

出國報告（出國類別：開會）

參加國際自然保護聯盟（IUCN）鯊魚專家小組描繪軟骨魚類重要棲地工作坊

服務機關：農業部水產試驗所沿近海漁業生物研究中心

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報告日期：113 年 3 月 29 日

## 摘要

筆者此次參加國際自然保護聯盟 (International Union for Conservation of Nature, IUCN) 物種存續委員會 (Species Survival Commission, SSC) 中的鯊魚專家小組 (Shark Specialist Group, SSG) 於 2024 年 1 月 22-26 日在印尼峇里島所舉辦的描繪軟骨魚類重要棲地—亞洲區工作坊，有 18 個國家/地區/組織共 31 人與會。筆者擔任臺灣海域棲地部分的主要貢獻者，最終提出 8 個軟骨魚類重要棲地評估計畫，包括富基海域斑竹狗鯨重要棲地、宜蘭海域洄游性鯊魚重要棲地、龜山及北方三島底棲性鯊魚重要棲地、花蓮海域巨口鯊重要棲地、臺東海域鯨鯊重要棲地、琉球海域砂勞越絨毛鯊重要棲地、澎湖海域沙拉白眼鯨重要棲地以及東沙海域尖齒檸檬鯊重要棲地等。一旦評估計畫通過審查，計畫中所描繪的軟骨魚類重要棲地即可成為未來海域空間規劃以及棲地管理及保育之重要依據。

## Abstract

The author attended the Delineating Important Shark and Ray Areas – Asia workshop hosted by the International Union for Conservation of Nature (IUCN) Species Survival Commission (SSC) – Shark Specialist Group (SSG) in Bali, Indonesia, during 22–26 January 2024. A total of 31 people including representatives of 18 countries/regions/organizations participated the workshop. The author served as a major contributor to the assessment of certain habitats in the waters of Taiwan, ultimately submitting eight Important Shark and Ray Areas delineating proposals, including Fuji for the Whitespotted Bambooshark, Yilan for pelagic speies, Turtle-and-Northern Islands for benthic species, Hualien for the Megamouth Shark, Taitung for the Whale Shark, Liuchiu for the Sarawak Pygmy Swell Shark, Penghu for the Spottail Shark, and Dongsha for the Sharptooth Lemon Shark. Once the proposals are reviewed and approved, the Important Shark and Ray Areas delineated in the proposals can serve as crucial foundations for future marine spatial planning, habitat management, and conservation efforts.

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## 一、 目的

軟骨魚類（包括鯊魚、魴鯊和銀魴，以下通稱“鯊魚”）正面臨全球性滅絕危機。根據國際自然保護聯盟瀕危物種紅色名錄（IUCN Red List of Threatened Species），目前估計超過三分之一的鯊魚物種面臨滅絕的威脅。在過去的一個世紀裡，漁業對鯊魚產生巨大的影響，並且還因棲地喪失和氣候變遷而使得威脅加劇。鯊魚物種通常壽命較長，數量較少，自然死亡率低，便對漁業壓力特別敏感，僅靠漁業和貿易管理措施不足以扭轉其資源下降，然而，棲地的保育管理措施可以在阻止族群資源下降發揮重要作用。

因此，IUCN 物種存續委員會之鯊魚專家小組已經發展出一套評估方式，用來評估軟骨魚類的棲地重要性，在全球水域中得以劃定並應用於各種棲地的保育和管理措施。重要軟骨魚類棲地（Important Shark and Ray Areas, ISRAs）被劃定並在全球水域的各種基於地點的保護和管理倡議中使用。ISRAs 除了可以用來作為海洋保護區（MPA）或 MPA 網絡的規畫外，ISRAs 還可以提供專門影響鯊魚保護活動的環境影響評估、海洋空間規劃的重要資訊。鑒於極高比例的鯊魚物種受威脅狀態的迅速惡化，而棲地的保育管理可以有效阻止惡化，因此全球需加緊實施 ISRA 方法以進一步維持鯊魚族群。

## 二、 與會人員

主辦單位及與會人員分別有 SSG 主席-Dr. Rima Jabado、亞洲區副主席- 張絜博士（中國）及 Dr. Fahmi（印尼），ISRA 工作小組 7 人、馬來西亞代表 2 人、印尼代表 4 人、菲律賓代表 2 人、印度、斯里蘭卡、孟加拉、日本、越南、泰國、緬甸、柬埔寨、南韓、俄羅斯代表各 1 人，臺灣代表 1 人（筆者），Oceans 5（NGO）代表 1 人，以及海洋哺乳動物重要棲地評估專家 1 人擔任顧問等共 31 人。

