but with small litters of 1–8 pups. Maximum observed ages are five years for males and eight years for females, although it is suggested that the species may reach ~10 years longevity. This species is a common component of landings in directed and incidental fisheries throughout its range, both commercial and artisanal. Fishing effort is increasing in coastal areas of northern Brazil and with declines in the main target species, coastal elasmobranchs (including Caribbean Sharpnose Shark) have been increasingly targeted directly. In Pernambuco, Brazil it has been demonstrated that age at maturity and age of recruitment to fisheries coincide. In Panama, the species is landed in targeted fisheries and from the bycatch of commercial and artisanal fisheries. In Uruguay, the species is more rarely landed, given that it is the southern extent of the species' distribution. No other country-specific landing information is available. The species' widespread distribution and abundance, together with its small size, relatively fast growth, and moderate productivity results in a Least Concern assessment. However, given that coastal artisanal fishing effort is intense (and increasing), certainly in Brazil and other parts of South America, and likely throughout coastal areas of the Caribbean, and that landings have been increasing, the conservation status of this species will need to be monitored. In particular, catch data are required, and stock assessments should be undertaken where the species is fished, thus requiring biological information from outside Brazil. Effective management of coastal fisheries throughout the region is essential for the conservation of this and other species.

Atlantic Sharpnose Shark

Rhizoprionodon terraenovae (Richardson, 1836)

Red List Assessment: **Global: Least Concern** (Cortés, E. 2000).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Atlantic Sharpnose Shark (*Rhizoprionodon terraenovae*) is a very abundant, small coastal shark found in warm-temperate and tropical waters of the Northwest and Western Central Atlantic. It is caught in both commercial and recreational fisheries, and in incidental fisheries, mainly as bycatch in gillnets and shrimp trawl fisheries. This species is fast maturing and relatively fecund with moderate population growth rates and short generation times. The juvenile and adult stages seem to affect population growth rates almost equally. The species is assessed as Least Concern because of its abundance and life history characteristics, which make it less susceptible to removals than many other species of sharks.

Whitetip Reef Shark

Triaenodon obesus (Rüppell, 1837)

Red List Assessment: **Global: Near Threatened** (Smale, M.J. 2000).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Whitetip Reef Shark (*Triaenodon obesus*) has a widespread distribution in the tropical and subtropical Indian and Pacific Oceans. This species is commonly found at depths of 10–40 m around coastal reefs. Divers frequently see it resting in caves by day and it is most common in areas of high relief coral and caves. Formally abundant over coral reefs, numbers of this shark are at lower levels than those found prior to widespread expansion of fishing in the past 20 years. The species' restricted habitat, depth range, small litter size, and moderately late age at maturity suggest that with increasing fishing pressure this species may become threatened.

ORDER	**CARCHARHINIFORMES**
FAMILY	**SPHYRNIDAE**
	Family synopsis: *7 species (2 EN; 2 VU; 1 NT; 1 LC; 1 DD)*

Mallethead Shark

Sphyrna corona Springer, 1940

Red List Assessment: **Global: Near Threatened** (Mycock, S.G. 2004).

Regional Occurrence: Eastern Central Pacific.

Rationale: The biology of the Mallethead Shark (*Sphyrna corona*) is poorly known though the available information suggests it has a low productivity. This apparently rare species almost meets the requirements for Vulnerable A4ad; however, there is no direct evidence to suggest that the population is in decline due to the low numbers observed over its range. Marked declines have been observed in the Smalleye Hammerhead (*S. tudes*), occurring in similar habitats and subjected to artisanal fisheries, and it is likely that the Mallethead Shark is fished similarly though with greater impact due to its lower fecundity. Further investigation into the population and biology of this uncommon species is required.

Scalloped Hammerhead

Sphyrna lewini (Griffith & Smith, *in* Cuvier, Griffith & Smith, 1834)

Red List Assessment: **Global: Endangered A2bd+4bd; Northwest and Western Central Atlantic subpopulation: Endangered A2bd+4bd; Eastern Central and Southeast Pacific subpopulation: Endangered A4bd** (Baum, J.K., Clarke, S.C., Domingo, A., Ducrocq, M., Lamónaca, A.F., Gaibor, N., Graham, R.T., Jorgensen, S., Kotas, J.E., Medina, E., Martínez-Ortíz, J., Monzini, J., Morales, M.R., Navarro, S.S., Pérez-Jiménez, J.C., Ruíz, C., Smith, W.D., Valenti, S.V. & Vooren, C.M. 2007).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Northeast Pacific; Eastern Central Pacific.

Rationale: ***Global:*** The Scalloped Hammerhead (*Sphyrna lewini*) is a coastal and semi-oceanic hammerhead shark that is circumglobal in coastal warm-temperate and tropical seas, from the surface and intertidal zone to at least 275 m depth. Although it is wide-ranging, there is genetic evidence for multiple subpopulations. All life-stages are vulnerable to capture as both target and bycatch in fisheries: large numbers of juveniles are captured in a variety of fishing gears in nearshore coastal waters, and adults are taken in gillnets and longlines along the shelf and offshore in oceanic waters. Population segregation and the species' aggregating habits make large schools highly vulnerable to fisheries and means that high CPUEs can be recorded, even when stocks are severely depleted. Hammerhead shark fins are more highly valued than other species because of their high fin ray count, leading to increased targeting of this species in some areas. Where catch data are available, significant declines have been documented. Both species-specific estimates for Scalloped Hammerhead and grouped estimates for *Sphyrna* species combined suggest declines in abundance of 50–90% over periods of up to 32 years in several areas of its range, including South Africa, the Northwest and Western Central Atlantic, and Brazil. Interviews with fishers also suggest declining trends. Similar declines are also inferred in areas of the species' range from which specific data are not available, but fishing pressure is known to be high. Although the Scalloped Hammerhead is relatively fecund compared to other large sharks (with litters of 12–38 pups), the generation period is >15 years in the Gulf of Mexico and its life history characteristics mean that its resilience to exploitation is relatively low. Given the major declines reported in many areas of this species' range, increased targeting for its high value fins, low resilience to exploitation, and largely unregulated, continuing fishing pressure from both inshore and offshore fisheries, this species is assessed as Endangered globally.

In addition to the Endangered global assessment, a number of subpopulation and regional assessments have also been designated for the Scalloped Hammerhead including: Endangered A2bd+4bd in the Northwest and Western Central Atlantic; and, Endangered A4bd in the Eastern Central and Southeast Pacific.

Northwest and Western Central Atlantic subpopulation: Estimates of trends in abundance are available from two long-term research surveys conducted on the U.S. east coast, both of which indicate this species has undergone substantial declines in this region (98% between 1972 and 2003, and an order of magnitude between 1975 and 2005). A third survey comparing catch rates between 1983/84 with those in 1993–95 showed a decline of two-thirds, while a survey beginning more recently showed increases in catch rates of juveniles. Standardized catch rates from the U.S. pelagic longline fishery show declines in *Sphyrna* species of 89% between 1986 and 2000 (according to the logbook data) and declines of 76% between 1992 and 2005 (according to observer data). The other information for this species from this region comes from Belize, where it has been heavily fished since the 1980s and fishers have reported dramatic declines, which led to the end of the fishery. Fishing pressure is sustained in Belize by Guatemalan fishers.

Eastern Central and Southeast Pacific subpopulation: This species is heavily exploited through its range in the Eastern Pacific. Of particular concern is increasing fishing pressure at adult aggregating sites such as Cocos Island (Costa Rica) and the Galapagos Islands (Ecuador), and along the slopes of the continental shelf where high catch rates of juveniles can be obtained. The number of adult individuals at a well known Scalloped Hammerhead aggregation site in the Gulf of California (Espiritu Santo seamount) has declined sharply since 1980. Large hammerheads were also formerly abundant in coastal waters off Central America, but were reportedly depleted in the 1970s. A comparison of standardized catch rates of pelagic sharks (species-specific information was not available) in the EEZ of Costa Rica from 1991–2000

showed a decrease of 60%. In Ecuador, landings (grouped for the family Sphyrnidae) peaked in 1996 and declined until 2001. Illegal fishing for shark fins is occurring around the Galapagos. There are no species-specific data for these fisheries, but the Scalloped Hammerhead is one of the most common species around the Galapagos and given the high value of its fins, it is very likely being targeted. Divers and dive guides in the Galapagos have noted a severe decrease in shark numbers and schools of hammerhead sharks. Given continued high fishing pressure, and observed and inferred declines, the species is assessed as Endangered in this region.

Scoophead Shark

Sphyrna media Springer, 1940

Red List Assessment: **Global: Data Deficient** (Casper, B.M. & Burgess, G.H. 2006).

Regional Occurrence: Western Central Atlantic; Eastern Central Pacific.

Rationale: A widely distributed hammerhead of Central America and northern South America, the Scoophead Shark (*Sphyrna media*) is found in both the Western Atlantic and Eastern Pacific. It occurs over the continental shelf and reaches ~150 cm TL, but very little is known of its habitat and ecology. Presumably taken with bottom longlines, gillnets, and hook-and-line throughout its coastal range, but no information is available as to the extent of capture and fishing practices. It is, however, known to be a common bycatch in the mackerel gillnet fishery off Trinidad. Further data on habitat, biology, and catch rates are required before an accurate assessment of the status of this species can be undertaken.

Great Hammerhead

Sphyrna mokarran (Rüppell, 1837)

Red List Assessment: **Global: Endangered A2bd+4bd; Northwest Atlantic and Gulf of Mexico (regional assessment): Endangered A2d+A4d** (Denham, J., Stevens, J.D., Simpfendorfer, C.A., Heupel, M.R., Cliff, G., Morgan, A., Graham, R.T., Ducrocq, M., Dulvy, N.K, Seisay, M., Asber, M., Valenti, S.V., Litvinov, F., Martins, P., Lemine Ould Sidi, M., Tous, P. & Bucal, D. 2007).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Eastern Central Pacific.

Rationale: A large, widely distributed, tropical hammerhead shark largely restricted to continental shelves. The Great Hammerhead (*Sphyrna mokarran*) is highly valued for its fins (in target and incidental fisheries), suffers very high bycatch mortality, and only reproduces once every two years, making it vulnerable to overexploitation and population depletion. It is generally regarded as solitary, and is therefore unlikely to be abundant wherever it occurs. In West Africa (Eastern Atlantic), previously observed from Mauritania to Angola, reportedly abundant from November to January in Senegal, and in October in Mauritania, stocks have since collapsed and it is recognized as one of the four most threatened species by member states of the Sub Regional Fishing Commission. Although there is very little species-specific data available, the absence of recent records gives cause to suspect a decline of at least 80% in the past 25 years. Fishing proceeds unmanaged and unmonitored, resulting in an assessment of Critically Endangered in the Eastern Atlantic. Although not targeted in the Northwest Atlantic and Gulf of Mexico, it is taken as bycatch in several fisheries and suffers >90% at-vessel mortality. Two time series datasets (pelagic logbook, large pelagic survey) have shown a decline in the catch of *Sphyrna* species since 1986. Difficulties in species identification and accurate recording make an assessment of this species very difficult, however, low survival at capture makes it highly vulnerable to fishing pressure, whether directed or incidental. It is therefore assessed as Endangered in the Northwest Atlantic and Gulf of Mexico, based on a suspected decline of at least >50% over the past 10 years. The decline is poorly documented and has not been curtailed. In the Southwest Indian Ocean this species is assessed as Endangered based on a continued decline in catch rate of 79% reported for the period 1978 to 2003. It is uncertain whether these declines reflect highly localized stock depletion or whether they reflect a general decline in the Southwest Indian Ocean, but large numbers of longline vessels have been reported to be operating illegally in coastal waters of the Western Indian Ocean where they are

targeting primarily hammerhead sharks and Giant Guitarfish (*Rhynchobatus djiddensis*). The Great Hammerhead is found along the northern coast of Australia where a large increase in illegal, unregulated, and unreported (IUU) fishing in the last few years points to great concern that this species is being increasingly targeted for its valuable large fins. Recent risk assessments of northern Australian elasmobranchs indicate that it may be 'high risk'. However, due to a lack of data to form the basis of an accurate assessment, the species is considered Data Deficient in Australia at the present time. Further investigation of its status there is required. Given its vulnerability to depletion, low survival at capture and high value for the fin trade this species is considered to meet the criteria for Endangered globally based on the available evidence for declines of >50%. There is an urgent need for data collection in other parts of its range, but considering the high value of its fins and high fishing pressure in other parts of its range, similar declines are likely to have occurred elsewhere.

Bonnethead Shark

Sphyrna tiburo (Linnaeus, 1758)

Red List Assessment: **Global: Least Concern** (Cortés, E. 2000).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Northeast Pacific; Eastern Central Pacific.

Rationale: The Bonnethead Shark (*Sphyrna tiburo*) is a very abundant small hammerhead of shallow estuaries and bays on the Atlantic and Pacific coasts of the Americas. Despite pressure from both directed and incidental fisheries, this is an abundant species with some of the highest population growth rates calculated for sharks, making it much less susceptible to removals than most other species of shark.

Smalleye Hammerhead

Sphyrna tudes (Valenciennes, 1822)

Red List Assessment: **Global: Vulnerable A2ad+3d+4ad** (Mycock, S.G., Lessa, R. & Almeida, Z. 2006).

Regional Occurrence: Western Central Atlantic.

Rationale: With a confused taxonomic history, the Smalleye Hammerhead (*Sphyrna tudes*) has likely been misreported from several localities, and its true range appears restricted to the Western Central and Southwest Atlantic from Venezuela to Uruguay. Records from the Mediterranean are probably incorrect. The adults' preference for inshore habitats at depths of 9–40 m and the juveniles' use of shallow coastal nursery areas predisposes this species to capture in inshore multi-species artisanal gillnet fisheries. It is taken as bycatch in such fisheries throughout its range with all size classes and reproductive stages susceptible to capture. This species has a one year reproductive cycle with litters of 5–19 pups. Marked declines have been reported anecdotally in catches of this species off Trinidad and declines are now apparent off northern Brazil. Given its inshore coastal habitat, limited reproductive capacity, susceptibility to capture and heavy (and increasing) gillnet fishing pressure throughout its range, the Smalleye Hammerhead is assessed as Vulnerable. Quantitative evaluation of gillnet catches across its range is a priority and protected areas should be established.

Smooth Hammerhead

Sphyrna zygaena (Linnaeus, 1758)

Red List Assessment: **Global: Vulnerable A2bd+3bd+4bd** (Casper, B.M., Domingo, A., Gaibor, N., Heupel, M.R., Kotas, J.E., Lamónaca, A.F., Pérez-Jiménez, J.C., Simpfendorfer, C.A., Smith, W.D., Stevens, J.D., Soldo, A. & Vooren, C.M. 2005).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Northeast Pacific; Eastern Central Pacific.

Rationale: The Smooth Hammerhead (*Sphyrna zygaena*) is one of the larger hammerhead sharks, found worldwide in temperate and tropical seas, with a wider range than other members of its family.

It is semi-pelagic and occurs on the continental shelf. Although few data are available on the Smooth Hammerhead's life history characteristics, it is a large hammerhead shark and presumably at least as biologically vulnerable as the Scalloped Hammerhead (*S. lewini*). This species is caught with a wide variety of gears in both coastal and oceanic fisheries, as bycatch and a target species. Therefore, in some areas all size classes and reproductive stages are susceptible to capture. The Smooth Hammerhead's large fins are highly valued for their high fin ray count and they are being increasingly targeted in some areas in response to increasing demand for the fin trade. Few species-specific data are available to assess population trends because catches of hammerhead sharks are often grouped together under a single category. Very often these sharks are finned and the carcasses discarded. This species has sometimes been confused with the Scalloped Hammerhead in the tropics and these two species are probably misidentified with each other in some areas. Time series data on population trends in hammerhead sharks, including the Smooth Hammerhead, are available from the Northwest and Western Central Atlantic, and the Mediterranean Sea. In the Northwest and Western Central Atlantic, where the Smooth Hammerhead is outnumbered by the Scalloped Hammerhead by about ten to one, analysis of U.S. pelagic longline logbook data estimated that Sphyrnidae (including Scalloped Hammerhead, Great Hammerhead (*S. mokarran*) and Smooth Hammerhead) declined in abundance by 89% since 1986. In the Mediterranean Sea, where the Smooth Hammerhead outnumbers the Scalloped Hammerhead, compilation and meta-analysis of time series abundance indices estimated that Sphyrnidae (including Scalloped Hammerhead, Great Hammerhead, and Smooth Hammerhead) declined by >99% in abundance and biomass since the early-19th century. While very steep declines have been recorded in these areas, the species is afforded some refuge in other areas of its range, such as southern Australia, where it is abundant and fishing pressure is low. The species is currently assessed as Vulnerable globally and further investigation into threats, population trends, catches, and life history parameters throughout its range is required to determine whether it may warrant a higher category in the future.

7.2 Batoids

ORDER	**RAJIFORMES**
FAMILY	**PRISTIDAE**
	Family synopsis: 2 species (CR)

Smalltooth Sawfish

Pristis pectinata Latham, 1794

Red List Assessment: **Global: Critically Endangered A2bcd+3cd+4bcd** (Adams, W.F., Fowler, S.L., Charvet-Almeida, P., Faria, V., Soto, J. & Furtado, M. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic. Note: All sawfishes are currently undergoing reassessment.

Rationale: The Smalltooth Sawfish (*Pristis pectinata*) is a large, widely distributed sawfish which has been wholly or nearly eliminated from large areas of its former range in the North Atlantic (Mediterranean, U.S. Atlantic, and Gulf of Mexico) and the Southwest Atlantic coast by fishing and habitat modification. Remaining populations are now small, fragmented, and Critically Endangered globally. It is apparently extinct in the Mediterranean and likely also the Northeast Atlantic. Reports of this species outside the Atlantic are now considered to have been misidentifications of other *Pristis* species.

Largetooth Sawfish

Pristis perotteti Valenciennes, *in* Müller & Henle, 1841

Red List Assessment: **Global: Critically Endangered A2abcd** (Charvet-Almeida, P., Faria, V., Furtado, M., Cook, S.F., Compagno L.J.V. & Oetinger, M.I. 2007).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic. Note: Taxonomic resolution of the 'largetooth' *Pristis* species-complex is pending, including *P. perotteti* in the Atlantic, and what has been referred to as *P. pristis* in the Eastern Pacific. Due to this poor taxonomic resolution an account for Pristis in the Eastern Pacific is not included here. Note: All sawfishes are currently undergoing reassessment.

Rationale: The Largetooth Sawfish (*Pristis perotteti*) is a large, previously widely distributed marine, estuarine, and freshwater sawfish. It has been taken in (former) directed fisheries and is extremely vulnerable to bycatch in virtually all fisheries throughout its tropical Atlantic range. The relationship of this species to a similar form that occurs in the tropical Eastern Pacific is uncertain, but is currently being investigated, and the present assessment relates only to the Atlantic form. The species has been eliminated from most of its former range and its population status is known to be critical especially in Lake Nicaragua (Nicaragua), other Central/South American sites, and in West Africa. Artisanal and commercial landings are in decline in regions where it still occurs. Habitat degradation (mainly mangrove destruction) is also a threat. Information on biology and ecology is known only from an overfished population in Lake Nicaragua, but it is a long lived species with little capacity to recover from depletion. This species is assessed as Critically Endangered on the basis of observed and inferred declines in abundance in both the Eastern and Western Atlantic where it is believed to have been eliminated from much of its former range. Further data on the biology and trade of this species is being collected.

ORDER **RAJIFORMES**

FAMILY **RHINOBATIDAE**

Family synopsis: *8 species (4 NT; 4 DD)*

Slatyspotted Guitarfish

Rhinobatos glaucostigma Jordan & Gilbert, 1883

Red List Assessment: **Global: Data Deficient** (Bizzarro, J.J. 2009).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Slatyspotted Guitarfish (*Rhinobatos glaucostigma*) is a poorly known guitarfish, found on soft bottoms from shallow, nearshore regions to 112 m depth in the Eastern Central Pacific. It ranges from Magdalena Bay, Baja California Sur, Mexico, to Ecuador, including the Gulf of California. Caught in artisanal gillnet fisheries in Sonora and Sinaloa, Mexico, especially during spring and summer months when reproductive aggregations occur in shallow nearshore and insular waters. Almost nothing is known about the biology of this species, its population size, or status and it is assessed as Data Deficient at present. Significant declines have been documented in other guitarfish where they are heavily fished and this species could also prove to be threatened.

Atlantic Guitarfish

Rhinobatos lentiginosus Garman, 1880

Red List Assessment: **Global: Near Threatened** (Casper, B.M., Burgess, G.H. & Shepherd, T. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Atlantic Guitarfish (*Rhinobatos lentiginosus*) has a wide distribution in the southeast U.S. and coastal regions of the Gulf of Mexico, from North Carolina to Yucatán, Mexico, and also Nicaragua. It is a shallow coastal species from inshore to 30 m on sandy and weedy bottom habitats. In some regions, for example Texas, it appears to be only seasonally and locally common. Little biological information is available for the Atlantic Guitarfish. It reaches 76 cm TL and has a low fecundity (mean of 6.6 young per litter in the U.S.). Its narrow inshore habitat is susceptible to human impacts and it is taken as bycatch in bottom shrimp trawls in the Gulf of Mexico, and occasionally by recreational fishers. Shrimp trawl fishing is intense in the Gulf of Mexico, particularly in shallow waters where this species occurs, with four to five million trawl hours annually. Although data from trawl surveys on the eastern coast of the U.S. (1989–2005) showed no trend in the population of this species, trawl and longline surveys in the northern Gulf of Mexico (1972–2002) recorded it in only very low numbers, with the last record in 1994. Rhinobatids are known to be vulnerable to population depletion as a result of their limiting life history characteristics and serious declines have been documented where they are heavily affected by fisheries. Given that demersal fishing pressure is very intensive throughout the southern part of this species' range and its limiting life history characteristics, it is given a precautionary assessment of Near Threatened on the basis of inferred declines as a result of continuing high levels of exploitation (close to meeting the criteria for Vulnerable A2d+4d). Collection of further data from throughout this species' range is a priority.

Whitenose Guitarfish

Rhinobatos leucorhynchus Günther, 1866

Red List Assessment: **Global: Near Threatened** (Bizzarro, J.J. 2006).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Whitenose Guitarfish (*Rhinobatos leucorhynchus*) is a small (to 62.5 cm TL) guitarfish of shallow marine coastal waters and embayments in the Eastern Central and Southwest Pacific

from central Baja California, Mexico to Ecuador. It occurs from the intertidal zone, reportedly to 50 m depth, but only reliably verified to 8 m. The biology of the species is virtually unknown, although studied *Rhinobatos* species have an annual reproductive cycle with litter sizes of 2–16 pups. The extent of landings of this species is unknown across its range, but rhinobatids are the most common batoid target species in Mexican waters. This species is taken in the artisanal elasmobranch fishery in the Gulf of California, especially in Sinaloa, and likely to the south in Mexico and beyond. It is also taken as bycatch in commercial trawl and gillnet fisheries in Mexico. While exact catches are not documented and little information is available on landings/bycatch across its range, the shallow inshore occurrence of this species and the unregulated nature of fisheries throughout Central America warrant a Near Threatened assessment. Information is required on fishing activities and the species' conservation status needs to be reassessed once such data are obtained.

Southern Guitarfish

Rhinobatos percellens (Walbaum, 1792)

Red List Assessment: **Global: Near Threatened** (Casper, B.M. & Burgess, G.H. 2009).

Regional Occurrence: Western Central Atlantic.

Rationale: The Southern Guitarfish (*Rhinobatos percellens*) has a wide distribution in the Western Atlantic from the Caribbean to Brazil. Records of the species south to Mar del Plata (Argentina) apparently refer to the Brazilian Guitarfish (*R. horkelii*). The Southern Guitarfish is found on the continental shelf at 0–110 m depth. Very little information is available and life history data are completely lacking. It is likely that this species is taken as bycatch in commercial and artisanal fisheries throughout its range and in some regions (i.e. parts of South America) inshore fishing is intense. It is also collected for the aquarium trade in Brazil. No species-specific data are available on population trends or catches for this species, however, the closely related Brazilian Guitarfish has suffered severe population depletion from overfishing in Brazil as a result of intense inshore fishing pressure. The Southern Guitarfish is captured by similar intense fisheries (shrimp trawls, otter trawls, beach seines, and gillnets) operating on the northern coast of South America. Therefore, it is inferred that Southern Guitarfish populations in this area have also decreased. The level of impact of fisheries on this species throughout the Caribbean Islands is uncertain. Trawl effort appears to be less in fisheries off Caribbean Islands (north of Trinidad and Tobago), although it may be taken by small-scale gillnet and beach seines there. This species is assessed as Near Threatened on the basis of inferred declines as a result of continuing high levels of exploitation (close to meeting the criteria for Vulnerable A2d+4d). Assessment of catches and the collection of species-specific data to determine population trends throughout its range is a priority and it may prove to have been more seriously depleted than estimated above.

Gorgona Guitarfish

Rhinobatos prahli Acero & Franke, 1995

Red List Assessment: **Global: Data Deficient** (Kyne, P.M. 2007).

Regional Occurrence: Eastern Central Pacific.

Rationale: A little known guitarfish of the Eastern Pacific continental shelf (holotype taken at a depth of 70 m). Its distribution is not well defined, but it has been recorded from localities in Costa Rica, Panama, Colombia, Ecuador, and northern Peru. It is uncertain whether its occurrence is continuous across this range. There are no data available on the biology or ecology of the species, and the general paucity of information concerning the species leads to an assessment of Data Deficient. Surveys need to better document the distribution and abundance of the species, and an assessment of catches needs to be made for any fishing activities which potentially take this species, including shrimp trawl fisheries operating off Panama and elsewhere within its range. The type locality is part of the Gorgona National Natural Park in Colombia and this should afford the species some level of protection.

