UNITED ARAB EMIRATES
MINISTRY OF CLIMATE CHANGE
& ENVIRONMENT

TECHNICAL REPORT

UAE National Red List of Marine Species

Reef–building corals, cartilaginous fishes, and select bony fishes

2021

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Reef–building corals, cartilaginous fishes, and select bony fishes

2021

Ralph, G.M., Stump, E., Linardich, C., Bullock, R.W., Carpenter, K.E., Allen D.J., Hilton-Taylor, C., Al Mheiri, R., and Alshamsi, O.

Reviewed by MoCCaE Biodiversity Department: Ahmed Mashli, Hassina Ali, Hiba Alshehhi, Maitha Al Mheiri, Muna Alshamsi, Nahla Noobi, Obaid Alshamsi, Reem Al Mheiri

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Acknowledgements

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We would like to give our thanks to all the photographers who have contributed photographs to this report and to the individual species assessments. All images are credited to the photographer.

Executive Summary

The coastal waters of the United Arab Emirates comprise a diversity of marine habitats, supporting hundreds of marine species. This report focuses on reef–building corals (66 species), cartilaginous fishes (80 species), and select bony fishes in 12 commercially exploited families (126 species). An additional 95 species were listed as Not Applicable, as reported occurrences in the literature could not be verified. None of the species considered in this report are endemic to the UAE; however, 34 species are currently considered endemic to the Arabian Sea region. The conservation status of these marine species was assessed at the National Red List Assessment Workshop, held in Dubai on 15–19 September 2019, using the Guidelines for Application of the International Union for Conservation of Nature (IUCN) Red List Criteria at Regional and National Levels. Distribution maps for all species were compiled based on the exclusive economic zone (EEZ) of the UAE. The full dataset, including species assessments, supporting information, and distribution maps, is available at **https://gis.moccae.gov.ae**.

Two hundred and seventy–two species were assessed, with another 95 species considered Not Applicable for this UAE National Red List. None of these species are Regionally Extinct. Ninety species (33%) are listed as threatened (Critically Endangered, Endangered, and Vulnerable). Ninety–five species are categorised as Data Deficient (35%), including more than 50% of reef–building corals.

Climate change and coastal development are the main threats to reef–building corals, which have experienced accelerating mortality in the past few decades. Although species in the genus *Acropora* are of particular concern, even species typically considered resistant to anthropogenic stressors have experienced significant declines in recent years. Overexploitation through directed fisheries and bycatch is the main threat to the fishes that was evaluated for this project. As most of the marine fishes in the UAE are widely distributed in the northwestern Indian Ocean, region–wide initiatives to enhance efficacy of fisheries management will be essential to improve the status of marine fish biodiversity in the country.

1. Introduction

1.1. The United Arab Emirates

Lined with thousands of kilometres of mangroves and coral, the tropical Indo–Pacific Ocean is the largest and most diverse marine province (Spalding et al. 2007). The Arabian Peninsula lies in a corner of this realm, notable for large, semi–enclosed bodies of water and extreme climactic regimes. Within this region lies the United Arab Emirates

(UAE) a federation of seven emirates (Abu Dhabi, Ajman, Dubai, Fujairah, Ras Al Khaimah, Sharjah, Umm Al Quwain) in the southeast of the Arabian Peninsula and on the southern side of the Arabian Gulf.

Low rainfall (35–200 mm/year), high humidity, and high temperatures (12–52°C) characterise the climate of the UAE (Tourenq and Launay 2008). Marine habitats,
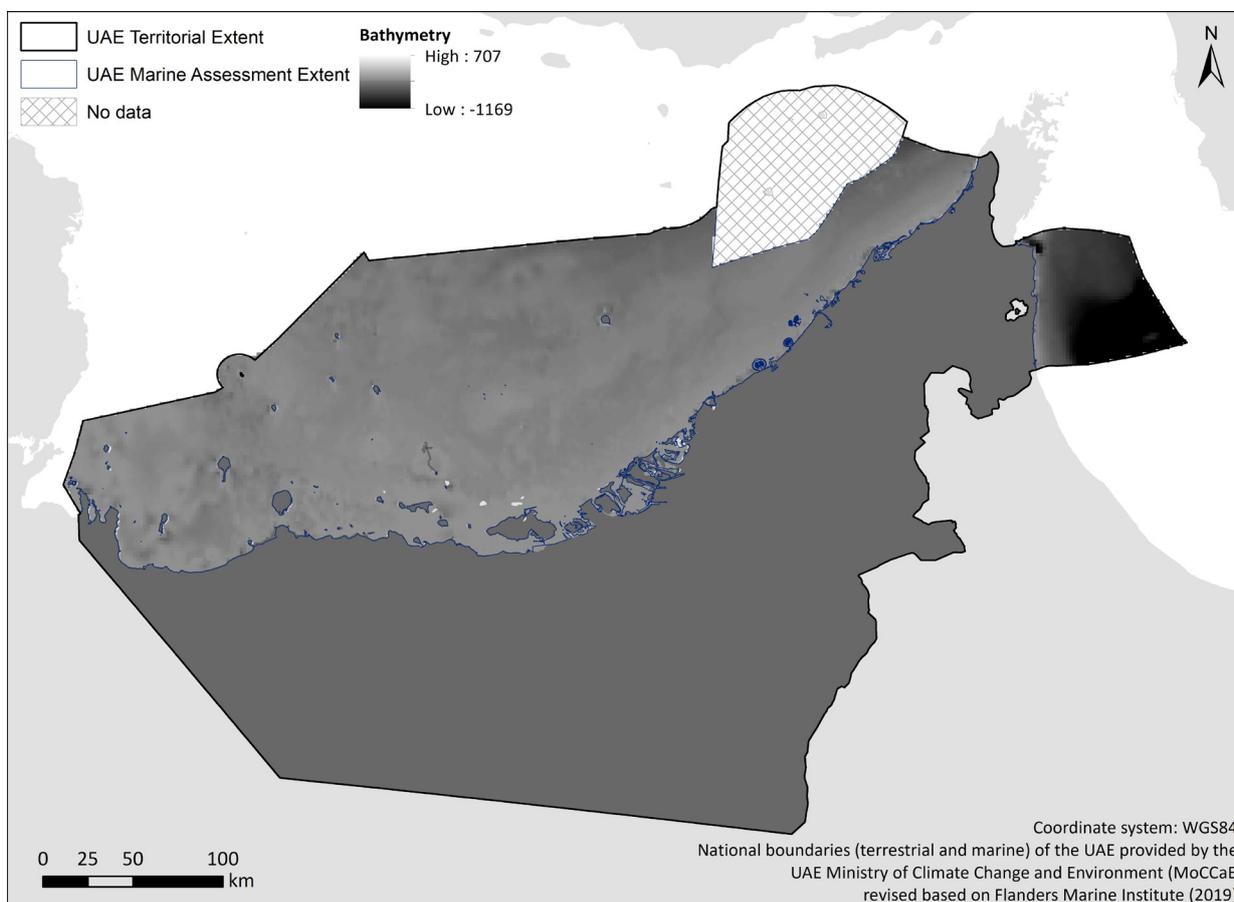
Figure 1. *The UAE and its exclusive economic zone. Depth based on the ETOPO1 global relief model (http://dx.doi.org/10.7289/V5C8276M).*

including sandy beaches, mangrove forests, seagrass beds, and coral reefs, occur throughout the country (Sheppard et al. 1992), including portions of the Arabian Gulf and the Sea of Oman.

Substantial differences exist between the UAE's marine waters in the Arabian Gulf and the Sea of Oman. UAE waters in the Arabian Gulf make up > 90% of the entire EEZ area of the country (Flanders Marine Institute 2019). This part of the Arabian Gulf is relatively shallow (mean depth =

20 m), metahaline (37–45 ppt), and has a large range in seasonal temperatures (11–35°C: Sheppard et al. 1992, Riegl et al. 2011). The southern part of the UAE in the Arabian Gulf hosts numerous inshore and offshore islands (Figure 1). Nearshore areas are swampy with a rich diversity of seagrasses; while most offshore waters are too muddy to sustain corals, there are limited patch reefs and island–associated fringe reefs, historically *Acropora*–dominated (Shinn 1976).