### 三、會議過程

#### (一) 大會行程

1月22日(一) 09:00~18:00

由 SSG 主席 Dr. Rima Jabado 介紹此次工作坊會議的背景、緣由及目的(圖一);接著由每個人自我介紹來自哪裡,以及預計所要撰寫的區域部分,而 ISRA 團隊的人員則介紹其工作項目與任務(圖二);接著由亞洲區的副主席 Dr. Fahmi 進行演講,主題為印尼的鯊魚及魷魚(圖三);最後則由海洋哺乳動物生態專家,擔任本次工作坊顧問的 Notarbartolo di Sciara 教授進行演講,主題是將不同海洋物種群體重要棲地套疊之潛力(圖四)。

工作坊開始則由 ISRA 團隊人員協助各地區負責人進行描繪撰寫。高度重疊地區如印尼與馬來西亞,印度、孟加拉與斯里蘭卡等地的代表同桌進行。



圖一、鯊魚工作小組 Dr. Rima Jabado 說明本次工作坊的背景、緣由及目的。



圖二、各與會人員自我介紹。



圖三、亞洲區副主席同時也是主辦單位印尼代表 **Dr. Fahmi** 進行演講。



圖四、此次工作坊顧問，海洋哺乳動物生態專家 **Notarbartolo di Sciara** 教授進行演講。

1 月 22~24 日（二~四）09：00~18：00

由各地區代表與 ISRA 團隊人員，針對之前預先提出的軟骨魚類重要棲地計畫，進行修改，包括資料文獻的查找、定義確認、文字修改、地圖劃設等。

1 月 25 日（五）09：00~12：00

各地的軟骨魚類重要棲地計畫提交截止，由主席報告此次工作坊結果，並將各地區所提出的重要棲地計畫一一唱名，對於重要棲地的命名有意見需當場提出，經討論後決定修正或維持原名。最後，並由大會頒發各與會人員的工作坊參與證書（圖五）。



圖五、筆者獲頒之工作坊參與證書。

## （二） 參與工作坊之主要內容

在工作坊開始當天，各地區代表已經提交該地區各個重要棲地計畫書，以臺灣來說，筆者共提交 8 份計畫書，分別是富基海域斑竹狗鯨重要棲地、宜蘭海域洄游性鯊魚重要棲地、龜山及北方三島底棲性鯊魚重要棲地、花蓮海域巨口鯊重要棲地、臺東海域鯨鯊重要棲地、琉球海域砂勞越絨毛鯊重要棲地、澎湖海域沙拉白眼鯨重要棲地以及東沙海域尖齒



檸檬鯊重要棲地等（圖六），而這些重要棲地的規劃，需符合特定條件，各條件描述如下（附錄一）：

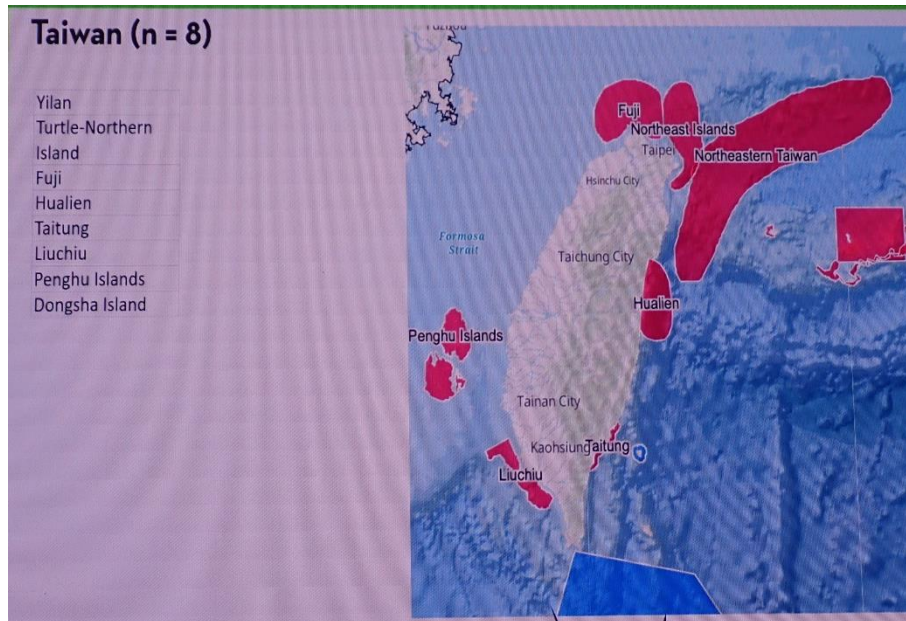
- (A) 該棲地持續出現受威脅物種。受威脅物種定義為 IUCN 受威脅物種紅色名錄 (IUCN Red List of Threatened Species) 中屬於易危 (Vulnerable, VU)、瀕危 (Endangered, EN) 以及極危 (Critically Endangered, CR) 程度之物種。然而符合條件 A 者還必須同時符合條件 B~D 中任何一條件。
- (B) 或該棲地持續出現區域限定之物種。
- (C) 或該棲地為持續出現物種行使與生活史相關之重要功能之區域，包括有：
  - (C1) 交配、產卵/仔、提供剛出生幼魚庇護；
  - (C2) 攝食場；
  - (C3) 休憩場；
  - (C4) 洄游移動必經之地；
  - (C5) 無法定義（未知）的群聚行為。
- (D) 特殊屬性，包括有：
  - (D1) 出現明顯的生物上、行為上或生態上的特徵；
  - (D2) 重要的軟骨魚類生物多樣性區域。