Shovelnose Guitarfish

Rhinobatos productus Ayres, 1854

Red List Assessment: **Global: Near Threatened; USA (regional assessment): Least Concern** (Márquez-Farías, J.F., Smith, W.D. & Bizzarro, J.J. 2006).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Shovelnose Guitarfish (*Rhinobatos productus*) is a medium-sized (to 156 cm TL) guitarfish inhabiting shallow waters of bays, sloughs, and estuaries in the Eastern Pacific from central California, USA, to the southern Gulf of California, Mexico. Typically found in water shallower than 12 m, but has been recorded to 91.5 m. Reaches at least 11 years of age, exhibiting an annual reproductive cycle with litters of 1–16 pups. In Mexican waters, this species is taken in directed artisanal elasmobranch fisheries in both the Gulf of California and on the Pacific coast of Baja California. Also landed when taken indirectly by demersal trawls and gillnets. Its occurrence is strongly seasonal, peaking in spring-summer mostly due to gravid females migrating to shallower waters where they become vulnerable to bottom gillnets used in local artisanal fisheries. The Shovelnose Guitarfish is the most heavily targeted batoid in northern Pacific Mexico in a fishery that targets primarily gravid females before they pup. The fishery in Bahía Almejas, Baja California, has severely declined after greatly increased effort in the mid- to late-1990s and its abundance has almost surely declined in this region as a result of fishing pressure. Further data are required on trends in catches in Mexico, but given the heavy fishing pressure on this species, particularly on gravid females, across a large portion of its relatively restricted range, it is assessed as Near Threatened. It is, however, Least Concern in the U.S. where only a limited sporadic fishery exists in southern Californian waters.

Banded Guitarfish

Zapteryx exasperata (Jordan & Gilbert, 1880)

Red List Assessment: **Global: Data Deficient** (Bizzarro, J.J. & Kyne, P.M. 2006).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Banded Guitarfish (*Zapteryx exasperata*) is a very poorly known guitarfish of the Eastern Pacific. Its range is not well defined; reported from central California south to Peru, however, its occurrence south of Mazatlán, Mexico is questionable due to possible confusion with the Southern Banded Guitarfish (*Z. xyster*), a more tropically distributed species. The Banded Guitarfish may therefore have a relatively restricted occurrence in the Eastern Central Pacific. It inhabits rocky reefs, shallow sandy lagoons, and nearshore waters, from the intertidal zone down to 200 m depth, but mostly at depths of 2.5–10 m. This species is taken in artisanal fisheries in the Gulf of California and Bahía Almejas, Baja California, Mexico. In the directed batoid fishery in Bahía Almejas, fishers target aggregations of primarily gravid females during late spring and early summer months in nearshore and inshore nursery grounds. Within the Gulf of California, landings information is scarce outside of Sonora. It is not a primary fishery target, however, and is apparently rarely taken in the Gulf of California. Exceptions may be during reproductive aggregations and possible large catches by shrimp trawlers, although information on indirect landings by commercial trawls and gillnets is lacking. It is not known if this is a relatively uncommon species, as landings would suggest, or (other than during breeding aggregations) it simply occupies areas that are not heavily fished. In the first instance the distribution of the species needs to be accurately documented and catch information obtained. This species is potentially at threat due to targeting of reproductive aggregations and generally unregulated artisanal fishing across its Mexican range. When further information is obtained, the species' conservation status should be reassessed with priority.

Southern Banded Guitarfish

Zapteryx xyster Jordan & Evermann, 1896

Red List Assessment: **Global: Data Deficient** (Casper, B.M., Ebert, D.A. & Kyne, P.M. 2009).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Southern Banded Guitarfish (*Zapteryx xyster*) has a poorly defined distribution in the Eastern Pacific; known from Mazatlán, Mexico to Panama and Columbia. References to the closely related Banded Guitarfish (*Z. exasperata*) from Ecuador and Peru are probably attributable to the Southern Banded Guitarfish. The Southern Banded Guitarfish replaces the Banded Guitarfish, which is more common in the Gulf of California and along the Pacific coast of Baja California, Mexico. Very little information is available on this species and there is a general absence of life history data. Assumed to be a probable bycatch, similar to other species of guitarfish, but details are unknown. Research needs to better define the species' range, obtain information on biology and ascertain interactions with fisheries. Due to a lack of available information it is currently assessed as Data Deficient.

ORDER **RAJIFORMES**

FAMILY **PLATYRHINIDAE**

Family synopsis: *1 species (LC)*

Thornback Ray

Platyrhinoidis triseriata (Jordan & Gilbert, 1880)

Red List Assessment: **Global: Least Concern; Mexico (regional assessment): Data Deficient** (Carlisle, A.B. & Villavicencio-Garayzar, C. 2006).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Thornback Ray (*Platyrhinoidis triseriata*) is an inshore species usually found in shallow water in bays, sloughs, lagoons, coastal beaches, and kelp forests. It appears to be common in certain bays, sloughs, and lagoons, but not throughout its range. Very little is known about its biology and ecology. Individuals reach 91 cm TL and litter size ranges 1–15 pups. This species has no commercial value but is known to be occasionally caught in commercial and recreational fisheries in the U.S., although catch information from Mexico is lacking. The species is common in parts of its range in California with no identifiable threats in that state. As California represents a significant proportion of the species' distribution it is assessed globally as Least Concern. However, little information is available from Mexican waters where it is found along Baja California, with isolated populations in the Gulf of California. Trawl and inshore net fisheries operate in these areas. This could be cause for concern, and although this species cannot be assessed beyond Data Deficient in Mexico at the present time, its status there needs assessing and monitoring if its long-term viability is to be assured.

ORDER **RAJIFORMES**

FAMILY **NARCINIDAE**

Family synopsis: *8 species (1 CR; 4 VU; 1 NT; 1 LC; 1 DD)*

Deepsea Blindray

Benthobatis marcida Bean & Weed, 1909

Red List Assessment: **Global: Least Concern** (Carvalho, M.R. de & McCord, M.E. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Deepsea Blindray (*Benthobatis marcida*) is a small electric ray which occurs in deep water (275 to >900 m) off Western Atlantic continental and insular shelves. When caught, this species is recorded as bycatch in large numbers from more than one area, indicating that it may be relatively abundant. It is also distributed in slightly deeper water in areas that are not targeted by fisheries. It is unlikely that any fisheries will begin at these depths in the foreseeable future. Given that there are no known major threats and the species appears to be relatively abundant there is no reason to suspect that the population has declined and it is assessed as Least Concern.

Colombian Electric Ray

Diplobatis colombiensis Fechhelm & McEachran, 1984

Red List Assessment: **Global: Vulnerable A2bd+3bd+4bd** (Caldas, J.P., Carvalho, M.R. de & McCord, M.E. 2006).

Regional Occurrence: Western Central Atlantic.

Rationale: The Colombian Electric Ray (*Diplobatis colombiensis*) has a very restricted distribution in the Western Central Atlantic, where it is known only off the Caribbean coast of northern Colombia at depths of 30–100 m. Little information is available on this small (to 17 cm TL) batoid, and information concerning biology, population dynamics, and status are generally lacking. The Colombian Electric Ray is sympatric with the more common Brownband Numbfish (*D. guamachensis*) in parts of its range and due to identification difficulties between these species it may be more heavily fished than currently thought. However, most of the range of the Colombian Electric Ray is distinct from that of the Brownband Numbfish. The species is taken as bycatch in trawl fisheries and the genus *Diplobatis* has been shown to have a 27.5% occurrence in the captures of the offshore trawl fishery in the region. Even though little information is available on the species, its high level of endemicity indicates that this species is threatened by high levels of incidental fishing mortality and it is assessed as Vulnerable as a precautionary measure given its restricted distribution in mostly heavily trawled areas.

Brownband Numbfish

Diplobatis guamachensis Martín Salazar, 1957

Red List Assessment: **Global: Vulnerable A2bd+3bd+4bd** (Caldas, J.P., Carvalho, M.R. de & McCord, M.E. 2006).

Regional Occurrence: Western Central Atlantic.

Rationale: The Brownband Numbfish (*Diplobatis guamachensis*) has a restricted distribution in the Western Central Atlantic, where it is known only from Trinidad, Venezuela, and northeastern Colombia, occurring in depths of 30–183 m. Little information is available on this small (to 21 cm TL) batoid, and information concerning biology, population dynamics, and status are generally lacking. It is, however, considered to be common in parts of its range. The Brownband Numbfish is sympatric with the Colombian Electric Ray (*D. colombiensis*) in part of its Colombian range and, due to identification difficulties between these species it may be more heavily fished than currently thought. However, most of the range of the Brownband Numbfish is distinct from that of the Colombian Electric Ray. The species is taken as bycatch in trawl fisheries and the genus *Diplobatis* has been shown to have a 27.5% occurrence in the captures from offshore trawl

fishing in Colombia. Even though little information is available on the species, it is assigned the category of Vulnerable as a precautionary measure given its restricted regional distribution in generally heavily trawled areas.

Target Ray

Diplobatis ommata (Jordan & Gilbert, *in* Jordan & Bollman, 1889)

Red List Assessment: **Global: Vulnerable A2bd+3bd+4bd** (Carvalho, M.R. de, McCord, M.E. & Bizzarro, J.J. 2006).

Regional Occurrence: Eastern Central Pacific.

Rationale: This electric ray has a restricted distribution in shallow water within a heavily trawled area. The Target Ray (*Diplobatis ommata*) is taken as bycatch in shrimp fisheries and although it is not utilized it may appear incidentally in markets. The genus *Diplobatis* has been shown to have a 27.5% occurrence in the captures of the offshore trawl fishery operating off the Caribbean coast of northern Colombia. There is little information available on the Target Ray, which occurs in the Pacific. However, its restricted regional distribution indicates that it is threatened by high levels of incidental fishing mortality. Furthermore, due to identification difficulties the catch rate is likely to be under-recorded, and therefore it may be more heavily fished than currently thought. As a result this species is assessed as Vulnerable, given its relatively restricted distribution in areas where there is intensive trawling pressure.

Painted Electric Ray

Diplobatis pictus Palmer, 1950

Red List Assessment: **Global: Vulnerable A2bd+3bd+4bd** (Carvalho, M.R. de & McCord, M.E. 2006).

Regional Occurrence: Western Central Atlantic.

Rationale: The Painted Electric Ray (*Diplobatis pictus*) ranges from southeastern Venezuela to northern Brazil and occurs in very shallow water in a heavily trawled area where it is taken as bycatch in shrimp fisheries. This species is not utilized, although it may appear incidentally in markets. A poorly known species, with little information available on this small (<18 cm TL) batoid; data concerning biology, population dynamics, and status are generally lacking. Due to identification difficulties, this species may be under-recorded and hence more heavily fished than currently thought. Despite this lack of information, this species is assessed as Vulnerable as a precautionary measure, given that its distribution coincides with that of intensive trawling activity.

Caribbean Electric Ray

Narcine bancroftii (Griffith, 1834)

Red List Assessment: **Global: Critically Endangered A2abd+3bd+4bd** (Carvalho, M.R. de, McCord, M.E. & Myers, R.A. 2007).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Caribbean Electric Ray (*Narcine bancroftii*) is a shallow water species found on soft substrates from the intertidal zone to a depth of 35 m. The species has a wide range in the Western Atlantic from North Carolina, through the Gulf of Mexico, the Caribbean, the Greater and Lesser Antilles, and the north coast of South America to at least Maranhão in northern Brazil. The southern extent of its range is uncertain due to previous records representing the Southwest Atlantic endemic Lesser Electric Ray (*N. brasiliensis*). The species reaches ~60 cm TL, females are reported to have a fecundity of up to ~20 pups, and the species is characterized by a very low age at maturity in females of two years. The species is captured as bycatch by inshore shrimp trawl and other fisheries. It does not appear to be utilized and is discarded at sea, but survivorship rates are thought to be very low. Furthermore, abortion of embryos by captured gravid females is of concern. While specific catch data are lacking over most of the species'

range, declines to 2% (95% confidence intervals 0.5–5%) of its baseline abundance in 1972 have been demonstrated in the northern Gulf of Mexico. Shrimp trawl fishing is intense in that area and while the implementation of Turtle Exclusion Devices and Bycatch Reduction Devices has lowered overall bycatch rates, these mitigation measures are thought to be ineffective for this species due to it size and sluggish swimming ability. Given the species' very low age at maturity it would take a very intense fishery to locally eliminate this species; however, this has been demonstrated in the northern Gulf of Mexico. Further data showing declines of a similar magnitude are available from the U.S. east coast and Florida. While specific data are lacking, fishing activities, both artisanal and commercial in nature are generally intense and most often unregulated in shallow inshore waters of the remainder of the species' range. Given that large declines have been documented in U.S. waters where data are available, there is no reason to suspect that similar declines have not also occurred elsewhere across the species' range. The species is therefore globally assessed as Critically Endangered, based on observed declines in U.S. waters and inferred declines throughout the rest of the species' range. Information from outside U.S. waters is a priority.

Giant Electric Ray

Narcine entemedor Jordan & Starks, 1895

Red List Assessment: **Global: Data Deficient; Mexico (regional assessment): Near Threatened** (Villavicencio-Garayzar, C. & Bizzarro, J.J. 2009).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Giant Electric Ray (*Narcine entemedor*) is a common nearshore species found from the intertidal to 100 m depth. It is reported from Laguna Ojo de Liebre on the central Pacific coast of Baja California, Mexico, through the Gulf of California and south to Caleta La Cruz, northern Peru. This species is fished intensively in the Bahía Magdalena lagoon complex and Sonora during the spring and summer, when it enters coastal and inshore waters for embryonic development, parturition, and mating. There is no information about its historical abundance to compare with data from recent years, which are also fragmentary and not species-specific. Since 1992, however, rays in general were more heavily fished in the Mexican Pacific. Since this increase in effort, the overall catches of rays have declined dramatically. This species has a relatively high fecundity (4–20), but since Mexican artisanal fisheries typically target gravid females, it is highly vulnerable to overfishing in this area. Shrimp trawlers in the Gulf of California also land this species as bycatch to an unknown extent and could be a significant source of additional mortality. As a result of intense fishing pressure and observed declines in overall catches of rays, an assessment of at least Near Threatened is considered appropriate for Mexico (with concern that it may qualify for Vulnerable A2bd). The lack of any species-specific information on historic or current landings or knowledge on the population structure, regional abundance, and movement patterns throughout the rest of its range precludes a global assessment beyond Data Deficient at present. Investigation into trends and catches throughout the species' range is an urgent priority.

Vermiculated Electric Ray

Narcine vermiculatus Breder, 1926

Red List Assessment: **Global: Near Threatened** (Bizzarro, J.J., Carvalho, M.R. de & McCord, M.E. 2009).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Vermiculated Electric Ray (*Narcine vermiculatus*) has a fairly restricted distribution from Mexico to Costa Rica in the Eastern Central Pacific, but its biology, abundance, and precise range are poorly known. It is reported from 0–100 m depth, but is typically found on soft bottom habitats in shallow, protected areas of the continental shelf at ~7–50 m depth. A disjunct population has been reported in the southwestern Gulf of California, but reliable records of this species are scarce and a single population in the southern Gulf of California is probable. The heavy trawl pressure in this region and aquaculture developments may detrimentally affect its shallow water habitat. In addition, the Vermiculated Electric Ray is taken incidentally in

extensive artisanal and industrial shrimp trawl fisheries off Mazatlán. Although its contribution to these fisheries is mostly unknown, it is probable that populations of this species in heavily fished waters are experiencing, and will continue to experience, considerable fishing mortality. This species is not typically utilized, but incidental catch may appear in markets. The species is assessed as Near Threatened on the basis of suspected declines as a result of continuing high levels of exploitation.

ORDER	**RAJIFORMES**
FAMILY	**TORPEDINIDAE**
	Family synopsis: *4 species (1 LC; 3 DD)*

Florida Torpedo Ray

Torpedo andersoni Bullis, 1962

Red List Assessment: **Global: Data Deficient** (Herndon, A.P. & Burgess, G.H. 2006).

Regional Occurrence: Western Central Atlantic.

Rationale: The Florida Torpedo Ray (*Torpedo andersoni*) is a rare benthic ray with a restricted distribution in the Western Central Atlantic. The Florida Torpedo Ray is known from only two specimens (the types; 16 and 22 cm TL) taken at 229 m on the upper continental slope on the western edge of the Grand Bahama Bank, and a photographic record of an individual amongst coral at 11 m from Grand Cayman Island. With these limited records, essentially nothing is known of its biology. It is potentially a bycatch of demersal trawl fisheries, although no information is available on the possible extent of such fisheries. The Florida Torpedo Ray is presently assessed as Data Deficient until further specimens and data become available, but potentially of conservation concern due to its restricted range and apparent rarity.

Pacific Torpedo Ray

Torpedo californica Ayres, 1855

Red List Assessment: **Global: Least Concern** (Neer, J.A. 2000).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Pacific Electric Ray (*Torpedo californica*) has a restricted distribution in relatively shallow, inshore waters on the west coast of North America. Targeted commercial or recreational fisheries do not threaten it and levels of bycatch appear low.

Atlantic Torpedo Ray

Torpedo nobiliana Bonaparte, 1835

Red List Assessment: **Global: Data Deficient** (Notarbartolo-di-Sciara, G., Serena, F., Ungaro, N., Ferretti, F., Holtzhausen, H.A. & Smale, M.J. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Atlantic Torpedo Ray (*Torpedo nobiliana*) has a relatively wide range in the Atlantic, including the Mediterranean Sea. Adults are frequently pelagic or semi-pelagic, from near the surface to 800 m depth, whereas juveniles are mainly benthic living on soft substrate and coral reef habitat in shallower water. Very little data are available on population or catch trends, although surveys suggest that this species is rare in the Mediterranean Sea. When caught, torpedo rays are usually discarded at sea, resulting in very little data on catches of these species. The Atlantic Torpedo Ray is caught with bottom trawls and line gear and further research is required to determine the impact of fishing activities on the species. Destruction and degradation of the species' shallow water nursery grounds may threaten juveniles. At present this species is assessed as Data Deficient globally due to very little information on catches and population trends.

Chilean Torpedo Ray

Torpedo tremens de Buen, 1959

Red List Assessment: **Global: Data Deficient** (Lamilla, J. & Romero, M. 2006).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Chilean Torpedo Ray (*Torpedo tremens*) is a poorly known electric ray from the Eastern Pacific recorded from Costa Rica, Colombia, Ecuador, Peru, and Chile. It has been reported from shallow inshore waters to a depth of 700 m (in Peru). Virtually nothing is known of its biology, and no information is available on interactions with fisheries, although it is most definitely taken as bycatch in various fisheries throughout its range. Research into distribution, life history, and bycatch is a priority. There is insufficient information to assess the species beyond Data Deficient at present.

ORDER **RAJIFORMES**

FAMILY **ARHYNCHOBATIDAE**

Family synopsis: *17 species (1 NT; 11 LC; 5 DD)*

Deepsea Skate

Bathyraja abyssicola (Gilbert, 1896)

Red List Assessment: **Global: Data Deficient** (Cook, S.F. & Zorzi, G. 2000).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: Information is lacking on the range, population size, and general and reproductive biology of this (and indeed other) rarely recorded deepsea species; hence it is assessed as Data Deficient. However, as fisheries for other traditional species move deeper, the Deepsea Skate (*Bathyraja abyssicola*) will be subjected to increased incidental capture. More research is required on this and other poorly known deepsea species to fully determine their status.

Aleutian Skate

Bathyraja aleutica (Gilbert, 1895)

Red List Assessment: **Global: Least Concern** (Davis, C.D., Ebert, D.A., Ishihara, H., Orlov, A.M. & Compagno, L.J.V. 2009).

Regional Occurrence: Northeast Pacific.

Rationale: The Aleutian Skate (*Bathyraja aleutica*) is a large (to 154 cm TL) deepwater skate, widely distributed in the North Pacific. This species inhabits the outer continental shelf and upper slopes and occurs at depths of 15–1,602 m. It is taken as bycatch in commercial trawl and longline fisheries, operating in the upper part of its bathymetric distribution. Biomass estimates from scientific surveys suggest that biomass may have increased in the eastern Bering Sea in recent years. Few time series data are available for other areas of its range. Given that this species appears to be more abundant in deeper waters, outside the range of current fishing pressure, and in the absence of any evidence to suggest significant declines, it is assessed as Least Concern. However, increasing interest in target fisheries for skates within this species' range is of concern, particularly as it exhibits limiting life history characteristics, similar to other large skates. Species-specific monitoring is required to determine catch levels and trends. If fisheries expand further across this species' range, or if a target fishery was to develop, then this assessment should be revisited.

Bering Skate

Bathyraja interrupta (Gill & Townsend, 1897)

Red List Assessment: **Global: Least Concern** (Davis, C.D. & Ebert, D.A. 2009).

Regional Occurrence: Northeast Pacific.

Rationale: The distribution of the common but poorly known Bering Skate (*Bathyraja interrupta*) is uncertain outside the eastern Bering Sea. It occurs in the Aleutian Islands, Gulf of Alaska, and possibly elsewhere in the North Pacific, but records of this species outside this area may be the Sandpaper Skate (*B. kincaidii*). This species is found at depths of <1,372 m. Population growth rates suggest moderate growth potential which makes this species appear to be somewhat resilient. Furthermore, the species' wide bathymetric distribution extends well below the depths currently fished in the eastern Bering Sea and therefore it is currently listed as Least Concern. Monitoring of catch levels and population trends should be undertaken. If fisheries expand across this species' geographic and bathymetric range in the future, this assessment may need to be revisited.

Sandpaper Skate

Bathyraja kincaidii (Garman, 1908)

Red List Assessment: **Global: Data Deficient** (Flammang, B.E., Ebert, D.A. & Cailliet, G.M. 2009).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Sandpaper Skate (*Bathyraja kincaidii*) is commonly found at depths of 200–500 m, but is usually found in deeper water in the southern portion of its range, possibly to 1,372 m. It is reported from the Gulf of Alaska to northern Baja California in the Eastern Pacific, although the distribution of this species is uncertain as it is often confused with the Bering Skate (*B. interrupta*) in the northern extent of its range. The species reaches 63 cm TL. The Sandpaper Skate may be an occasional bycatch of fisheries operating within its range, but data to determine population trends for this species are not yet available. The larger Longnose Skate (*Raja rhina*) occurs in a similar range and surveys and stock assessments suggest that populations of that species are stable. The Sandpaper Skate is less abundant than the Longnose Skate. Given that this species may form part of a complex of skate species and that nothing is currently known of population trends, it is assessed as Data Deficient. Population trends should be monitored and the assessment revisited once further information becomes available.

Commander Skate

Bathyraja lindbergi Ishiyama & Ishihara, 1977

Red List Assessment: **Global: Least Concern** (Davis, C.D., Ebert, D.A. & Orlov, A.M. 2009).

Regional Occurrence: Northeast Pacific.

Rationale: The Commander Skate (*Bathyraja lindbergi*) is a large (to 126 cm TL) deepwater skate, found in the North Pacific. It inhabits the outer shelves and upper continental slopes at depths of 126–1,193 m. This species appears to be relatively common and, according to biomass estimates from recent bottom trawl surveys, is the second most abundant deepsea skate on the eastern Bering Sea slope. It is taken as bycatch in commercial trawl and longline fisheries, operating in the upper part of its bathymetric distribution. Time series data are not available to evaluate trends in other areas. The species is only taken in very small numbers in fisheries in the eastern Bering Sea, and its bathymetric distribution extends well below the depths of fishing operations, offering it refuge from fishing pressure. Globally, it is assessed as Least Concern in the absence of evidence to suggest any significant decline. However, this species probably has limiting life history characteristics, similar to other large deepwater skates. Species-specific monitoring is required to determine catch levels and trends. If fisheries expand further across this species' range, or if a target fishery was to develop, then this assessment should be revisited.

Whiteblotched Skate

Bathyraja maculata Ishiyama & Ishihara, 1977

Red List Assessment: **Global: Least Concern** (Davis, C.D., Ebert, D.A., Orlov, A.M. & Ishihara, H. 2009).

Regional Occurrence: Northeast Pacific.

Rationale: The Whiteblotched Skate (*Bathyraja maculata*) is a large (to 120 cm TL), common skate with a wide range in the North Pacific on outer shelves and upper continental slopes at 73–1,193 m depth. It is taken as bycatch in commercial trawl and longline fisheries, operating in the upper part of its bathymetric distribution. Biomass estimates from scientific surveys suggest that biomass may have increased in the Bering Sea in recent years. Given that this species appears to be more abundant in deeper waters, outside the range of current fishing pressure, and in the absence of any evidence to suggest significant declines, it is assessed as Least Concern. However, increasing interest in target fisheries for skates within this species' range is of concern, particularly as it exhibits limiting life history characteristics, similar to other large skates. Species-specific monitoring is required to determine catch levels and trends. If fisheries expand further across this species' range, or if a target fishery was to develop, then this assessment may need to be revisited.

Butterfly Skate

Bathyraja mariposa Stevenson, Orr, Hoff & McEachran, 2004

Red List Assessment: **Global: Data Deficient** (Davis, C.D. & Ebert, D.A. 2009).

Regional Occurrence: Northeast Pacific.

Rationale: The Butterfly Skate (*Bathyraja mariposa*) is a relatively recently described skate found at depths of 90–448 m off the Aleutian Islands in the Bering Sea. It is known from only a few dozen specimens, and it may have a limited range, but further surveys and studies are required to confirm its full distribution and its abundance. Virtually nothing is known of this species and it is not possible to assess it beyond Data Deficient at present. It is presumably taken as bycatch of bottom trawl and bottom seine fisheries targeting various teleost fishes, crabs, and shrimp in the Bering Sea, but no specific data are available on catches of this species. The scale of illegal fishing activity is also high in this area. Deepwater skates generally have limiting life history characteristics (slow growth, late maturity and produce relatively few young). These unproductive characteristics and presence in an area where fishing pressure is high and unregulated, point to concern for this species and efforts should be made to obtain data to enable reassessment.

Finespined Skate

Bathyraja microtrachys (Osburn & Nichols, 1917)

Red List Assessment: **Global: Least Concern** (Carlisle, A.B. & Ebert, D.A. 2009).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Finespined Skate (*Bathyraja microtrachys*) is a deepwater skate with a patchy distribution in the Eastern Pacific, from Washington State to southwest of San Diego, California, USA. This species occurs at depths of 1,995–2,900 m and is common below 2,000 m, beyond the range of groundfish fisheries. The only known specimens have been collected by scientific research cruises and there is no reason to suspect that the population has declined, resulting in an assessment of Least Concern.

