



Checklist of Chondrichthyans in Indian waters

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Abstract

Conservation, management and sustainable utilisation of biological resources depend on the accurate identification of exploited taxa, which emphasises the need for systematic taxonomic research. Chondrichthyans (sharks, rays, skates and chimaeras) are considered to be one of the most vulnerable exploited marine resources, however, the basic taxonomic study of these groups in Indian waters needs improvement to achieve better management for their sustainable exploitation. We discuss issues concerning chondrichthyan taxonomic research in India and provide an extended, updated checklist of chondrichthyans listed/reported from Indian waters, together with comments on their occurrence.

Keywords: *Chondrichthyans, checklist, taxonomy, status, India, diversity, management, conservation.*

Introduction

India has many different climatic, ecological and biogeographical zones, and diverse faunal and floral groups in its ecosystems. Conservation and management of this diversity is important to maintain the equilibrium of ecosystems and for their potential human usage. Conservation, management

and sustainable utilisation depend on the quantitative and qualitative assessment of biodiversity, taxonomic identity and understanding the taxa of concern (Narendran, 2001; Agnarsson and Kuntner, 2007; Prathapan *et al.*, 2009).

Large amounts of research funding and effort have been invested to provide an inventory of the biodiversity of India. However, our current taxonomic and systematic knowledge on certain groups are inadequate, scattered and mostly unorganised (Narendran, 2001; Hariharan and Balaji, 2002; Kumaran, 2002; Aravind *et al.*, 2004; Das *et al.*, 2006; James, 2010; Vishwanath and Linthoingambi, 2010; Wafar *et al.*, 2011). Understanding the fauna and its diversity in specific habitats/ecosystems/regions of the country, with their distribution patterns and phylogeography, is an important baseline for future studies and for the formulation of conservation and management plans.

Chondrichthyans include all cartilaginous fish species commonly called sharks, rays, skates and chimaeras. They are widely distributed in all the world's oceans, but are most diverse in the tropical and subtropical Indo-Pacific Ocean (Bonfil, 2002). Chondrichthyans are one of the most vulnerable groups due to their biological characteristics. Global concern over these apex predators is increasing as

high exploitation rates are decreasing their stocks (Smith *et al.*, 1998; Baum *et al.*, 2003; Garcia *et al.*, 2008; Dulvy *et al.*, 2014). Documenting chondrichthyans in specific regions and understanding their taxonomy and diversity in particular ecosystems are very important for conservation and management of these decreasing resources.

Chondrichthyan research is limited in India despite its rich diversity, long history and huge fishery. An impediment to chondrichthyan research in India is a lack of comprehensive taxonomic studies/revisions and conclusive checklists. This paper presents an extended, updated checklist of chondrichthyans reported from Indian waters, together with comments on their taxonomic status and validity of occurrence.

Material and methods

The chondrichthyan checklist presented in this paper is based on a review of available publications, monographs and catalogues on their diversity, taxonomy, life history (biology, food and feeding, stock assessments), ecology and fishery; along with reports of exploratory surveys from Indian seas. Chondrichthyans identified from field and exploratory surveys conducted during 2008-2013 by the authors and information shared by colleagues are also included in the list. Validity status and occurrence from the region was confirmed and evaluated following recent publications and Eschmeyer (2014). The IUCN assessment category (IUCN, 2013) for each species is also listed.

Results

Diversity and taxonomic status of Indian chondrichthyans

Chondrichthyans found in Indian waters have been catalogued by several researchers, but an exhaustive inventory remains elusive. Day (1889) reported 69 species, Misra (1952) reported 52, Misra (1969) reported 114 species and Talwar and Kacker (1984) reported 76 species. Raje *et al.* (2002) listed 110 elasmobranch species, Venkataraman *et al.* (2003) prepared a field identification handbook on sharks containing 72 species, and Raje *et al.* (2007) listed 84 elasmobranchs from the commercial fishery. These publications during different periods have therefore recorded between 52 and 114 species occurring in the Indian seas.

This study provides a checklist of 227 chondrichthyan species (from 11 orders and 41 families) recorded/listed from Indian seas (Table 1). In this combined list, 27 species (12%) have questionable status with regard to their occurrence because their distributional range does not fall within Indian seas as

per recent studies. For example, the yellow spotted catshark *Scyliorhinus capensis* (Smith, 1838) is known only from the southeast Atlantic Ocean and off South Africa in the Indian Ocean (Compagno, 1984) but is listed as occurring in India (Gunther, 1870; Day, 1878). A further 41 species (18%) listed from India need confirmation. These may have distributional ranges including India or parts of Indian seas, but require taxonomic reports for confirmation. Excluding species with uncertain status and several undescribed common species, the valid species from Indian waters total 155. This includes more than 40 additional species over those reported by previous workers (Raje *et al.*, 2007), but we believe the list is still incomplete.

Chondrichthyan species diversity in Indian seas is higher than that reported in many other tropical Indian Ocean countries or regions such as the Arabian Gulf (43 sharks) (Moore *et al.*, 2012), Sri Lanka (92 elasmobranchs) (Moron *et al.*, 1998; De Silva, 2006), Maldives (51 elasmobranchs) (Anderson and Hafiz, 2002) and Thailand (145 elasmobranchs) (Vidthayanon, 2002). However, a higher number (137-207 species) have been reported from Indonesia (White *et al.*, 2006; Fahmi, 2010).

The taxonomic problems with regard to Carcharhiniformes, Squaliformes and Myliobatiformes are yet to be resolved, which could lead to a greater known diversity in Indian seas. e.g., of the 24 squaliform shark species listed from India, 54% have uncertain status. The deep-sea chondrichthyans of India form a mostly overlooked group. Many species belonging to the same genera look alike and are possibly widely distributed. Genetic and specific morphological data are needed to clarify taxonomic status of deep-sea chondrichthyans from Indian waters.

Many descriptions of chondrichthyans from Indian waters by earlier ichthyologists have been synonymised or are considered invalid at present (Table 2). But, several such species have been recently revalidated by advanced studies with wider geographic sampling (Marshall *et al.*, 2009; Ebert *et al.*, 2010; White *et al.*, 2010a,b,c), which suggests many additional species could be revalidated through studies in the future.

Not all the species listed currently as being from India are available in collections, which increases the difficulty in resolving taxonomic issues. While the checklist was supposed to give the reference collection numbers (see Compagno *et al.*, 2005; Ebert *et al.*, 2013), the absence of Indian specimens and appropriate cataloguing hindered this effort. Clearly, national museums and reference collections should strive to have specimens of all the Indian species in custody.

The confusion and inconsistency in species identification due to the usage of invalid/misapplied names, complex taxonomic

histories and presence of several undescribed species in commercial fisheries, are impediments in resolving species listings. In turn, this results in poor reporting on catch, exports and management at a species level. There is also significant confusion persisting for similar-looking species occurring in Indian seas, which need to be critically studied and compared through collaborative studies.

Conservation status of Indian chondrichthyans

Excluding the species with uncertain status (questionable and those which need confirmation), the total number of Indian chondrichthyan species are 155, of which 3% are listed as Critically Endangered (CR), 5% are Endangered (EN), 26% are Vulnerable (VU), 21% are Near Threatened (NT), 8% are of Least Concern (LC), 27% are Data Deficient (DD) and 10% are Not Evaluated (NE) (Table 1, Fig. 1).

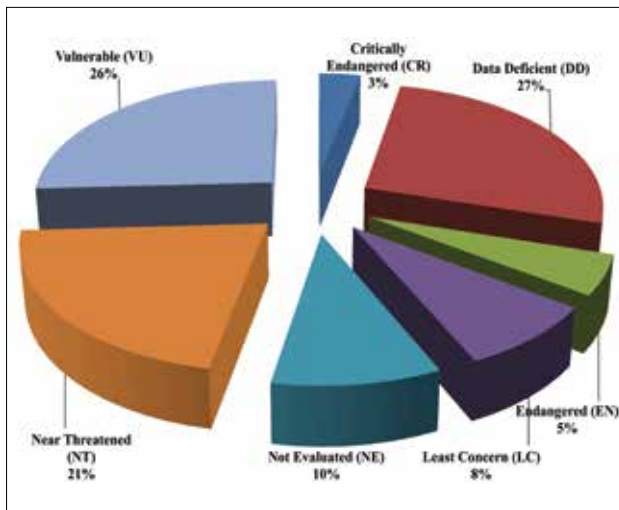


Fig 1. Conservation status of Indian chondrichthyans.