符合上述條件後，便需開始撰寫該棲地海域的介紹，包括地理位置、行政管轄、水文、海底地形、是否有涵蓋保護區、是否與其他物種類群之重要棲地重疊；此外還需替該棲地命名；接著需劃設棲地範圍，可以根據等深線、週邊環境範圍、漁業作業範圍等進行劃設並加以說明根據為何；還能提供其他附加資訊以支持該棲地之重要性，舉例來說：該區域每年三至五月可以發現鯊魚物種 a 在該處產卵（此為符合上述 C1 之條件），同時在過去 5 年內也曾經發現鯊魚物種 b、c、d 在該處產卵（此為附加資訊）；最後需列上所有文獻資料來源；至此才算完成一份計畫書。

而 ISRA 團隊成員的工作，即是協助各地區代表，將計畫書撰寫完整，包括使用精準而通順的用語、釐清初步的疑問、補充缺失的資料、劃設標準化的地圖等。

至工作坊最後一天，計畫書提交截止，之後會由 ISRA 團隊人員做最後文字上的修改與修飾，然後提交至獨立的審查委員加以審查，確認資料內容正確，符合重要棲地定義等，若有疑問或建議則會回到 ISRA 團隊及地區代表進行修改及回覆，審查通過才能正式確認

該區域為某軟骨魚類重要棲地，之後則會正式出版（附錄二），整個區域（如本次工作坊的亞洲區）都完成劃設後一起出版。



圖六、筆者所提交臺灣 8 處軟骨魚類重要棲地之初步規劃（東沙海域未顯示於該圖中）。

#### 四、心得及建議


- （一）描繪軟骨魚類重要棲地，分類階層需準確至物種，這可能會失去許多海域評估為軟骨魚類重要棲地的機會，它可能是軟骨魚類多樣性及豐度皆很高的區域，但因缺乏至種的分類紀錄而無法納入評估。
- （二）許多地方的軟骨魚類生物資料來自漁業捕獲，然而小型軟骨魚類常會歸入下雜魚中不會另外記錄，很可能因而錯失許多重要資訊。
- （三）符合重要棲地的條件多需要該物種經常性或規律的出現紀錄，以臺灣目前的查報（申報）系統，無法完整記錄各物種，因此主管機關（漁業署、海洋保育署）可擬定長期監控計畫。
- （四）臺灣周邊海域還有許多軟骨魚類類群（譬如琵琶魷、蝠魷、尖鰭魷等）未進行進一步調查，需要有更多的研究調查計畫。