Comparatively, the Sea of Oman coast, or the east coast of the UAE, is less saline (< 37 ppt) and has a smaller seasonal temperature range (20–32°C: Reynolds 1993, Wang et al. 2013). The coast includes a narrow strip of shallow water that rapidly drops off to almost 1,000 m (Tourenq and Launay 2008). Generally, corals along this coast are not reef–forming (Sheppard et al. 1992).

Growth in human population and GDP has led to extensive coastal development and land reclamation. The UAE, particularly Dubai, is well–known for land reclamation projects, including high–valued developments such as the Palm Islands and World Islands (Burt and Bartholomew 2019). Fisheries are economically and culturally important in the country and exploit a diverse suite of fishes; of primary interest are hamour (primarily *Epinephelus coioides*, but can also refer to *E. bleekeri* and *E. areolatus*) shaari (*Lethrinus nebulosus*), and farsh (*Diagramma pictum*) (EAD 2018). Major taxa caught in the UAE include tunas and mackerels (family Scombridae), herrings, sardines, and their relatives (family Clupeidae), jacks (family Carangidae), emperors (family Lethrinidae), and groupers (family Epinephelidae) (AGEDI 2015). Recent catches have been estimated at 50,000 tons per year (Al–Abdulrazzak 2013).

1.2. Marine biodiversity of the United Arab Emirates

The diverse marine habitats of the UAE are home to a wide array of marine fauna and flora, however, as with many other countries of the Indian Ocean (Wafar et al. 2011), comprehensive knowledge of the diversity of many taxonomic groups is limited. For example, only 6.698 occurrence records for 378 unique species are reported for the UAE in the Ocean Biodiversity Information System, nearly half of which are small crustaceans in the class Hexanauplia (**https://obis.org/area/246**).

In general, limited information is available regarding the status of marine biodiversity in the country. Select marine species were evaluated as part of ongoing work on the UAE National Red List: marine mammals (19 species, Mallon et al. 2019), marine reptiles (13 species, Els et al. 2019), marine birds (80 species, Burfield et al. 2021), and marine plants (5 species, Allen et al. 2021). This component of the UAE National Red List extends the work in the marine realm by

focusing on all reef–building corals, cartilaginous fishes, and select bony fishes from commercially exploited families.

1.2.1. Reef–building corals

In total, 66 species of reef–building corals have been reported in the UAE (Table 1). None are endemic to the country, but three species (*Acropora arabensis*, *A. downingi*, and *Porites harrisoni*) are regionally endemic to the Arabian Sea region, which includes the Arabian Gulf and Red Sea. The complete diversity of reef–building corals in the UAE remains uncertain. Due to taxonomic uncertainty, it is suspected the current list may include species that do not range in the country's waters and/or exclude species that do range in its waters. As many species are difficult to identify in situ, it is likely that a thorough taxonomic review of reef–building corals in the UAE, and more broadly in the Arabian Gulf (Reigl et al. 2012), would confirm the true number of species. New coral species (e.g., *Psammocora albopicta:* Benzoni 2006) have been described in the Gulf. In the Arabian Gulf, the offshore islands of Iran and Saudi Arabia have a richer diversity of reef–building corals (Reigl et al. 2012), and further surveys of the UAE's offshore islands may increase the number of coral species present in the country.

1.2.2. Cartilaginous fishes

The 80 cartilaginous fishes present in the UAE include 54 sharks, 16 rays, and 10 skates (Table 1). None are endemic to the country, but 30 species are endemic to the broader Arabian Sea region (Jabado et al. 2018). Cartilaginous fishes provide considerable income, cultural heritage, and recreational value for the UAE and form an important component of the country's unique marine environment (Jabado et al. 2015, Jabado and Spaet 2017).

1.2.3. Bony fishes

The diversity of bony fishes in UAE waters is extensive, with more than 450 species of actinopterygian fishes reported (Froese and Pauly 2018). Species within this large group were prioritised by identifying the families with the highest reconstructed landings in UAE waters from 1950 to 2014 (Al–Abdulrazzak 2013). The species were further verified for changes in taxonomy with Eschmeyer's Catalog of

Fishes (Eschmeyer et al. 2018), and for documented occurrence within the UAE with national and international experts during the assessment workshop. Within these 12 priority families, 126 species are confirmed in the UAE (Table 2). None are endemic to the country, though one species (*Lisa persicus*) is currently considered endemic to the broader Arabian Sea region.

Taxa	Order	Common name	Species
Bony fishes	Clupeiformes	Herrings, sardines, and relatives	11
	Mugiliformes	Mullets	7
	Perciformes	Perciform fishes	108
Total			**126**
Cartilaginous fishes	Carcharhiniformes	Ground sharks	33
	Lamniformes	Mackerel sharks	5
	Orectolobiformes	Carpet sharks	5
	Squaliformes	Dogfish sharks	1
	Rhinopristiformes	Shovelnose rays	10
	Myliobatiformes	Rays	16
	Rajiformes	Skates	10
Total			**80**
Reef–building corals	Scleractinia	Stony corals	66
Total			**66**

Table 1. *Summary of reef–building corals, cartilaginous fishes and selected bony fishes reported to occur in the UAE.*

Family	Species
Carangidae	40
Clupeidae	11
Epinephelidae	10
Gerreidae	4
Haemulidae	9
Lethrinidae	4
Lutjanidae	11
Mugilidae	7
Scombridae	11
Siganidae	3
Sparidae	11
Sphyraenidae	5

Table 2. *Number of species in the 12 bony fish families with the highest reconstructed landings from the UAE (data from the Sea Around Us Project, Al–Abdulrazzak 2013).*

1.3. Assessment of species extinction risk

The IUCN Red List of Threatened Species™ is widely considered to be the most objective system for evaluating extinction risk at global, regional, and national scales (Miller et al. 2007, Mace et al. 2008). Standard and transparent criteria are used to apply information regarding the population (size, trends, and structure) and geographic range (size and configuration) against quantitative thresholds (IUCN 2001, 2012a; IUCN Standards and Petitions Subcommittee 2017). At the global level, species can be assigned to one of nine categories of increasing extinction risk: from Least Concern (LC), through Near Threatened (NT), Vulnerable (VU), Endangered (EN), and Critically Endangered (CR). Species already lost are assigned to Extinct (EX), or Extinct in the Wild (EW) when the species remains extant in ex–situ conditions. Data Deficient (DD) is applied to species with insufficient information to confidently make an assessment of conservation status (IUCN 2001, 2012a; IUCN Standards and Petitions Subcommittee 2017).

1.4. Red List Index

The Red List Index (RLI) was developed to use the IUCN Red List methodology to measure the rate of biological diversity loss (Butchart et al. 2004, 2005, 2007), and is a component in both the Convention on Biological Diversity (CBD) and Sustainable Development Goals (SDGs) indicator sets. The RLI is based on the number of species in each Red List Category. Trends in the RLI are based on the species that experience genuine improvement or deterioration in status. The RLI can be calculated for any set of species that has been assessed at least twice. To date, global RLIs have been published for birds (1988–2016), mammals (1996–2008), amphibians (1980–2004), reef–forming warm–water corals (1998–2008), and cycads (2003–2014) (see the Red List Index page on The IUCN Red List of Threatened Species: **https://www.iucnredlist.org/assessment/red-list-index**).