Smallthorn Skate

Bathyraja minispinosa Ishiyama & Ishihara, 1977

Red List Assessment: **Global: Least Concern** (Davis, C.D., Ebert, D.A. & Orlov, A.M. 2009).

Regional Occurrence: Northeast Pacific.

Rationale: The Smallthorn Skate (*Bathyraja minispinosa*) is a medium-sized (to 83 cm TL) North Pacific skate found at depths of 150–1,420 m. It is taken as bycatch in commercial trawl and longline fisheries, operating in the upper part of its bathymetric distribution. Recent biomass estimates from scientific surveys do not show evidence of decline. Given that this species' deep bathymetric range provides refuge outside current fishing operations, and in the absence of any evidence to suggest significant declines, it is assessed as Least Concern. However, increasing interest in target fisheries for skates within this species' range is of concern, particularly as it exhibits limiting life history characteristics, similar to other large skates. Species-specific monitoring is required to determine catch levels and trends. If fisheries expand further across this species' range, or if a target fishery was to develop, then this assessment may need to be revisited.

Alaska Skate

Bathyraja parmifera (Bean, 1881)

Red List Assessment: **Global: Least Concern** (Davis, C.D., Ebert, D.A. & Orlov, A.M. 2009).

Regional Occurrence: Northeast Pacific.

Rationale: The Alaska Skate (*Bathyraja parmifera*) is one of the most abundant large (to 111 cm TL) skates in the North Pacific. It has a wide distribution in the Bering Sea, Gulf of Alaska, and Sea of Okhotsk. This is predominantly a shelf species, occurring at 17 to ~400 m depth, but with the majority of the population occurring no deeper than 200 m. This species accounts for more than 90% of skate biomass in trawl surveys on the eastern Bering Sea shelf. It is a bycatch of longline, bottom trawl, and gillnet fisheries. Although this species occurs predominantly within the range of fisheries, there is no evidence to suggest significant population declines. Although there are no long-term species-specific data to analyze trends, biomass estimates for all skates combined in the eastern Bering Sea (where this species is abundant) have increased during the last few decades. The species is therefore assessed as Least Concern. However, increasing interest in target fisheries for skates within this species' range is of concern, particularly as it exhibits limiting life history characteristics, similar to other large skates. Species-specific monitoring is required to determine catch levels and trends. If fishing pressure increases or a target fishery was to develop, then this assessment may need to be revisited.

Richardson's Skate

Bathyraja richardsoni (Garrick, 1961)

Red List Assessment: **Global: Least Concern** (Kulka, D.W., Orlov, A.M. & Barker, A.S. 2007).

Regional Occurrence: Northwest Atlantic.

Rationale: Richardson's Skate (*Bathyraja richardsoni*) is likely to be cosmopolitan; sporadic, deep records from various parts of its range indicate that this species is widespread and it is suspected that the distribution is much wider than records indicate. Its deep bathydemersal distribution (most records exceed 1,000 m) places them outside of the range of most human threats, including deepwater fishing. Given the species' wide depth and geographic range, the majority of the population is thought to exist outside the range of deepwater fisheries and this species is considered Least Concern. Deepwater fisheries should be monitored and managed.

Spinytail Skate

Bathyraja spinicauda (Jensen, 1914)

Red List Assessment: **Global: Near Threatened; Northwest Atlantic (regional assessment): Vulnerable A2b** (Kulka, D.W., Orlov, A.M., Devine, J.A., Baker, K.D. & Haedrich, R.L. 2009).

Regional Occurrence: Northwest Atlantic.

Rationale: The Spinytail Skate (*Bathyraja spinicauda*) is a deepsea skate found along the North Atlantic continental slope from 140 to at least 1,650 m. Its population density increases with depth, suggesting that it may extend into waters that exceed depths surveyed or commercially fished, although few data exist at these greater depths. Most life history parameters are unknown, but this is one of the largest species of skates recorded from the Atlantic and it is likely to have a low resilience to fisheries. Deepwater fishing effort and distribution in the Northwest Atlantic has been greatly reduced since its peak in the early-1970s. Spinytail Skate still comprises the most common bycatch skate species in the slope fishery for Greenland Halibut (*Reinhardtius hippoglossoides*) off the Grand Bank to Labrador Shelf and thus is vulnerable to fishing pressure, but effort and quotas have recently been reduced in this fishery. Survey data from Canadian Atlantic waters demonstrated a population decline exceeding 80% and a 25% reduction in body size during 1978–1994, but it has been queried whether this trend is representative of the entire population, including poorly surveyed deepwater areas, or part of the population only. In the Northeast Atlantic, Spinytail Skate records are relatively rare suggesting that fishing and survey/fishing effort rarely overlap the depth range of the species in that region, although there is concern that fisheries are moving into deeper water there. That a large proportion of the population occurs outside of the area fished and surveyed, particularly in the Northeast Atlantic, presently affords some protection against anthropogenic effects. The species is therefore assessed as Near Threatened globally, Vulnerable A2b in the Northwest Atlantic, and Least Concern in the Northeast Atlantic, with concern expressed that fisheries and population trends should be monitored extremely carefully and the assessment revised when more data become available from deeper water parts of the species' range.

Pacific White Skate

Bathyraja spinosissima (Beebe & Tee-Van, 1941)

Red List Assessment: **Global: Least Concern** (Ebert, D.A. & Orlov, A.M. 2009).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Pacific White Skate (*Bathyraja spinosissima*) is a large, rarely encountered deepwater skate, known only from a few scattered specimens caught in trawl and longline surveys in the Eastern Pacific and Sea of Okhotsk, Northwest Pacific. It is one of the deepest living skate species, occurring to nearly 3,000 m depth, beyond the range of most trawl operations. Remote operated vehicle footage off central California suggests that this species lives on rocky substrate, which also precludes it being caught by trawl fisheries. Given that this species' deep habitat is mostly outside the range of current fisheries, that the rocky substrate on which it is found is unsuitable for trawling, and that no population declines have been observed, it is assessed as Least Concern. The designation of the Davidson Seamount as a marine protected area will also offer this species protection in the future. However, any fisheries extending further into its range should be monitored, as any bycatch may be of concern due to the large body size and likely intrinsic vulnerability of this species to population depletion.

Mudskate

Bathyraja taranetzi (Dolganov, 1985)

Red List Assessment: **Global: Least Concern** (Davis, C.D., Ebert, D.A. & Orlov, A.M. 2009).

Regional Occurrence: Northeast Pacific.

Rationale: The Mudskate (*Bathyraja taranetzi*) is widely distributed in the North Pacific from the central Kuril Islands to the eastern Bering Sea and Aleutian Islands, at depths of 81–1,000 m. It is occasionally caught as bycatch in eastern Bering Sea trawl fisheries above 200 m depth. It is also caught and retained by bottom trawl fisheries targeting groundfishes in Russian waters above 600 m depth. These fisheries only impact the species over the shallower part of its bathymetric range. The majority of the species' area of occurrence is thought to lie outside the range of current fisheries and it is assessed as Least Concern at present. However, as the species may have limiting life history characteristics, similar to other deepwater skates, the situation should be monitored.

Roughtail Skate

Bathyraja trachura (Gilbert, 1892)

Red List Assessment: **Global: Least Concern** (Davis, C.D., Ebert, D.A., Orlov, A.M. & Ishihara, H. 2009).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: This widespread, moderate-sized (to 91 cm TL) deepsea skate is known from the North Pacific, from the Sea of Okhotsk to northern Baja California. The Roughtail Skate (*Bathyraja trachura*) occurs at depths of 213–2,550 m, but the majority of the population appears to exist below 600 m depth, with abundance increasing at greater depths. It is occasionally taken as bycatch in trawl fisheries, but is discarded as it is not commercially valuable. The bulk of the population is thought to occur beyond the range of current fisheries and in the absence of any information to suggest that declines have occurred, the species is currently assessed as Least Concern. The very wide depth distribution of the species likely provides refuge from anthropogenic effects; however, the situation should be monitored as fisheries continue to expand into greater depths in the future. Given that this species, like other deepwater skates, has limiting life history characteristics that would make it vulnerable to depletion, this assessment should be revisited if fisheries expand further and deeper across its range.

Okhotsk Skate

Bathyraja violacea (Suvorov, 1935)

Red List Assessment: **Global: Data Deficient** (Davis, C.D., Ebert, D.A. & Orlov, A.M. 2009).

Regional Occurrence: Northeast Pacific.

Rationale: The Okhotsk Skate (*Bathyraja violacea*) is found in the North Pacific, in the Bering Sea, Commander and Kuril Islands to Hokkaido and the Sea of Okhotsk. Although occasionally reported from Alaskan waters of the eastern Bering Sea slope, it was not recorded in recent surveys there. It inhabits the continental shelf and slope waters within the depth range 43–1,110 m; however, the majority of the population occurs above 600 m. Biomass estimates from trawl surveys suggest that this is the sixth most abundant skate in Russian waters, but very few data are available to determine population trends over time. Fisheries operate throughout the entire range of this species and it is a bycatch species of bottom trawl fisheries for groundfish and gillnet fisheries for Greenland Halibut (*Reinhardtius hippoglossoides*), operating to 650 m depth. Given that the majority of this species' population lies entirely within the range of fisheries, further investigation is required into catch levels and population trends. Insufficient information is currently available to assess the species beyond Data Deficient and it is recommended that this assessment be revisited in the near term.

Fanfin Skate

Pseudoraja fischeri Bigelow & Schroeder, 1954

Red List Assessment: **Global: Data Deficient** (Huveneers, C., McEachran, J.D. & McCormack, C. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Fanfin Skate (*Pseudoraja fischeri*) is a small (to at least 58 cm TL), possibly rare deepwater skate, found at depths of 420–570 m. The species has a disjunct known distribution in the Gulf of Mexico, Florida Keys, and Caribbean Sea, and is known from only 10–15 specimens. Its biology is virtually unknown and no information is available on catches of this species. An increase of fishing pressure in this location could have dramatic effects on this narrow ranging species. However, at present it is not possible to assess this species beyond Data Deficient. Reassessment should be undertaken as further samples are collected and as fisheries data become available.

ORDER	**RAJIFORMES**
FAMILY	**RAJIDAE**
	Family synopsis: *49 species (3 EN; 1 VU; 3 NT; 14 LC; 28 DD)*

Broad Skate

Amblyraja badia Garman, 1899

Red List Assessment: **Global: Least Concern** (Davis, C.D. & Ebert, D.A. 2009).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Broad Skate (*Amblyraja badia*) is a moderate-sized (to 99 cm TL) deepwater skate known from the continental slopes of the Eastern Pacific from the eastern Bering Sea to Panama. Only a few specimens have been caught throughout its broad geographic range at depths of 846–2,324 m. The species is occasionally taken in deepwater trawl and trap fisheries; however, its wide depth range offers a refuge beyond the depth of most fisheries. Given the species' relatively broad geographic range and deep bathymetric distribution, which afford it refuge from fishing pressure, and in the absence of data to indicate population declines, this species is assessed as Least Concern.

Arctic Skate

Amblyraja hyperborea (Collette, 1879)

Red List Assessment: **Global: Least Concern** (Kulka, D.W., Barker, A.S., Pasolini, P. & Orlov, A.M. 2007).

Regional Occurrence: Northwest Atlantic; Eastern Central Pacific.

Rationale: The Arctic Skate (*Amblyraja hyperborea*) is a deepwater skate very widely distributed, found in the North Atlantic, Southwest and Eastern Pacific, and off southern Australia in the Eastern Indian Ocean. It occurs at 260–2,500 m depth, primarily at depths greater than most fisheries along lower continental slopes and therefore has apparently limited interaction with human threats. There is no current fishery interest. It reaches a maximum size of ~100 cm TL, and appears to live exclusively at temperatures below 4ºC. Very little is known of the life history parameters, although this is a medium to large skate, which may exhibit similar characters to other unproductive deepwater skates. In the Northwest Atlantic, this species has been taken occasionally in research trawls and in deepwater commercial fisheries off Canada. In the Northeast Atlantic, it is commonly caught during surveys on the slope of the eastern Norwegian Sea and more recently in bottom trawl surveys of the Svalbard archipelago. Given that this species is primarily distributed outside the range of current fishing activity and has a wide geographic range, it is assessed as Least Concern. Continued monitoring of catches and expanding deepwater fisheries, and the collection of life history data should be a priority.

Jensen's Skate

Amblyraja jenseni (Bigelow & Schroeder, 1950)

Red List Assessment: **Global: Least Concern** (Kulka, D.W., Orlov, A.M. & Barker, A.S. 2009).

Regional Occurrence: Northwest Atlantic.

Rationale: Jensen's Skate (*Amblyraja jenseni*) is a little known deepwater skate, occurring from southern New England (USA), Nova Scotia and Grand Banks to Labrador, Canada in the Northwest Atlantic, to waters off Ireland in the Northeast Atlantic, including the Mid-Atlantic Ridge. The species occurs at depths of 167–2,548 m, with a shallower distribution in the Northwest Atlantic, and in deeper water in the Northeast Atlantic. Although part of the species' range is fished in the Northwest Atlantic, the species' wide depth range in this area, its occurrence over the Mid-Atlantic Ridge and at great depths in the Northeast Atlantic, offer refuges from fishing pressure. Increasing density with depth suggests that the majority of the population occurs well beyond areas surveyed and fished. In the absence of major potential threats and data to suggest declines, the species is assessed as Least Concern. If deepwater fisheries expand to greater depths within this species' range in future, this assessment should be revisited.

Thorny Skate

Amblyraja radiata (Donovan, 1808)

Red List Assessment: **Global: Vulnerable A2b; Canada (regional assessment): Vulnerable A2b; USA (regional assessment): Critically Endangered A2b** (Kulka, D.W., Sulikowski, J.A., Gedamke, T., Pasolini, P. & Endicott, M. 2009).

Regional Occurrence: Northwest Atlantic.

Rationale: ***Global:*** The Thorny Skate (*Amblyraja radiata*) is found in the Northeast and Northwest Atlantic at depths of 18–1,400 m, but is most common at 27–439 m. There is evidence which might support population segregation and sub-division into subpopulations, but at this time it is unknown if genetic mixing of subpopulations takes place in either the Northeast or Northwest Atlantic stocks. Its geographic range includes contrasting population trends: relatively stable in recent years in Canada and the Northeast Atlantic, yet declining in the U.S. Moreover, the potential occurrence of subpopulations with different age and growth rates and the potential lack of protection under a continuing U.S. wing fishery, warranted a precautionary approach to the evaluation. On the other hand, the overall abundance (whether divided among subpopulations or not) still constitutes several hundred millions of individuals. Skates are under fisheries management measures in both Canada and the U.S., but the causes of observed declines are not well understood across the range of this species. Overall, the extent of the decline is considered to warrant a global assessment of Vulnerable. Regional population trends are summarized below.

Canada (regional assessment): In Canada, this species is found largely on the continental shelf. The population on the Grand Banks, the center of its mass in Canadian waters, underwent a ~68% decline in extent of occurrence between the 1970s and the early-1990s. Causes for this decline are unclear since the majority of the decline occurred in an area that is largely unfished. Recent work suggests that the decline coincided with a period of cold ambient temperatures. Spring surveys there indicate a minimum estimate of biomass of ~100,000 t, which has been stable or increasing slightly over the past 15 years. This compares to ~350,000 t observed in the 1970s. Both exploitation levels and population abundance are relatively stable at the present time. It has been recently recommended that Thorny Skate catches in the Grand Banks not exceed current levels. Summer survey biomass on the Scotian Shelf (which lies between the Grand Banks and U.S. waters) is less than that on the Grand Banks, but has declined by 80% since 1970, with no obvious environmental cause. Survey biomass has been relatively stable at a low level over the past 12 years, and is correlated with greatly reduced groundfish fishing effort. In Canadian waters as a whole, the low abundance relative to early survey abundance estimates and the long-term population decline result in an assessment of Vulnerable in Canadian waters.

USA (regional assessment): The Thorny Skate is generally considered a deeper water species off the continental U.S. where it is not commercially targeted, but is landed as bycatch. The biomass of large-sized skates (>100 cm TL: Barndoor Skate (*Dipturus laevis*), Winter Skate (*Leucoraja ocellata*), and Thorny Skate) has steadily declined since the mid-1980s. Moreover, the abundance of Thorny Skate has declined to historic lows, and is currently 10–15% of the peak abundance observed in the late-1960s to early-1970s. In addition, the most recent NOAA Northeast Fisheries Science Center autumn average biomass index of 0.55 kg per tow is well below the biomass threshold level of 2.2 kg per tow. Thus, the Thorny Skate is considered to be overfished (population level is below threshold levels) in the U.S. A FMP for the seven species skate complex of the U.S. Northwest Atlantic was implemented in September 2003. The plan prohibits the possession of Thorny Skate, Barndoor Skate, and Smooth Skate (*Malacoraja senta*) in the Gulf of Maine. However, landings are not reported by species (even though this is now mandated under the FMP), with over 99% of the landings reported as 'unclassified skates'. The low relative abundance, below the fisheries limit reference point compared to early survey abundance estimates, the long-term population decline, lack of population increase with strict management laws, and the inability to monitor species-specific landings result in an assessment of this species as Critically Endangered in U.S. waters.

Brightspot Skate

Breviraja claramaculata McEachran & Matheson, 1985

Red List Assessment: **Global: Data Deficient** (McCormack, C., Brash, J.M. & McEachran, J.D. 2009).

Regional Occurrence: Northwest Atlantic.

Rationale: The Brightspot Skate (*Breviraja claramaculata*) is a little known deepsea skate found on the upper to middle slope at depths of 293–896 m from North Carolina to the Florida Keys, USA. No information is available on the interaction of this species with fisheries, but it may be taken as bycatch in some parts of its range. Virtually no information is available on this species and it cannot be assessed beyond Data Deficient at present.

Lightnose Skate

Breviraja colesi Bigelow & Schroeder, 1948

Red List Assessment: **Global: Data Deficient** (McCormack, C., Brash, J.M. & McEachran, J.D. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Lightnose Skate (*Breviraja colesi*) is a little known deepwater skate that is often confused with the Brightspot Skate (*B. claramaculata*). It is reported from eastern Florida (USA), the Bahamas, and Cuba on the upper slope at depths of 366–522 m. This species is thought to attain 40 cm TL, with males maturing at 32 cm TL. It is a potential bycatch of deepwater demersal fisheries, but no information is available. There is insufficient information to assess this species beyond Data Deficient and reassessment should be undertaken as biological and fisheries data become available.

Blacknose Skate

Breviraja mouldi McEachran & Matheson, 1995

Red List Assessment: **Global: Data Deficient** (Brash, J.M. & McEachran, J.D. 2008).

Regional Occurrence: Western Central Atlantic. Note: The validity of this species is questionable and it is likely a synonym of *Rajella fyllae*. Taxonomic resolution is pending.

Rationale: The Blacknose Skate (*Breviraja mouldi*) is a little known deepwater skate that is often confused with the Spinose Skate (*B. spinosa*). It is reported from Honduras to Panama on the slope at depths of 353–776 m. This species is thought to attain 41 cm TL, with little else known about its biology. No information is available on the capture of this species in fisheries; however, given

its possible narrow depth and range distribution, any development of fisheries into deeper water should be closely monitored. There is insufficient information to assess this species beyond Data Deficient and reassessment should be undertaken as biological and fisheries data become available.

Blackbelly Skate

Breviraja nigriventralis McEachran & Matheson, 1985

Red List Assessment: **Global: Data Deficient** (Brash, J.M., McEachran, J.D. & McCormack, C. 2009).

Regional Occurrence: Western Central Atlantic.

Rationale: The Blackbelly Skate (*Breviraja nigriventralis*) is a poorly known, small (to at least 44 cm TL) deepwater skate found at depths of 549–776 m off the northern coast of South America from Panama to French Guiana. There is no specific information on the threats to this species; however, it may form part of the bycatch of deeper trawl fisheries especially as fisheries expand into greater depths in the future. At present there are insufficient biological and fisheries data to assess the species beyond Data Deficient. Further research is required in order to reassess potential threats to this apparently narrowly distributed species.

Spinose Skate

Breviraja spinosa Bigelow & Schroeder, 1950

Red List Assessment: **Global: Data Deficient** (Brash, J.M. & McEachran, J.D. 2009).

Regional Occurrence: Northwest Atlantic.

Rationale: The Spinose Skate (*Breviraja spinosa*) is a little known deepwater skate that is often confused with the Brightspot Skate (*B. claramaculata*). It is reported from North Carolina to the Florida Keys, USA, with a possible record in the northern Gulf of Mexico, on the upper slope at depths of 366–671 m. This species is thought to attain at least 33 cm TL, but little else is known about its biology. No information is available on the capture of this species in fisheries; however, given its possible narrow geographic and depth distribution, any development of fisheries into deeper water should be closely monitored. There is insufficient information to assess this species beyond Data Deficient and reassessment should be undertaken as biological and fisheries data become available.

Skilletskate

Dactylobatus armatus Bean & Weed, 1909

Red List Assessment: **Global: Data Deficient** (Brash, J.M. & McEachran, J.D. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Skilletskate (*Dactylobatus armatus*) is a small (to at least 32 cm TL) deepwater skate found on the upper slope at depths of 338–685 m with a patchy distribution in the Western Atlantic. This species is assessed as Data Deficient due to the limited knowledge of its biology and capture in fisheries. Research into this species' abundance, distribution, life history, and population trends is required to enable future reassessment.

Hookskate

Dactylobatus clarkii (Bigelow & Schroeder, 1958)

Red List Assessment: **Global: Data Deficient** (Brash, J.M. & McEachran, J.D. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Hookskate (*Dactylobatus clarkii*) is a medium-sized (to at least 75 cm TL), poorly known deepwater skate with a patchy distribution in the Western Atlantic. It occurs on muddy bottoms of the continental slope at depths of 315–915 m. It is a potential bycatch of deepwater demersal fisheries, although no information is available. Due to the limited knowledge of its biology and extent of capture in fisheries, this species is presently assessed as Data Deficient. Research into this species' abundance, distribution, life history, and population trends is required to enable future reassessment.

Tortugas Skate

Dipturus bullisi (Bigelow & Schroeder, 1962)

Red List Assessment: **Global: Data Deficient** (Brash, J.M. & McEachran, J.D. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Tortugas Skate (*Dipturus bullisi*) is a medium-sized (reaches 77 cm TL) skate found on the outer shelf and upper slope at depths of 183–549 m. This species has a patchy distribution in the Gulf of Mexico, the Lesser Antilles, and the Caribbean coast of Central and South America. It is generally poorly known and is assessed as Data Deficient due to the limited knowledge of its biology and capture in fisheries (although it is a potential bycatch of deepwater demersal fisheries). Further research into the occurrence and biology of this species, and any threats facing it, is required for future reassessment of this species' Red List status.

San Blas Skate

Dipturus garricki (Bigelow & Schroeder, 1958)

Red List Assessment: **Global: Data Deficient** (McCormack, C., Brash, J.M. & McEachran, J.D. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The San Blas Skate (*Dipturus garricki*) is a relatively large (to at least 100 cm TL), deepwater skate known from depths of 275–476 m on the continental slope, from the northern Gulf of Mexico to Nicaragua. The species may be taken as bycatch by deepwater fisheries in some parts of its range, but no specific information is available. Virtually nothing is known about this skate and it is not possible to assess it beyond Data Deficient without further study and information.

Barndoor Skate

Dipturus laevis (Mitchell, 1817)

Red List Assessment: **Global: Endangered A1bcd** (Dulvy, N.K. 2003).

Regional Occurrence: Northwest Atlantic. Note: This species has been flagged for priority reassessment and is currently undergoing revision.

Rationale: The Barndoor Skate (*Dipturus laevis*) was previously assessed as Vulnerable A1bcd under the 1994 IUCN Red List Categories and Criteria. With better information available on this species, it is now reassessed as Endangered. The Barndoor Skate is highly vulnerable to exploitation because of its slow growth rate, late maturity, low fecundity, and large body size. The slow life history exhibited by the Barndoor Skate would render it particularly vulnerable to decline under exploitation and would be associated with an elevated risk of extinction. Although never directly targeted, it was a bycatch of multi-species trawl fisheries on the Georges Bank,

Scotian Shelf, Grand Banks, and Labrador Shelf and is also taken on longlines. Catch rates of Barndoor Skates in U.S. waters <400 m within the center of its latitudinal range on the southern shelf (<43°N) declined by 96 to 99% from the mid-1960s to the 1990s. While the severity of this decline would be considered grounds for listing as Critically Endangered, there are three reasons for a lower listing: 1) fishing effort on the shelf area has declined in the last decade; 2) the latitudinal and depth range of this species is considerably wider than previously thought; and, 3) numbers of juveniles now appear to be increasing not only in no-take zones on Georges Bank and southern New England shelf, but also in adjacent areas to the north and south and elsewhere. It also occurs up to 63ºN in channels and deep slopes (>450 m depth), where less fishing occurs. There is no evidence for a decline in the newly discovered northern and deepwater parts of the species' range, but fisheries have only recently moved into these areas and it is assumed that the population here is much smaller. The shallow water section of the population is presumed to have, in the past, represented most of the global population and also the most productive section of the population. However, it should be noted that increases in trawl fishing effort and/or opening of no-take areas could lead to the decline of the Barndoor Skate in these areas.

Sailskate

Dipturus linteus (Fries, 1838)

Red List Assessment: **Global: Least Concern** (Kulka, D.W., Orlov, A.M. & Stenberg, C. 2009).

Regional Occurrence: Northwest Atlantic.

Rationale: Sporadic, deepwater records from various parts of the North Atlantic indicate that the little known Sailskate (*Dipturus linteus*) is widespread but distributed deeply: at 316–1,455 m (deepest sets fished) in the Northwest Atlantic, and at 196–635 m in the Northeast Atlantic. Increasing density with depth in the Northwest Atlantic suggests that its center of biomass is well beyond areas surveyed and fished, placing the species outside of the range of most human threats. In the Northeast Atlantic, potential overlap with fishing effort is greater but catches there are rare. This species is thus assessed as Least Concern, but monitoring of population trends and capture in fisheries in the Northeast Atlantic should be implemented.