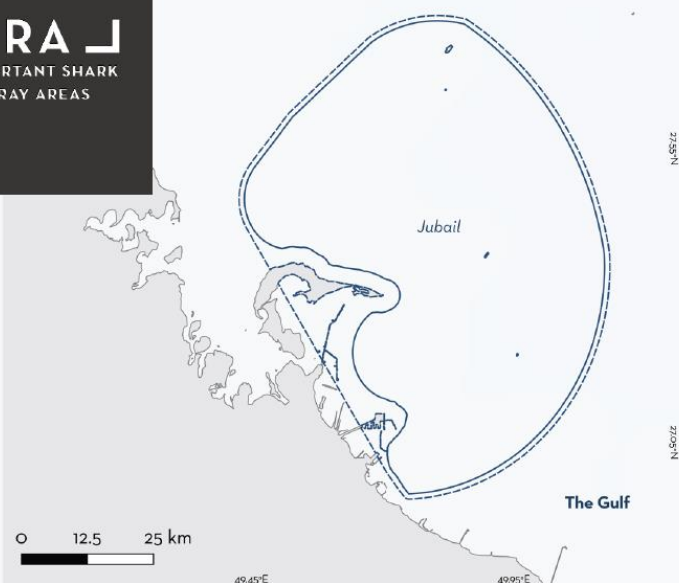
## 附錄一、軟骨魚類重要棲地之劃設準則



### ISRA CRITERIA

CRITERIA	DESCRIPTION
Criterion A Vulnerability	Areas important to the persistence and recovery of threatened sharks. <i>(This criterion must be associated with an additional criterion.)</i>
Criterion B Range Restricted	Areas holding the regular and/or predictable presence of range-restricted sharks, that are occupied year round or seasonally.
Criterion C Life-History	Areas that are important to sharks for carrying out vital functions across their life-cycle (i.e., reproduction, feeding, resting, movement, or undefined aggregations).
Sub-criterion C1 Reproductive Areas	Areas that are important for sharks to mate, give birth, lay eggs, or provide refuge and other advantages to the young.
Sub-criterion C2 Feeding Areas	Areas that are important for shark nutrition at one or more life-cycle stages.
Sub-criterion C3 Resting Areas	Areas that are important for sharks to conserve energy, often related to environmental conditions or temporal factors.
Sub-criterion C4 Movement	Areas used by sharks regularly or predictably during their movements, such as migrations, which contribute to connectivity of other functionally important areas.
Sub-criterion C5 Undefined Aggregations	Areas where an aggregation or assemblage of sharks regularly and/or predictably occur, year round or seasonally, but the function of the aggregation or assemblage is currently unknown.
Criterion D Special Attributes	Areas important for sharks considered for distinct biological, behavioral, or ecological attributes (unique or associated with a unique habitat type), or which support an important diversity of species.
Sub-criterion D1 Distinctiveness	Areas with sharks that display distinct biological, behavioral, or ecological characteristics.
Sub-criterion D2 Diversity	Areas that sustain an important diversity of sharks.

附錄二、筆者之前所提交沙烏地阿拉伯於阿拉伯灣軟骨魚類重要棲地之出版內容(共 7 頁)





Blue lines indicate the area meeting the ISRA Criteria; dashed lines indicate the suggested buffer for use in the development of appropriate place-based conservation measures

### JUBAIL ISRA

**Western Indian Ocean Region**

#### SUMMARY

Jubail lies on the central Gulf coast of Saudi Arabia. It includes coastal and nearshore islands and offshore coral islands, such as Jana Island. The area supports a variety of coastal and marine habitats, including sandy substrates, mangroves, coral reefs, and seagrass beds. Within this area there are: **threatened species** (e.g., Oman Cownose Ray *Rhinoptera jayakari*); **range-restricted species** (Human's Whaler Shark *Carcharhinus humani*); **reproductive areas** (e.g., Whitecheek Shark *Carcharhinus dussumieri*); **feeding areas** (Whale Shark *Rhincodon typus*); and **undefined aggregations** (e.g., Wafic's Eagle Ray *Aetomylaeus wafickii*).


#### CRITERIA

**Criterion A - Vulnerability; Criterion B - Range Restricted;**  
**Sub-criterion C1 - Reproductive Areas; Sub-criterion C2 - Feeding Areas;**  
**Sub-criterion C5 - Undefined Aggregations**

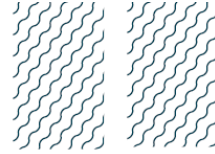
**SAUDI ARABIA**

**0-65 metres**

**3,723.19 km<sup>2</sup>**



sharkrayareas.org



## DESCRIPTION OF HABITAT

Jubail is located on the central Saudi Arabian coast in the Arabian/Persian Gulf (referred to as 'The Gulf'). It is near the coastal town of Jubail and includes coastal and offshore islands. Coastal islands represent an extension of the coastal environment, having been separated from the mainland due to the forces of storms and wind-driven waves. Other islands are entirely encircled by water channels during low tide. These include coral islands, such as Jana Island, located ~40 km off the coast. Jana Island is situated along the southern edge of a vast, shallow reef flat, which becomes visible during the neap tides (Maneja et al. 2020). Jubail supports a variety of habitats, including sandy substrates, mangroves, coral reefs, and seagrass beds. The area is warmer in summer and cooler in winter than most seas of equivalent latitude. Sea surface temperatures range from <math>10^{\circ}\text{C}</math> in the boreal winter to >math>35^{\circ}\text{C}</math> in summer. Extensive evaporation and little precipitation lead to elevated salinity levels of ~40‰ (Price 1981).