Often, decisions made at the national scale have the greatest influence on biodiversity trends. National RLIs, based on national–scale assessments of extinction risk, allow for more sensitive tracking of biodiversity trends, and are therefore of greater utility than global RLIs used at the national level. However, UAE–specific information on the distribution and population trends for the vast majority of marine species is insufficient to support the back–casting of the RLI to 1996 (i.e., an estimate of status as would have been determined in 1996), as has been done for mammals (Mallon et al. 2019), birds (Burfield et al. 2021), and plants (Allen et al. 2021). Therefore, for reef–building corals, cartilaginous fishes, and select bony fishes, a 2019 datapoint was calculated, setting a baseline value from which future changes to marine biodiversity can be determined.

1.5. Assessment workshop

The National Red List Assessment Workshop took place in Dubai on 15–19 September 2019 with three concurrent working groups. The primary objectives were:

- To review the status and distribution of reef–building corals, cartilaginous fishes, and select bony fishes occurring within the region;

- To undertake national Red List assessments of all eligible species;

- To provide a baseline to assist in monitoring and national conservation planning.

2. Assessment methodology

2.1. Geographic scope

The assessment region comprised the UAE's EEZ in the Arabian Gulf and in the Sea of Oman (Figure 1). National land boundaries followed those provided by the UAE Ministry of Climate Change and Environment (MOCCAE), and the EEZ boundaries were based on the Flanders Marine Institute (2019).

2.2. Taxonomic scope

The Red List assessment and calculation of the single datapoint for the Red list Index included the 272 marine species with confirmed native presence in the UAE. The 95 species that are unconfirmed in the country's waters were excluded, as these species were considered Not Applicable for Red List assessment at the national level (IUCN 2012a, 2012b).

2.3. Assessment protocol

For all assessments, the following data were compiled using IUCN's online database, the Species Information Service (SIS);

- Taxonomic classification and UAE–specific taxonomic notes;

- Geographic range within the UAE and, briefly, the global distribution of the species;

- Population information and overall population trend;

- Habitat preferences and primary ecological requirements, including pertinent biological information (e.g., generation length, maximum size and age), where available;

- Species use and trade;

- Major threats;

- Conservation measures (in place and needed);

- Research needed;

- Other general information;

- National Red List Categories and Criteria and rationale;

- Key literature references.

Draft assessments were compiled based on existing draft and published global assessments, review of available literature, and consultation with domestic and international experts. Finalisation of assessments and distribution maps (see section 2.4 Species mapping below) followed a three–stage process. First, the draft assessments and maps were submitted to MOCCAE in May 2019, who circulated them to national experts, and returned edits and comments to IUCN. The main review occurred through the National Red List of Endangered Species Workshop, held in Dubai on 15–19 September 2019, hosted by MOCCAE and facilitated by members of the IUCN Marine Biodiversity Unit. A large number of experts contributed their time and expertise during the workshop to review both the draft assessments and distribution maps, and to assign Red List Categories. Post–workshop editing was undertaken by IUCN staff,

and after a final stage of review and commenting, the drafts were again circulated by MOCCAE to national experts, and resulting comments and data incorporated by IUCN. Consistency in the use of IUCN Red List Criteria was checked by IUCN staff. The resulting finalised IUCN Red List assessments are products of scientific consensus concerning species status, and are supported by relevant literature and data sources.

The Red List status of these 272 species was assessed by application of the IUCN Red List Categories and Criteria, version 3.1 (IUCN 2001, IUCN 2012a), and guidelines for their application (IUCN Standards and Petitions Subcommittee 2017). The initial assessments were then reviewed following the Guidelines for Application of IUCN Criteria at Regional and National Levels (IUCN 2012b), which includes two additional categories beyond the nine used in global assessments (Figure 2). Regionally Extinct (RE) applies to species that are no longer extant within the region but occur elsewhere. Not Applicable (NA) pertains to species that have been excluded from the regional assessment process; these are typically
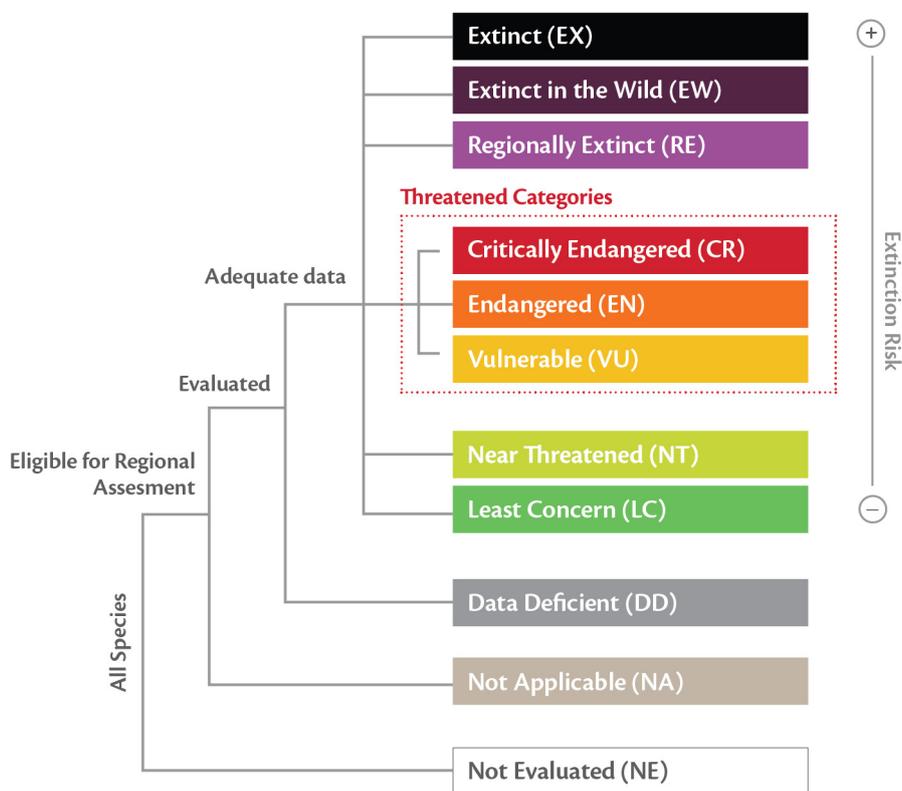

Figure 2. *Structure of the IUCN Red List Categories used at the sub–global level.*

species that are considered vagrants or have been introduced to the region. A limited post–workshop review was carried out to solicit views from experts who were unable to attend the workshop.

Three estimates of the proportion of threatened species were used to account for the uncertainty surrounding the true status of the species listed as Data Deficient (IUCN 2016a). The mid–point assumes that the Data Deficient species are as threatened as the species for which data were sufficient to assess (Table 3). However, given that the true status of the Data Deficient species is unknown, the lower and upper bound bracket the plausible range of proportion threatened. The lower bound is the proportion of all species assessed that are listed as threatened, and assumes that none of the Data Deficient species are threatened, while the upper bound is the proportion of all species assessed that are listed as threatened or Data Deficient.

Estimate	Equation
Lower bound	(CR+EN+VU)/Assessed
Mid–point	(CR+EN+VU)/(Assessed–DD)
Upper bound	(CR+EN+VU+DD)/Assessed

Table 3. *The equations for the three estimates of the proportion of threatened species based on the IUCN Red List (IUCN 2016). The IUCN Red List Categories include the three threatened categories: Critically Endangered (CR), Endangered (EN), and Vulnerable (VU); Near Threatened (NT); Least Concern (LC); and Data Deficient (DD).*

2.4. Distribution maps and analyses

Draft digital distribution maps were created by downloading the global distribution map for each species in GIS shapefile format from The IUCN Red List of Threatened Species website, where available, and clipping it to the national EEZ boundaries provided by MOCCAE (Flanders Marine Institute 2019). The draft maps underwent review and editing during the assessment workshop, then a second stage of review after the workshop before finalisation.

Metadata coding was used to distinguish presence, origin, and seasonality across the spatial extent of species distributions in the UAE. These codes differentiate the species' presence (extant, possibly extant, or extinct), seasonal presence (the default setting of 'resident' was assigned), and the origin of the species (native, introduced, reintroduced, or uncertain). The coding information can be found in the Red List digital distribution metadata guidance (IUCN 2018).