In 1999, the FAO developed a framework for the conservation of sharks, which recommended all States to prepare management policies and develop a National Plan of Action (NPOA) to identify information gaps, issues and priorities for the conservation and management of sharks. Despite several international commitments, there has been little action to better understand, manage and protect elasmobranch species in India other than the Indian Wildlife (Protection) Act, 1972. At present India does not have a National Plan of Action for the conservation and management of sharks, but the preparation of plans for regional management is underway. In 2013, shark finning was prohibited by the Ministry of Environment and Forests, Government of India.

The Indian Wildlife (Protection) Act, 1972 lists 10 elasmobranchs in Schedule I part 2(A) in MoEF, 2001, which have to be

identified accurately in the field to ensure their protection. But the absence of *Carcharhinus hemiodon* (Müller and Henle, 1839), *Glyphis glyphis* (Müller and Henle, 1839) and *Glyphis gangeticus* (Müller and Henle, 1839) in recent collections questions the availability of these species, the possibility of their extinction, or them being mis-identified (see Compagno *et al.*, 2003; Compagno, 2007; Compagno *et al.*, 2009). Another species listed in IWPA, 1972 is *Himantura fluviatilis* (Hamilton, 1822), which is considered as a junior synonym of *Pastinachus sephen* (Forsskål, 1775) (Eschmeyer, 2014). Recently *P. sephen* was considered as a complex with new species described and resolved (Last *et al.*, 2005, 2010 a,b), of which at least two are available in India. The National Biodiversity Action Plan (NBAP, 2008) has stated that the "implementation of Biological Diversity Act and National Environmental Policy 2006 would be difficult without having adequate number of trained taxonomists". Resolving taxonomic ambiguities is, thus, the first step towards evolving a comprehensive conservation plan for chondrichthyans from Indian waters.

Discussion

This century has been called the century of extinctions (Dubois, 2003, 2010). Over-exploitation and habitat degradation/alteration are major concerns causing biodiversity declines and extinction of species. There is an urgent need for cataloguing biodiversity before several species become extinct without humans even knowing of their existence. Proper identification of species is necessary for cataloguing and monitoring biodiversity (Vecchione and Collette, 1996), with taxonomic accuracy in reports, publications and datasets being crucial, because these form the foundation of management and policy (Kholia and Jenkins, 2011).

Recent taxonomic studies on chondrichthyans around the world (e.g. in Indonesia, Taiwan and Australia) have resulted in descriptions of many new species and have increased the resolution of species complexes (Last, 2007; Last *et al.*, 2008a,b; Last *et al.*, 2008a, b, 2010c). This suggests that a systematic taxonomic study of this group in Indian waters, with wide regional sampling, molecular studies, and comparisons would identify a greater diversity of this group and validate many of the currently used names in India.

In recent years, several species have been added to the elasmobranch faunal lists of Indian seas (Akhilesh *et al.*, 2010; Babu *et al.*, 2011; Benjamin *et al.*, 2012; Kizhakudan and Rajapackiam, 2013; Bineesh *et al.*, 2014) due to the extension of fishing to newer and deeper grounds. According to White and Last (2012), Indian waters are poorly known for its elasmobranch fauna and more scientific exploration and investigations are needed in the region. In particular,

examples and case studies in White and Last (2012) suggest the need for more studies with molecular support and wide geographical sampling which would validate several unrecognized species.

In recent years, the use of molecular and genetic data has allowed the discrimination of species with morphological similarity and overlapping characters. Hebert *et al.* (2003) proposed a global identification system for animals by using the mitochondrial gene, cytochrome c oxidase subunit 1 (COI) to differentiate the vast majority of animal species, including the discovery of new or cryptic species. DNA barcoding techniques (i.e., sequencing a region of mitochondrial cytochrome oxidase I gene) for rapid and accurate species identification including their life stages will be a useful tool. In India, such advanced technologies have been used on chondrichthyan by Pavan-Kumar *et al.* (2013) and Bineesh *et al.* (2014).

In this checklist, we have tried to include recent additions to chondrichthyan fauna, with recent taxonomic changes, but there still are many unrecognized species occurring in Indian seas

and several others with misapplied names. Research institutes and Universities in India should form a network for cataloguing marine biodiversity, with multinational and multi-institutional collaboration where necessary, in the interests of conservation.

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Table 1. Checklist of chondrichthyan reported/listed from Indian waters

Order /Family	Species	Validity in India	IUCN status (Global)
CHIMAERIFORMES			
RHINOCHIMAERIDAE	<i>Neoharriotta pinnata</i> (Schnakenbeck, 1931)		DD
	<i>Neoharriotta pumila</i> Didier & Stehmann, 1996	Needs confirmation	DD
	<i>Rhinochimaera atlantica</i> Holt & Byrne, 1909	Questionable	LC
	<i>Harriotta raleighana</i> Goode & Bean, 1895	Questionable	LC
CHIMAERIDAE	<i>Chimaera monstrosa</i> Linnaeus, 1758	Questionable	NT
	<i>Hydrolagus cf. africanus</i> (Gilchrist, 1922)		DD
HEXANCHIFORMES			
HEXANCHIDAE	<i>Hexanchus griseus</i> (Bonnaterre, 1788)		NT
	<i>Hexanchus nakamurai</i> Teng, 1962	Needs confirmation	DD
	<i>Heptranchias perlo</i> (Bonnaterre, 1788)		NT
	<i>Notorynchus cepedianus</i> (Péron, 1807)	Needs confirmation	DD
ORECTOLOBIFORMES			
HEMISCYLLIIDAE	<i>Chiloscyllium arabicum</i> Gubanov, 1980		NT
	<i>Chiloscyllium griseum</i> Müller & Henle, 1838		NT
	<i>Chiloscyllium indicum</i> (Gmelin, 1789)		NT
	<i>Chiloscyllium plagiosum</i> (Bennett, 1830)		NT
	<i>Chiloscyllium punctatum</i> Müller & Henle, 1838		NT
	<i>Chiloscyllium hasselti</i> Bleeker, 1852	Needs confirmation	NT
	<i>Chiloscyllium burmensis</i> Dingerkus & DeFino, 1983	Needs confirmation	DD
STEGOSTOMATIDAE	<i>Stegostoma fasciatum</i> (Hermann, 1783)		VU
GINGLYMOSTOMATIDAE	<i>Nebrius ferrugineus</i> (Lesson, 1831)		VU
	<i>Ginglymostoma cirratum</i> (Bonnaterre, 1788)	Questionable	DD
RHINCODONTIDAE	<i>Rhincodon typus</i> Smith, 1828		VU