This area overlaps with two Key Biodiversity Areas (KBAs: Abu Ali and Gulf Coral Islands) (KBA 2023a, 2023b), and partly overlaps with the Jubail Marine Wildlife Sanctuary (Krupp & Khushaim 1996).

This Important Shark and Ray Area is benthopelagic and is delineated from 0 to 65 m based on the bathymetry of the area.

## ISRA CRITERIA

### CRITERION A – VULNERABILITY

Three Qualifying Species considered threatened with extinction according to the IUCN Red List of Threatened Species™ regularly occur in the area. These are the Endangered Whitecheek Shark (Simpfendorfer et al. 2019), Whale Shark (Pierce & Norman 2016), and Oman Cownose Ray (Sherman et al. 2021).

### CRITERION B – RANGE RESTRICTED

Jubail holds the regular presence of Human's Whaler Shark as a resident range-restricted species. This species occurs year-round in the area and is regularly encountered and caught in local fisheries (Hsu et al. 2022). In 135 landing surveys between 2016–2020, 854 specimens were recorded in 80 surveys (59% occurrence; Hsu et al. 2022). Human's Whaler Shark is poorly known and has a patchy distribution (Pollom et al. 2019). The numbers reported here make this the main site for the species in the northern region of its distribution.

### SUB-CRITERION C1 – REPRODUCTIVE AREAS

This area is important for the reproduction of two shark species.

Pregnant (n = 20), neonate (n = 6), and young-of-the-year (YOY; n = 6) Whitecheek Sharks were caught during fishery-independent benthic trawls during surveys between 2013 and 2016 (30 min trawl duration; n = 228 stations; 119 stations with shark and ray catch; Hsu et al. 2022). Neonates were defined by an open umbilical scar, and YOY by a healed umbilical scar (H Hsu pers. obs. 2023).

Research trawls captured the specimens in July, and commercial benthic trawlers, operating from August–January, seasonally capture pregnant and neonate Whitecheek Sharks from August–November (H Hsu unpubl. data 2023), indicating that the reproductive season for this species in the area is during the second half of the year.

The same research surveys collected 28 pregnant, 19 neonate, and 25 YOY Human’s Whaler Sharks (H Hsu unpubl. data 2023). Additional catches in commercial gillnet operations show that pregnant females are mostly captured in November–April, followed by captures of neonates in May–July (H Hsu unpubl. data 2023).

## SUB-CRITERION C2 – FEEDING AREAS

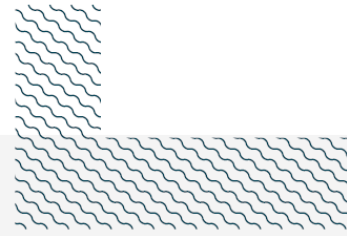
Researchers and recreational scuba divers reported Whale Shark feeding aggregations from Jana Island during September–November in 2018–2020 (Hsu et al. 2019, 2023). Surveys of fishers and other boat captains indicated that Jana Island was the second-most likely location in the Saudi Gulf Exclusive Economic Zone where Whale Sharks are encountered (Hsu et al. 2023). Up to five individuals were seen feeding together in the area (H Hsu unpubl. data 2023). Zooplankton tows showed that prey biomass was higher when Whale Sharks were present ( $60\text{--}100\text{ mg m}^{-3}$ ) than when they were absent ( $\sim 15\text{ mg m}^{-3}$ ;  $n = 7$  surveys) and was mostly composed of calanoid copepods (Hsu et al. 2023). Although the reasons for elevated zooplankton biomass are not understood yet, it appears that Whale Sharks come to the area to feed. Of three satellite-tagged individuals, one swam to the region’s largest feeding aggregation site at Al Shaheen in Qatar, and one migrated to the Gulf of Oman (similar to individuals tracked from Al Shaheen; Robinson et al. 2017), indicating that they are part of the same population in the Gulf (H Hsu unpubl. data 2023).

## SUB-CRITERION C5 – UNDEFINED AGGREGATIONS

Jubail is an important area for undefined aggregations of two ray species. During 135 landing site surveys in 2016–2020, aggregations were defined as  $>10$  individuals caught in the same operation (Hsu et al. 2022). Fishers indicated that they did not sort the catch before landing, meaning that individuals landed together were also caught together (H Hsu unpubl. data 2023).