The spatial data were analysed to produce species richness maps. For the richness analyses, individual species distribution maps were modified to better reflect the depth and habitat preferences of the species. While the Gulf waters of the UAE are generally < 30m, the east coast includes deeper waters that are unlikely to be occupied by shallow, demersal species. As a result, all reef–building corals were restricted to waters < 30m, while 29 demersal cartilaginous fishes and 54 demersal bony fishes were restricted to waters < 30m or < 100m. A single cartilaginous fish (Iago omanensis) is known only from deep water (> 110 m), and was therefore removed from the coastal zone. The richness maps (all species, threatened species, and Data Deficient species) were generated by counting the number of species in each 865km^2 hexagonal grid, with coastal cells clipped to the coastline.

2.5. Red List Index methodology

The RLI datapoints for reef–building corals, cartilaginous fishes, and select bony fishes of the UAE were calculated based on national–scale assessments, following the guidelines of Bubb et al. (2009), recent practice (e.g. Butchart et al. 2010; Hoffmann et al. 2010, 2011), and guided by the recent development of national RLI values calculated for the UAE using national data on mammals, herpetofauna, and birds.

The calculation of the RLI used equal–steps weights for each Red List Category – i.e., 0 for LC, 1 for NT, 2 for VU, 3 for EN, 4 for CR, and 5 for EW (RE) and CR species tagged as Possibly Extinct in the Wild sensu IUCN Standards and Petitions Subcommittee (2017) – rather than weights based on relative extinction risk, as the latter approach makes the index much less sensitive to

changes in status of less threatened taxa. The number of taxa in each IUCN Red List Category was multiplied by these weights, and the sum expressed as a fraction of the maximum possible sum (equating to all taxa having gone extinct, i.e., the number of species multiplied by the maximum weight of 5) and subtracted from one.

The calculation produces an index value that ranges from 0 to 1. The lower the value, the faster the taxon is heading toward extinction. If the value is 1, all species in the set are Least Concern, and if the value is 0, all species are (Regionally) Extinct.
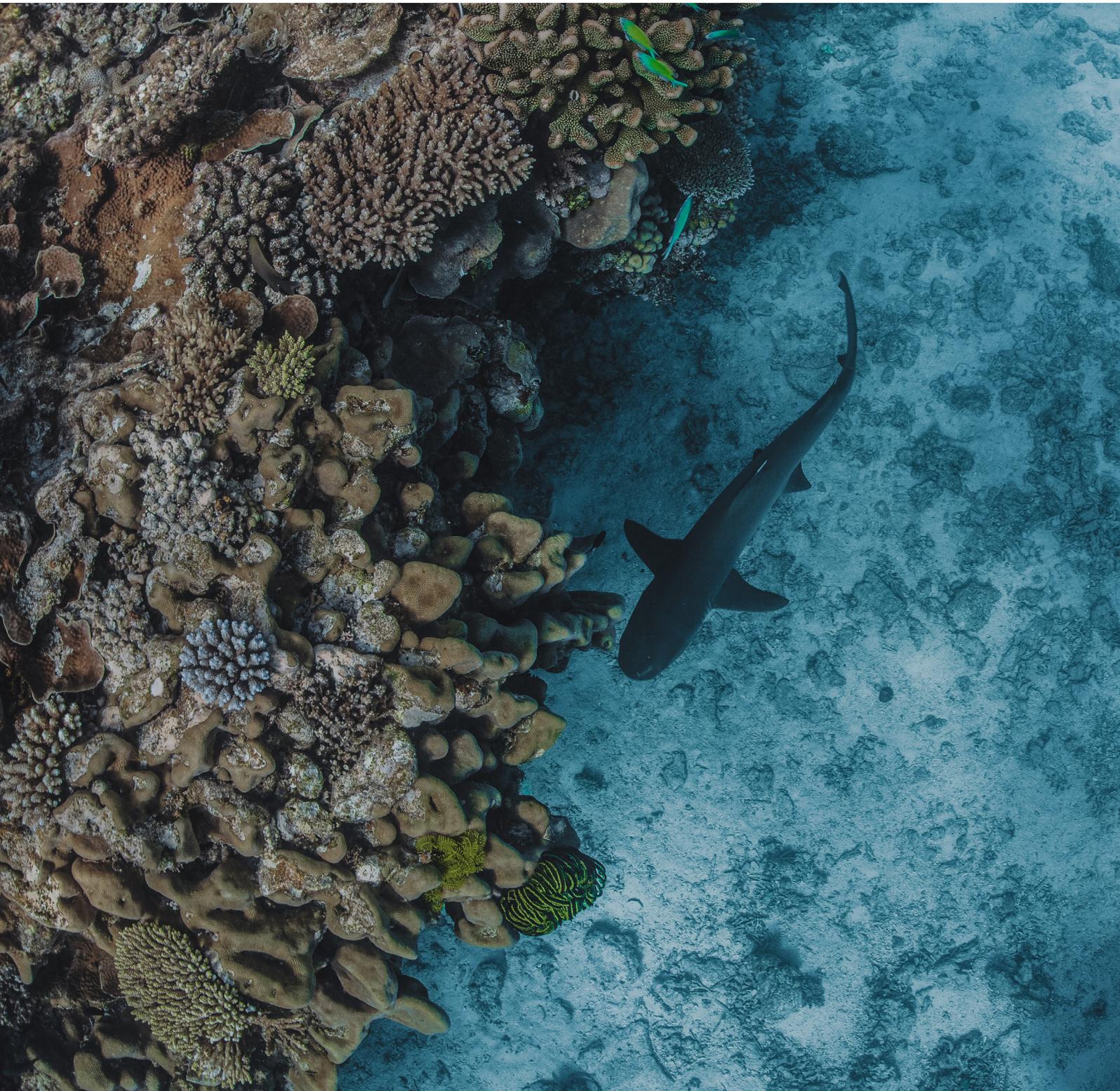
Red List Category	Reef–building corals	Cartilaginous fishes	Select bony fishes	Total
Extinct (EX)	–	–	–	–
Extinct in the Wild (EW)	–	–	–	–
Regionally Extinct (RE)	–	–	–	–
Critically Endangered (CR)	4	4	3	11
Endangered (EN)	5	20	9	34
Vulnerable (VU)	19	24	2	45
Near Threatened (NT)	2	21	–	23
Least Concern (LC)	1	3	60	64
Data Deficient (DD)	35	8	52	95
Total species assessed	66	80	126	272

Table 4. *The threat status of the select marine species assessed for the UAE National Red List. All reef–building corals and cartilaginous fishes confirmed in the UAE were assessed; a subset of bony fishes – those in commercially exploited families – was assessed.*

3. Results

3.1. Threat status

Information on distribution, status, and threats for these select marine species in the UAE was reviewed, and the 272 species were assessed for the National Red List (see Appendix 2 for the national and global Red List status, where available, for each species). Through this process, 95 species were identified as having been reported in the UAE, but their presence could not be verified; these species are not eligible for national Red List assessment and are categorised as Not Applicable (NA).

The full Red List assessments, including supporting information on distribution, population, threats and conservation, are available: **https://gis.moccae.gov.ae**. A summary of the status and distribution of the species not assessed is provided in Appendix 3

Across the three taxonomic groups considered for this Red List, no species are listed as Extinct (EX), Extinct in the Wild (EW), or Regionally Extinct (RE). The 90 threatened species, those listed as Critically Endangered (CR), Endangered (EN), or Vulnerable (VU), were unevenly distributed across the three groups; more than half of the threatened species are cartilaginous fishes (Table 4). Twenty–three species nearly met the thresholds and criteria for a threatened listing and are therefore assessed as Near Threatened (NT). Only 64 species across all three taxa are listed as Least Concern (LC), while the number of Data Deficient (DD) species is high: 95 species, almost 35%, across the three groups (Table 4).