LAMNIFORMES			
ODONTASPIDIIDAE	<i>Carcharias taurus</i> Rafinesque, 1810		VU
	<i>Odontaspis ferox</i> (Risso, 1810).		VU
	<i>Odontaspis noronhai</i> (Maul 1955)		DD
ALOPIIDAE	<i>Alopias pelagicus</i> Nakamura, 1935		VU
	<i>Alopias superciliosus</i> (Lowe, 1841)		VU
	<i>Alopias vulpinus</i> (Bonnaterre, 1788)		VU
LAMNIDAE	<i>Carcharodon carcharias</i> (Linnaeus, 1758)	Questionable	VU
	<i>Isurus oxyrinchus</i> Rafinesque, 1810		VU
	<i>Isurus paucus</i> Guitart Manday, 1966		VU
PSEUDOCARCHARIIDAE	<i>Pseudocarcharias kamoharai</i> (Matsubara, 1936)		NT
CARCHARHINIFORMES			
SCYLORHINIDAE	<i>Apristurus indicus</i> (Brauer, 1906)	Questionable	DD
	<i>Apristurus investigatoris</i> (Misra, 1962)		DD
	<i>Apristurus microps</i> (Gilchrist, 1922)	Questionable	LC
	<i>Apristurus saldanha</i> (Barnard, 1925)	Questionable	LC
	<i>Apristurus canutus</i> Springer & Heemstra, 1979	Questionable	DD
	<i>Atelomycterus marmoratus</i> (Anonymous [Bennett], 1830)	Need additional reports	NT
	<i>Cephaloscyllium silasi</i> (Talwar, 1974)		DD
	<i>Cephaloscyllium sufflans</i> (Regan, 1921)	Questionable	LC
	<i>Halaelurus buergeri</i> (Müller & Henle, 1838)	Questionable	DD
	<i>Halaelurus natalensis</i> (Regan, 1904)	Questionable	DD
	<i>Halaelurus quagga</i> (Alcock, 1899)		DD
	<i>Halaelurus boesemani</i> Springer & D'Aubrey, 1972	Needs confirmation	DD
	<i>Bythaelurus lutarius</i> (Springer & D'Aubrey, 1972)	Needs confirmation	DD
	<i>Bythaelurus hispidus</i> (Alcock, 1891)		DD
	<i>Holohalaelurus punctatus</i> (Gilchrist, 1914)	Needs confirmation	EN
	<i>Scyliorhinus capensis</i> (Müller & Henle, 1838)	Questionable	NT
PROSCYLLIIDAE	<i>Eridacnis radcliffei</i> Smith, 1913		LC
	<i>Eridacnis sinuans</i> (Smith, 1957)	Questionable	LC
	<i>Proscyllium magnificum</i> Last & Vongpanich, 2004		NE
PSEUDOTRIAKIDAE	<i>Planonassus</i> sp. (Sensu Akhilesh <i>et al.</i> , 2010)		NE
TRIAKIDAE	<i>Iago omanensis</i> (Norman, 1939)		LC
	<i>Iago</i> sp. A [Sensu Compagno <i>et al.</i> , 2005]		NE
	<i>Mustelus mangalorensis</i> Cubelio, Remya & Kurup, 2011	Holotype possibly lost	NE
	<i>Mustelus mosis</i> Hemprich & Ehrenberg, 1899		DD
HEMIGALEIDAE	<i>Chaenogaleus macrostoma</i> (Bleeker, 1852)		VU
	<i>Hemigaleus microstoma</i> Bleeker, 1852		VU
	<i>Paragaleus randalli</i> Compagno, Krupp & Carpenter, 1996		NT
	<i>Hemipristis elongata</i> (Klunzinger, 1871)		VU
CARCHARHINIDAE	<i>Carcharhinus altimus</i> (Springer, 1950)		DD
	<i>Carcharhinus amblyrhynchoides</i> (Whitley, 1934)		NT
	<i>Carcharhinus amblyrhynchus</i> (Bleeker, 1865)		NT
	<i>Carcharhinus albimarginatus</i> (Ruppel, 1837)		NT
	<i>Carcharhinus amboinensis</i> (Müller & Henle, 1839)		DD
	<i>Carcharhinus brevipinna</i> (Müller & Henle, 1839)		NT

	<i>Carcharhinus dussumieri</i> (Müller & Henle, 1839)		NT
	<i>Carcharhinus falciformis</i> (Müller & Henle, 1839)		NT
	<i>Carcharhinus hemiodon</i> (Müller & Henle, 1839)		CR
	<i>Carcharhinus leucas</i> (Müller & Henle, 1839)		NT
	<i>Carcharhinus limbatus</i> (Müller & Henle, 1839)		NT
	<i>Carcharhinus longimanus</i> (Poey, 1861)		VU
	<i>Carcharhinus macloti</i> (Müller & Henle, 1839)		NT
	<i>Carcharhinus melanopterus</i> (Quoy & Gaimard, 1824)		NT
	<i>Carcharhinus obscurus</i> (Lesueur, 1818)		VU
	<i>Carcharhinus sealei</i> (Pietschmann, 1913)	Needs confirmation	NT
	<i>Carcharhinus sorrah</i> (Müller & Henle, 1839)		NT
	<i>Galeocerdo cuvier</i> (Péron & Lesueur, 1822)		NT
	<i>Glyphis gangeticus</i> (Müller & Henle, 1839)		CR
	<i>Glyphis glyphis</i> (Müller & Henle, 1839)	Needs confirmation	EN
	<i>Lamiopsis temminckii</i> (Müller & Henle, 1839)		EN
	<i>Lamiopsis tephrodes</i> (Fowler, 1905)	Needs confirmation	NE
	<i>Loxodon macrorhinus</i> Müller & Henle, 1839		LC
	<i>Negaprion acutidens</i> (Rüppell, 1837)		VU
	<i>Prionace glauca</i> (Linnaeus, 1758)		NT
	<i>Rhizoprionodon acutus</i> (Rüppell, 1837)		LC
	<i>Rhizoprionodon oligolinx</i> Springer, 1964		LC
	<i>Scoliodon laticaudus</i> Müller & Henle, 1838		NT
	<i>Triaenodon obesus</i> (Rüppell, 1837)		NT
SPHYRNIDAE	<i>Eusphyrna blochii</i> (Cuvier, 1817).		NT
	<i>Sphyrna lewini</i> (Griffith & Smith, 1834)		EN
	<i>Sphyrna mokarran</i> (Rüppell, 1837)		EN
	<i>Sphyrna zygaena</i> (Linnaeus, 1758)		VU
	<i>Sphyrna tudes</i> (Valenciennes, 1822)	Questionable	VU
SQUALIDAE	<i>Squalus blainville</i> (Risso, 1827)	Needs confirmation	DD
	<i>Squalus acanthias</i> Linnaeus, 1758	Needs confirmation	VU
	<i>Squalus megalops</i> (Macleay, 1881)	Needs confirmation	DD
	<i>Squalus mitsukurii</i> Jordan & Snyder, 1903	Needs confirmation	DD
	<i>Squalus</i> cf. <i>lalannei</i> Baranes, 2003		DD
CENTROPHORIDAE	<i>Centrophorus moluccensis</i> Bleeker, 1860	Needs confirmation	DD
	<i>Centrophorus uyato</i> Rafinesque, 1810	Needs confirmation	NE
	<i>Centrophorus</i> cf. <i>granulosus</i> (Bloch & Schneider, 1801)		VU
	<i>Centrophorus lusitanicus</i> (Bocage & Capello, 1864)	Needs confirmation	VU
	<i>Centrophorus squamosus</i> (Bonnaterre, 1788)		VU
	<i>Centrophorus atromarginatus</i> Garman, 1913		DD
	<i>Centrophorus</i> cf. <i>zeehaani</i> White, Ebert & Compagno, 2008		NE
	<i>Deania profundorum</i> (Smith & Radcliffe, 1912)		LC
ETMOPTERIDAE	<i>Centroscyllium ornatum</i> (Alcock, 1889)		DD
	<i>Centroscyllium fabricii</i> (Reinhardt, 1825)	Needs confirmation	LC
	<i>Etmopterus granulosus</i> (Günther, 1880)	Needs confirmation	LC
	<i>Etmopterus pusillus</i> (Lowe, 1839)		LC
	<i>Etmopterus spinax</i> (Linnaeus, 1758)	Needs confirmation	LC