Spreadfin Skate

Dipturus olseni (Bigelow & Schroeder, 1951)

Red List Assessment: **Global: Data Deficient** (Brash, J.M., McEachran, J.D. & Sulikowski, J.A. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Spreadfin Skate (*Dipturus olseni*) is a benthic continental shelf and upper slope dwelling skate found at depths of 55–384 m in the northern Gulf of Mexico from Florida to Texas, USA. It reaches a maximum size of ~69 cm TL. The interaction of this species with fisheries is largely unknown, although it is a potential bycatch of shrimp trawl fisheries operating on the upper continental shelf in the northern Gulf of Mexico. At present there is insufficient information to assess this species beyond Data Deficient and this needs to be rectified. Given the uncertainties of the effects of fisheries in a part of its range, bycatch levels need to be quantified and monitored and the effect on the population determined.

Hooktail Skate

Dipturus oregoni (Bigelow & Schroeder, 1958)

Red List Assessment: **Global: Data Deficient** (Brash, J.M. & McEachran, J.D. 2009).

Regional Occurrence: Northwest Atlantic.

Rationale: The Hooktail Skate (*Dipturus oregoni*) is a large (to at least 144 cm TL) deepwater skate found on the lower slopes of eastern Florida and the northern Gulf of Mexico at depths of 475–1,079

m. It attains a maximum size of 144 cm TL. This species is assessed as Data Deficient due to the limited knowledge of its biology and capture in fisheries. Research into this species' abundance, distribution, life history, and population trends is required to enable future reassessment.

Caribbean Skate

Dipturus teevani (Bigelow & Schroeder, 1951)

Red List Assessment: **Global: Data Deficient** (Brash, J.M. & McEachran, J.D. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Caribbean Skate (*Dipturus teevani*) is a medium-sized (to ~84 cm TL) deepwater skate found on the upper slope at depths of 311–732 m with a patchy distribution in the Western Atlantic. This species is assessed as Data Deficient due to the limited knowledge of its biology and capture in fisheries (although it is a potential bycatch of deepwater demersal fisheries). Given the uncertainties of the effects of fisheries, bycatch levels need to be quantified and monitored and the effect (if any) on the population determined.

Blackfin Pygmy Skate

Fenestraja atripinna (Bigelow & Schroeder, 1950)

Red List Assessment: **Global: Data Deficient** (McCormack, C. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Blackfin Pygmy Skate (*Fenestraja atripinna*) is a poorly known deepwater skate found at depths of 366–951 m, with a patchy distribution in the Western Atlantic. There is no specific information on the threats to this species but it may be vulnerable to trawl fisheries particularly as these expand to greater depths in the future. At present there are insufficient biological and fisheries data to assess the species beyond Data Deficient.

Cuban Pygmy Skate

Fenestraja cubensis (Bigelow & Schroeder, 1950)

Red List Assessment: **Global: Data Deficient** (McCormack, C. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Cuban Pygmy Skate (*Fenestraja cubensis*) is a poorly known deepwater skate found at 440–869 m depth, recorded from southern Florida, USA, to Cuba in the Western Atlantic. Very little is known of its biology. It is possibly a bycatch of trawl and longline fisheries, especially as these expand to greater depths in the future. Without further information on its biology and the fisheries that may capture this species, it cannot be assessed beyond Data Deficient.

Plain Pygmy Skate

Fenestraja ishiyamai (Bigelow & Schroeder, 1962)

Red List Assessment: **Global: Data Deficient** (McCormack, C. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Plain Pygmy Skate (*Fenestraja ishiyamai*) is a little known deepwater skate found at depths of 503–950 m, with a patchy distribution in the Western Atlantic. There is no specific information on the threats to this species but it may be vulnerable to bycatch in deeper trawl and longline fisheries, especially as these expand to greater depths in the future. The wide depth distribution of the species may offer refuge from fishing pressure, however, further information on the fisheries operating within the species' range is required and bycatch levels should be quantified. There are insufficient biological and fisheries data to assess the species beyond Data Deficient.

Pluto Skate

Fenestraja plutonia (Garman, 1881)

Red List Assessment: **Global: Data Deficient** (McCormack, C. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Pluto Skate (*Fenestraja plutonia*) is a small (to 27 cm TL) deepwater skate known from depths of 293–1,024 m with a patchy distribution in the Western Atlantic. Virtually nothing is known of this species' biology. No information is available on interactions with fisheries and while it is a potential bycatch of deeper water demersal trawling, its wide bathymetric range probably provides it with refuge at depth. However, at present this species cannot be assessed beyond Data Deficient.

Gulf of Mexico Pygmy Skate

Fenestraja sinusmexicanus (Bigelow & Schroeder, 1950)

Red List Assessment: **Global: Data Deficient** (Kyne, P.M. & Valenti, S.V. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Gulf of Mexico Pygmy Skate (*Fenestraja sinusmexicanus*) is a small (to 36 cm TL) deepwater skate with a patchy distribution in the Western Atlantic. This is a poorly known species occurring on the outer continental shelf and slope at depths of 56–1,096 m. No information is available on interactions with fisheries and, while it is a potential bycatch of demersal trawl fisheries, its wide bathymetric range probably provides it with refuge at depth. However, at present this species cannot be assessed beyond Data Deficient.

Atlantic Pygmy Skate

Gurgesiella atlantica (Bigelow & Schroeder, 1962)

Red List Assessment: **Global: Data Deficient** (Kyne, P.M. & Valenti, S.V. 2007).

Regional Occurrence: Western Central Atlantic.

Rationale: The Atlantic Pygmy Skate (*Gurgesiella atlantica*) is a deepwater skate occurring in the Western Central and Southwest Atlantic from Nicaragua to northern Brazil. This small (to 49 cm TL) species has been recorded from depths of 247–960 m on the continental slope, but is generally poorly known. This species cannot be assessed beyond Data Deficient at this time. While intense trawl fisheries are known to operate on the continental shelf off the northern coasts of South America, there is little information available on any deeper water slope fisheries which may be taking this skate as bycatch. Further information on fisheries operating within this species' range is required to make a full assessment of its status.

Little Skate

Leucoraja erinacea (Mitchell, 1825)

Red List Assessment: **Global: Near Threatened** (Sulikowski, J.A., Kulka, D.W. & Gedamke, T. 2009).

Regional Occurrence: Northwest Atlantic.

Rationale: The Little Skate (*Leucoraja erinacea*) is considered a shallow water species and occurs to depths of 90 m. It has a relatively narrow distribution, found only in the Northwest Atlantic from Grand Banks, Canada to Cape Hatteras, North Carolina, USA, and reaches its highest concentrations in U.S. waters. It is relatively rare to the north in Canadian waters, with very few records north of the Scotian Shelf. In the continental U.S., this species is commercially targeted for lobster bait and is landed as bycatch. The Little Skate is managed in the U.S. as part of the Northeast skate complex. There is a framework that could implement restrictions to the fishery

if biomass levels fall below threshold levels. Biomass estimates for Little Skate were increasing until recently. However, recent trawl surveys (2006) conducted by NMFS suggest that the Little Skate is near the overfishing threshold (18.7 vs. 20.0%) and will likely be above the threshold as of 2007. It is also near the minimum biomass threshold (3.32 vs. 3.27 kg per tow) and may become overfished. The lack of information on sexual maturity coupled with the apparent recent declines in biomass warrant a precautionary assessment of Near Threatened (close to meeting Vulnerable A4bd). Population trends should be monitored.

Rosette Skate

Leucoraja garmani (Whitley, 1939)

Red List Assessment: **Global: Least Concern** (Gedamke, T. 2009).

Regional Occurrence: Northwest Atlantic.

Rationale: This U.S. endemic species is found from Nantucket Shoals to the Dry Tortugas, Florida with the separation of two subspecies at Cape Hatteras, North Carolina. There is no directed fishery for the Rosette Skate (*Leucoraja garmani*) and it is caught only as incidental bycatch. The species is found at depths of 33–530 m and is most common at 74–274 m. Survey indices from north of Cape Hatteras have been increasing gradually since 1967. Although catch indices were not available from the southern range of the species there is no reason to believe there is any current threat to the Rosette Skate throughout its range and it is assessed as Least Concern.

Freckled Skate

Leucoraja lentiginosa (Bigelow & Schroeder, 1951)

Red List Assessment: **Global: Data Deficient** (Cronin, E.S. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Freckled Skate (*Leucoraja lentiginosa*) is endemic to the Gulf of Mexico, from northwestern Florida, USA, to Yucatán, Mexico. It is found on soft substrates along the outer continental shelf and upper slope, recorded from 53–588 m depth, but is common at 60–366 m. It is probably taken as bycatch in demersal shrimp trawl fisheries operating in this area. Few data on catches or population trends are available at this time and the species is currently assessed as Data Deficient. Monitoring of catches and population trends is required to enable reassessment.

Winter Skate

Leucoraja ocellata (Mitchell, 1815)

Red List Assessment: **Global: Endangered A2abd+3b+4abd; USA (regional assessment): Vulnerable A2abd+3b+4abd** (Kulka, D.W., Sulikowski, J.A. & Gedamke, T. 2009).

Regional Occurrence: Northwest Atlantic.

Rationale: The Winter Skate (*Leucoraja ocellata*) is a common shelf species, found in the Northwest Atlantic from Labrador, Canada, to the Carolinas, USA. The Winter Skate has a narrow latitudinal range and a high degree of endemicity. Like many other elasmobranchs, it possesses life history characteristics (including delayed age at maturity, long generation time, low fecundity, and consequently slow population growth) that may increase its vulnerability to exploitation, reduce its rate of recovery, and increase its risk of extinction. Presently there is no directed fishery for the species. Population trends vary in different areas of the Winter Skate's range, as described below.

Northern Gulf of St Lawrence-Newfoundland, Canada: At the northern extent of its distribution, the Winter Skate exists in low concentrations in the northern Gulf of St. Lawrence, in the coastal waters off the southern coast of Newfoundland, and on the southern portion of the Grand Bank. A quantitative analysis of spatial and temporal variation in population size

is not possible because of the infrequency with which the species is caught. It is, however, subjected to bycatch.

Southern Gulf of St Lawrence, Canada: Here the species appears to have a restricted distribution and individuals mature at a significantly smaller size than those found elsewhere. Abundance of mature individuals is estimated to have declined by 98% since the early-1970s, and is now at a historically low level. The probable cause is an unsustainable rate at which the species was captured as bycatch in fisheries directed at other demersal species.

Eastern Scotian Shelf, Canada: Individuals here mature at a significantly larger size than those in the southern Gulf and mature at a significantly different age than those inhabiting waters further south. Abundance of mature individuals is estimated to have declined by more than 90% since the early-1970s and is now at a historically low level. The area occupied by the population appears to have declined significantly since the mid-1980s. Larger, older individuals have been severely depleted from this population. The probable cause of the decline is an unsustainable rate at which they were captured as bycatch in fisheries directed at other groundfish species, although current reported catches are low.

Western Scotian Shelf-Bay of Fundy, Georges Bank, Canada: The area of occupancy of Winter Skate here has been stable. Estimates of population status show no discernible trend over time. There is a high probability that the population receives immigrants from the population inhabiting the U.S. portion of Georges Bank. The population is subjected to bycatch in fisheries for other groundfish and shellfish species.

Georges Bank to Carolinas, USA: Abundance currently is slightly above the low levels recorded in the early-1970s. Presently, it is ~25% of the peak observed in the mid-1980s which followed the establishment of the 200 mile EEZ. The trajectory declined in the late-1980s/early-1990s to a level similar to the 1970s then increased slightly and has been relatively stable since. Here it continues to be taken as bycatch but is no longer commercially targeted. It has declined by almost 50% since the inception of a FMP in 2003. However, since the 2004–2006 survey index was only 9% lower than the 2003–2005 NOAA Northeast Fisheries Science Center survey index, overfishing is not occurring for this species, but is in an overfished state. Since abundance is low in all areas (particularly in the southern Gulf and the eastern Scotian Shelf), despite a reduction in groundfish effort and management measures (no directed fishing) in place, a regional Vulnerable listing is recommended for the U.S.

Substantial declines (>90%) have occurred in two of the major areas of this species' range and declines have also occurred off the U.S. Although the causes of these declines are mixed and uncertain, given the level of the declines and that these are ongoing in some areas, a precautionary assessment of Endangered globally is warranted. The situation should continue to be monitored.

Yucatan Skate

Leucoraja yucatanensis (Bigelow & Schroeder, 1950)

Red List Assessment: **Global: Data Deficient** (McCormack, C. 2009).

Regional Occurrence: Western Central Atlantic.

Rationale: The Yucatan Skate (*Leucoraja yucatanensis*) is a small (to at least 30 cm TL) deepwater skate known from 192–457 m depth on the upper slope of the Caribbean coast of Central America. Virtually nothing is known of the biology of the species and it is assessed as Data Deficient. Given the uncertainties of the effects of fisheries, bycatch levels need to be quantified and monitored and the effect on the population determined.

Smooth Skate

Malacoraja senta (Garman, 1885)

Red List Assessment: **Global: Endangered A2bcd; Canada (regional assessment): Endangered A2bcd; USA (regional assessment): Near Threatened** (Sulikowski, J.A., Kulka, D.W., Gedamke, T. & Barker, A.S. 2009).

Regional Occurrence: Northwest Atlantic. Note: This species has been flagged for priority reassessment and is currently undergoing revision. The following rationale is a slightly modified version of the

original rationale published in 2009 in order to update the species' situation, but it does not encompass all new information which will have a bearing on the species' Red List status.

Rationale: The Smooth Skate (*Malacoraja senta*) is a small Northwest Atlantic skate, occurring from shelf waters off Labrador, Canada, to New Jersey, USA. It is known from depths of 25–1,436 m, although the large majority of the population appears to occur at 70–480 m. The species appears to be temperature specific, avoiding cold areas within its range and occupying a relatively narrow range of water temperature (3–10°C). Extensive separation between various concentrations and no evidence of occurrence between these concentrations, suggests the possibility of four or five separate subpopulations. This species is not targeted, but is taken in mixed fisheries or as bycatch by trawls, longlines, crab pots, and scallop dredges in relatively low numbers. Scientific survey data from Canada indicate large declines in adult abundance in some areas, ranging from 91% over 28 years (1977–2005) in one area to 73% over 29 years (1976–2005) in another area. Small increases in those areas have been subsequently observed but abundance remains low compared to historic levels. Elsewhere in Canada, the population is more stable. Given the significant declines observed in certain areas, the species is assessed as Endangered off Canada. In the USA, there was an initial decline in the 1970s, but the species has been stable or increasing since. It is assessed as Near Threatened in U.S. waters. Globally, an assessment of Endangered is warranted, as the majority of the total population of the Smooth Skate (~75.6%) is found within Canadian waters.

Soft Skate

Malacoraja spinacidermis (Barnard, 1923)

Red List Assessment: **Global: Least Concern** (Smale, M.J. & Kulka, D.W. 2007).

Regional Occurrence: Northwest Atlantic.

Rationale: The Soft Skate (*Malacoraja spinacidermis*) is an apparently uncommon or rarely caught skate. This large deepwater species is widely distributed and may be more common in deeper waters that are not presently exploited by commercial trawlers. There are 147 records of sets containing Soft Skate off Canada from over 40,000 sets, nearly all at depths of over 800 m. The species is taken occasionally as bycatch in deep fisheries off Canada but is currently regarded as Least Concern because it is distributed primarily outside of the range of current fishing efforts. However, expansion of trawling operations to deeper waters may increase the threat to this species and the situation should be monitored closely. Catch data and information on the life history characteristics of this little known species should be collected as a priority.

Carolina Pygmy Skate

Neoraja carolinensis McEachran & Stehmann, 1984

Red List Assessment: **Global: Data Deficient** (Cronin, E.S. 2009).

Regional Occurrence: Northwest Atlantic.

Rationale: The Carolina Pygmy Skate (*Neoraja carolinensis*) is a poorly known, small (to at least 28.5 cm TL) deepwater skate reported from the continental slope of the southeastern U.S., off North Carolina and northeastern Florida at depths of 695–1,010 m. It is a potential bycatch of deepwater trawl fisheries, although no specific information is available. Insufficient information is available to assess the species beyond Data Deficient at present.

Ocellate Skate

Raja ackleyi Garman, 1881

Red List Assessment: **Global: Data Deficient** (Cronin, E.S. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Ocellate Skate (*Raja ackleyi*) is a little known demersal skate found along the continental shelf and upper slope at 32–384 m depth off southern Florida (USA), Cuba, the southern Gulf of Mexico, and eastern Yucatán, Mexico. It reaches at least 41 cm TL, but little else is known of its biology. It is a potential bycatch of shrimp trawl fisheries operating on the shelf, but no specific information is available on its capture. Insufficient information is available to assess this species beyond Data Deficient at present. Bycatch levels should be quantified and monitored and this species should be reassessed when further information becomes available.

Bahama Skate

Raja bahamensis Bigelow & Schroeder, 1965

Red List Assessment: **Global: Data Deficient** (McCormack, C. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Bahama Skate (*Raja bahamensis*) is a rare and poorly known deepwater skate found on upper slopes of the Bahamas and southern Florida at depths of 388–411 m. Attains at least 54 cm TL, but little is known about its biology. Nothing is known about the interaction of this species with fisheries and it is not possible to assess it beyond Data Deficient at present. Its bathymetric distribution may place it beyond the range of most shrimp trawling effort at present, however, the species has a very limited range and close monitoring is required.

Big Skate

Raja binoculata Girard, 1854

Red List Assessment: **Global: Near Threatened** (Ellis, J. & Dulvy, N.K. 2000).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: This large-bodied demersal skate occurs in the Eastern Pacific, from Baja California to Alaska. The Big Skate (*Raja binoculata*) has not been subject to meaningful study and there are insufficient data on the population to determine its status. It is, however, one of the larger species of skate and, as with the Common Skate (*Dipturus batis*) and Barndoor Skate (*D. laevis*), may be susceptible to overfishing.

Venezuela Skate

Raja cervigoni Bigelow & Schroeder, 1964

Red List Assessment: **Global: Near Threatened** (Valenti, S.V. 2007).

Regional Occurrence: Western Central Atlantic.

Rationale: The Venezuela Skate (*Raja cervigoni*) is a little known skate with a relatively restricted distribution on the continental shelf from Venezuela to Suriname in the Western Central Atlantic. This species is found at depths of 37–174 m and reaches a maximum size of 51 cm TL. Little is known of the biology and ecology. Demersal trawling is intense off Venezuela, with a commercial fleet of shrimp trawlers operating on the continental shelf, and Trinidad and Tobago, where overall bycatch levels have declined from 13,712 t in 1987 to 4,099 t in 2001 (the species composition of this catch has not been examined). Although no specific data are available, given the species' relatively limited geographic range, intense trawl fisheries operating throughout much of its range, and high levels of bycatch, this species is assigned a precautionary assessment of Near Threatened. Bycatch levels of this species need to be defined and monitored in order to make a full assessment of this species' status and the assessment may need to be revisited in the near term.

Cortez Skate

Raja cortezensis McEachran & Miyake, 1988

Red List Assessment: **Global: Data Deficient** (Cronin, E.S. 2009).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Cortez Skate (*Raja cortezensis*) is a poorly known small skate found on the continental shelf, endemic to the Gulf of California, Mexico, in the Eastern Central Pacific. Little information is available on life history parameters. It is a potential bycatch of trawl and other demersal fisheries operating in the Gulf of California, but no data are available. Very little information is available on this species and it cannot be assessed beyond Data Deficient at present. The species' apparently limited range is of concern and investigation of mortality in fisheries and population trends should be a priority.

Clearnose Skate

Raja eglanteria Bosc, 1802

Red List Assessment: **Global: Least Concern** (Ha, D.S., Luer, C. & Sulikowski, J.A. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Clearnose Skate (*Raja eglanteria*) is endemic to the Northwest and Western Central Atlantic, occurring from Massachusetts to southern Florida and in the eastern and northern Gulf of Mexico. It is primarily found in inshore areas (at <111 m depth), but ranges from saltwater estuaries to depths of 330 m. The primary threat to this species is capture as bycatch of otter trawls during groundfish trawling and scallop dredge operations. Age data for this species suggest that females mature at 4–6 years. NOAA Fisheries Service trawl surveys indicate that biomass of this species has steadily decreased over the last five years. Analysis of trends in abundance of this species in six different scientific surveys on the eastern coast of the U.S. (during various periods from 1966–2005), found it to be increasing in three surveys, decreasing in one, with no apparent trend in two others. The NOAA Fisheries Service does not consider this species overfished in its 2006 assessment and, given that the overall population trend does not appear to be declining this species is assessed as Least Concern. However, the declines observed in some areas, coupled with the species' potentially limiting life history characteristics suggests that population trends should be carefully monitored. Further research on this species' life history and population structure is also required.

Equatorial Skate

Raja equatorialis Jordan & Bollman, 1890

Red List Assessment: **Global: Data Deficient** (Kyne, P.M. & Valenti, S.V. 2009).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Equatorial Skate (*Raja equatorialis*) is a medium-sized (to 88 cm TL) Eastern Pacific skate found from the Gulf of California, Mexico, south to Tumbes, Peru. It occurs on the continental shelf at depths of 20–200 m. It is presumably taken as bycatch by demersal fisheries operating on the continental shelf. Shrimp trawl fisheries are particularly intense in inshore areas of its range, but no data are currently available on catches. This is a poorly known species, whose generic placement remains unresolved, and it cannot currently be assessed beyond Data Deficient due to insufficient information. Research is needed on this species' life history parameters and efforts should be made to quantify bycatch levels.

California Skate

Raja inornata Jordan & Gilbert, 1880

Red List Assessment: **Global: Data Deficient** (Robinson, H.J., Ebert, D.A. & Cailliet, G.M. 2009).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The California Skate (*Raja inornata*) is found at depths of 17–671 m on the continental shelf of the Northeast and Eastern Central Pacific. It occurs from the Strait of Juan de Fuca, southwards to central Baja California, Mexico, with a disjunct population in the Gulf of California. Very little is known about this skate and no detailed life history studies have been conducted. It is often misidentified with other hardnose skates from the Northeast and Eastern Central Pacific, precluding the collection of species-specific catch data. The species is a utilized bycatch in commercial longline and trawl fisheries and is one of three commercially important skate species in California. Total annual landings for unspecified skate species in California declined from 577 t and 633 t in 2000 and 2001, respectively, to between 82 and 125 t from 2002–2005. The proportion of this species in the catches is not known. Effort in the California trawl fishery has recently reduced and a network of proposed marine protected areas is being instigated (2007) in response to declining fish stocks. Fishing pressure on this species has therefore likely reduced. However, as no data are available to determine past population trends in this species, it is assessed as Data Deficient at the present time.

Longnose Skate

Raja rhina Jordan & Gilbert, 1880

Red List Assessment: **Global: Least Concern** (Robinson, H.J., Ebert, D.A. & Cailliet, G.M. 2009).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Longnose Skate (*Raja rhina*) is found on mud-cobble bottoms near vertical relief from nearshore to 1,000 m depth, although records of this species from the deeper end of its depth range may actually be misidentifications of other large deepsea skates. It is distributed across the Eastern Pacific coast, from the southeastern Bering Sea southward to the Gulf of California. It is often misidentified with other hardnose skates from the Northeast and Eastern Central Pacific, precluding the collection of species-specific catch data. The species is a utilized bycatch in commercial longline and trawl fisheries and is one of three commercially important skate species in California. It is also taken as bycatch by trawl and hook-and-line fisheries off Canada and a directed fishery developed recently in the Gulf of Alaska. Although fishing mortality on this species may have increased in recent years, it was designated as 'not at risk' by a recent stock assessment. Information on population trends throughout much of the species' range indicates that abundance has remained stable or increasing. As such, this species is assessed as Least Concern at present and population trends should continue to be monitored.

Pacific Starry Skate

Raja stellulata Jordan & Gilbert, 1880

Red List Assessment: **Global: Least Concern** (Robinson, H.J., Ebert, D.A. & Cailliet, G.M. 2009).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: A skate found mostly in rocky habitats at depths of 18–732 m, but more common inshore to 100 m depth. The species is confirmed from off Eureka, northern California, USA, to Coronado Bank, northern Baja California, Mexico. There are no confirmed records or voucher specimens of the Pacific Starry Skate (*Raja stellulata*) from north of California. Total annual commercial landings data for grouped catches of 'Skate, unspecified' for California show that landings declined during 2000–2005. However, this catch primarily originates from trawl fisheries, of which this species is an insignificant component. Scientific survey samples have confirmed that the species is only occasionally captured by trawls, but it is one of the most common species

caught in longline surveys on rocky, untrawlable reefs. The species may be an occasional bycatch in recreational fisheries, but fishing pressure is not considered a significant threat to it at present. There are no data to suggest that the species' population has declined and it is assessed as Least Concern, given that its habitat offers it protection from fisheries. Research on the species is ongoing and further data will become available in the future.

Roundel Skate

Raja texana Chandler, 1921

Red List Assessment: **Global: Data Deficient** (Bethea, D.M., Carlson, J.K. & Sulikowski, J.A. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Roundel Skate (*Raja texana*) occurs in nearshore and offshore waters to a depth of 183 m. It is distributed off the southeastern coast of Florida, USA, the Gulf of Mexico, and Yucatán Bank, Mexico, and is a potential bycatch in demersal trawls throughout this range. While a trend in abundance for a 30 year trawl dataset in the Gulf of Mexico indicates that this species may be slightly increasing in abundance, which might warrant a status of Least Concern, this abundance trend is only from one series. Moreover, the overall productivity of this species is still unknown. Therefore, this species is assessed as Data Deficient until further information is available to conduct a full evaluation of the impact of fisheries on the population.