3.2. Status and distribution of reef–building corals

The best estimate for the proportion of threatened reef–building corals is 90%, with a range of 42–95% to account for the uncertainty surrounding the species assessed as DD. Twenty–eight species are listed in one of the three threatened categories (CR, EN, VU), and one other is listed as NT (Figure 3). Only one species (*Turbinaria peltata*) is listed as LC; this species is common in deeper water habitats of the UAE, which is thought to provide a buffer from the deleterious effects of elevated sea surface temperatures. More than half of the reef–building corals are listed as Data Deficient.

Of primary concern in the UAE are the reef–building corals in the genus *Acropora*. The four species with well–documented distributions in the UAE (*A. arabensis, A. clathrata, A. downingi*, and *A. pharaonis*) are all listed as CR, having experienced declines greater than 90% over the past three decades. *Acropora* were the dominant reef–building species in the UAE historically but have experienced rapid declines, primarily as a result of increasingly frequent bleaching events (e.g., 1996–1998, 2002, 2010, and 2017). The declines of these ecosystem engineers further impact other taxonomic groups, as evidenced by the high extinction risk of coral–dependent fishes in the Arabian Gulf (Buchanan et al. 2016).

Species–specific distribution of reef–building corals in the UAE is poorly known. Based on these assessments, there are more species and more threatened species along the east coast of the country as compared to the Arabian Gulf coast (Figure 4).
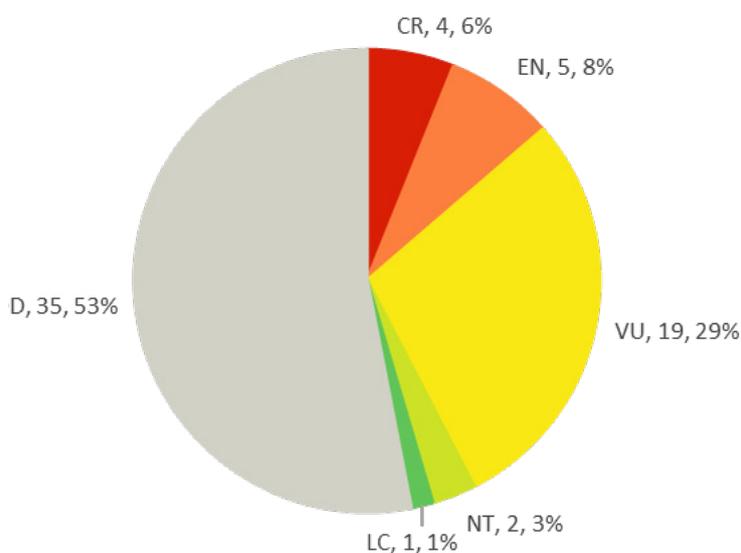
Figure 3. *The proportion of reef–building corals assessed in each Red List Category; each slice is labelled with the Red List Category abbreviation, the number of species in that category, and the proportion this represents.*
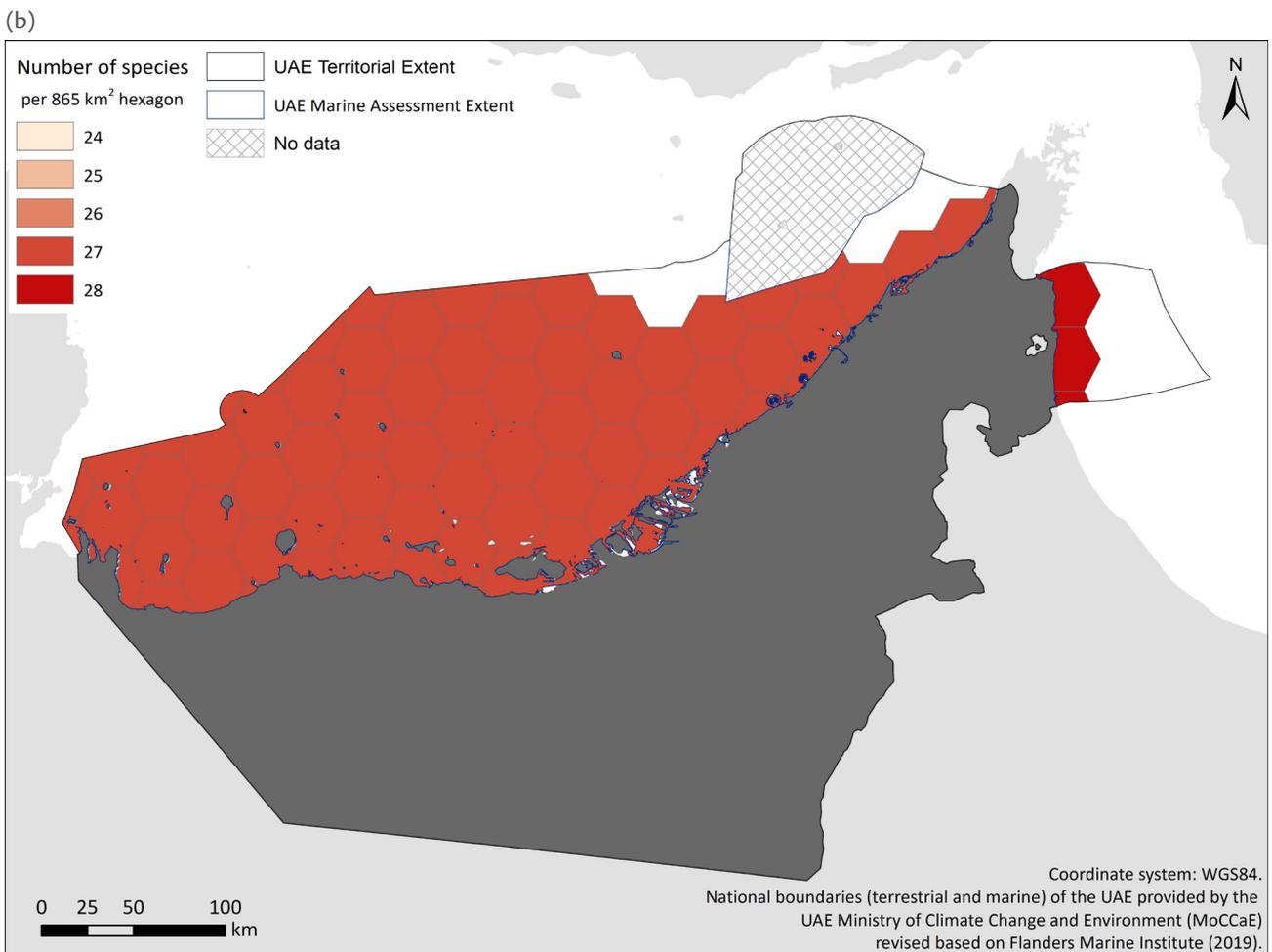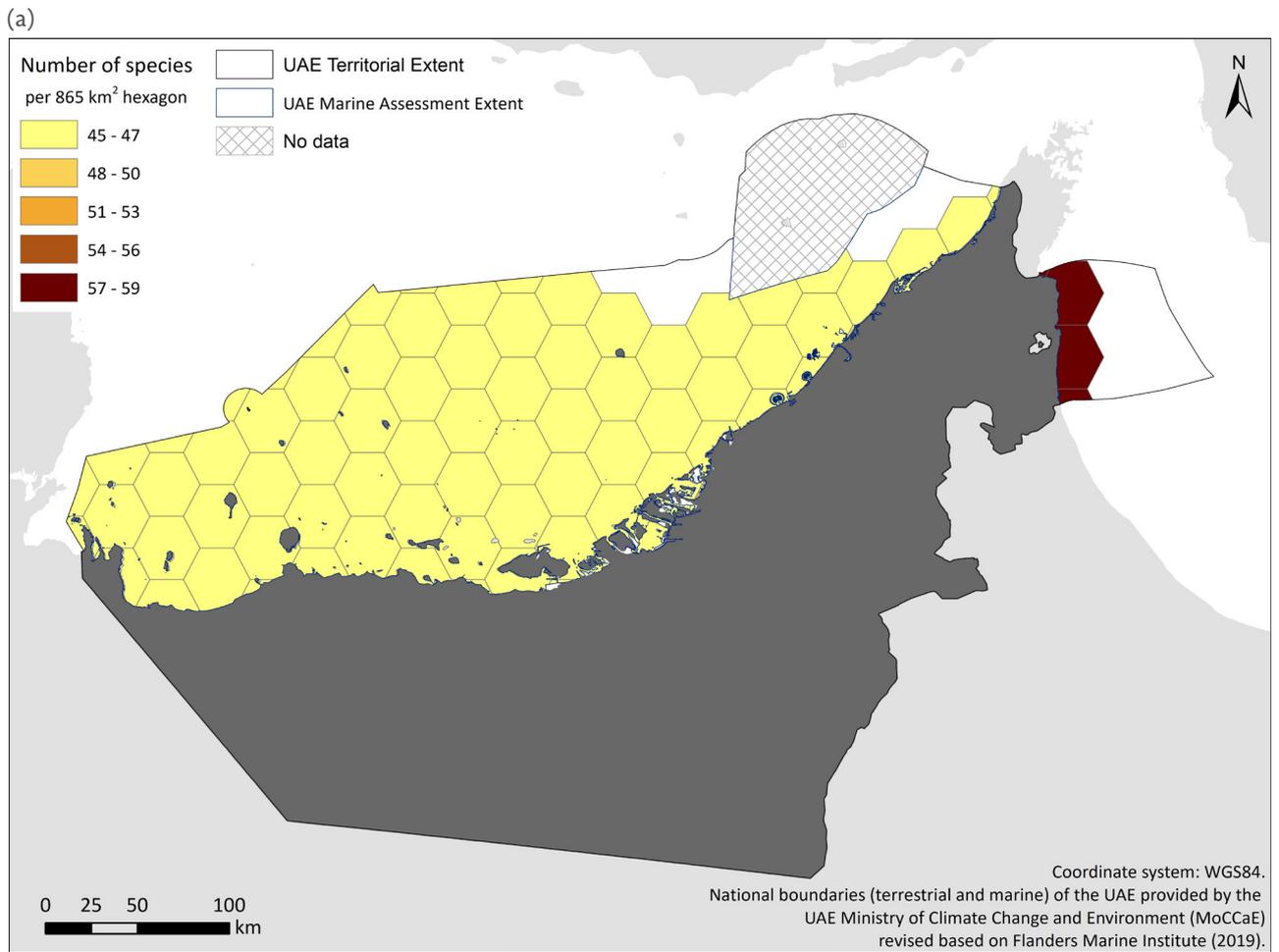
Figure 4. *Overall (a) and nationally threatened (b) richness of reef–building corals in the UAE.*