For the Oman Cownose Ray, aggregations were recorded eight times in landing site surveys, with the largest aggregations occurring in late winter ( $\sim 10$  individuals twice in January,  $\sim 80$  in February,  $\sim 40$  and  $>30$  in March,  $\sim 20$  in April, and 17 and  $>20$  in July) (H Hsu unpubl. data 2023). The species is frequently caught (31% of landing site surveys) and comprised  $\sim 10\%$  of the weight of landed sharks and rays in the surveys (Hsu et al. 2022). Oman Cownose Rays often aggregate in large schools (Last et al. 2016).

Six aggregations of Wafic’s Eagle Ray were recorded, mostly in spring ( $>20$  individuals twice in April,  $>10$  and  $>30$  in May,  $>10$  in June,  $>10$  in September) from the catch of commercial gillnet operations (H Hsu unpubl. data 2023). This species was newly described in 2022 and detailed information are lacking, although their schooling behaviour has been noted (Jabado et al. 2022).



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**Acknowledgments**

Hua Hsun Hsu (Fisheries Research Institute, Ministry of Agriculture, Taiwan; National Sun Yat-sen University, Taiwan), and Christoph A. Rohner (IUCN SSC Shark Specialist Group - ISRA Project) contributed and consolidated information included in this factsheet. We thank all participants of the 2023 ISRA Region 7 - Western Indian Ocean workshop for their contributions to this process.

This factsheet has undergone review by the ISRA Independent Review Panel prior to its publication.

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**Suggested citation**

IUCN SSC Shark Specialist Group. 2023. Jubail ISRA Factsheet. Dubai: IUCN SSC Shark Specialist Group.

QUALIFYING SPECIES

Scientific Name	Common Name	IUCN Red List Category	Global Depth Range (m)	ISRA Criteria/Sub-criteria Met									
				A	B	C1	C2	C3	C4	C5	D1	D2	
<b>SHARKS</b>													
<i>Carcharhinus dussumieri</i>	Whitecheek Shark	EN	0-100	X		X							
<i>Carcharhinus humani</i>	Human's Whaler Shark	DD	0-43		X	X							
<i>Rhincodon typus</i>	Whale Shark	EN	0-1,928	X			X						
<b>RAYS</b>													
<i>Aetomylaeus wafickii</i>	Wafic's Eagle Ray	NE	0-44							X			
<i>Rhinoptera jayakari</i>	Oman Cownose Ray	EN	0-50	X						X			



SUPPORTING SPECIES

Scientific Name	Common Name	IUCN Red List Category
<b>SHARKS</b>		
<i>Carcharhinus amblyrhynchoides</i>	Graceful Shark	VU
<i>Carcharhinus amboinensis</i>	Pigeeye Shark	VU
<i>Carcharhinus brevipinna</i>	Spinner Shark	VU
<i>Carcharhinus leucas</i>	Bull Shark	VU
<i>Carcharhinus limbatus</i>	Common Blacktip Shark	VU
<i>Carcharhinus melanopterus</i>	Blacktip Reef Shark	VU
<i>Carcharhinus sorrah</i>	Spottail Shark	VU
<i>Chaenogaleus macrostoma</i>	Hooktooth Shark	VU
<i>Negaprion acutidens</i>	Sicklefin Lemon Shark	EN
<i>Paragaleus randalli</i>	Slender Weasel Shark	VU
<i>Rhizoprionodon acutus</i>	Milk Shark	VU
<i>Sphyrna lewini</i>	Scalloped Hammerhead	CR
<i>Sphyrna mokarran</i>	Great Hammerhead	CR
<i>Stegostoma tigrinum</i>	Indo-Pacific Leopard Shark	EN
<b>RAYS</b>		
<i>Glaucostegus halavi</i>	Halavi Guitarfish	CR
<i>Rhina ancylostomus</i>	Bowmouth Guitarfish	CR
<i>Rhynchobatus djiddensis</i>	Whitespotted Wedgefish	CR
<i>Rhynchobatus laevis</i>	Smoothnose Wedgefish	CR

IUCN Red List of Threatened Species Categories are available by searching species names at [www.iucnredlist.org](http://www.iucnredlist.org). Abbreviations refer to: CR, Critically Endangered; EN, Endangered; VU, Vulnerable; NT, Near Threatened; LC, Least Concern; DD, Data Deficient; NE, Not Evaluated.





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