Rasptail Skate

Raja velezi Chirichigno, 1973

Red List Assessment: **Global: Data Deficient** (Valenti, S.V. & Kyne, P.M. 2009).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Rasptail Skate (*Raja velezi*) is a medium-sized (to 76 cm TL) Eastern Pacific skate found in the Gulf of California, Mexico, from Costa Rica south to Colombia, Ecuador (including the Galapagos Islands), and Peru. It occurs on the continental shelf at depths of 35–140 m. This is a poorly known species whose generic placement remains unresolved. It is presumably taken in demersal fisheries operating within its range, although no specific information is available on its capture. Insufficient information is available to assess the species beyond Data Deficient and further research is required on taxonomy, threats, and population trends.

Deepwater Skate

Rajella bathyphila (Holt & Byrne, 1908)

Red List Assessment: **Global: Least Concern** (Stehmann, M. 2009).

Regional Occurrence: Northwest Atlantic.

Rationale: A deepwater skate occurring in the Northeast and Northwest Atlantic on deeper continental slopes and probably abyssal plains, mainly at depths >1,400 m. The Deepwater Skate (*Rajella bathyphila*) is occasionally landed as bycatch of deepwater fisheries, but its deepwater range places the majority of the population outside the range of current fishing pressure. In the absence of potential threats and data to suggest declines, the species is assessed as Least Concern. If deepwater fisheries expand to greater depths within this species' range in future, this assessment should be revisited. Monitoring of catches is important given that deepwater skates generally have limiting life history characteristics that can make them vulnerable to rapid depletion when heavily fished.

Bigelow's Skate

Rajella bigelowi (Stehmann, 1978)

Red List Assessment: **Global: Least Concern** (Orlov, A.M., Kulka, D.W., Barker, A.S. & Stehmann, M. 2009).

Regional Occurrence: Northwest Atlantic.

Rationale: Bigelow's Skate (*Rajella bigelowi*) is a little known, small (to 53 cm TL) deepwater skate recorded from depths of 367–4,156 m. Sporadic, deepwater records from various parts of the North and Central Atlantic indicate that this species is widespread but distributed at great depths (the mean depth of existing records is 1,669 m; most records exceed 1,000 m). It is suspected that the distribution is much wider in very deep water than records indicate. Its bathydemersal distribution and relatively wide geographic distribution probably places the majority of the population outside the range of current deepwater fisheries. In the absence of potential threats and data to suggest declines in abundance, this species is assessed as Least Concern. If deepwater fisheries expand to greater depths within this species' range in future, this assessment should be revisited.

Sooty Skate

Rajella fuliginea (Bigelow & Schroeder, 1954)

Red List Assessment: **Global: Least Concern** (Cronin, E.S. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Sooty Skate (*Rajella fuliginea*) is a deepwater skate found on the continental slope at depths of 731–1,280 m off southern Florida and the Florida Keys, throughout the Gulf of Mexico, the Lesser Antilles, and the Caribbean coast of South America (Colombia and Venezuela). This species reaches a maximum size of 45 cm TL, but nothing is known about its biology. Its deep bathymetric distribution is most likely beyond the range of most fisheries in this area and, in the absence of any information to suggest that declines have occurred, it is assessed as Least Concern. Any expanding deepwater fisheries in the region should be closely monitored to ensure that this species is not adversely affected. Given that this species, like other deepwater skates, probably has limiting life history characteristics that would make it vulnerable to depletion (slow growth, late maturity, low fecundity), this assessment would need to be revisited if fisheries expand into its range.

Round Skate

Rajella fyllae (Luetken, 1888)

Red List Assessment: **Global: Least Concern** (Kulka, D.W., Barker, A.S., Orlov, A.M. & Pasolini, P. 2009).

Regional Occurrence: Northwest Atlantic.

Rationale: The Round Skate (*Rajella fyllae*) is widely distributed in the deeper shelf and upper slope waters of the North Atlantic, at depths of 170–2,050 m. This is a small-bodied species which may have moderate to high population growth rates and thus be fairly resilient to low levels of exploitation. It is taken as bycatch by trawl and longline fisheries operating in the North Atlantic and is discarded. The species' wide depth distribution offers refuge beyond the deepest depths reached by trawl fisheries at present. Available data on trends in abundance suggest that the population is currently relatively stable and possibly increasing in some areas and as such, the species is assessed as Least Concern. Given that fisheries are known to operate at depths at which the species is most abundant, bycatch levels should be monitored. If fisheries expand further throughout its depth range, this assessment should be revisited in the near term.

Purplebelly Skate

Rajella purpuriventralis (Bigelow & Schroeder, 1962)

Red List Assessment: **Global: Least Concern** (Kyne, P.M. & Valenti, S.V. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Purplebelly Skate (*Rajella purpuriventralis*) is a small (to 51 cm TL) deepwater skate, patchily distributed in the Western Atlantic, with its center of abundance in the Gulf of Mexico. This poorly known species' deep bathymetric distribution (732–2,010 m) is most likely beyond the range of current fishing pressure and, in the absence of any information to suggest that declines have occurred it is assessed as Least Concern. Any expanding deepwater fisheries in the region should be closely monitored to ensure that this species is not adversely affected. Given that this species, like other deepwater skates, probably has limiting life history characteristics that would make it vulnerable to depletion (slow growth, late maturity, low fecundity), this assessment would need to be revisited if fisheries expand into its range.

ORDER **RAJIFORMES**

FAMILY **ANACANTHOBATIDAE**

Family synopsis: *7 species (DD)*

American Legskate

Anacanthobatis americanus Bigelow & Schroeder, 1962

Red List Assessment: **Global: Data Deficient** (McCormack, C. 2009).

Regional Occurrence: Western Central Atlantic.

Rationale: The American Legskate (*Anacanthobatis americanus*) is a small (to at least 38 cm TL) deepwater skate found in the Caribbean and off northern South America. It occurs along the slope at depths of 183–915 m. The species may be taken as bycatch by deepwater fisheries in some parts of its range, but no data are available. The American Legskate's relatively wide depth distribution probably affords it refuge from fishing pressure. Virtually nothing is known about this skate and it is not possible to assess it beyond Data Deficient without further study and information.

Leafnose Legskate

Anacanthobatis folirostris (Bigelow & Schroeder, 1951)

Red List Assessment: **Global: Data Deficient** (McCormack, C. 2009).

Regional Occurrence: Northwest Atlantic.

Rationale: The Leafnose Legskate (*Anacanthobatis folirostris*) is a deepsea skate from the northern Gulf of Mexico found along the slope at depths of 300–512 m. The species attains a maximum size of at least 62 cm TL, but little else if known of its biology. At present very little is known of this species and it is not possible to assess it beyond Data Deficient without further study and information. Reassessment should be undertaken as data become available.

Longnose Legskate

Anacanthobatis longirostris Bigelow & Schroeder, 1962

Red List Assessment: **Global: Data Deficient** (McCormack, C. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Longnose Legskate (*Anacanthobatis longirostris*) is a deepwater skate from the northern Gulf of Mexico and parts of the Caribbean, occurring on the slope at depths of 520–1,052 m. The wide depth distribution of the species probably provides refuge beyond the range of current fishing pressure. It attains a maximum of 78 cm TL, but little is known of its biology. At present very little is known of this species and it is not possible to assess it beyond Data Deficient without further study and information. Reassessment should be undertaken as data become available.

Atlantic Legskate

Cruriraja atlantis Bigelow & Schroeder, 1948

Red List Assessment: **Global: Data Deficient** (McCormack, C. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Atlantic Legskate (*Cruriraja atlantis*) is a small (reported to 34 cm TL) deepwater skate known from depths of 512–777 m, from eastern Florida to northern Cuba in the Western Atlantic. Virtually nothing is known of the biology of the species or potential threats from fisheries. Given the species' potentially narrow distribution and depth range, any current or future expansion of deepwater fisheries in the region needs to be carefully monitored and managed to ensure that this species is not adversely affected. At present there are insufficient data to assess the species beyond Data Deficient.

Broadfoot Legskate

Cruriraja cadenati Bigelow & Schroeder, 1962

Red List Assessment: **Global: Data Deficient** (McCormack, C. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Broadfoot Legskate (*Cruriraja cadenati*) is a small (reported to 38 cm TL) deepwater skate known from depths of 458–896 m off eastern Florida and Puerto Rico in the Caribbean. Virtually nothing is known of the biology of the species or potential threats from fisheries. Insufficient information is available to assess this species beyond Data Deficient at present. Further research is required on the species' biology, population, and capture in fisheries.

Cuban Legskate

Cruriraja poeyi Bigelow & Schroeder, 1948

Red List Assessment: **Global: Data Deficient** (McCormack, C. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Cuban Legskate (*Cruriraja poeyi*) is a little known small (to 32.8 cm TL) deepsea skate found at depths of 366–870 m, with a patchy distribution centered in the Western Central Atlantic. As few specimens exist and little is known of the biology of the species and its capture in fisheries, this species cannot be assessed beyond Data Deficient. Reassessment should be undertaken as soon as biological and fisheries data become available.

Rough Legskate

Cruriraja rugosa Bigelow & Schroeder, 1958

Red List Assessment: **Global: Data Deficient** (McCormack, C. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Rough Legskate (*Cruriraja rugosa*) is a small, poorly known, deepwater skate with a patchy distribution in the Western Atlantic. It is recorded from the continental slope at depths of 366–1,007 m. It reaches 49 cm TL, but nothing is known of the species' biology. This legskate is a potential bycatch of deepwater demersal fisheries, although no specific details are available. Due to a lack of information, this species cannot be assessed beyond Data Deficient. Reassessment should be undertaken as soon as biological and fisheries data become available.

ORDER **RAJIFORMES**

FAMILY **UROTRYGONIDAE**

Family synopsis: *13 species (2 VU; 1 NT; 3 LC; 7 DD)*

Bullseye Stingray

Urobatis concentricus Osburn & Nichols, 1916

Red List Assessment: **Global: Data Deficient** (Bizzarro, J.J. 2006).

Regional Occurrence: Eastern Central Pacific. Note: The taxonomic status of this species is uncertain.

Rationale: The Bullseye Stingray (*Urobatis concentricus*) is a small (to 28 cm DW) inshore batoid restricted to Mexico, with a limited known distribution. Almost nothing is known about the biology or abundance of this species and its taxonomic status is also unclear, as it may be a synonym (color morph) of the Round Stingray (*U. halleri*). The Bullseye Stingray is reportedly taken in bottom-set nets and with spears, but spearing is extremely uncommon. This species is also likely taken incidentally by shrimp trawlers, but the extent of this practice is not well known and no species-specific information is documented. Artisanal and commercial fisheries in Mexico do not typically utilize urotrygonid rays due to their small size and when they are caught they are not typically retained. However, the tail is usually cleaved off before it is returned to the sea, which may result in high mortality of discards. Despite these potential threats and restricted range, due to the lack of available information and taxonomic issues this species is considered Data Deficient at the present time. Its conservation status will need to be reassessed when these issues are better resolved.

Round Stingray

Urobatis halleri (Cooper, 1863)

Red List Assessment: **Global: Least Concern** (Ebert, D.A. 2006).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Round Stingray (*Urobatis halleri*) is a small (to 31 cm DW), common inshore stingray found along the coastal waters of the Eastern Pacific. It is distributed from northern California, USA, to Panama but appears to be most common between southern California and Baja California, Mexico. It is not fished commercially, but is occasionally taken by recreational fishers and by artisanal fisheries. This species is also likely taken incidentally by Mexican shrimp trawlers, but the extent of this practice is not well known and no species-specific information is documented. When caught in artisanal fisheries it is generally discarded and its small size and large tail spine make it an undesirable target species. However, in Mexico, the tail is usually cleaved off before it is returned to the sea, which may result in high mortality of discards. This species matures after 2.6 years with a biannual reproductive cycle, making it a relatively productive batoid. As the species is generally abundant where it occurs, is productive, and as there are no major threats apparent (in particular, there are few threats to the species in southern California where is it very abundant) it is assessed as Least Concern.

Yellow Stingray

Urobatis jamaicensis (Cuvier, 1816)

Red List Assessment: **Global: Least Concern** (Piercy, A.N., Snelson Jr., F.F. & Grubbs, R.D. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Yellow Stingray (*Urobatis jamaicensis*) is a small (to 36 cm DW) nearshore batoid of coastal zones, bays and estuaries with a wide distribution in the Western Atlantic from North Carolina around Florida, USA, into and throughout the Gulf of Mexico and throughout the Caribbean (including the Antilles), Central America, and the northern coast of South America. It is common in parts of its range including the Florida Keys and areas of the Antilles. Bears litters of 2–5 pups and shallow coastal lagoons and seagrass beds are important for parturition. The Yellow Stingray is not targeted by commercial fisheries, but is likely taken as bycatch in nearshore fisheries throughout its range. However, it is collected for the marine aquarium trade and the extent of this harvesting requires examination. Although no catch information is available, the species is assessed as Least Concern given its wide range, common occurrence in some areas and small size (and thus relatively productive biology). However, the continued vitality of the species will be reliant on healthy seagrass habitats, which are important for parturition.

Cortez Round Stingray

Urobatis maculatus Garman, 1913

Red List Assessment: **Global: Data Deficient** (Bizzarro, J.J. 2006).

Regional Occurrence: Eastern Central Pacific. Note: The taxonomic status of this species is uncertain.

Rationale: The Cortez Round Stingray (*Urobatis maculatus*) is a small (to 26 cm DW) inshore batoid restricted to Mexico, with a limited known distribution. Almost nothing is known about the biology or abundance of this species and its taxonomic status is also unclear, as it may be a synonym (color morph) of the Bullseye Stingray (*U. concentricus*) (which may in turn be a synonym of the Round Stingray *U. halleri*). The Cortez Round Stingray is reportedly taken in bottom-set nets and with spears, but spearing is extremely uncommon. This species is also likely taken incidentally by shrimp trawlers, but the extent of this practice is not well known and no species-specific information is documented. Artisanal and commercial fisheries in Mexico do not typically utilize urotrygonid rays due to their small size and when they are caught they are not typically retained. However, the tail is usually cleaved off before it is returned to the sea, which may result in high mortality of discards. Despite these potential threats and restricted range, due to the lack of available information and taxonomic issues this species is considered Data Deficient at the present time. Its conservation status will need to be reassessed when these issues are better resolved.

Roughtail Round Stingray

Urotrygon aspidura (Jordan & Gilbert, 1882)

Red List Assessment: **Global: Data Deficient** (Valenti, S.V. & Robertson, R. 2009).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Roughtail Round Stingray (*Urotrygon aspidura*) is a poorly known stingray found in the Eastern Pacific from southern Baja California, Mexico, to Peru, at depths of 5–100 m. It attains 42.1 cm TL, but little else is known about its biology. This species is locally common from Panama to El Salvador. It is taken as bycatch of shrimp trawl fisheries, which are extensive in inshore waters throughout its range, although specific catch details are not available. At present insufficient information is available on catch levels, threats, and the life history parameters of this species to assess it beyond Data Deficient.

Thorny Round Stingray

Urotrygon chilensis (Günther, 1871)

Red List Assessment: **Global: Data Deficient** (Lamilla, J. 2004).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Thorny Round Stingray (*Urotrygon chilensis*) is a very poorly known Eastern Pacific urotrygonid ray known from the Gulf of California, Mexico, through Central America south to Peru. Maximum size reported is 42 cm TL. No information is available on populations, ecology, or threats, and thus this species cannot be assessed beyond Data Deficient at this time.

Smalleyed Round Stingray

Urotrygon microphthalmum Delsman, 1941

Red List Assessment: **Global: Least Concern** (Rosa, R.S. 2004).

Regional Occurrence: Western Central Atlantic.

Rationale: The Smalleyed Round Stingray (*Urotrygon microphthalmum*) is a small, tropical, coastal species from the Western Atlantic occurring from Venezuela to northern Brazil in shallow waters (common <2 m and not reported >25 m). Although no population studies are currently available, the species is apparently not threatened due to its small size (~25 cm TL, 13 cm DW) and abundance. It is common in the Orinoco River Delta of Venezuela, is abundant off Maranhão State, Brazil and is commonly captured in beach seining along the coast of Paraíba State, Brazil. Regulations should be introduced to ensure that individuals taken as bycatch are released.

Shortfin Round Stingray

Urotrygon munda Gill, 1863

Red List Assessment: **Global: Data Deficient** (Valenti, S.V. & Robertson, R. 2009).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Shortfin Round Stingray (*Urotrygon munda*) is a poorly known round stingray found in the Eastern Pacific from southern Baja California, Mexico, to Peru at depths of 5–50 m. Little is known about the life history parameters of this species. It is taken as bycatch of shrimp trawl fisheries, which are extensive in inshore waters throughout its range, although specific catch details are not available. This species may be discarded due to its small size but discard survivorship is unlikely to be high. At present insufficient information is available on catch levels, threats, and the life history parameters of this species to assess it beyond Data Deficient. Given that inshore fisheries are relatively intensive throughout much of this coastal species' range in the Eastern Pacific, assessment of catches and population trends is a priority.

Dwarf Round Stingray

Urotrygon nana Miyake & McEachran, 1988

Red List Assessment: **Global: Data Deficient** (Robertson, R., Rojas, R., Valenti, S.V. & Cronin, E.S. 2009).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Dwarf Round Stingray (*Urotrygon nana*) is a small, little known stingray from the Eastern Central Pacific. This species is taken as bycatch by trawl fisheries operating throughout much of its range. Inshore fishing pressure is relatively intensive, although no data are available on the capture of this species. At present insufficient information is available on catch levels, threats, and the life history parameters of this species to assess it beyond Data Deficient. Given that this species occurs in inshore waters that are generally heavily affected by anthropogenic pressures, and has very low fecundity, further investigation into its status is urgently required.

Reticulate Round Stingray

Urotrygon reticulata Miyake & McEachran, 1988

Red List Assessment: **Global: Vulnerable A4d** (Robertson, R. & Valenti, S.V. 2009).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Reticulate Round Stingray (*Urotrygon reticulata*) is a rare, poorly known stingray known only from Panama at depths of 2–15 m. Little is known about the life history parameters of this species. The species' rarity and occurrence in very shallow water, compared to others of the same genus, most likely make it more vulnerable to depletion. The Reticulate Round Stingray is taken as bycatch by bottom trawl fisheries targeting shrimp throughout its range. Although no specific data are available, the species is rare with a restricted range in shallow waters, which are extensively fished by shrimp trawlers. There is no reason to expect that fishing pressure will decrease in the region. Given its rarity, restricted range, intensive fishing pressure across its inshore range, and the destruction and degradation of its coastal habitat, a precautionary assessment of Vulnerable is warranted on the basis of suspected population declines. Further research is required on the population trends and catch levels of this species in order to assess the full extent of decline.

Lined Round Stingray

Urotrygon rogersi (Jordan & Starks, 1895)

Red List Assessment: **Global: Data Deficient** (Valenti, S.V. 2009).

Regional Occurrence: Eastern Central Pacific.

Rationale: This apparently common coastal stingray occurs from southern Baja California and the Gulf of California, Mexico, to Ecuador in the Eastern Pacific. The Lined Round Stingray (*Urotrygon rogersi*) occurs at depths of 2–30 m and reaches a maximum of 46.2 cm TL. Little is known about the life history parameters of this species. It is captured as bycatch by bottom trawl fisheries. At present insufficient information is available on catch levels, threats, and the life history parameters of this species to assess it beyond Data Deficient.

Stellate Round Stingray

Urotrygon simulatrix Miyake & McEachran, 1988

Red List Assessment: **Global: Vulnerable B1ab(v)** (Robertson, R. & Valenti, S.V. 2009).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Stellate Round Stingray (*Urotrygon simulatrix*) is a rare, poorly known stingray only recorded from the Gulf of Panama. Little is known about the life history parameters of this species. It is taken as bycatch by bottom trawl fisheries targeting shrimp throughout its range. The species' relatively restricted distribution and rarity compared to others of the same genus likely make it more vulnerable to depletion. Although no specific data are available, the species is rare with a restricted range in shallow waters, which are extensively fished by shrimp trawlers. The species' extent of occurrence is <20,000 km² and a continuing decline in abundance is inferred as a result of bycatch in trawl fisheries. Hence it is assessed as Vulnerable.

Venezuela Round Stingray

Urotrygon venezuelae Schultz, 1949

Red List Assessment: **Global: Near Threatened** (Kyne, P.M. & Valenti, S.V. 2007).

Regional Occurrence: Western Central Atlantic.

Rationale: The Venezuela Round Stingray (*Urotrygon venezuelae*) is a small (to 29 cm TL) round stingray endemic to western Venezuela. There is very little information available on this species. It is of conservation concern due to its restricted distribution, its inshore coastal occurrence and the fact that it is reported as not common. Artisanal and commercial trawl effort is intense in Venezuela and this species is most probably taken as bycatch in these fisheries, although no species-specific data are available. Given that intense fisheries appear to be operating throughout the species' limited range, and the high levels of bycatch in these trawl fisheries, current fishing pressure is likely to prove unsustainable for this species and it is assessed as Near Threatened. Details are urgently required on bycatch levels of this species in these fisheries, and this assessment will need to be revisited once further data are available, at which time it may qualify for a threatened category.

ORDER **RAJIFORMES**

FAMILY **DASYATIDAE**

Family synopsis: *10 species (1 NT; 4 LC; 5 DD)*

Southern Stingray

Dasyatis americana Hildebrand & Schroeder, 1928

Red List Assessment: **Global: Data Deficient; USA (regional assessment): Least Concern** (Grubbs, R.D., Snelson Jr., F.F., Piercy, A.N., Rosa, R.S. & Furtado, M. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Southern Stingray (*Dasyatis americana*) is a coastal marine and estuarine species with a wide distribution in the Western Atlantic south from New Jersey, USA, through the Gulf of Mexico and the Caribbean to southeastern Brazil. It is associated with sand flats, seagrass beds, and coral reefs at 0–53 m depth and is common to locally abundant in some regions. The species is taken as bycatch in various fisheries throughout its range and is harvested in some parts of South America. In some areas it is also an important ecotourism resource. The population appears healthy in the U.S. and, with no threats apparent, is assessed as Least Concern in that country. However, there is little information available on population trends and the impacts of fishing throughout the rest of its range and it is thus assessed as Data Deficient globally. Increasing artisanal fishing pressure in some regions of Brazil (which may mirror increases in other parts of South America) is of concern and catch monitoring in countries such as Brazil and Venezuela are a priority. Impacts on its inshore environment (including coral reefs) may also represent a threat.

Roughtail Stingray

Dasyatis centroura (Mitchill, 1815)

Red List Assessment: **Global: Least Concern; USA (regional assessment): Least Concern** (Rosa, R.S., Furtado, M., Snelson Jr., F.F., Piercy, A.N., Grubbs, R.D., Serena, F. & Mancusi, C. 2007).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Roughtail Stingray (*Dasyatis centroura*) is one of the largest marine and brackish water stingrays distributed widely throughout the Atlantic. Populations in the North Atlantic, South Atlantic, and Eastern Atlantic are considered separate. Although limited data are available on the biology of this species, its huge size (maximum 260 cm DW) and low fecundity (2–6 pups per

litter) make it intrinsically vulnerable to depletion. In U.S. waters of the Northwest Atlantic this species is not targeted and the available data on population trends suggests that populations off the U.S. east coast are stable. In the Southwest Atlantic and Mediterranean, it is taken in trawl and artisanal fisheries operating throughout much of its depth range. Batoid landings in the artisanal fishery in the Rio Grande do Sul, southern Brazil have declined significantly since the early-1950s and there is some anecdotal evidence that the abundance of this species in catches has declined off Rio Grande do Norte, northeastern Brazil. It has only been rarely reported from the Mediterranean, where intense trawl fisheries operate at depths of 50–800 m. Given that its very large size makes it intrinsically vulnerable to population depletion, intense trawl fisheries in its range in the Mediterranean and the Southwest Atlantic, and the declines observed in other vulnerable batoid species in these regions, the species is given a precautionary assessment of Near Threatened in the Mediterranean and Southwest Atlantic. As populations in the U.S. appear stable it is assessed as Least Concern in this region and Least Concern globally.

Diamond Stingray

Dasyatis dipterura Jordan & Gilbert, 1880

Red List Assessment: **Global: Data Deficient; Mexico (regional assessment): Near Threatened** (Smith, W.D., Bizzarro, J.J. & Lamilla, J. 2006).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Diamond Stingray (*Dasyatis dipterura*) is a broadly distributed but poorly known stingray from the Eastern Pacific. Biological and fishery information is primarily available from Mexico where the Diamond Stingray is commonly landed among artisanal elasmobranch fisheries and frequently taken as bycatch in trawl fisheries (especially by shrimp trawlers). Populations from the Mexican Pacific display seasonal movement patterns related to reproductive events, but no information is available on trends in abundance. Recent studies indicate that this stingray is relatively long lived (to at least 28 years), has a low fecundity (1–4), and a low intrinsic rate of increase. Female growth rates are estimated to be among the lowest reported for any batoid. These combined factors indicate that Diamond Stingray populations are of low productivity and demonstrate limited resilience to fishing pressure. Due to its vulnerability and importance within the unregulated artisanal elasmobranch fishery, this stingray is considered Near Threatened in Mexico. Based on the lack of information pertaining to the biology, distribution, and fisheries for this species throughout the majority of its range, the Diamond Stingray is classified as Data Deficient globally. Where is it taken in fisheries in those regions it may prove to be at risk when more information is available.

Wingfin Stingray

Dasyatis geijskesi Boeseman, 1948

Red List Assessment: **Global: Near Threatened** (Charvet-Almeida, P. & de Almeida, M.P. 2006).

Regional Occurrence: Western Central Atlantic.

Rationale: The Wingfin Stingray (*Dasyatis geijskesi*) is a large, relatively uncommon stingray that is found on the northern coast of South America (Venezuela to Brazil) in the Western Central and Southwest Atlantic, mainly in estuarine and coastal areas near the Amazon River mouth. Very limited data are available regarding the habitat and ecology of this species. Pregnant females are observed with only 1–3 pups per litter. Population trends and dynamics are completely unknown. The species is taken as bycatch by both artisanal and industrial fisheries, which continue to be unregulated. It is used regionally as a subsistence food source but as a secondary option due to its dark (reddish) colored flesh. Fisheries tend to show an interest in large dasyatids as a source of minced fish products, implying that exploitation pressure and population depletion may increase in the future. Baseline studies and fishery monitoring are required for this species, but given its inshore occurrence in fished regions, relatively restricted range and habitat, biology, and apparent interest to industrial fisheries, the species is assessed as Near Threatened.