3.3. Status and distribution of cartilaginous fishes

The best estimate for the proportion of threatened cartilaginous fishes is 67%, with a range of 60–70% to account for the uncertainty surrounding the species assessed as DD. More than half of the 80 cartilaginous fishes are listed in one of the three threatened categories, with another 25% listed as NT (Figure 5). Two carcharhinid sharks (*Iago omanensis* and *Mustelus mosis*) and one ray (*Maculabatis randalli*) are listed as LC, with no indications of decline. Only 10% of species are listed as DD, substantially less than the nearly 50% of cartilaginous fishes listed as DD globally (Dulvy et al. 2014). Overall, the proportion of threatened species among sharks (Carcharhiniformes, Lamniformes, and Orectolobiformes) is slightly higher than among batoids (Myliobatiformes, Rajiformes, and Rhinopristiformes); however, in all but one order – carpet sharks (Orectolobiformes) – the mid–point is greater than 50% (Figure 6).

In the UAE, the most speciose order of cartilaginous fishes is the Ground Sharks (*Carcharhiniformes*). Among the most threatened ground sharks are *Eusphyra blochii* (CR) and *Galeocerdo cuvier* (CR). The Winghead Shark (*Eupsphyra blochii*) occurs only peripherally within UAE territory, in the Sea of Oman, and is found in coastal waters and along continental shelves, including muddy river deltas and estuaries, where it is accessible to extensive, multi–gear artisanal fisheries. It is highly valued in the international shark fin trade and is heavily exploited throughout most of its global range. This species is late–maturing and is suspected to have declined by at least 80% in the last three generation lengths (42 years). The Tiger Shark (*Galeocerdo cuvier*) has also undergone suspected declines > 90% in the Arabian Sea region; once common in UAE fish markets, this species is now rare in surveys of landing sites
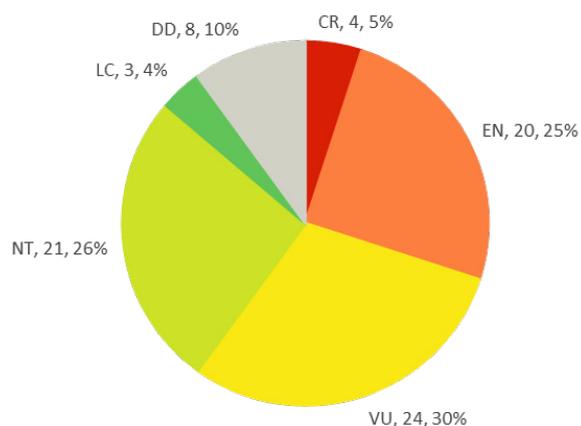
Figure 5. *The proportion of cartilaginous fishes assessed in each Red List Category; each slice is labelled with the Red List Category abbreviation, the number of species in that category, and the proportion this represents.*
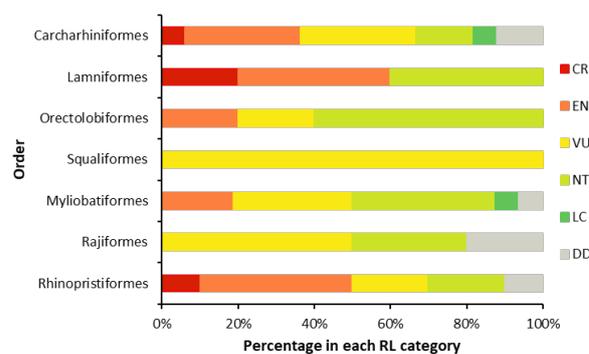
Figure 6. *The proportion of cartilaginous fishes in each Red List Category by order. The superorder Selachimorpha (sharks) consists of the Carcharhiniformes, Lamniformes, and Orectolobiformes, while the superorder Batoidea (batoids, including rays and skates) consists of the Myliobatiformes, Rajiformes, and Rhinopristiformes.*

Most of the cartilaginous fishes in the UAE are widely distributed throughout both the Arabian Gulf and Sea of Oman coasts, with the number of species and threatened species higher in shallow waters along the Sea of Oman (Figure 7). Only two Data Deficient species occur in the UAE's Gulf waters, while seven occur along the Sea of Oman.