	<i>Etmopterus baxteri</i> Garrick, 1957	Needs confirmation	LC
	<i>Etmopterus lucifer</i> Jordan & Snyder, 1902	Needs confirmation	LC
SOMNIOSIDAE	<i>Centroselachus crepidater</i> (Bocage & Capello, 1864)		LC
	<i>Zameus squamulosus</i> (Günther, 1877)		DD
ECHINORHINIDAE	<i>Echinorhinus brucus</i> (Bonnaterre, 1788)		DD
	<i>Echinorhinus cookei</i> Pietschmann, 1928	Questionable	NT
PRISTIFORMES			
PRISTIDAE	<i>Anoxypristis cuspidata</i> (Latham, 1794)		EN
	<i>Pristis microdon</i> Latham, 1794		CR
	<i>Pristis pectinata</i> Latham, 1794	Needs confirmation	CR
	<i>Pristis pristis</i> (Linnaeus, 1758)		CR
	<i>Pristis zijsron</i> Bleeker, 1851		CR
SQUATINIFORMES			
SQUATINIDAE	<i>Squatina squatina</i> (Linnaeus, 1758)	Questionable	CR
	<i>Squatina africana</i> Regan, 1908	Needs confirmation	DD
TORPEDINIFORMES			
TORPEDINIDAE	<i>Torpedo panthera</i> Olfers, 1831	Needs confirmation	DD
	<i>Torpedo fuscomaculata</i> Peters, 1855	Needs confirmation	DD
	<i>Torpedo sinuspersici</i> Olfers, 1831	Needs confirmation	DD
	<i>Torpedo marmorata</i> Risso, 1810		DD
	<i>Torpedo zugmayeri</i> Engelhardt, 1912		NE
NARCINIDAE	<i>Benthobatis moresbyi</i> Alcock, 1898		DD
	<i>Narcine brunnea</i> Annandale, 1909		NE
	<i>Narcine lingula</i> Richardson, 1840		DD
	<i>Narcine prodorsalis</i> Bessednov, 1966	Needs confirmation	DD
	<i>Narcine timlei</i> (Bloch & Schneider, 1801).		DD
	<i>Narcine cf oculifera</i> Carvalho, Compagno & Mee, 2002		DD
	<i>Narcine maculata</i> (Shaw, 1804)		DD
NARKIDAE	<i>Heteronarce prabhui</i> Talwar, 1981		DD
	<i>Narke dipterygia</i> (Bloch & Schneider, 1801)		DD
RAJIFORMES			
RHINIDAE	<i>Rhina ancylostoma</i> Bloch & Schneider, 1801		VU
RHYNCHOBATIDAE	<i>Rhynchobatus laevis</i> (Bloch & Schneider, 1801)		VU
	<i>Rhynchobatus australiae</i> Whitley, 1939		VU
	<i>Rhynchobatus djiddensis</i> (Forsskål 1775)		VU
	<i>Rhynchobatus palpebratus</i> Compagno & Last, 2008		NE
RHINOBATIDAE	<i>Glaucostegus granulatus</i> (Cuvier, 1829)		VU
	<i>Glaucostegus halavi</i> (Forsskål, 1775)		DD
	<i>Glaucostegus obtusus</i> (Müller & Henle, 1841)		VU
	<i>Glaucostegus thouin</i> (Anonymous, 1798)		VU
	<i>Glaucostegus typus</i> (Anonymous [Bennett] 1830).		VU
	<i>Rhinobatos annandalei</i> Norman, 1926		DD
	<i>Rhinobatos annulatus</i> (Müller & Henle, 1841)	Needs confirmation	LC
	<i>Rhinobatos holcorhynchus</i> Norman, 1922	Needs confirmation	DD
	<i>Rhinobatos lionotus</i> Norman, 1926		DD
	<i>Rhinobatos punctifer</i> Compagno & Randall, 1987		DD

	<i>Rhinobatos variegatus</i> Nair & Lal Mohan, 1973		DD
ZANOBATIDAE	<i>Zanobatus schoenleinii</i> (Müller & Henle, 1841)	Questionable	DD
ANACANTHOBATIDAE	<i>Cruriraja andamanica</i> (Lloyd, 1909)		DD
RAJIDAE	<i>Amblyraja reversa</i> (Lloyd, 1906)	Needs confirmation	DD
	<i>Dipturus</i> sp. A (Sensu Bineesh <i>et al.</i> , 2013)		NE
	<i>Dipturus johannisdavisi</i> (Alcock, 1899)		DD
	<i>Dipturus crosnieri</i> Seret, 1989	Needs confirmation	VU
	<i>Fenestraja mamillidens</i> (Alcock, 1889)		DD
	<i>Leucoraja circularis</i> (Couch, 1838)	Needs confirmation	VU
	<i>Okamejei powelli</i> (Alcock, 1898)		DD
	<i>Okamejei</i> sp. A		NE
	<i>Raja miraletus</i> Linnaeus, 1758	Questionable	LC
	<i>Raja texana</i> (Chandler, 1921)	Questionable	DD
	<i>Rostroraja alba</i> (Lacépède, 1803)	Questionable	EN
MYLIOBATIFORMES			
HEXATRYGONIDAE	<i>Hexatrygon bickelli</i> Heemstra & Smith, 1980		LC
PLESIOBATIDAE	<i>Plesiobatis daviesi</i> (Wallace, 1967)		LC
DASYATIDAE	<i>Dasyatis bennetti</i> (Müller & Henle, 1841)	Needs confirmation	DD
	<i>Dasyatis centroura</i> (Mitchill, 1815)	Questionable	LC
	<i>Dasyatis chrysonota</i> (Smith, 1828)	Questionable	LC
	<i>Dasyatis lata</i> (Garman, 1880)	Questionable	LC
	<i>Dasyatis microps</i> (Annandale, 1908)		DD
	<i>Dasyatis pastinaca</i> (Linnaeus, 1758)	Needs confirmation	DD
	<i>Dasyatis thetidis</i> Ogilby, 1899	Needs confirmation	DD
	<i>Himantura alcockii</i> (Annandale, 1909)		NE
	<i>Himantura draco</i> Compagno & Heemstra, 1984	Needs confirmation	NE
	<i>Himantura uarnacoides</i> (Bleeker, 1852)		VU
	<i>Himantura fai</i> Jordan & Seale, 1906		LC
	<i>Himantura fava</i> (Annandale, 1909)		NE
	<i>Himantura gerrardi</i> (Gray, 1851)		VU
	<i>Himantura granulata</i> (Macleay, 1883)		NT
	<i>Himantura imbricata</i> (Bloch & Schneider, 1801)		DD
	<i>Himantura</i> cf. <i>imbricata</i> (Bloch & Schneider, 1801)		NE
	<i>Himantura jenkinsii</i> (Annandale, 1909)		LC
	<i>Himantura leoparda</i> Manjaji-Matsumoto & Last, 2008		VU
	<i>Himantura marginata</i> (Blyth, 1860)		DD
	<i>Himantura pastinacoides</i> (Bleeker, 1852)		VU
	<i>Himantura polylepis</i> Bleeker, 1852		EN
	<i>Himantura uarnak</i> (Forsskål, 1775)		VU
	<i>Himantura undulata</i> (Bleeker, 1852)		VU
	<i>Himantura walga</i> (Müller & Henle, 1841)		NT
	<i>Neotrygon kuhlii</i> (Müller & Henle, 1841)		DD
	<i>Pastinachus sephen</i> (Forsskål, 1775)		DD
	<i>Pastinachus atrus</i> (Macleay, 1883)		NE
	<i>Pteroplatytrygon violacea</i> (Bonaparte, 1832)		LC
	<i>Taeniura lymma</i> (Forsskål, 1775)		NT