Longnose Stingray

Dasyatis guttata (Bloch & Schneider, 1801)

Red List Assessment: **Global: Data Deficient** (Rosa, R.S. & Furtado, M. 2004).

Regional Occurrence: Western Central Atlantic.

Rationale: The Longnose Stingray (*Dasyatis guttata*) is a small marine and brackish water stingray distributed from the southern Gulf of Mexico and the West Indies south to Brazil. This is the most common ray species in artisanal fisheries in some states of northeastern Brazil (Maranhão and Paraíba). It is also taken as bycatch in shrimp trawls (Ceará) and a targeted species of sport surf fisheries (Paraíba). For some states, such as Ceará, Paraíba, and Bahia, there are increasing fishing pressure on the species, but no population assessments based on these fisheries. Monitoring of artisanal fisheries directed towards this species, protection of breeding and nursery grounds, population studies, and more information from its range outside Brazil are all required before the conservation status of the species can be accurately assessed.

Longtail Stingray

Dasyatis longa (Garman, 1880)

Red List Assessment: **Global: Data Deficient** (Smith, W.D. 2006).

Regional Occurrence: Eastern Central Pacific.

Rationale: A large (to 158 cm DW) batoid distributed in the Eastern Pacific from Mexico to Colombia, occurring on the continental shelf to at least 90 m. Extremely limited information is available on the Longtail Stingray (*Dasyatis longa*). Misidentification of the species may confound or further limit clarity of fisheries and biological details due to morphological similarities with its congener, the Diamond Stingray (*D. dipterura*). The relatively large body size of the species could be associated with slow growth and extended longevity. This potential, coupled with the observed low fecundity of 1–5 offspring suggests that the species could be highly vulnerable to fisheries, particularly when females move inshore to give birth. However, it may occupy deeper waters for much of the year than are typically exploited by artisanal fisheries. It represents only a small proportion of the total observed elasmobranch landings in the Gulf of California. Detailed information on landings of the Longtail Stingray is unavailable outside of Mexico, although it is likely to be taken by inshore fisheries throughout its Central American range. Based on the extremely limited information pertaining to the biology, distribution, and fisheries of this species, it is classified as Data Deficient. However, given its potential vulnerability and the unregulated fishing pressure across its range, research should be directed at better defining its conservation status.

Atlantic Stingray

Dasyatis sabina (Lesueur, 1824)

Red List Assessment: **Global: Least Concern** (Piercy, A.N., Snelson Jr., F.F. & Grubbs, R.D. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Atlantic Stingray (*Dasyatis sabina*) is a small (to 45 cm DW) inshore, estuarine, and freshwater stingray distributed on the Atlantic seaboard of the U.S. and Mexico from Chesapeake Bay to southern Florida, and the Gulf coast to Campeche. It is common throughout most of its range. There is no directed fishery for this ray, however it is taken as bycatch in nearshore gillnet and trawl fisheries throughout its range. Population data do not indicate any significant decline for the Atlantic Stingray and in the U.S. (the larger part of its range) it is mostly released alive with apparent low mortality.

Bluntnose Stingray

Dasyatis say (Lesueur, 1817)

Red List Assessment: **Global: Least Concern** (Snelson Jr., F.F., Piercy, A.N. & Grubbs, R.D. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Bluntnose Stingray (*Dasyatis say*) is a medium-sized (to 78 cm DW) inshore batoid of the Western Atlantic. It is widespread and generally common, and locally abundant in parts of its center of distribution in the U.S. Atlantic and Gulf of Mexico. This species inhabits bays, estuaries, lagoons, and coastal waters usually at depths of <10 m (rarely to 20 m). It is taken as bycatch in nearshore trawl and gillnet fisheries; in U.S. waters it is mostly released with probable low mortality. There are no data to indicate any population declines. Little information is available on catches and utilization in the Caribbean and southern parts of the species' range, however, the species becomes rare and patchy further south and so any directed or incidental catches there would pose little threat to the global status of the species, although these may affect local populations. Given its abundance, relatively widespread distribution, and no major threats, the species is assessed as Least Concern.

Chupare Stingray

Himantura schmardae (Werner, 1904)

Red List Assessment: **Global: Data Deficient** (Charvet-Almeida, P. & Almeida, M.P. 2006).

Regional Occurrence: Western Central Atlantic. Note: The taxonomic status of this species requires resolution.

Rationale: The Chupare Stingray (*Himantura schmardae*) is a large (to 200 cm DW) tropical stingray that is distributed in the Western Central and Southwest Atlantic from Mexico to Brazil including the Greater and Lesser Antilles. Almost no data are available on its habitat, biology, ecology, and population trends. However, it is caught as bycatch and used as a subsistence food source. Baseline studies, including taxonomic aspects, need to be elucidated for this species. Given its probable inshore occurrence in fished areas its conservation status will need to be reassessed once data are collected, particularly concerning catch levels. In the first instance though, the species' taxonomic status needs resolution.

Pelagic Stingray

Pteroplatytrygon violacea (Bonaparte, 1832)

Red List Assessment: **Global: Least Concern** (Baum, J.K., Bianchi, I., Domingo, A., Ebert, D.A., Grubbs, R.D., Mancusi, C., Piercy, A.N., Serena, F. & Snelson Jr., F.F. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Northeast Pacific; Eastern Central Pacific.

Rationale: The Pelagic Stingray (*Pteroplatytrygon violacea*) is widespread, with an almost circumglobal distribution throughout tropical and subtropical areas of the Pacific, Atlantic, and Indian Oceans. It is perhaps the only species of stingray that occurs in pelagic, oceanic waters. The species is taken as bycatch in pelagic longline fisheries around the world. It is caught frequently by tuna and swordfish longliners and mostly discarded, but is retained and utilized in some areas (e.g. Indonesia). Post-discard survival rates are thought to be low in some areas because the fish are often discarded with serious mouth and jaw damage. Analyses of research surveys conducted with pelagic longlines in the 1950s and recent (1990s) observer data from commercial pelagic longline fisheries suggest increases in CPUE in the tropical Pacific Ocean and Northwest Atlantic. Although there is some debate as to the consistency of reporting of Pelagic Stingrays in fishery statistics and data are lacking from several areas of the species' range, there are no data to suggest that significant declines have occurred in this species. Increasing fishing effort in pelagic fisheries, owing to decreasing abundance of target species (swordfish and tunas) will result in an increase in catches of this species and associated high discard mortality in some

areas. Careful monitoring is therefore required; however, given increasing trends observed in some regions, this species' widespread distribution, and in the absence of evidence to suggest significant declines it is currently assessed as Least Concern globally.

ORDER	**RAJIFORMES**
FAMILY	**GYMNURIDAE**
	Family synopsis: *4 species (1 VU; 1 LC; 2 DD)*

Spiny Butterfly Ray

Gymnura altavela (Linnaeus, 1758)

Red List Assessment: **Global: Vulnerable A2bd+4bd; USA (regional assessment): Least Concern** (Vooren, C.M., Piercy, A.N., Snelson Jr., F.F., Grubbs, R.D., Notarbartolo-di-Sciara, G. & Serena, F. 2007).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Spiny Butterfly Ray (*Gymnura altavela*) is a wide-ranging butterfly ray from tropical and warm-temperate continental shelf waters on the eastern (Portugal to Angola) and western (Massachusetts, USA to Buenos Aires Province, Argentina) sides of the Atlantic, including the Mediterranean Sea, the Black Sea, and the Madeira and Canary Islands. A large (to 220 cm DW) ray with a small litter size (producing 1–8 pups depending on geographic location), making it intrinsically vulnerable to population depletion. It has a patchy and discontinuous distribution and appears to be habitat-dependent. Noted for the quality of its meat and is landed for human consumption. Globally, the extent of demonstrated declines in the Southwest Atlantic, Mediterranean, and West Africa is considered to meet the criteria for Vulnerable, based on an overall past and suspected continuing decline of >30%. Species-specific monitoring, and urgent protection in areas where it is threatened are needed.

USA (regional assessment)*:* The Spiny Butterfly Ray has a very patchy distribution in U.S. waters, where it can be locally abundant (i.e. adults in the mouths of tidal creeks along the Virginia coast) and appears to be habitat-dependent. It is rarely taken as bycatch and is not commercially targeted in U.S. waters, and fishery-independent longline surveys show no trends in catch rates over the period 1996 to 2003. In the absence of significant threats to the species in U.S. waters, the species is assessed as Least Concern for the U.S.

Longsnout Butterfly Ray

Gymnura crebripunctata (Peters, 1869)

Red List Assessment: **Global: Data Deficient** (Bizzarro, J.J. & Smith, W.D. 2012).

Regional Occurrence: Eastern Central Pacific. Note: *Gymnura crebripunctata* had previously been considered conspecific with *G. marmorata*, but the species has recently been confirmed as valid.

Rationale: The Longsnout Butterfly Ray (*Gymnura crebripunctata*) appears to be distributed throughout tropical and subtropical regions of the Eastern Pacific (Mexico to Peru) but details of its biology and fisheries exploitation are largely unknown and complicated by the historic taxonomic uncertainty of this species (it has been considered a junior synonym of the California Butterfly Ray *G. marmorata*). Even details of the species' exact geographic and depth range are lacking, and no life history information is available. A designation of Data Deficient is therefore warranted. However, given the susceptibility of gymnurids to capture in a variety of fishing gear, there is a need for more information about this species in order to better determine its conservation status.

California Butterfly Ray

Gymnura marmorata (Cooper, 1864)

Red List Assessment: **Global: Least Concern** (Bizzarro, J.J. & Smith, W.D. 2012).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The California Butterfly Ray (*Gymnura marmorata*) occurs in nearshore and inshore waters of the Eastern Pacific, from southern California to the central or southern Gulf of California, Mexico, and appears to be abundant throughout its range. Probably as a consequence of its apparent abundance, the California Butterfly Ray is one of the primary species landed in artisanal elasmobranch fisheries of northwestern Mexico. Catch records of the California Butterfly Ray have been historically lumped into generalized categories and therefore population trends cannot be determined. This issue is further complicated by the historic taxonomic confusion between this species and the Longsnout Butterfly Ray (*Gymnura crebripunctata*). It should not be assumed, however, that current and historic levels of fishing activity have negatively affected this species. Severe declines in the landings of large, predatory sharks and upper trophic level teleosts have been noted in Mexican waters and predation pressure on the California Butterfly Ray may therefore be lower than historic levels. The California Butterfly Ray also has a moderately high fecundity (up to 16 pups/litter) compared with other elasmobranchs, including congeners, may reproduce throughout the year, and appears to grow rapidly. In addition, although it has not yet been enforced, the recent Mexican national management plan for sharks and rays provides for a cessation of fishing activities in important nursery regions, including Bahía Almejas, during the peak summer breeding season. Based on this information and the apparent abundance of the California Butterfly Ray throughout its range, this species is assessed as Least Concern.

Smooth Butterfly Ray

Gymnura micrura (Bloch & Schneider, 1801)

Red List Assessment: **Global: Data Deficient; USA (regional assessment): Least Concern** (Grubbs, R.D. & Ha, D.S. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Smooth Butterfly Ray (*Gymnura micrura*) is reasonably widespread in inshore waters (to 40 m depth) in the Eastern and Western Atlantic. Little is known of its biology, although it is reported to have litter sizes of 6–8 pups. There is no information available on the species throughout its Central American, South American, and West African range, but it is likely taken as bycatch in various (often intensive) inshore fisheries in these regions. Gymnurids are susceptible to a variety of fishing gear, are commonly taken in inshore fisheries and heavy fishing pressure appears to be affecting populations of some Indo-West Pacific gymnurids (i.e. Longtail Butterfly Ray *G. poecilura* and Zonetail Butterfly Ray *Aetoplatea zonura*), thus raising concerns for the Smooth Butterfly Ray. Due to lack of information it is assessed as Data Deficient globally, but given the vulnerability of gymnurids to inshore fishing, combined with limited biological characteristics, an immediate effort should be made to gather data to accurately assess catches of the Smooth Butterfly Ray throughout its range. In U.S. waters, where it is locally common in estuaries and nearshore waters, the species is not commercially targeted. Although taken as bycatch in shrimp trawl fisheries it is typically released alive (post-release survivorship is probably high). With no major threats affecting the species in the U.S., it is assessed as Least Concern in that country.

ORDER	**RAJIFORMES**
FAMILY	**MYLIOBATIDAE**
	Family synopsis: *6 species (2 NT; 1 LC; 3 DD)*

Spotted Eagle Ray

Aetobatus narinari (Euphrasen, 1790)

Red List Assessment: **Global: Near Threatened** (Kyne, P.M., Ishihara, H., Dudley, S.F.J. & White, W.T. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Eastern Central Pacific. Note: The name *Aetobatus ocellatus* has recently been resurrected for what was referred to as *A. narinari* in the Indo-West/Central Pacific. Re-evaluation of the global and regional status of spotted eagle rays is dependent on further taxonomic resolution of the '*A. narinari*' species-complex.

Rationale: A large eagle ray with a widespread distribution across the Indo-Pacific and Eastern and Western Atlantic in tropical and warm-temperate waters. It is recorded over the continental shelf from the surface to 60 m depth in coastal and open ocean environments. Sometimes enters lagoons and estuaries and is often associated with coral reef ecosystems. The presently known Spotted Eagle Ray (*Aetobatus narinari*) is most probably a species-complex of at least four different species. However, it is here considered as a single species as presently recognized. Taxonomic resolution of this issue is of priority as each form will have a more restricted range than the presently described wide-ranging species, which will alter the potential effects of threatening processes on each subpopulation. The 2000 Red List assessment for the Spotted Eagle Ray incorrectly classified the species as 'relatively fecund'. Females bear a maximum of four pups per litter after a gestation period of probably a year. These limited biological parameters, the species' inshore habitat and hence availability to a wide variety of inshore fishing gear (beach seine, gillnet, purse seine, benthic longline, trawl etc.), its marketability, and the generally intense and unregulated nature of inshore fisheries across large parts of the species' range warrant a global listing of Near Threatened and a Vulnerable listing in Southeast Asia, where fishing pressure is particularly intense and the species is a common component of landings (future declines of >30% are expected, if they have not already occurred). With further data it will likely fall into a threatened category in other regions also. For example, although specific details are not available, pressure on the inshore environment through artisanal fishing activities off West Africa, East Africa, throughout the Arabian Sea, the Bay of Bengal, and in large portions of the species' American range has likely affected this species. There is nothing to suggest that pressure will decrease in these regions in the future. In a few parts of its range (e.g. South Africa, the Maldives, USA, and Australia) the species faces lower levels of threat, but overall, pressure on the species is high and likely to cause population depletions. Management and conservation measures considering harvest and trade management need to be implemented immediately.

Bat Ray

Myliobatis californica Gill, 1865

Red List Assessment: **Global: Least Concern; Mexico (regional assessment): Data Deficient** (Cailliet, G.M. & Smith, W.D. 2006).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Bat Ray (*Myliobatis californica*) was assessed as Least Concern on the 2000 Red List. It is updated here due to new and better information available and remains Least Concern globally but is assessed as Data Deficient in Mexico. This abundant Eastern Pacific coastal ray is relatively fast growing, reaching maturity at ~2–3 years for males and five years for females. The Bat Ray produces up to 12 pups per year although smaller litter sizes are more common. It is not a main target of any major fishery, being taken in the U.S. primarily by recreational anglers and only secondarily by commercial fishers. In Mexico, it is taken in directed elasmobranch fisheries and as bycatch in other fisheries. There are no reliable population estimates, catch data are unreliable with some catches unreported or generically reported as ray, and CPUE data do not exist. However, it does not appear that the commercial or recreational catches pose any threat

to this population in U.S. waters, which represent a sizeable portion of its range and the main center of distribution for this species. The Bat Ray is considered to be a species of Least Concern at the time of this assessment. Improved recording and monitoring of landings in Mexican artisanal and industrial fisheries are needed and the species is assessed as Data Deficient in the Mexican Pacific.

Bullnose Ray

Myliobatis freminvillii Lesueur, 1824

Red List Assessment: **Global: Data Deficient** (Stehmann, M. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Bullnose Ray (*Myliobatis freminvillii*) is a little known eagle ray, widely distributed in the Western Atlantic, occurring from Cape Cod, USA, south to Argentina (but apparently absent from parts of the Western Central Atlantic). It is most frequently found in coastal waters including shallow estuaries to 10 m depth. It reaches a maximum size of 106 cm DW, with a reported fecundity of six embryos per litter. However, little else is known of the biology of this species. It is apparently much less common than the Southern Eagle Ray (*M. goodei*), with which it is easily confused. Although the Bullnose Ray is a fairly wide-ranging, migratory species, its inshore occurrence places it entirely within the range of coastal fisheries. This species is caught by both artisanal and industrial fisheries, on longlines, with trammel nets, and in trawls and is marketed in some areas. No data are available to assess population trends and it cannot currently be assessed beyond Data Deficient. Its inshore coastal occurrence, presence in some areas with intensive inshore fishing activity, apparent low abundance, and low fecundity may make it susceptible to localized population reductions. Further research on catch levels and the biology of this species is required to enable reassessment in the near future.

Southern Eagle Ray

Myliobatis goodei Garman, 1885

Red List Assessment: **Global: Data Deficient** (Stehmann, M. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Southern Eagle Ray (*Myliobatis goodei*) is a widely distributed shelf eagle ray of the Western Atlantic, occurring from South Carolina, USA, south to Patagonia, Argentina. It is found inshore to a depth of at least 181 m and it reaches a maximum size of 99 cm DW. However, little else is known of the biology of this species. It is apparently more common than the Bullnose Ray (*M. freminvillii*), with which it is easily confused. Although the Southern Eagle Ray is a fairly wide-ranging, migratory species, its inshore occurrence places it within the range of coastal fisheries. This species is caught in artisanal fisheries with trammel nets and longlines, and is a regular bycatch in trawl fisheries. No data are available to assess population trends and it cannot currently be assessed beyond Data Deficient. Further research on catch levels and the biology of this species is required to enable reassessment in the near future.

Longnose Eagle Ray

Myliobatis longirostris Applegate & Fitch, 1964

Red List Assessment: **Global: Near Threatened** (Smith, W.D. & Bizzarro, J.J. 2006).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Longnose Eagle Ray (*Myliobatis longirostris*) is a poorly known inshore eagle ray which reaches 95 cm DW and which is known from Pacific Baja California and the Gulf of California, Mexico, and from Sechura, Peru. It is likely distributed in the area between these two locations, through Central America. There is limited information available on the distribution, abundance, and biology of the Longnose Eagle Ray. It is not frequently landed in the artisanal elasmobranch

fisheries of the Gulf of California and Pacific coast of Baja California. The conservation status of myliobatid rays is of concern due to their limited biological characteristics, inshore habitat, schooling behavior, and morphology which exposes them to capture in a variety of fishing gear in often intense and unregulated fisheries. As such, this species is taken incidentally by various artisanal fisheries in Mexico and throughout Central America, if indeed it occurs there. Populations of many myliobatid rays together with similar rhinopterid species are reportedly declining in areas where inshore fishing activities are high. The Longnose Eagle Ray occurs in a region where artisanal fishing is generally intense and unregulated, and despite the lack of available information, a Near Threatened assessment is justified for this species.

Roughskin Bullray

Pteromylaeus asperrimus (Jordan & Evermann, 1898)

Red List Assessment: **Global: Data Deficient** (Valenti, S.V. & Kyne, P.M. 2009).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Roughskin Bullray (*Pteromylaeus asperrimus*) is a medium-sized (to at least 79 cm DW) coastal eagle ray from the Eastern Pacific, known only from Panama and the Galapagos Islands (Ecuador), although it may be more wide-ranging than presently known. The distribution of the species is not well defined, and overall there is very little information available concerning this eagle ray. Eagle rays are vulnerable to capture in trawl, line, and net gear and this species is probably taken as bycatch in artisanal fisheries operating within its coastal range, although no data are available on such catches. Insufficient information is currently available on this species' biology, range, population trends, and capture in fisheries to assess it beyond Data Deficient. Given that it may share the limiting life history characteristics of other eagle rays and that inshore fishing pressure is relatively intensive in parts of its range, the assessment of catches and population trends are a priority.

ORDER	**RAJIFORMES**
FAMILY	**RHINOPTERIDAE**
	Family synopsis: *2 species (NT)*

Cownose Ray

Rhinoptera bonasus (Mitchill, 1815)

Red List Assessment: **Global: Near Threatened; USA (regional assessment): Least Concern** (Barker, A.S. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Cownose Ray (*Rhinoptera bonasus*) is a large (to 107 cm DW) batoid of shallow marine and brackish waters of the Western Atlantic distributed from the northern U.S. to Brazil, including through the Gulf of Mexico. The schooling nature and inshore habitat of this species together with its relatively late maturity and low productivity (generally one young per litter) increases its susceptibility to overexploitation and will limit its ability to recover from population decline. This species is assumed to be highly migratory, but movement patterns are not well known and research into this area is required. Although there is currently no directed fishery for the Cownose Ray in the U.S., it has been suggested due to their reputation as a 'pest' species to the shellfish industry. In U.S. waters they are currently taken as bycatch in fisheries employing pound nets, haul seines, and shrimp trawls, however, these activities do not pose a significant threat to the species at the present time and the population appears to be healthy. As such the species is assessed as Least Concern in the U.S. However, if a fishery for the Cownose Ray is ever established, it could be devastating to the population without proper monitoring. The species is assessed globally as Near Threatened due to heavy (and generally unregulated) fishing pressure on the inshore environment throughout large parts of Central and South America. Although no information is currently available on its contribution to artisanal fisheries in these regions, as a broadly distributed, migratory species inhabiting shallow coastal waters it is most certainly commonly taken either in directed catches or as bycatch. Rhinopterids are

regularly landed around the world and heavy pressure on the inshore ecosystem is having negative impacts on congeners of the Cownose Ray, for example the Javanese Cownose Ray (*R. javanica*) throughout Asia and the Brazilian Cownose Ray (*R. brasiliensis*) in Brazil. Similar adverse population trends are expected for the Cownose Ray and there is an urgent need to determine the current population status and catch levels.

Golden Cownose Ray

Rhinoptera steindachneri Evermann & Jenkins, 1891

Red List Assessment: **Global: Near Threatened** (Smith, W.D. & Bizzarro, J.J. 2006).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Golden Cownose Ray (*Rhinoptera steindachneri*) is the only representative of its family known from the Eastern Pacific. Little is known of the species' ecology yet it is one of the primary components of artisanal elasmobranch fisheries in the Gulf of California and the southern Pacific coast of Baja California, Mexico. As a broadly distributed, migratory species inhabiting shallow coastal waters, it is likely an important component of artisanal fisheries throughout its range. The extent of movements throughout the Eastern Pacific coast, longevity, growth rates, population structure, and age at maturity are unknown. Both sexes mature at similar sizes that are ~70% of their maximum size, suggesting that the species may have a relatively late age at maturity. The reproductive strategy of producing a single pup following an extended 10–12 month gestation period indicates that the species has a low productivity and is likely to be highly susceptible to overexploitation. Due to such low fecundity, fishing pressure and its important contribution to artisanal fisheries, the Golden Cownose Ray is considered to be Near Threatened throughout its range. An assessment of the species' current population status and monitoring of catches throughout its range is of priority.

ORDER **RAJIFORMES**

FAMILY **MOBULIDAE**

Family synopsis: *6 species (1 VU; 3 NT; 2 DD)*

Giant Manta Ray

Manta birostris (Donndorff, 1798)

Red List Assessment: **Global: Vulnerable A2abd+3bd+4abd** (Marshall, A.D., Bennett, M.B., Kodja, G., Hinojosa-Alvarez, S.A., Galván-Magaña, F., Harding, M.R., Stevens, G. & Kashiwagi, T. 2011).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Northeast Pacific; Eastern Central Pacific.

Rationale: The Giant Manta Ray (*Manta birostris*), the largest living batoid, has a circumtropical and also semi-temperate distribution throughout the world's major oceans. However, within this broad range, actual populations appear to be sparsely distributed and highly fragmented. This is likely due to the specific resource and habitat needs of this species. Overall population size is unknown, but subpopulations appear to be small (~100–1,000 individuals). Only recently separated from the Reef Manta Ray (*M. alfredi*), little is currently known about this ray except that it is elusive and potentially highly migratory. The degree of interchange of individuals between subpopulations is unclear but is assumed to be low as there are currently no data that support such interchange despite active efforts to do so. As such, the decline of these small subpopulations may result in regional depletions or extinctions with the reduced possibility of successful recolonization. To aggravate this situation, this species has a very conservative life history with an extremely low reproductive output (one pup per litter). These biological constraints would also contribute to its slow or non-existent recovery from population reductions. Currently this species has a high value in international trade and directed fisheries exist that target this species in what is certain to be unsustainable numbers. Artisanal fisheries also exist that target this species for food and medicine. Individuals are also taken as bycatch in everything from large-scale fisheries to shark control programs/bather protection nets. The rate of population reduction appears to be high in several regions, as much as 80% over the last three generations (~75 years),

and globally a decline of >30% is strongly suspected. Sustained pressure from fishing (both directed and bycatch) has been isolated as the main cause of these declines. Certain monitored subpopulations appear to have been depleted, such as in the Philippines, Indonesia, and parts of Mexico and are believed to be decreasing in other areas such as India and Sri Lanka as a result of sustained pressure from fishing. Of particular concern is the targeting of this species at critical habitats or well known aggregation sites where numerous individuals can be targeted with relatively low CPUE. Dive tourism involving this species is a growing industry and it has been demonstrated that sustainable tourism significantly enhances the economic value of such species in comparison to short-term returns from fishing. Tourism-related industries can also negatively impact individual behavior, entire populations, and critical habitat for this species, thus the responsible development of these industries is recommended.