(a)

(b)

(c)
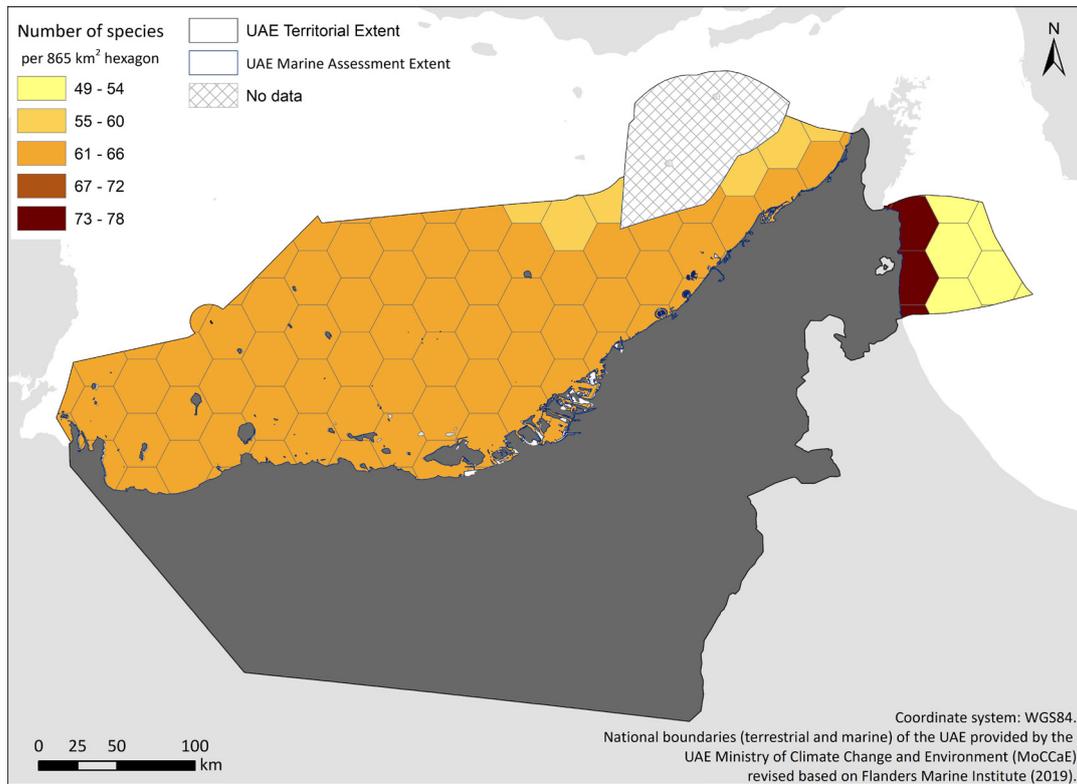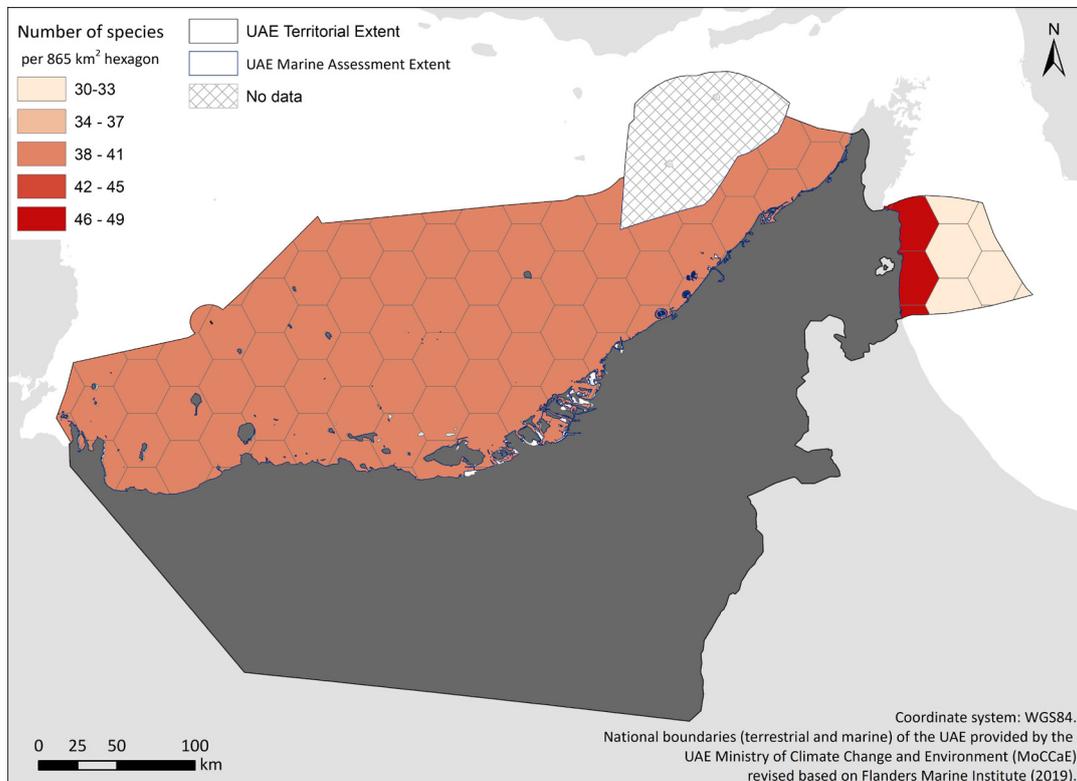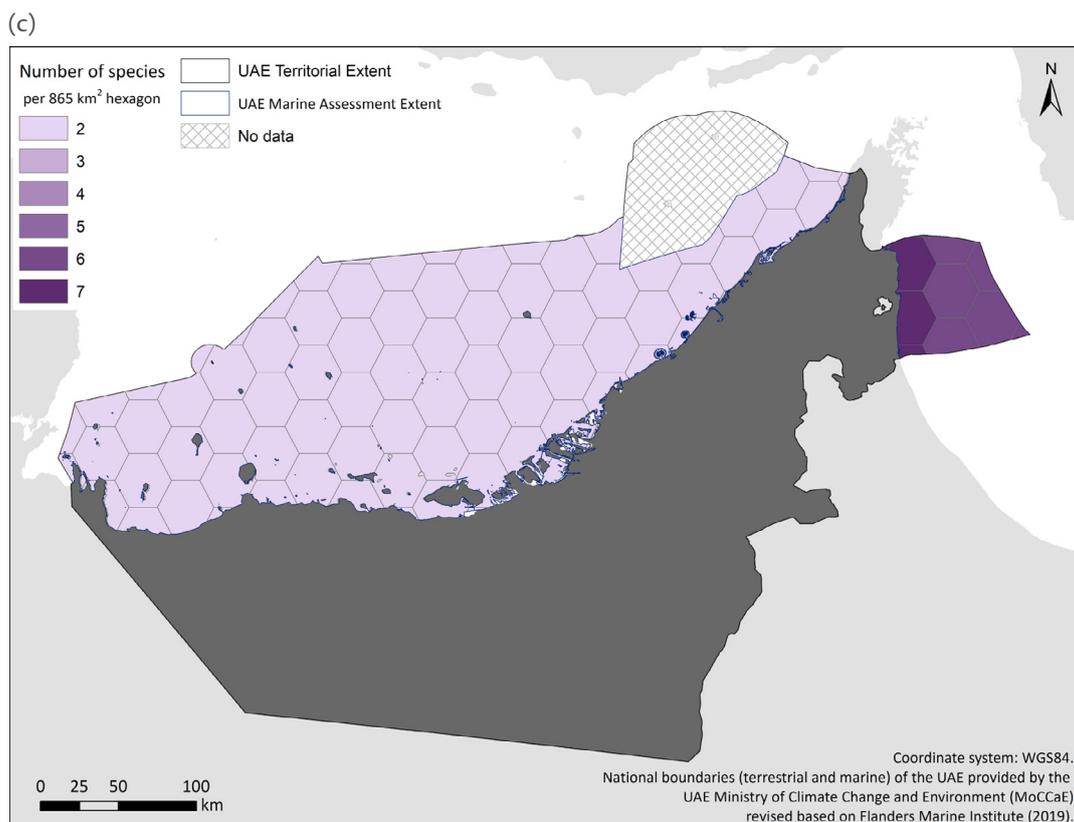
Figure 7. *Overall (a), nationally threatened (b), and Data Deficient (c) richness of cartilaginous fishes in the UAE.*

3.4. Status and distribution of select bony fishes

The best estimate for the proportion of threatened select bony fishes is 19%, with a range of 11–52% to account for the uncertainty surrounding the species assessed as DD. Fourteen species were listed in one of the three threatened categories, and almost 50% were listed as LC (Figure 8). Questions remain as to the status of the 41% of these species listed as DD, some of which may prove to be threatened in the future as more information regarding their exploitation becomes available. Continued monitoring, particularly of exploited fishes, such as the surveys undertaken by Hurst and Bagley (2017), is recommended, as is expanding monitoring to the east coast of the UAE.