	<i>Taeniura meyeri</i> (Müller & Henle, 1841)		VU
	<i>Urogymnus asperrimus</i> (Bloch & Schneider, 1801)		VU
GYMNURIDAE	<i>Gymnura japonica</i> (Schlegel, 1850)	Needs confirmation	DD
	<i>Gymnura cf micrura</i> (Bloch & Schneider, 1801)		DD
	<i>Gymnura zonura</i> (Bleeker, 1852)		VU
	<i>Gymnura poecilura</i> (Shaw, 1804)		NT
	<i>Gymnura tentaculata</i> (Müller & Henle, 1841)	Needs confirmation	DD
MYLIOBATIDAE	<i>Aetobatus flagellum</i> (Bloch & Schneider, 1801)		EN
	<i>Aetobatus ocellatus</i> (Kuhl, 1823)		NE
	<i>Aetobatus narinari</i> (Euphrasen, 1790)	Questionable	NT
	<i>Aetomylaeus vespertilio</i> (Bleeker, 1851)		EN
	<i>Aetomylaeus nichofii</i> (Bloch & Schneider, 1801)		VU
	<i>Aetomylaeus maculatus</i> (Gray, 1834)		EN
	<i>Aetomylaeus milvus</i> (Müller & Henle, 1841)		NE
	<i>Myliobatis aquila</i> (Linnaeus, 1758)	Questionable	DD
MOBULIDAE	<i>Manta alfredi</i> (Kreft, 1868)		VU
	<i>Manta birostris</i> (Walbaum, 1792)		VU
	<i>Mobula mobular</i> (Bonnaterre, 1788)	Needs confirmation	EN
	<i>Mobula japonica</i> (Muller & Henle, 1841)		NT
	<i>Mobula diabolus</i> (Shaw, 1804)		NE
	<i>Mobula thurstoni</i> (Lloyd, 1908)		NT
	<i>Mobula eregoodootenkee</i> (Bleeker, 1859)		NT
	<i>Mobula kuhlii</i> (Müller & Henle, 1841)		DD
	<i>Mobula tarapacana</i> (Philippi, 1892)		DD
RHINOPTERIDAE			
	<i>Rhinoptera javanica</i> Müller & Henle, 1841		VU
	<i>Rhinoptera jayakari</i> Boulenger, 1895		NE
	<i>Rhinoptera sewelli</i> Misra, 1947		NE
	<i>Rhinoptera brasiliensis</i> (Müller, 1836)	Questionable	EN

Table 2. List of chondrichthyans described from India and their present status

Species described from India	Type area	Present status/valid as
<i>Aetobatis indica</i> Swainson, 1839	Vizagapatnam, India	Synonym of <i>Aetobatus ocellatus</i> Kuhl, 1923
<i>Aetoplatea tentaculata</i> Müller & Henle, 1841	?Indian Seas	Valid as <i>Gymnura tentaculata</i> (Müller & Henle, 1841)
<i>Bengalichthys impennis</i> Annandale, 1909	Balasore Bay, Orissa coast, India	Synonym of <i>Narke dipterygia</i> (Bloch & Schneider, 1801)
<i>Benthobatis moresbyi</i> Alcock, 1898	Laccadive Sea, India	Valid as <i>Benthobatis moresbyi</i> Alcock, 1898
<i>Carcharias (Hypoprion) hemiodon</i> Muller & Henle, 1839	Puduchery, India	Valid as <i>Carcharhinus hemiodon</i> (Müller & Henle, 1839)
<i>Carcharias (Physodon) muelleri</i> Müller & Henle, 1839	Bengal, ? India	Synonym of <i>Scoliodon laticaudus</i> Müller & Henle, 1838
<i>Carcharias (Prionodon) bleekeri</i> Duméril, 1865	Puducherry, India	Synonym of <i>Carcharhinus sorrah</i> (Müller & Henle, 1839)
<i>Carcharias (Prionodon) dussumieri</i> Muller & Henle, 1839	Puduchery, India	Valid as <i>Carcharhinus dussumieri</i> (Müller & Henle, 1839)
<i>Carcharias (Prionodon) palasorra</i> Bleeker, 1853	Pala sorrah of Russell (1803)	Possible synonym of <i>Scoliodon laticaudus</i> Müller & Henle, 1838
<i>Carcharias (Prionodon) temminckii</i> Muller & Henle, 1839	India	Valid as <i>Lamiopsis temminckii</i> (Müller & Henle, 1839)
<i>Carcharias malabaricus</i> Day, 1873	Cochin, Calicut, India	Synonym of <i>Carcharhinus dussumieri</i> (Müller & Henle, 1839)
<i>Carcharias sorrah kowa</i> Bleeker, 1853	Vizagapatam, India	Synonym of <i>Rhizoprionodon acutus</i> (Rüppell, 1837)

<i>Carcharias sorrakowah</i> Cuvier, 1829	on Sorra Kowah of Russell (1803)	Possibly synonym of <i>Scoliodon laticaudus</i> Müller & Henle, 1838
<i>Carcharias watu</i> Sarangdhar & Setna, 1946	India	Synonym of <i>Carcharhinus hemiodon</i> (Müller & Henle, 1839)
<i>Centrophorus rossi</i> Alcock, 1898	Off Travancore coast, India	Synonym of <i>Centroscymnus crepidater</i> (Bocage & Capello, 1864)
<i>Cephaloptera kuhlii</i> Muller & Henle, 1841	India	Valid as <i>Mobula kuhlii</i> (Müller & Henle, 1841).
<i>Ceratoptera orissa</i> Lloyd, 1908	Puri, Orissa coast, Bay of Bengal	Possible synonym of <i>Manta birostris</i> (Walbaum, 1792)
<i>Cestracion leeuwenii</i> Day, 1865	Malabar coast, India	Synonym of <i>Sphyrna lewini</i> (Griffith & Smith, 1834).
<i>Dicerobatis eregoodoo</i> Cantor, 1849	Type locality includes Coromandel, India	Synonym of <i>Mobula eregoodootenkee</i> (Bleeker, 1859)
<i>Dicerobatis thurstoni</i> Lloyd, 1908	India	Valid as <i>Mobula thurstoni</i> (Lloyd, 1908)
<i>Galeocerdo tigrinus</i> Muller & Henle, 1839	Puduchery, India	Synonym of <i>Galeocerdo cuvier</i> (Péron & Lesueur, 1822)
<i>Ginglymostoma muelleri</i> Günther, 1870	India	Synonym of <i>Nebrius ferrugineus</i> (Lesson, 1831)
<i>Hemigaleus balfouri</i> Day, 1878	Coromandel coast, India	Synonym of <i>Chaenogaleus macrostoma</i> (Bleeker, 1852)
<i>Hemipristis pingali</i> Setna, 1946	India, Mumbai	Synonym of <i>Hemipristis elongata</i> (Klunzinger, 1871)
<i>Mustelus mangalorensis</i> Cubelio, Remya & Kurup, 2011	Mangalore	Uncertain/holotype couldn't be located
<i>Myliobatis eeltenkee</i> Rüppell, 1837	Type locality includes Vizagapatnam, India	Synonym of <i>Aetobatus ocellatus</i> (Kuhl, 1823)
<i>Myliobatis nieuhofii</i> var. <i>cornifera</i> Annandale, 1909	Balasore, Orissa	Uncertain
<i>Narcine brunnea</i> Annandale, 1909	Bay of Bengal, Hoogli	Valid as <i>Narcine brunnea</i> Annandale, 1909
<i>Narcine indica</i> Henle, 1834	Tharangambadi, India	Synonym of <i>Narcine timplei</i> (Bloch & Schneider, 1801)
<i>Narcine micropthalma</i> Dumeril, 1852	Malabar coast, India	Synonym of <i>Narcine timplei</i> (Bloch & Schneider, 1801)
<i>Pentanchus (Parapristurus) investigatoris</i> Misra, 1962	Andaman Sea	Valid as <i>Apristurus investigatoris</i> (Misra, 1962)
<i>Proscyllium alcocki</i> Misra, 1950	Andaman Sea	Synonym of <i>Eridacnis radcliffei</i> Smith, 1913
<i>Raja fluviatilis</i> Hamilton, 1822	Ganges	Synonym of <i>Pastinachus sephen</i> (Forsskål, 1775)
<i>Raja asperrima</i> Bloch & Schneider, 1801	Mumbai, India	Valid as <i>Urogymnus asperrimus</i> (Bloch & Schneider, 1801)
<i>Raja bicolor</i> Shaw, 1804	Indian Seas	Uncertain as <i>Narcine bicolor</i> (Shaw, 1804)
<i>Raja diabolus marinus</i> Bloch & Schneider, 1801	India	Synonym of <i>Manta birostris</i> (Walbaum, 1792)
<i>Raja flagellum</i> Bloch & Schneider, 1801	Coromandel	Valid as <i>Aetobatus flagellum</i> (Bloch & Schneider, 1801)
<i>Raja fluviatilis</i> Hamilton, 1822	Ganges, India	Synonym of <i>Pastinachus sephen</i> (Forsskål, 1775)
<i>Raja guttata</i> Shaw, 1804	Based on Russell (1803)	Synonym of <i>Aetobatus ocellatus</i> (Kuhl, 1823)
<i>Raja imbricata</i> Bloch & Schneider, 1801	Tarangambadi, India	Valid as <i>Himantura imbricata</i> (Bloch & Schneider, 1801)
<i>Raja johannisdavisii</i> Alcock, 1899	off Travancore, India	Valid as <i>Dipturus johannisdavisii</i> (Alcock, 1899)
<i>Raja poecilura</i> Shaw, 1804	Vizagapatam, India, (on Russell, 1803)	Valid as <i>Gymnura poecilura</i> (Shaw, 1804)
<i>Raja sancur</i> Hamilton, 1822	Ganges, India	Synonym of <i>Pastinachus sephen</i> (Forsskål, 1775)
<i>Raja timplei</i> Bloch & Schneider, 1801	Tarangambadi, India	Valid as <i>Narcine timplei</i> (Bloch & Schneider, 1801)
<i>Raja dipterygia</i> Bloch & Schneider, 1801	Tharangambadi, India	Valid as <i>Narke dipterygia</i> (Bloch & Schneider, 1801)
<i>Rhina ancylostomus</i> Bloch & Schneider, 1801	Coromandel coast, India	Valid as <i>Rhina ancylostoma</i> Bloch & Schneider, 1801
<i>Rhinobatos variegates</i> Nair & Lal Mohan, 1973	Gulf of Mannaar	Valid as <i>Rhinobatos variegatus</i> Nair & Lal Mohan, 1973
<i>Rhinobatus (Rhinobatus) tuberculatus</i> Bleeker, 1853	Suttivarah of Russell (1803)	Uncertain
<i>Rhinobatus (Rhinobatus) obtusus</i> Müller & Henle, 1841	Pondicherry, Malabar, India	Valid as <i>Rhinobatos obtusus</i> Müller & Henle, 1841
<i>Rhinobatus annandalei</i> Norman, 1926	Mouth of the Hooghli, India	Valid as <i>Rhinobatos annandalei</i> Norman, 1926
<i>Rhinobatus armatus</i> Gray, 1834	India	Synonym of <i>Glaucostegus typus</i> (Anonymous [Bennett], 1830)
<i>Rhinobatus laevis</i> Bloch & Schneider, 1801	India	Valid as <i>Rhynchobatus laevis</i> (Bloch & Schneider, 1801)
<i>Rhinobatus lionotus</i> Norman, 1926	Mouth of the Hooghli, India	Valid as <i>Rhinobatos lionotus</i> Norman, 1926
<i>Rhinoptera sewelli</i> Misra 1946	Calicut, India	Valid as <i>Rhinoptera sewelli</i> Misra, 1946
<i>Rhinoptera adpersa</i> Müller & Henle, 1841	India	Synonym of <i>Rhinoptera javanica</i> Müller & Henle, 1841
<i>Rhynchobatus laevis</i> Müller & Henle, 1841	Mumbai and Malabar, India	Synonym of <i>Rhynchobatus djiddensis</i> (Forsskål, 1775)