Atlantic Devilray

Mobula hypostoma (Bancroft, 1831)

Red List Assessment: **Global: Data Deficient** (Bizzarro, J.J., Smith, W.D., Baum, J.K., Domingo, A. & Menni, R. 2009).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Atlantic Devilray (*Mobula hypostoma*) is endemic to the Western Atlantic, found from North Carolina, USA, to northern Argentina, including the Gulf of Mexico, and the Greater and Lesser Antilles. This small-sized devil ray (reaches a maximum size of 120 cm DW) is primarily pelagic in coastal waters, although it occasionally enters oceanic waters. It is taken as bycatch in longline, net, and possibly other fisheries, but very little specific information is currently available on its capture, abundance, and population trends from across its range. Although trawl survey data from the east coast of the U.S. suggests possible increasing trends there, this represents the northern extent of its range, and further information is required on its abundance and interaction with fisheries from the Caribbean Sea and South America. This species is therefore assessed as Data Deficient until population trends and the impact of fisheries can be determined.

Spinetail Devilray

Mobula japanica (Müller & Henle, 1841)

Red List Assessment: **Global: Near Threatened** (White, W.T., Clark, T.B., Smith, W.D. & Bizzarro, J.J. 2006).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Spinetail Devilray (*Mobula japanica*) is probably circumglobal in all temperate and tropical seas, but its distribution is not completely defined. It is a large devil ray (reaching 310 cm DW) of inshore, offshore, and possibly oceanic environments. The Spinetail Devilray is highly susceptible to gillnets and is known to be landed in Indonesia, Mexico, the Philippines, and likely elsewhere across its range. It is a common component of the inshore pelagic tuna gillnet fishery in Indonesia where the flesh and gill rakers are utilized. The high value of gill rakers, which are dried and exported for the Asian medicinal market, has resulted in recent dramatic increases in fishing for mobulids in Indonesia with targeting now occurring. In the Gulf of California, Mexico, the species is also landed when targeted with harpoons and as bycatch from gillnets. In the Philippines, the species was historically targeted in a mixed mobulid fishery, and while a ban on fishing for devil rays is presently in place, enforcement is insufficient and landings still occur. Information on catches is not available from other parts of its range, but it is likely being captured elsewhere, certainly in Southeast Asia where target fisheries for Whale Sharks (*Rhincodon typus*) and manta rays (*Manta* species) operate. While few species composition data are available (limiting the assessment of current fishing pressures on populations), increased targeting and catches in Indonesia, which may mirror increases elsewhere, is cause for great concern and requires urgent international conservation measures as the species is unlikely to be able to tolerate present levels of exploitation. Its large size and fecundity of a single pup per litter emphasizes the limited reproductive potential and low productivity of this species. The Spinetail Devilray is assessed as Near Threatened globally, but

Vulnerable throughout Southeast Asia where catches and demand are increasing. Vulnerable listings may also be warranted elsewhere if future studies show declines in populations where fished.

Pygmy Devilray

Mobula munkiana Notarbartolo-di-Sciara, 1987

Red List Assessment: **Global: Near Threatened** (Bizzarro, J.J., Smith, W.D. & Clark, T.B. 2006).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Pygmy Devilray (*Mobula munkiana*) is a recently described inshore devil ray which is known to form large aggregations. It is endemic to the Eastern Pacific from the Gulf of California, Mexico to Peru and reaches 110 cm DW. It is listed as Near Threatened due to its episodically high catch rates from gillnet fisheries, restricted range, and low reproductive potential. The large schools, migratory nature, and demersal feeding of the Pygmy Devilray make it highly susceptible to coastal demersal gillnet fisheries throughout its range. Fishery information for this species is limited to the Gulf of California, Mexico, where it is landed in a mixed mobulid fishery south of La Paz and in nearshore artisanal elasmobranch fisheries throughout the Gulf of California. A fecundity of one pup per female emphasizes the limited reproductive potential and low productivity of this species. Sporadically high landings (>60 per gillnet) in the northern Gulf of California stress the vulnerability of the Pygmy Devilray to bottom-set gillnets and the extreme fluctuations in its local abundance. Life history characteristics, limited distribution, and exposure to many fisheries due to its highly migratory nature will likely result in designation of the species as Vulnerable should additional fisheries details become available.

Sicklefin Devilray

Mobula tarapacana (Philippi, 1892)

Red List Assessment: **Global: Data Deficient** (Clark, T.B., Smith, W.D. & Bizzarro, J.J. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic; Eastern Central Pacific.

Rationale: The Sicklefin Devilray (*Mobula tarapacana*) is probably circumglobal in temperate and tropical waters but at present it is known from scattered locations in the Indian, Pacific, and Atlantic Oceans. It is a large devil ray (reaching 370 cm DW) of primarily oceanic occurrence, but occasionally found in coastal waters. The threat from coastal fisheries in Mexico, Indonesia, the Philippines, and elsewhere where mobulids are captured is more limited for this species given its apparent offshore habitat. However, the species is landed in Indonesia where the catch of mobulids is increasing due to the high value of gill rakers for the Asian medicinal market. Apart from being taken as bycatch of the inshore pelagic tuna gillnet fisheries and purse seine fisheries, mobulids are increasingly being targeted in Indonesia. Although information is lacking it is most likely taken elsewhere in its Asian range (e.g. Taiwan). In studies of mobulid catches in the Gulf of California (Mexico) and the Philippines, the Sicklefin Devilray represented a minor part of landings. Given its more pelagic occurrence than other mobulids and its apparent ichthyophagous diet, its capture on longlines requires investigation. The effect of the long-term use of high seas gillnet and longline fisheries is not known for this species, but the deleterious impacts of such fishing practices on populations of other large elasmobranchs is well known. This is, however, one of the least known mobulids and the lack of population data and exploitation rates preclude a global assessment beyond Data Deficient at this time. Increasing catches of mobulids in Indonesia, which may mirror increases elsewhere, is of great concern for a species not likely to be able to tolerate high catch levels due to its low reproductive potential (fecundity of one pup per litter). As such, present catch levels in Southeast Asia together with increasing demand in that region warrant a Vulnerable listing there.

Bentfin Devilray

Mobula thurstoni (Lloyd, 1908)

Red List Assessment: **Global: Near Threatened** (Clark, T.B., Smith, W.D. & Bizzarro, J.J. 2006).

Regional Occurrence: Eastern Central Pacific.

Rationale: The Bentfin Devilray (*Mobula thurstoni*) is probably circumglobal in all temperate and tropical seas, but its distribution is not completely defined. It is usually pelagic in shallow, neritic waters (<100 m). The Bentfin Devilray is highly susceptible to gillnets and is known to be landed in Indonesia, Mexico, the Philippines, and likely elsewhere across its range. It is a component of the inshore pelagic tuna gillnet fishery in Indonesia where the flesh and gill rakers are utilized. The high value of gill rakers, which are dried and exported for the Asian medicinal market, has resulted in recent dramatic increases in fishing for mobulids in Indonesia with targeting now occurring. In the Gulf of California, Mexico, the species is landed in directed artisanal elasmobranch fisheries and as bycatch. In the Philippines, the species was historically targeted in a mixed mobulid fishery, and while a ban on fishing for devil rays is presently in place, enforcement is insufficient and landings still occur. Information on catches is not available from other parts of its range, but it is likely being captured elsewhere, certainly in Southeast Asia where target fisheries for Whale Sharks (*Rhincodon typus*) and manta rays (*Manta* species) operate. While little species composition data are available, limiting the assessment of current fishing pressures on populations, increased targeting and catches in Indonesia, which may mirror increases elsewhere, is cause for great concern and requires urgent international conservation measures as the species is unlikely to be able to tolerate present levels of exploitation. Its large size (to 180 cm DW) and fecundity of a single pup per litter emphasizes the limited reproductive potential and low productivity of this species. The Bentfin Devilray is assessed as Near Threatened globally, but Vulnerable throughout Southeast Asia where catches and demand are increasing. Vulnerable listings may also be warranted elsewhere if future studies show declines in populations where fished.

7.3 Chimaeras

ORDER	**CHIMAERIFORMES**
FAMILY	**RHINOCHIMAERIDAE**
	Family synopsis: *2 species (LC)*

Narrownose Chimaera

Harriotta raleighana Goode & Bean, 1895

Red List Assessment: **Global: Least Concern** (Dagit, D.D. 2006).

Regional Occurrence: Northwest Atlantic; Northeast Pacific; Eastern Central Pacific.

Rationale: The Narrownose Chimaera (*Harriotta raleighana*) appears to be the only chimaeroid with a widespread, global distribution. It occurs in deep waters of the continental slopes in depths of 380–2,600 m in both the Atlantic and Pacific Oceans, and also in the Indian Ocean (off southern Australia). It seems to be somewhat common in the North Atlantic, Northwest Pacific, and Southwest Pacific, although very little is known about the biology of this species. It is oviparous but nothing is known of spawning and reproduction and very few juveniles have been collected. As with many other chimaeroids, adults and juveniles may occupy different habitats. It is known to be captured in deepwater research trawls and as bycatch in deepwater commercial trawls. Data from the South Tasman Rise Trawl Fishery (south of Tasmania, Australia) indicates that this species is a negligible component of bycatch. Increased deepwater trawl fisheries could pose a potential threat to habitats and populations in the future. At present this species appears to be widespread geographically and bathymetrically and relatively abundant with no immediate threats to the population and is thus classified as Least Concern. However, bycatch data from other fisheries and the monitoring of expanding deepwater fisheries are required.

Spearnose Chimaera

Rhinochimaera atlantica Holt & Byrne, 1909

Red List Assessment: **Global: Least Concern** (Dagit, D.D. & Compagno, L.J.V. 2006).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The deepwater Spearnose Chimaera (*Rhinochimaera atlantica*) appears to be widespread throughout the Atlantic at depths of ~500–1,500 m and may be more widespread in deeper waters than is presently known. Nothing is known with regard to behavior, feeding, and reproduction, and no information is available on population structure. It is not known to be commercially exploited, and although it is not currently reported as bycatch, this species is known to occasionally occur in deepwater research trawls and almost certainly occurs as bycatch in some deepwater fishing activities. At present it is likely the species is most abundant beyond the range of most deepwater commercial fisheries. Given its wide distribution and depth range, the species is assessed as Least Concern, although it could be potentially threatened in the future by expanding deepwater demersal fisheries. Collection of data on size, sex, and depth is recommended to improve understanding of population size and structure and life history. Furthermore, the monitoring of bycatch should be undertaken.

ORDER **CHIMAERIFORMES**

FAMILY **CHIMAERIDAE**

Family synopsis: *6 species (1 NT; 3 LC; 2 DD)*

Bahamas Ghostshark

Chimaera bahamaensis Kemper, Ebert, Didier & Compagno, 2010

Red List Assessment: **Global: Data Deficient** (Kemper, J.M. & Ebert, D.A. 2011).

Regional Occurrence: Western Central Atlantic.

Rationale: The Bahamas Ghostshark (*Chimaera bahamaensis*) is known from only one specimen collected east of Andros Island in the Bahamas at a depth of 1,483–1,506 m and is therefore assessed as Data Deficient. Nothing is known about its biology, ecology, or population size or structure. It is not currently caught in commercial fisheries, as there are no deepwater commercial fisheries currently in the Bahamas that go to the depth range of this species. Further information needs to be collected including biological data, life history information, and population size, to better assess this species' conservation status.

Cuban Chimaera

Chimaera cubana Howell-Rivero, 1936

Red List Assessment: **Global: Data Deficient** (Dagit, D.D. & Caldas, J.P. 2006).

Regional Occurrence: Western Central Atlantic.

Rationale: The Cuban Chimaera (*Chimaera cubana*) is a regional endemic species restricted to the Western Central Atlantic, specifically the Caribbean off Cuba, Puerto Rico, the Lesser Antilles, and Columbia. This species may be more widespread in the Caribbean; however, information is currently unavailable with regard to possible captures off other countries of northern South America and Central America. It is known from 234–360 m depth off Colombia, but occurs in a wider depth range (270–450 m) in other parts of the Caribbean, and perhaps even in deeper waters. it is not commercially targeted or utilized but potentially threatened as bycatch in deepwater longline fisheries off Columbia. At present this species seems to occur at the limit or just outside the depth range of most fisheries in the region. Nothing is known of population size, structure or life history although recent captures from Columbia indicate the aggregation of this species in specific habitats perhaps for feeding or reproduction. More information on captures throughout the range is needed and it is recommended that efforts be made to collect basic data on all captures in an effort to increase understanding of the population and life history trends.

Atlantic Chimaera

Hydrolagus affinis (Capello, 1867)

Red List Assessment: **Global: Least Concern** (Dagit, D.D. & Clarke, M.W. 2007).

Regional Occurrence: Northwest Atlantic.

Rationale: The Atlantic Chimaera (*Hydrolagus affinis*) is a deepwater slope, seamount, and seaplain dwelling fish reported at depths of 300–2,410 m (most commonly found below 1,000 m). This species appears to be widespread in the North Atlantic. Almost nothing is known of population size, biology, and reproduction in this species and most captures are large adults near or >100 cm TL. It is likely a slow growing species with low fecundity. Not commonly captured except in deepwater research trawls and occasionally as bycatch in deepwater commercial trawls, but it is potentially threatened by emerging deepwater commercial trawl fisheries in the North Atlantic. However, this species is present deeper than the main fisheries operating within its range and it is therefore considered Least Concern. Furthermore, it may be distributed at greater

depths than currently reported offering a deep refuge from fishing pressure. Although it is considered unlikely that fisheries will ever target this species due to its low abundance, studies of population size, age, and growth are highly recommended as this may be a slow growing species that could be affected by bycatch.

Spotted Ratfish

Hydrolagus colliei (Lay & Bennett, 1839)

Red List Assessment: **Global: Least Concern** (Dagit, D.D. 2006).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Spotted Ratfish (*Hydrolagus colliei*) is a common species found in nearshore waters to depths of 913 m along the west coast of North America from southwestern Alaska to Baja California, Mexico (including the Gulf of California). This species appears to be abundant throughout most of its range, although not common in Alaskan waters. One of the best studied of all chimaeroid fishes, life history studies indicate segregation of populations by size and sex, and seasonal abundance in parts of its range. Limited information on reproduction indicates that eggs are laid in pairs every 10–14 days over a period of several months with development taking up to 12 months. Available fisheries data from the Northeast Pacific indicates that this species comprises a large proportion of the vertebrate biomass in Puget Sound, although reported catches from California, Oregon, and Washington State are very small. The Spotted Ratfish is not a targeted species and appears to be collected and utilized only locally in the Northeast Pacific and is taken as a bycatch in commercial trawl fisheries. This species is rarely landed from the Gulf of California where it appears to inhabit waters at depths >180 m. Evidence does not suggest that the small local fishery and/or bycatch are affecting the population in the Gulf of California. Given its wide distribution, depth range, abundance in some areas, and evidence to suggest that the impact of fisheries is minimal, the species is assessed as Least Concern.

Eastern Pacific Black Ghostshark

Hydrolagus melanophasma James, Ebert, Long & Didier, 2009

Red List Assessment: **Global: Least Concern** (James, K.C. & Ebert, D.A. 2011).

Regional Occurrence: Northeast Pacific; Eastern Central Pacific.

Rationale: The Eastern Pacific Black Ghostshark (*Hydrolagus melanophasma*) is a deepwater species (to 1,667 m depth) occurring in the Eastern Pacific from southern California, Mexico (including Baja California and the Gulf of California), Ecuador, and possibly Chile. This species is listed as Least Concern because there are currently no significant deepwater fisheries occurring within its range and no commercial interest in this species. In combination with its fairly large geographic range, it can be inferred that there are no threats to this species.

Large-eyed Rabbitfish

Hydrolagus mirabilis (Collett, 1904)

Red List Assessment: **Global: Near Threatened** (Dagit, D.D., Compagno, L.J.V. & Clarke, M.W. 2007).

Regional Occurrence: Northwest Atlantic; Western Central Atlantic.

Rationale: The Large-eyed Rabbitfish (*Hydrolagus mirabilis*) is a poorly known deepwater slope species occurring at depths of 450–1,933 m. It is known most commonly from the Northeast Atlantic on deep slopes off Iceland, Ireland, the Hebrides, and Scotland but also reported from the Eastern Central Atlantic off northwestern Africa and recently from Namibia. It is also known from the Gulf of Mexico and Suriname and the species may be more widespread in the Atlantic than previously reported. It is likely that this species is widespread throughout the North Atlantic and may be most abundant at deeper depths. Not presently commercially fished and no data exist on bycatch but potentially threatened by increased deepwater fishing efforts.

Nothing is known of population structure, ecology, and reproduction although it is likely this species shares similar life history traits with other *Hydrolagus* species (e.g. the Spotted Ratfish *H. colliei*). It is recommended that data be collected from all incidental captures to improve understanding of this species. It has a shallower depth range than its congeners and is therefore more vulnerable to deepwater fisheries operating within its range in the Northeast Atlantic. Heavy fishing pressure within its sampled depth range in the Eastern Atlantic gives cause for suspected past and future declines. A precautionary assessment of Near Threatened is assigned on this basis, due to concern that it may qualify for Vulnerable A4d.

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Appendix I: Red List status of North American, Central American, and Caribbean sharks, batoids, and chimaeras (in alphabetical order by genus)

Species	Common name	Regional occurrence[1]	Global Red List category[2]	Subpopulation and/or regional Red List category[3] (if applicable)	Species account page number
SHARKS					
Alopias pelagicus	Pelagic Thresher Shark	Pac	VU		46
Alopias superciliosus	Bigeye Thresher Shark	Atl; Pac	VU	NW & W Central Atlantic (Reg.): EN; E Central Pacific (Reg.): VU	46
Alopias vulpinus	Common Thresher Shark	Atl; Pac	VU	NW & W Central Atlantic (Reg.): VU; E Central Pacific (Reg.): NT	47
Apristurus brunneus	Brown Catshark	Pac	DD		52
Apristurus canutus	Hoary Catshark	Atl	DD		52
Apristurus kampae	Longnose Catshark	Pac	DD		52
Apristurus laurussonii	Iceland Catshark	Atl	DD		52
Apristurus manis	Ghost Catshark	Atl	LC		53
Apristurus melanoasper	Black Roughscale Catshark	Atl	DD		53
Apristurus microps	Smalleye Catshark	Atl	LC		53
Apristurus nasutus	Largenose Catshark	Pac	DD		54
Apristurus parvipinnis	Smallfin Catshark	Atl	DD		54
Apristurus profundorum	Deepwater Catshark	Atl	DD		54
Apristurus riveri	Broadgill Catshark	Atl	DD		54
Apristurus stenseni	Panama Ghost Catshark	Pac	DD		55
Carcharhinus acronotus	Blacknose Shark	Atl	NT		65
Carcharhinus albimarginatus	Silvertip Shark	Pac	NT		65
Carcharhinus altimus	Bignose Shark	Atl; Pac	DD	NW Atlantic (Reg.): NT	66
Carcharhinus brachyurus	Copper Shark	Pac	NT	E Pacific (Reg.): DD	66
Carcharhinus brevipinna	Spinner Shark	Atl	NT	NW Atlantic (Sub.): VU	67
Carcharhinus falciformis	Silky Shark	Atl; Pac	NT	NW & W Central Atlantic (Reg.): VU; E Central & SE Pacific (Reg.): VU	67
Carcharhinus galapagensis	Galapagos Shark	Atl; Pac	NT		68
Carcharhinus isodon	Finetooth Shark	Atl	LC	U.S. Atlantic & Gulf of Mexico (Sub.): LC	68
Carcharhinus leucas	Bull Shark	Atl; Pac	NT		69
Carcharhinus limbatus	Blacktip Shark	Atl; Pac	NT	NW Atlantic (Sub.): VU	69
Carcharhinus longimanus	Oceanic Whitetip Shark	Atl; Pac	VU	NW & W Central Atlantic (Reg.): CR	69
Carcharhinus obscurus	Dusky Shark	Atl; Pac	VU	NW & W Central Atlantic (Sub.); EN	70
Carcharhinus perezi	Caribbean Reef Shark	Atl	NT		70
Carcharhinus plumbeus	Sandbar Shark	Atl	VU		71
Carcharhinus porosus	Smalltail Shark	Atl; Pac	DD		71
Carcharhinus signatus	Night Shark	Atl	VU		72
Carcharias taurus	Sand Tiger	Atl	VU		44
Carcharodon carcharias	Great White Shark	Atl; Pac	VU		49
Centrophorus acus	Needle Dogfish	Atl	NT	W Central Atlantic (Sub.): DD	30
Centrophorus granulosus	Gulper Shark	Atl	VU	W Atlantic (Reg.): DD	31
Centrophorus niaukang	Taiwan Gulper Shark	Atl	NT		31
Centrophorus tessellatus	Mosaic Gulper Shark	Atl	DD		31
Centroscyllium fabricii	Black Dogfish	Atl	LC		32
Centroscyllium nigrum	Combtooth Dogfish	Pac	DD		33
Centroscymnus coelolepis	Portuguese Dogfish	Atl	NT		37
Centroscymnus owstoni	Roughskin Dogfish	Atl	LC		37
Cephaloscyllium ventriosum	Swellshark	Pac	LC		55

Species	Common name	Regional occurrence[1]	Global Red List category[2]	Subpopulation and/or regional Red List category[3] (if applicable)	Species account page number
SHARKS (continued)					
Cephalurus cephalus	Lollipop Catshark	Pac	DD		55
Cetorhinus maximus	Basking Shark	Atl; Pac	VU	N Pacific (Sub.): EN	49
Chlamydoselachus anguineus	Frilled Shark	Pac	NT		26
Cirrhigaleus asper	Roughskin Spurdog	Atl	DD		28
Dalatias licha	Kitefin Shark	Atl	NT		39
Deania profundorum	Arrowhead Dogfish	Atl	LC		32
Echinorhinus brucus	Bramble Shark	Atl	DD		28
Echinorhinus cookei	Prickly Shark	Pac	NT		28
Eridacnis barbouri	Cuban Ribbontail Catshark	Atl	DD		59
Etmopterus bigelowi	Blurred Smooth Lanternshark	Atl	LC		33
Etmopterus bullisi	Lined Lanternshark	Atl	DD		33
Etmopterus carteri	Cylindrical Lanternshark	Atl	DD		34
Etmopterus gracilispinis	Broadband Lanternshark	Atl	LC		34
Etmopterus hillianus	Caribbean Lanternshark	Atl	LC		34
Etmopterus perryi	Dwarf Lanternshark	Atl	DD		35
Etmopterus princeps	Great Lanternshark	Atl	DD		35
Etmopterus pusillus	Smooth Lanternshark	Atl	LC		35
Etmopterus robinsi	West Indian Lanternshark	Atl	LC		36
Etmopterus schultzi	Fringefin Lanternshark	Atl	LC		36
Etmopterus virens	Green Lanternshark	Atl	LC		36
Euprotomicrus bispinatus	Pygmy Shark	Pac	LC		39
Galeocerdo cuvier	Tiger Shark	Atl; Pac	NT		73
Galeorhinus galeus	Soupfin Shark	Pac	VU	EN Pacific (Reg.): LC	60
Galeus antillensis	Antilles Catshark	Atl	DD		55
Galeus arae	Roughtail Catshark	Atl	LC		56
Galeus cadenati	Longfin Sawtail Catshark	Atl	DD		56
Galeus piperatus	Peppered Catshark	Pac	LC		56
Galeus springeri	Springer's Sawtail Catshark	Atl	DD		57
Ginglymostoma cirratum	Nurse Shark	Atl; Pac	DD	W Atlantic (Sub.): NT; USA & Bahamas (Reg.): LC	42
Heptranchias perlo	Sharpnose Sevengill Shark	Atl	NT		26
Heterodontus francisci	Horn Shark	Pac	DD		41
Heterodontus mexicanus	Mexican Hornshark	Pac	DD		42
Hexanchus griseus	Bluntnose Sixgill Shark	Atl; Pac	NT		27
Hexanchus nakamurai	Bigeye Sixgill Shark	Atl	DD		27
Isistius brasiliensis	Cookiecutter Shark	Atl; Pac	LC		40
Isistius plutodus	Largetooth Cookiecutter Shark	Atl	LC		40
Isogomphodon oxyrhynchus	Daggernose Shark	Atl	CR		73
Isurus oxyrinchus	Shortfin Mako	Atl; Pac	VU	Atlantic (Sub.): VU; EN Pacific (Sub.): NT	49
Isurus paucus	Longfin Mako	Atl; Pac	VU		50
Lamna ditropis	Salmon Shark	Pac	LC		51
Lamna nasus	Porbeagle	Atl	VU	NW Atlantic (Sub.): EN	51
Megachasma pelagios	Megamouth Shark	Pac	DD		46
Mitsukurina owstoni	Goblin Shark	Atl; Pac	LC		45
Mustelus albipinnis	Whitefin Smoothhound	Pac	DD		61
Mustelus californicus	Gray Smoothhound	Pac	LC		61
Mustelus canis	Dusky Smoothhound	Atl	NT		61
Mustelus dorsalis	Sharpnose Smoothhound	Pac	DD		62
Mustelus henlei	Brown Smoothhound	Pac	LC		62

Species	Common name	Regional occurrence[1]	Global Red List category[2]	Subpopulation and/or regional Red List category[3] (if applicable)	Species account page number
SHARKS (continued)					
Mustelus higmani	Smalleye Smoothhound	Atl	LC		62
Mustelus lunulatus	Sicklefin Smoothhound	Pac	LC		63
Mustelus minicanis	Venezuelan Dwarf Smoothhound	Atl	DD		63
Mustelus norrisi	Narrowfin Smoothhound	Atl	DD		63
Mustelus sinusmexicanus	Gulf of Mexico Smoothhound	Atl	DD		64
Nasolamia velox	Whitenose Shark	Pac	DD		73
Negaprion brevirostris	Lemon Shark	Atl; Pac	NT		74
Notorynchus cepedianus	Broadnose Sevengill Shark	Pac	DD	E Pacific (Sub.): NT	27
Odontaspis ferox	Smalltooth Sand Tiger	Atl; Pac	VU		44
Odontaspis noronhai	Bigeye Sand Tiger	Atl	DD		45
Oxynotus caribbaeus	Caribbean Roughshark	Atl	DD		38
Parmaturus campechiensis	Campeche Catshark	Atl	DD		57
Parmaturus xaniurus	Filetail Catshark	Pac	DD		57
Prionace glauca	Blue Shark	Atl; Pac	NT		74
Pristiophorus schroederi	Bahamas Sawshark	Atl	DD		41
Pseudocarcharias kamoharai	Crocodile Shark	Pac	NT		45
Pseudotriakis microdon	False Catshark	Atl	DD		60
Rhincodon typus	Whale Shark	Atl; Pac	VU		43
Rhizoprionodon lalandii	Brazilian Sharpnose Shark	Atl	DD		74
Rhizoprionodon longurio	Pacific Sharpnose Shark	Pac	DD		75
Rhizoprionodon porosus	Caribbean Sharpnose Shark	Atl	LC		75
Rhizoprionodon terraenovae	Atlantic Sharpnose Shark	Atl	LC		76
Schroederichthys maculatus	Narrowtail Catshark	Atl	LC		58
Scyliorhinus boa	Boa Catshark	Atl	LC		58
Scyliorhinus hesperius	Whitesaddled Catshark	Atl	DD		58
Scyliorhinus meadi	Blotched Catshark	Atl	DD		58
Scyliorhinus retifer	Chain Catshark	Atl	LC		59
Scyliorhinus torrei	Dwarf Catshark	Atl	LC		59
Somniosus microcephalus	Greenland Shark	Atl	NT		37
Somniosus pacificus	Pacific Sleeper Shark	Pac	DD		38
Sphyrna corona	Mallethead Shark	Pac	NT		76
Sphyrna lewini	Scalloped Hammerhead	Atl; Pac	EN	NW & W Central Atlantic (Sub.): EN; E Central & SE Pacific (Sub.): EN	77
Sphyrna media	Scoophead Shark	Atl; Pac	DD		78
Sphyrna mokarran	Great Hammerhead	Atl; Pac	EN	NW Atlantic & Gulf of Mexico (Reg.): EN	78
Sphyrna tiburo	Bonnethead Shark	Atl; Pac	LC		79
Sphyrna tudes	Smalleye Hammerhead	Atl	VU		79
Sphyrna zygaena	Smooth Hammerhead	Atl; Pac	VU		79
Squaliolus laticaudus	Spined Pygmy Shark	Atl	LC		40
Squalus acanthias	Spiny Dogfish	Atl	VU	NW Atlantic (Sub.): EN	29
Squalus cubensis	Cuban Dogfish	Atl	DD		29
Squalus mitsukurii	Shortspine Spurdog	Atl	DD		30
Squalus suckleyi	North Pacific Spiny Dogfish	Pac	NE		30
Squatina californica	Pacific Angel Shark	Pac	NT		40
Squatina dumeril	Atlantic Angel Shark	Atl	DD		41

Species	Common name	Regional occurrence[1]	Global Red List category[2]	Subpopulation and/or regional Red List category[3] (if applicable)	Species account page number
SHARKS (continued)					
Triaenodon obesus	Whitetip Reef Shark	Pac	NT		76
Triakis semifasciata	Leopard Shark	Pac	LC		64
Zameus squamulosus	Velvet Dogfish	Atl	DD		38
BATOIDS					
Aetobatus narinari	Spotted Eagle Ray	Atl; Pac	NT		124
Amblyraja badia	Broad Skate	Pac	LC		96
Amblyraja hyperborea	Arctic Skate	Atl; Pac	LC		96
Amblyraja jenseni	Jenson's Skate	Atl	LC		97
Amblyraja radiata	Thorny Skate	Atl	VU	Canada (Reg.): VU; USA (Reg.): CR	97
Anacanthobatis americanus	American Legskate	Atl	DD		112
Anacanthobatis folirostris	Leafnose Legskate	Atl	DD		112
Anacanthobatis longirostris	Longnose Legskate	Atl	DD		113
Bathyraja abyssicola	Deepsea Skate	Pac	DD		90
Bathyraja aleutica	Aleutian Skate	Pac	LC		90
Bathyraja interrupta	Bering Skate	Pac	LC		91
Bathyraja kincaidii	Sandpaper Skate	Pac	DD		91
Bathyraja lindbergi	Commander Skate	Pac	LC		91
Bathyraja maculata	Whiteblotched Skate	Pac	LC		92
Bathyraja mariposa	Butterfly Skate	Pac	DD		92
Bathyraja microtrachys	Finespined Skate	Pac	LC		92
Bathyraja minispinosa	Smallthorn Skate	Pac	LC		93
Bathyraja parmifera	Alaska Skate	Pac	LC		93
Bathyraja richardsoni	Richardson's Skate	Atl	LC		93
Bathyraja spinicauda	Spinytail Skate	Atl	NT	NW Atlantic (Reg.): VU	94
Bathyraja spinosissima	Pacific White Skate	Pac	LC		94
Bathyraja taranetzi	Mudskate	Pac	LC		95
Bathyraja trachura	Roughtail Skate	Pac	LC		95
Bathyraja violacea	Okhotsk Skate	Pac	DD		95
Benthobatis marcida	Deepsea Blindray	Atl	LC		86
Breviraja claramaculata	Brightspot Skate	Atl	DD		98
Breviraja colesi	Lightnose Skate	Atl	DD		98
Breviraja mouldi	Blacknose Skate	Atl	DD		98
Breviraja nigriventralis	Blackbelly Skate	Atl	DD		99
Breviraja spinosa	Spinose Skate	Atl	DD		99
Cruriraja atlantis	Atlantic Legskate	Atl	DD		113
Cruriraja cadenati	Broadfoot Legskate	Atl	DD		113
Cruriraja poeyi	Cuban Legskate	Atl	DD		113
Cruriraja rugosa	Rough Legskate	Atl	DD		114
Dactylobatus armatus	Skilletskate	Atl	DD		99
Dactylobatus clarkii	Hookskate	Atl	DD		100
Dasyatis americana	Southern Stingray	Atl	DD	USA (Reg.): LC	118
Dasyatis centroura	Roughtail Stingray	Atl	LC	USA (Reg.): LC	118
Dasyatis dipterura	Diamond Stingray	Pac	DD	Mexico (Reg.): NT	119
Dasyatis geijskesi	Wingfin Stingray	Atl	NT		119
Dasyatis guttata	Longnose Stingray	Atl	DD		120
Dasyatis longa	Longtail Stingray	Pac	DD		120
Dasyatis sabina	Atlantic Stingray	Atl	LC		120
Dasyatis say	Bluntnose Stingray	Atl	LC		121
Diplobatis colombiensis	Colombian Electric Ray	Atl	VU		86
Diplobatis guamachensis	Brownband Numbfish	Atl	VU		86
Diplobatis ommata	Target Ray	Pac	VU		87
Diplobatis pictus	Painted Electric Ray	Atl	VU		87

Species	Common name	Regional occurrence[1]	Global Red List category[2]	Subpopulation and/or regional Red List category[3] (if applicable)	Species account page number
BATOIDS (continued)					
Dipturus bullisi	Tortugas Skate	Atl	DD		100
Dipturus garricki	San Blas Skate	Atl	DD		100
Dipturus laevis	Barndoor Skate	Atl	EN		100
Dipturus linteus	Sailskate	Atl	LC		101
Dipturus olseni	Spreadfin Skate	Atl	DD		101
Dipturus oregoni	Hooktail Skate	Atl	DD		101
Dipturus teevani	Caribbean Skate	Atl	DD		102
Fenestraja atripinna	Blackfin Pygmy Skate	Atl	DD		102
Fenestraja cubensis	Cuban Pygmy Skate	Atl	DD		102
Fenestraja ishiyamai	Plain Pygmy Skate	Atl	DD		102
Fenestraja plutonia	Pluto Skate	Atl	DD		103
Fenestraja sinusmexicanus	Gulf of Mexico Pygmy Skate	Atl	DD		103
Gurgesiella atlantica	Atlantic Pygmy Skate	Atl	DD		103
Gymnura altavela	Spiny Butterfly Ray	Atl	VU	USA (Reg.): LC	122
Gymnura crebripunctata	Longsnout Butterfly Ray	Pac	DD		122
Gymnura marmorata	California Butterfly Ray	Pac	LC		123
Gymnura micrura	Smooth Butterfly Ray	Atl	DD	USA (Reg.): LC	123
Himantura schmardae	Chupare Stingray	Atl	DD		121
Leucoraja erinacea	Little Skate	Atl	NT		103
Leucoraja garmani	Rosette Skate	Atl	LC		104
Leucoraja lentiginosa	Freckled Skate	Atl	DD		104
Leucoraja ocellata	Winter Skate	Atl	EN	USA (Reg.): VU	104
Leucoraja yucatanensis	Yucatan Skate	Atl	DD		105
Malacoraja senta	Smooth Skate	Atl	EN	Canada (Reg.): EN; USA (Reg.): NT	105
Malacoraja spinacidermis	Soft Skate	Atl	LC		106
Manta birostris	Giant Manta Ray	Atl; Pac	VU		127
Mobula hypostoma	Atlantic Devilray	Atl	DD		128
Mobula japanica	Spinetail Devilray	Pac	NT		128
Mobula munkiana	Pygmy Devilray	Pac	NT		129
Mobula tarapacana	Sicklefin Devilray	Atl; Pac	DD		129
Mobula thurstoni	Bentfin Devilray	Pac	NT		130
Myliobatis californica	Bat Ray	Pac	LC	Mexico (Reg.): DD	124
Myliobatis freminvillii	Bullnose Ray	Atl	DD		125
Myliobatis goodei	Southern Eagle Ray	Atl	DD		125
Myliobatis longirostris	Longnose Eagle Ray	Pac	NT		125
Narcine bancroftii	Caribbean Electric Ray	Atl	CR		87
Narcine entemedor	Giant Electric Ray	Pac	DD	Mexico (Reg.): NT	88
Narcine vermiculatus	Vermiculated Electric Ray	Pac	NT		88
Neoraja carolinensis	Carolina Pygmy Skate	Atl	DD		106
Platyrhinoidis triseriata	Thornback Ray	Pac	LC	Mexico (Reg.): DD	85
Pristis pectinata	Smalltooth Sawfish	Atl	CR		81
Pristis perotteti	Largetooth Sawfish	Atl	CR		81
Pseudoraja fischeri	Fanfin Skate	Atl	DD		96
Pteromylaeus asperrimus	Roughskin Bullray	Pac	DD		126
Pteroplatytrygon violacea	Pelagic Stingray	Atl; Pac	LC		121
Raja ackleyi	Ocellate Skate	Atl	DD		106
Raja bahamensis	Bahama Skate	Atl	DD		107
Raja binoculata	Big Skate	Pac	NT		107
Raja cervigoni	Venezuela Skate	Atl	NT		107
Raja cortezensis	Cortez Skate	Pac	DD		108
Raja eglanteria	Clearnose Skate	Atl	LC		108
Raja equatorialis	Equatorial Skate	Pac	DD		108

Species	Common name	Regional occurrence[1]	Global Red List category[2]	Subpopulation and/or regional Red List category[3] (if applicable)	Species account page number
BATOIDS (continued)					
Raja inornata	California Skate	Pac	DD		109
Raja rhina	Longnose Skate	Pac	LC		109
Raja stellulata	Pacific Starry Skate	Pac	LC		109
Raja texana	Roundel Skate	Atl	DD		110
Raja velezi	Rasptail Skate	Pac	DD		110
Rajella bathyphila	Deepwater Skate	Atl	LC		110
Rajella bigelowi	Bigelow's Skate	Atl	LC		111
Rajella fuliginea	Sooty Skate	Atl	LC		111
Rajella fyllae	Round Skate	Atl	LC		111
Rajella purpuriventralis	Purplebelly Skate	Atl	LC		112
Rhinobatos glaucostigma	Slatyspotted Guitarfish	Pac	DD		82
Rhinobatos lentiginosus	Atlantic Guitarfish	Atl	NT		82
Rhinobatos leucorhynchus	Whitenose Guitarfish	Pac	NT		82
Rhinobatos percellens	Southern Guitarfish	Atl	NT		83
Rhinobatos prahli	Gorgona Guitarfish	Pac	DD		83
Rhinobatos productus	Shovelnose Guitarfish	Pac	NT	USA (Reg.): LC	84
Rhinoptera bonasus	Cownose Ray	Atl	NT	USA (Reg.): LC	126
Rhinoptera steindachneri	Golden Cownose Ray	Pac	NT		127
Torpedo andersoni	Florida Torpedo Ray	Atl	DD		89
Torpedo californica	Pacific Torpedo Ray	Pac	LC		89
Torpedo nobiliana	Atlantic Torpedo Ray	Atl	DD		89
Torpedo tremens	Chilean Torpedo Ray	Pac	DD		90
Urobatis concentricus	Bullseye Stingray	Pac	DD		114
Urobatis halleri	Round Stingray	Pac	LC		114
Urobatis jamaicensis	Yellow Stingray	Atl	LC		115
Urobatis maculatus	Cortez Round Stingray	Pac	DD		115
Urotrygon aspidura	Roughtail Round Stingray	Pac	DD		115
Urotrygon chilensis	Thorny Round Stingray	Pac	DD		116
Urotrygon microphthalmum	Smalleyed Round Stingray	Atl	LC		116
Urotrygon munda	Shortfin Round Stingray	Pac	DD		116
Urotrygon nana	Dwarf Round Stingray	Pac	DD		116
Urotrygon reticulata	Reticulate Round Stingray	Pac	VU		117
Urotrygon rogersi	Lined Round Stingray	Pac	DD		117
Urotrygon simulatrix	Stellate Round Stingray	Pac	VU		117
Urotrygon venezuelae	Venezuela Round Stingray	Atl	NT		118
Zapteryx exasperata	Banded Guitarfish	Pac	DD		84
Zapteryx xyster	Southern Banded Guitarfish	Pac	DD		85
CHIMAERAS					
Chimaera bahamaensis	Bahamas Ghostshark	Atl	DD		132
Chimaera cubana	Cuban Chimaera	Atl	DD		132
Harriotta raleighana	Narrownose Chimaera	Atl; Pac	LC		131
Hydrolagus affinis	Atlantic Chimaera	Atl	LC		132
Hydrolagus colliei	Spotted Ratfish	Pac	LC		133
Hydrolagus melanophasma	Eastern Pacific Black Ghostshark	Pac	LC		133
Hydrolagus mirabilis	Large-eyed Rabbitfish	Atl	NT		133
Rhinochimaera atlantica	Spearnose Chimaera	Atl	LC		131

[1]Atl, Atlantic; Pac, Pacific; [2]CR, Critically Endangered; EN, Endangered; VU, Vulnerable; NT, Near Threatened; LC, Least Concern; DD, Data Deficient; NE, Not Evaluated; [3]Reg., Regional assessment; Sub., Subpopulation assessment (see Methodology Section).

Appendix II: Summary of the five criteria (A–E) used to evaluate if a taxon belongs in a threatened category

Use any of the criteria A–E	Critically Endangered	Endangered	Vulnerable
A. Population reduction	Declines measured over the longer of 10 years or 3 generations		
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3 & A4	≥ 80%	≥ 50%	≥ 30%
A1. Population reduction observed, estimated, inferred, or suspected in the past where the causes of the reduction are clearly reversible **AND** understood **AND** have ceased, based on and specifying any of the following: **(a)** direct observation **(b)** an index of abundance appropriate to the taxon **(c)** a decline in area of occupancy (AOO), extent of occurrence (EOO) and/or habitat quality **(d)** actual or potential levels of exploitation **(e)** effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.			
A2. Population reduction observed, estimated, inferred, or suspected in the past where the causes of reduction may not have ceased **OR** may not be understood **OR** may not be reversible, based on (a) to (e) under A1.			
A3. Population reduction projected or suspected to be met in the future (up to a maximum of 100 years) based on (b) to (e) under A1.			
A4. An observed, estimated, inferred, projected or suspected population reduction (up to a maximum of 100 years) where the time period must include both the past and the future, and where the causes of reduction may not have ceased **OR** may not be understood **OR** may not be reversible, based on (a) to (e) under A1.			
B. Geographic range in the form of either B1 (extent of occurrence) AND/OR B2 (area of occupancy)			
B1. Extent of occurrence (EOO)	< 100 km²	< 5,000 km²	< 20,000 km²
B2. Area of occupancy (AOO)	< 10 km²	< 500 km²	< 2,000 km²
AND at least 2 of the following:			
(a) Severely fragmented, **OR**			
Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline in any of: **(i)** extent of occurrence; **(ii)** area of occupancy; **(iii)** area, extent and/or quality of habitat; **(iv)** number of locations or subpopulations; **(v)** number of mature individuals.			
(c) Extreme fluctuations in any of: **(i)** extent of occurrence; **(ii)** area of occupancy; **(iii)** number of locations or subpopulations; **(iv)** number of mature individuals.			
C. Small population size and decline			
Number of mature individuals	< 250	< 2,500	< 10,000
AND either C1 or C2:			
C1. An estimated continuing decline of at least: (up to a max. of 100 years in future)	25% in 3 years or 1 generation	20% in 5 years or 2 generations	10% in 10 years or 3 generations
C2. A continuing decline **AND** (a) and/or (b):			
(a i) Number of mature individuals in each subpopulation: **or**	< 50	< 250	< 1,000
(a ii) % individuals in one subpopulation =	90–100%	95–100%	100%
(b) Extreme fluctuations in the number of mature individuals.			
D. Very small or restricted population			
Either:			
Number of mature individuals	< 50	< 250	**D1.** < 1,000
			AND/OR
VU D2. Restricted area of occupancy or number of locations with a plausible future threat that could drive the taxon to CR or EX in a very short time.			**D2.** typically: AOO < 20 km² or number of locations ≤ 5
E. Quantitative Analysis			
Indicating the probability of extinction in the wild to be:	≥ 50% in 10 years or 3 generations (100 years max.)	≥ 20% in 20 years or 5 generations (100 years max.)	≥ 10% in 100 years

Source: IUCN Standards and Petitions Subcommittee. 2011. Guidelines for Using the IUCN Red List Categories and Criteria. Version 9.0. Prepared by the Standards and Petitions Subcommittee. Downloadable from <http://www.iucnredlist.org/documents/RedListGuidelines.pdf>

Appendix III: List of assessors for Red List assessments contained in this report

Acuña, E.
Adams, W.F.
Almeida, M.P.
Almeida, Z.
Amorim, A.F.
Anderson, C.
Arauz, R.
Arfelli, C.A.
Asber, M.
Baker, K.D.
Barker, A.S.
Baum, J.K.
Bennett, M.B.
Bethea, D.M.
Bianchi, I.
Bizzarro, J.J.
Blasdale, T.
Bonfil, R.
Bradai, M.
Branstetter, S.
Brash, J.M.
Bucal, D.
Burgess, G.H.
Cailliet, G.M.
Caldas, J.P.
Carlisle, A.B.
Carlson, J.K.
Carvalho, M.R. de
Casper, B.M.
Castillo-Geniz, J.L.
Castro, A.L.F.
Cavanagh, R.D.
Charvet-Almeida, P.
Chiaramonte, G.E.
Chin, A.
Clark, T.B.
Clarke, M.W.
Clarke, S.C.
Cliff, G.
Clò, S.
Coelho, R.
Compagno, L.J.V.
Conrath, C.
Cook, S.F.
Correia, J.P.S.
Cortés, E.
Cronin, E.S.
Crozier, P.
Dagit, D.D.
Davis, C.D.
Denham, J.
Devine, J.A.
Dicken, M.
Domingo, A.
Duarte, A.
Ducrocq, M.
Dudley, S.F.J.
Duffy, C.A.J.
Dulvy, N.K.
Ebert, D.A.
Ellis, J.
Endicott, M.
Fagundes, L.
Faria, V.
Fergusson, I.K.
Ferretti, F.
Flaherty, A.
Flammang, B.E.
Fordham, S.V.
Fowler, S.L.
Francis, M.
Furtado, M.
Gerber, L.
Goldman, K.J.
Guallart, J.
Ha, D.S.
Haedrich, R.L.
Harding, M.R.
Herndon, A.P.
Heupel, M.R.
Hinojosa-Alvarez, S.A.
Holtzhausen, H.A.
Horodysky, A.Z.
Huveneers, C.
Gadig, O.B.F.
Gaibor, N.
Galván-Magaña, F.
Gedamke, T.
Gonzalez, M.
Gonzalez, P.
Gordon, I.
Graham, K.J.
Graham, R.T.
Grubbs, R.D.
Guallart, J.
Iglésias, S.
Ishihara, H.
James, K.C.
Jolón, M.
Jones, L.M.
Jorgensen, S.
Kashiwagi, T.
Kemper, J.M.
Kodja, G.
Kohin, S.
Kotas, J.E.
Kulka, D.W.
Kyne, P.M.
Lamilla, J.
Lamónaca, A.F.
Leandro, L.
Lemine Ould Sidi, M.
Lessa, R.
Lisney, T.J.
Litvinov, F.
Luer, C.
Macías, D.
Mancini, P.
Mancusi, C.
Marks, M.
Márquez-Farías, J.F.
Marshall, A.D.
Martínez-Ortíz, J.
Martins, P.
Massa, A.
McCord, M.E.
McCormack, C.
McEachran, J.D.
Medina, E.
Megalofonou, P.
Menni, R.
Montealegre-Quijano, S.
Monzini, J.
Morales, M.R.
Morey, G.
Morgan, A.
Motta, F.S.
Musick, J.A.
Mycock, S.G.
Myers, R.A.
Namora, R.C.
Navarro, S.S.
Neer, J.A.
Norman, B.
Notarbartolo-di-Sciara, G.
Oetinger, M.I.
Orlov, A.M.
Ormond, C.G.A.
Pasolini, P.
Paul, L.J.
Perez, M.
Pérez-Jiménez, J.C.
Piercy, A.N.
Pillans, R.
Pollard, D.
Reardon, M.B.
Robertson, R.
Robinson, H.J.
Rojas, R.
Romero, M.
Rosa, R.S.
Ruíz, C.
Samiengo, B.
Santana, F.M.
Seisay, M.
Serena, F.
Shepherd, T.
Sherrill-Mix, S.A.
Simpfendorfer, C.A.
Siu, S.
Smale, M.J.
Smith, A.
Smith, S.E.
Smith, W.D.
Snelson Jr., F.F.
Soldo, A.
Soriano-Velásquez, S.
Soto, J.
Stehmann, M.
Stenberg, C.
Stevens, G.
Stevens, J.D.
Sulikowski, J.A.
Sundström, L.F.
Tanaka, S.
Tous, P.
Trejo, T.
Ungaro, N.
Vacchi, M.
Valenti, S.V.
Villavicencio-Garayzar, C.
Vooren, C.M.
Walker, T.I.
White, W.T.
Williams, S.
Yano, K.
Zorzi, G.

The Conservation Status of North American, Central American, and Caribbean Chondrichthyans

Edited by

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Executive Summary

This report from the IUCN Shark Specialist Group includes the first compilation of conservation status assessments for the 282 chondrichthyan species (sharks, rays, and chimaeras) recorded from North American, Central American, and Caribbean waters. The status and needs of those species assessed against the IUCN Red List of Threatened Species criteria as threatened (Critically Endangered, Endangered, and Vulnerable) are highlighted. An overview of regional issues and a discussion of current and future management measures are also presented. A primary aim of the report is to inform the development of chondrichthyan research, conservation, and management priorities for the North American, Central American, and Caribbean region.

Results show that 13.5% of chondrichthyans occurring in the region qualify for one of the three threatened categories. These species face an extremely high risk of extinction in the wild (Critically Endangered; 1.4%), a very high risk of extinction in the wild (Endangered; 1.8%), or a high risk of extinction in the wild (Vulnerable; 10.3%). Sixteen (of 43) chondrichthyan families within the region contain one or more threatened species. A further 16.0% are classified as Near Threatened, 27.0% as Least Concern, and 43.4% as Data Deficient. The high proportion of Data Deficient species reveals serious information and knowledge gaps, despite the exceptional chondrichthyan research capacity in parts of the region.

Results, for the most part, reflect the global status of chondrichthyans. Three out of the four species classified as globally Critically Endangered are rays, including two species of sawfishes (arguably the most imperiled group of fishes worldwide). Species categorized as Endangered comprise two hammerhead sharks and three species of skates (a group of rays). The Vulnerable group of species consists of nine rays and 20 sharks. Additional subpopulation and regional threatened assessments highlight further concern locally for a variety of sharks and skates. No chimaeras were assessed as threatened.

Subregional analyses indicate that the proportion of threatened species is similar across the Northwest Atlantic (19.0%), the Western Central Atlantic (18.5%), the Northeast Pacific (16.7%), and the Eastern Central Pacific (15.2%). The Northeast Pacific, however, has a high proportion of Least Concern species (45.8%) compared to other subregions (19.9–30.4%), as well as a relatively low level of Data Deficient species (22.2% vs. 38.0–47.0%).

The North American, Central American, and Caribbean region as a whole is currently seeing significant improvements in shark and ray management and, at the same time, the primary threats to chondrichthyan species (overexploitation, excessive bycatch, and degradation of key habitats) continue. Recovered shark and ray populations and sustainable associated fisheries will require considerable immediate, concerted action across the region's research, conservation, fishing, policy-making, and enforcement communities. This report includes specific management and conservation recommendations to that end.

The IUCN Species Survival Commission Shark Specialist Group (SSG) was established in 1991 to promote the sustainable use, wise management, and conservation of the world's chondrichthyan fishes. The SSG has recently concluded its 10-year Global Shark Red List Assessment program by completing Red List assessments for all chondrichthyan species, an important baseline for monitoring the global status of sharks, rays, and chimaeras.

IUCN SSC Species Survival Commission
SHARK Specialist Group
CHARLES DARWIN UNIVERSITY Research Institute for the Environment and Livelihoods
TRaCK Tropical Rivers and Coastal Knowledge
SFU
NOAA
MOTE MARINE LABORATORY
THE OCEAN FOUNDATION
firedoll FOUNDATION