<i>Scoliodon ceylonensis</i> Sarangdhar & Setna, 1946	Mumbai, India	Synonym of <i>Loxodon macrorhinus</i> Müller & Henle, 1839
<i>Scoliodon laticaudus</i> Müller & Henle, 1838	India	Valid as <i>Scoliodon laticaudus</i> Müller & Henle, 1838
<i>Scyliorhinus (Halealurus) silasi</i> Talwar, 1974	Off Kollam, Arabian Sea	Valid as <i>Cephaloscyllium silasi</i> (Talwar, 1974)
<i>Scyllium hispidum</i> Alcock, 1891	Andaman Sea	Valid as <i>Bythaelurus hispidus</i> (Alcock, 1891)
<i>Scyllium maculatum</i> Gray, 1830	?India	Synonym of <i>Atelomycterus marmoratus</i> (Anonymous [Bennett], 1830)
<i>Scyllium quagga</i> Alcock, 1899	Laccadive Sea, India	Valid as <i>Halaelurus quagga</i> (Alcock, 1899)
<i>Squalus caudatus</i> Gronow, 1834	Indian Seas	Synonym of <i>Chiloscyllium indicum</i> (Gmelin, 1789)
<i>Squalus palasorrah</i> Cuvier, 1829	Vizagapatam and Madras, India	Uncertain as <i>Scoliodon palasorrah</i> (Cuvier, 1829)
<i>Squalus semisagittatus</i> Shaw, 1804	Based on Russell (1803)	Uncertain
<i>Squalus zebra</i> Shaw, 1804	Indian Seas	Synonym of <i>Stegostoma fasciatum</i> (Hermann, 1783)
<i>Stegostoma carinatum</i> Blyth, 1847	India	Synonym of <i>Stegostoma fasciatum</i> (Hermann, 1783)
<i>Trygon alcockii</i> Annandale 1909	Puri, Orissa Coast. India	Uncertain as <i>Himantura alcockii</i> (Annandale, 1909) or a possible synonym of <i>Himantura gerrardi</i> (Gray, 1851)
<i>Trygon atrocissimus</i> Blyth, 1860	India	Uncertain
<i>Trygon bleekeri</i> Blyth, 1860	Calcutta, India	Synonym of <i>Himantura uarnacoides</i> (Bleeker, 1852)
<i>Trygon chindrakee</i> Cuvier, 1853	Based on Russell (1803)	Uncertain
<i>Trygon crozieri</i> Blyth, 1860	?Arakan coast, India	Synonym of <i>Dasyatis zugei</i> (Müller & Henle, 1841)
<i>Trygon ellipti</i> Blyth, 1860	Calcutta fish market, India	Synonym of <i>Himantura uarnak</i> (Gmelin, 1789)
<i>Trygon favus</i> Annandale, 1909	off Orissa, Bay of Bengal	Questionably valid as <i>Himantura fava</i> (Annandale, 1909)
<i>Trygon gerrardi</i> Gray, 1851	India	Valid as <i>Himantura gerrardi</i> (Gray, 1851)
<i>Trygon jenkinsii</i> Annandale, 1909	off Ganjam	Valid as <i>Himantura jenkinsii</i> (Annandale, 1909)
<i>Trygon marginatus</i> Blyth, 1860	Calcutta fish market, India	Valid as <i>Himantura marginata</i> (Blyth, 1860)
<i>Trygon nuda</i> Günther, 1870	Indian Seas	Uncertain
<i>Trygon russellii</i> Gray, 1834	India	Questionably the same as (juvenile of) <i>Himantura leoparda</i> Manjaji, 2004
<i>Trygon variegatus</i> M'Clelland, 1841	Calcutta, India	Synonym of <i>Himantura uarnak</i> (Gmelin, 1789)
<i>Trygon walga</i> Müller & Henle, 1841	Ganges, India	Valid as <i>Himantura walga</i> (Müller & Henle, 1841)
<i>Urogymnus asperrimus</i> var. <i>krusadiensis</i> Chacko, 1944	Gulf of Mannar	Possible synonym of <i>Urogymnus asperrimus</i> (Bloch & Schneider, 1801)
<i>Urogymnus laevior</i> Annandale, 1909	Malpe	Uncertain
<i>Zygaena indica</i> van Hasselt, 1823	Vizagapatam, India	Synonym of <i>Sphyrna lewini</i> (Griffith & Smith, 1834)
<i>Zygaena laticeps</i> Cantor, 1837	Bay of Bengal	Synonym of <i>Eusphyra blochii</i> (Cuvier, 1816)

References

- Agnarsson, I. M. and Kuntner, 2007. Taxonomy in a Changing World: Seeking Solutions for a Science in Crisis. *Syst. Biol.*, 56(3):531-539.
- Akhilesh, K. V., M. Hashim, K. K. Bineesh, C. P. R. Shanis and U. Ganga, 2010. New distributional records of deep-sea sharks from Indian waters. *J. Mar. Biol. Ass. India*, 52 (1): 29-34.
- Anderson, R. C. and A. Hafiz, 2002. Elasmobranch Fisheries in the Maldives. In: Fowler, S. L., Reed, T. M. and Dipper, F. A. (Eds). Elasmobranch Biodiversity, Conservation and Management: Proceedings of the International Seminar and Workshop, Sabah, Malaysia, July 1997. IUCN SSC Shark Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK. xv + 258 pp.
- Aravind, N. A., K. N. Ganeshaiah and R. Uma Shanker. 2004. Croak, croak, croak: Are there more frogs to be discovered in Western Ghats?. *Curr. Sci.*, 86: 1471-1472.
- Babu, C., S. Ramachandran and B. C. Varghese. 2011. On a new record of sixgill sting ray *Hexatrygon bickelli* Heemstra and Smith, 1980 from south-west coast of India. *Indian J. Fish.*, 58 (2): 137-139.
- Baum, J. K., R. A. Myers, D. G. Kehler, B. Worm, S. J. Harley and P. A. Doherty. 2003. Collapse and conservation of shark populations in the Northwest Atlantic. *Sci.*, 299: 389-392.
- Benjamin, D., J. V. Rozario, D. Jose, B. M. Kurup and M. Harikrishnan. 2012. Morphometric characteristics of the Ornate eagle ray *Aetomylaeus vespertilio* (Bleeker, 1852) caught off Cochin, southwest coast of India. *Int. J. Env. Sci.* 3(1): 685-688.
- Bineesh, K. K., A. Gopalakrishnan, J. K. Jena, K. V. Akhilesh, V. S. Basheer and N. G. K. Pillai. 2013. Sharks and rays in Indian commercial fisheries: need for revision of taxonomy. In: Regional Symposium on Ecosystem Approaches to Marine Fisheries & Biodiversity, October 27-30, 2013, Kochi.
- Bineesh, K. K., K. V. Akhilesh, K. A. Sajeela, E. M. Abdussamad, A. Gopalakrishnan, V. S. Basheer and J. K. Jena. 2014. DNA Barcoding Confirms the Occurrence Rare Elasmobranchs in the Arabian Sea of Indian EEZ. *Middle-East J. Sci. Res.*, 19 (9): 1266-1271.
- Bonfil, R. 2002. Trends and Patterns in World and Asian Elasmobranch Fisheries. In: Fowler, S. L., Reed, T. M. and Dipper, F. A. (Eds). Elasmobranch biodiversity, conservation and management: Proceedings of the International Seminar and Workshop in Sabah, July 1997. IUCN SSC Shark Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK
- Compagno, L. J. V. 1984. FAO species catalogue. Vol. 4. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Part 2. Charcharhiniformes. *FAO Fisheries Synopsis* No. 125, v. 4 (pt 2): 251-655.
- Compagno, L. J. V. 2007. *Glyphis gangeticus*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 10 April 2014.
- Compagno, L. J. V., P. R. Last, J. D. Stevens and M. N. R. Alava. 2005. Checklist of Philippine Chondrichthyes. *CSIRO Marine Laboratories Report* No. 243: 103 pp
- Compagno, L.J.V., W. White and S. Fowler. 2003. *Carcharhinus hemiodon*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 10 April 2014
- Compagno, L. J. V., J. Pogonoski and D. Pollard 2009. *Glyphis glyphis*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 10 April 2014.

- Das, S., P. S. Lyla and S. A. Khan 2006. Marine microbial diversity and ecology: importance and future perspectives. *Curr. Sci.*, 90 (10): 1325-1335.
- Day, F. 1878. The fishes of India; being a natural history of the fishes known to inhabit the seas and fresh waters of India, Burma, and Ceylon. Part 4: i-xx + 553-779
- Day, F. 1889. The Fauna of British India Including Ceylon and Burma. Fishes. Vol. I. Taylor and Francis, London.
- De Silva, R. I. 2006. Taxonomy and Status of the Sharks and Rays of Sri Lanka. The Fauna of Sri Lanka. In Bambaradeniya, C.N.B. (Ed), 2006. Fauna of Sri Lanka: Status of Taxonomy, Research and Conservation. The World Conservation Union, Colombo, Sri Lanka and Government of Sri Lanka. 294-301.
- Dubois, A. 2003. The relationships between taxonomy and conservation biology in the century of extinctions. *Comptes Rendus Biol.*, 326 (1): 9-21.
- Dubois, A. 2010. Zoological nomenclature in the century of extinctions: priority vs. 'usage'. *Org. Divers. Evol.*, 10: 259-274.
- Dulvy, N. K., S. L. Fowler, J. A. Musick, R. D. Cavanagh, P. M. Kyne, L. R. Harrison, J. K. Carlson, L. N. K. Davidson, S. V. Fordham, M. P. Francis, C. M. Pollock, C. A. Simpfendorfer, G. H. Burgess, K. E. Carpenter, L. J. V. Compagno, D. A. Ebert, C. Gibson, M. R. Heupel, S. R. Livingstone, J. C. Sanciangco, J. D. Stevens, S. Valenti, W. T. White. 2014. Extinction risk and conservation of the world's sharks and rays. *eLife*, 3: e00590 DOI: 10.7554/eLife.00590. 1-34.
- Ebert, D. A., W. T. White, K. J. Goldman, L. J. V. Compagno, T. S. Daly-Engel, and R. D. Ward. 2010. Resurrection and redescription of *Squalus suckleyi* (Girard, 1854) from the North Pacific, with comments on the *Squalus acanthias* subgroup (Squaliformes: Squalidae). *Zootaxa*, 2612: 22-40.
- Ebert, D. A., H. C. Ho, W. T. White, and M. R. De Carvalho. 2013. Introduction to the systematics and biodiversity of sharks, rays, and chimaeras (Chondrichthyes) of Taiwan. *Zootaxa*, 3752: 5-19
- Eschmeyer, W. N. (Ed) 2014. Catalogue of Fishes: Genera, Species, References. (<http://research.calacademy.org/research/ichthyology/catalog/fishcatmain.asp>). Electronic version accessed 01/2/2014.
- Fahmi. 2010. Sharks and rays in Indonesia. *Mar. Res Indonesia*, 35, (1), 43-54.
- García, V. B., L. O. Lucifora, and R. A. Myers. 2008. The importance of habitat and life history to extinction risk in sharks, skates, rays and chimaeras. *Proc. R. Soc. Biol. Sci.*, 275: 83-89.
- Günther, A. 1870. Catalogue of the fishes in the British Museum. Catalogue of the Physostomi, containing the families Gymnotidae, Symbranchidae, Muraenidae, Pegasidae, and of the Lophobranchii, Plectognathi, Dipnoi, ...[thru] ... Leptocardi, in the British Museum. v. 8: i-xxv + 1-549.
- Hariharan, G.N. and P. Balaji, 2002. Taxonomic research in India: Future prospects. *Curr. Sci.*, 83(9):1068-1070.
- Hebert, P. D. N., A. Cywinska, S. L. Ball, & J. R. deWaard. 2003. Biological identifications through DNA barcodes. *Proc. R. Soc. Biol. Sci.*, 270: 313-322.
- IUCN. 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 01 May 2014.
- James, P. S. B. R. 2010. Taxonomic status of marine pelagic fishes of India, research priorities and conservation strategies for the sustainability of their fisheries. *Indian J. Anim. Sci.* 80 (4): 39-45.
- Kholia, B. S and C. R. F. Jenkins. 2011. Misidentification makes scientific publications worthless - save our taxonomy and taxonomists. *Curr. Sci.*, 100(4):458-461.
- Kizhakudan, S. J. and S. Rajapackiam. 2013. First report of the crocodile shark *Pseudocarcharias kamoharai* (Matsubara, 1936) from Chennai, southeast coast of India. *J. Mar. Bio. Ass. India*, 55 (1): 86-88.
- Kumaran, P. L. 2002. Marine mammal research in India - a review and critique of the methods. *Curr. Sci.*, 83 (10): 1210-1220.
- Last, P. R. 2007. The state of chondrichthyan taxonomy and systematics. *Mar. Freshw. Res.*, 58, 7-9.
- Last, P. R., B. M. Manjaji and G. K. Yearsley. 2005. *Pastinachus solocirostris* sp. nov., a new species of stingray (Elasmobranchii: Myliobatiformes) from the Indo-Malay Archipelago. *Zootaxa*, 1040: 1-16.
- Last, P. R., W. T. White and J. J. Pogonoski. 2008a. (Eds.). Descriptions of New Australian Chondrichthyan. *CSIRO Marine and Atmospheric Research* 022: 1-368.
- Last, P. R., W. T. White, J. J. Pogonoski and D. C. Gledhill. 2008b. (Eds.). Descriptions of new Australian skates (Batoidea: Rajoidei). *CSIRO Marine and Atmospheric Research Paper* No. 021:1-181.
- Last, P. R., W. T. White and J. J. Pogonoski. 2010a. (Eds.). Descriptions of new sharks and rays from Borneo. *CSIRO Marine and Atmospheric Research Paper*. No. 032: 1-166.
- Last, P. R. and B. M. Manjaji-Matsumoto. 2010b. Description of a new stingray, *Pastinachus gracilicaudus* sp nov. (Elasmobranchii: Myliobatiformes), based on material from the Indo-Malay Archipelago. In: Descriptions of new sharks and rays from Borneo. *CSIRO Marine and Atmospheric Research Paper* No. 032: 115-127.
- Last, P. R., Fahmi and G. J. P. Naylor. 2010c. *Pastinachus stellurostris* sp. nov., a new stingray (Elasmobranchii: Myliobatiformes) from Indonesian Borneo. In: Descriptions of new sharks and rays from Borneo. *CSIRO Marine and Atmospheric Research Paper* No. 032: 129-139.
- Marshall, A. D., L. J. V. Compagno, and M. B. Bennett. 2009. Redescription of the genus *Manta* with resurrection of *Manta alfredi* (Krefft, 1868) (Chondrichthyes; Myliobatoidei; Mobulidae). *Zootaxa*. 2301: 1-28.
- Misra, K. S. 1952. An aid to the identification of the fishes of India, Burma and Ceylon. 1. Elasmobranchii and Holocephali. *Rec. Indian Mus.* 49 (1): 89-137.
- Misra, K. S. 1969. Elasmobranchii and Holocephali. In M. L. Roonwal, (Ed.) The fauna of India and the adjacent countries. Pisces, (Second Edition). Zoological Survey of India, Government of India Press, Faridabad, 1-276.
- Moore, A. B. M., R. D. Ward and R. Peirce. 2012. Sharks of the Persian (Arabian) Gulf: a first annotated checklist (Chondrichthyes: Elasmobranchii). *Zootaxa*, No. 3167: 1-16
- Moron, J., Bertrand, B. and Last, P. R. (1998) A check-list of sharks and rays of western Sri Lanka. *J. Mar. Biol. Ass. India*, 40: 142-157.
- Narendran, T. C. 2001. Taxonomic entomology: Research and education in India. *Curr. Sci.* 81(5): 445-447.
- NBAP. 2008. National Biodiversity Action Plan 2008. Govt. of India. Ministry of Environment and Forest. 78 pp.
- Pavan-Kumar, A., P. Gireesh-Babu, P. P. Suresh Babu, A. K. Jaiswar, K. Pani Prasad, Aparna Chaudhari, S. G. Raje, S. K. Chakraborty, Gopal Krishna and W. S. Lakra. 2013. DNA barcoding of elasmobranchs from Indian Coast and its reliability in delineating geographically widespread specimens. Mitochondrial DNA, 1940-1736. 1-9. [Early online].
- Prathapan, K. D., P. D. Rajan and J. Poorani (2009). Protectionism and natural history research in India. *Curr. Sci.*, 91:1006-1007.
- Raje, S. G., Grace Mathew., K. K. Joshi, R. J. Nair, G. M. Ra, M. Srinath, S. Gomathy and Rudramurthy. 2002. Elasmobranch fisheries of India-An Appraisal. 71: 1-76
- Raje, S. G., S. Sivakami, G. Mohan Raj, P. P. Manoj Kumar, A. A. Raju and K. K. Joshi 2007. An Atlas on the Elasmobranch fishery resources of India. 95: 1-253.
- Smith, S. E., D. W. Au and C. Show. (1998). Intrinsic rebound potentials of 26 species of Pacific sharks. *Mar. Freshw. Res.* 41: 663-678.
- Talwar, P. K. and R. K. Kacker. 1984. Commercial sea fishes of India. Zoological Survey of India, Calcutta. 997.
- Vecchione, M., and B. B. Collette. 1996. The central role of systematics in marine biodiversity issues. *Oceanogr.*, 9(1): 44-49.
- Venkataraman, K., M. C. J. Milton and K. P. Raghuram. 2003. Handbook on sharks of Indian waters. ZSI, Kolkata 1-113.
- Vidhayanon, C. 2002. Elasmobranch Diversity and Status in Thailand. In, Fowler, S.L., Reed, T. M. and Dipper, F. A. (eds). Elasmobranch Biodiversity, Conservation and Management: Proceedings of the International Seminar and Workshop, Sabah, Malaysia, July 1997. IUCN SSC Shark Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK. xv + 258 pp.
- Vishwanath, W. and I. Linthoingambi. 2010. Emerging trends in taxonomy research and evolutionary systematics of fish fauna of North- East India. *Indian J. Anim. Sci.*, 80 (4) (Suppl. 1): 16-25.
- Wafar, M., K. Venkataraman, B. Ingole, S. Ajmal Khan, and P. Loka Bharathi. 2011. State of Knowledge of Coastal and Marine Biodiversity of Indian Ocean Countries. *PLoS ONE*, 6(1): e14613.
- White, W. T., P. R. Last, J. D. Stevens, G. K. Yearsley, Fahmi and Dharmadi. 2006. Economically important sharks and rays of Indonesia. *ACIAR. Monograph series*, no. 124. 338.
- White, W. T., P. R. Last, G. J. P. Naylor, K. Jensen and J. N. Caira. 2010a. Clarification of *Aetobatus ocellatus* (Kuhl, 1823) as a valid species, and a comparison with *Aetobatus narinari* (Euphrasen, 1790) (Rajiformes: Myliobatidae). In Last, P. R., White, W. T. and Pogonoski, J. J., (Eds), Descriptions of New Sharks and Rays from Borneo pp. 141-164. *CSIRO Marine and Atmospheric Research Paper* 032.
- White, W. T., P. R. Last and G. J. P. Naylor. 2010b. *Scoliodon macrorhynchus* (Bleeker, 1852), a second species of spadonose shark from the Western Pacific (Carcharhiniformes: Carcharhinidae). In Last, P.R., White, W.T. and Pogonoski, J.J., (Eds). Descriptions of New Sharks and Rays from Borneo, pp. 61-76. *CSIRO Marine and Atmospheric Research Paper* 032.
- White, W.T., P. R. Last, G. J. P. Naylor and M. Harris. 2010c. Resurrection and redescription of the Borneo broadfin shark *Lamiopsis tephrodes* (Fowler, 1905) (Carcharhiniformes: Carcharhinidae). In Last, P. R., White, W. T. and Pogonoski, J. J., (Eds). Descriptions of New Sharks and Rays from Borneo, pp. 45-59. *CSIRO Marine and Atmospheric Research Paper* 032.
- White, W. T. and P. R. Last. (2012). A review of the taxonomy of chondrichthyan fishes: a modern perspective. *J. Fish Biol.*, 80: 901-917.