However, these numbers must be interpreted with caution; unlike the other taxonomic groups, not all bony fishes in the country were assessed. Thus, this reflects the status of the species within highly exploited fish families (Table 2, Figure 9), with threatened species occurring in seven of the 12 families. The estimates presented here are substantially higher than the regional extinction risk of all bony fishes in the Arabian Gulf (8.2%, with a range of 6.6–26.8%: Buchanan et al. 2019), and as a result, may overestimate the extinction risk of all bony fishes in the UAE.
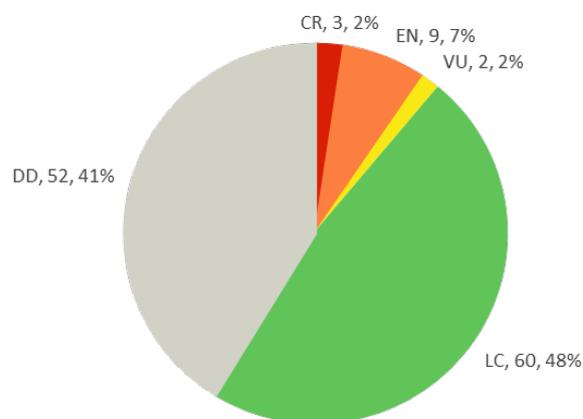
Figure 8. *The proportion of assessed select bony fish species in each Red List Category. Each slice is labelled with the Red List Category abbreviation, the number of species in that category, and the proportion this represents.*
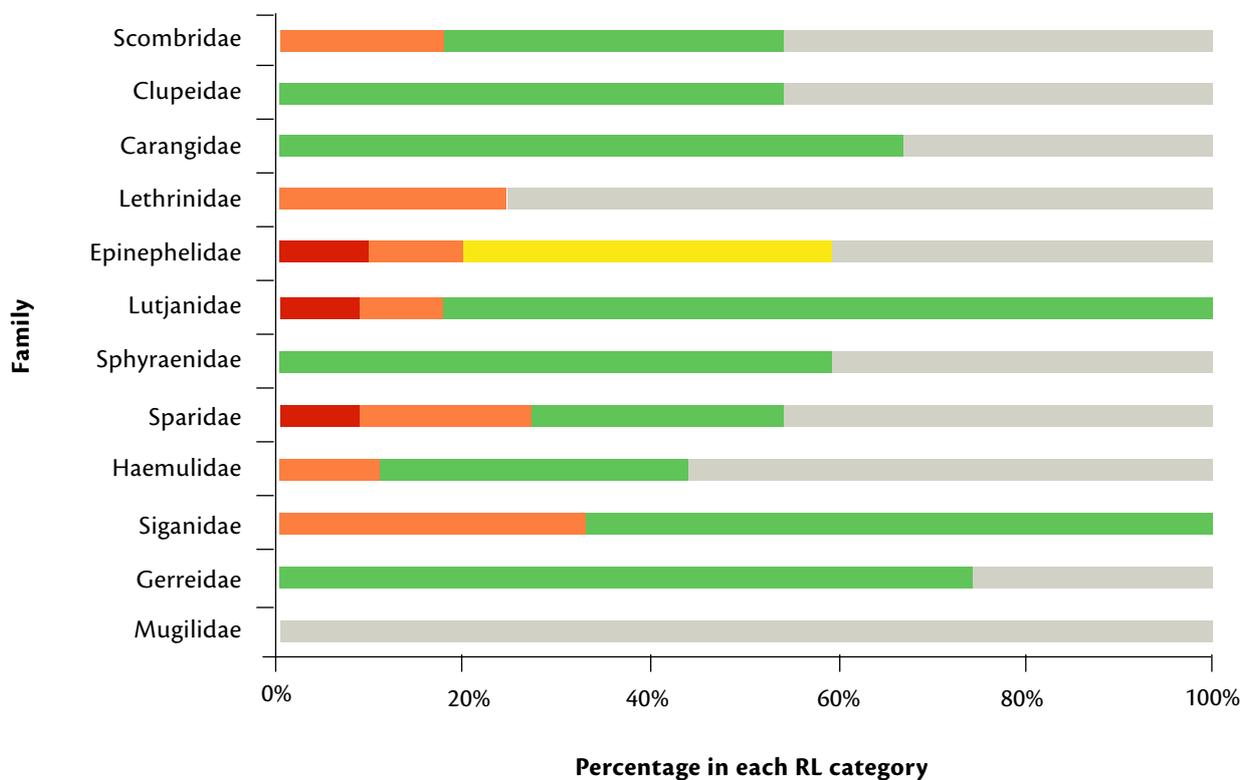
Figure 9. *The proportion of assessed bony fishes in each Red List Category by family. Families are listed in order of the extent of landings based on the Sea Around Us reconstructed landings for the UAE (Al–Abdulrazzak 2013).*

In general, the statuses as determined by the national Red List assessment process and by the fisheries stock assessment process are congruent. Although four of the threatened species have not been formally assessed for stock status, of the 10 threatened species that have, nine are considered overexploited (Table 5). The Twobar Seabream (*Acanthopagrus bifasciatus*), a coral reef–associated species, is the only one to be considered underexploited based on the 2014 Abu Dhabi stock assessment. It is listed nationally as EN based on an inferred population decline of at least 50% over three generation lengths. Catch has declined by more than 91% over the past 16 years, and although there have been some management measures to limit the use of gargoor fishing cages, the declines in effort are unlikely to be sufficient to have caused such extensive declines in catch, particularly as the regulations aimed at reducing fishing effort are inconsistent across the emirates.

Family	Species	UAE National Status	Stock Assessment	
			Status	Year
Epinephelidae	*Cephalopholis hemi-stiktos*	CR	overexploited	2013
Lutjanidae	*Lutjanus malabaricus*	CR	–	–
Sparidae	*Argyrops spinifer*	CR	overexploited	2014
Epinephelidae	*Epinephelus areolatus*	EN	–	–
Haemulidae	*Diagramma pictum*	EN	overexploited	2018
Lethrinidae	*Lethrinus nebulosus*	EN	overexploited	2018
Lutjanidae	*Lutjanus argentimaculatus*	EN	overexploited	2013
Scombridae	*Scomberomorus commerson*	EN	overexploited	2018
Scombridae	*Thunnus albacares*	EN	–	–
Siganidae	*Siganus canaliculatus*	EN	overexploited	2018
Sparidae	*Acanthopagrus bifasciatus*	EN	underexploited	2014
Sparidae	*Rhabdosargus sarba*	EN	overexploited	2018
Epinephelidae	*Epinephelus bleekeri*	VU	–	–
Epinephelidae	*Epinephelus coioides*	VU	overexploited	2018

Table 5. *The stock assessment status and year (where available) for the 14 marine bony fishes listed as nationally threatened (Critically Endangered, CR; Endangered, EN; Vulnerable, VU) in the UAE.*

Species–specific information is limited for many of these bony fishes, particularly the data required to apply the IUCN criteria for exploited species. In many cases, species–specific life history information (longevity and age at first maturity), population trends over time (or proxies, such as landings over time), and confirmation of occurrence in the region were unavailable. Additionally, the regional aggregation of catch statistics across species groups can mask the severity of species–specific population declines.

As with the cartilaginous fishes, most of the bony fishes assessed for the UAE are widely distributed along both coasts (Figure 10). Higher numbers of both overall species and Data Deficient species are found in shallow waters along the east coast.

(a)

Number of species
per 865 km² hexagon

- 69 - 79
- 80 - 90
- 91 - 101
- 102 - 112
- 113 - 123

UAE Territorial Extent
UAE Marine Assessment Extent
No data

N

0 25 50 100
km

Coordinate system: WGS84.
National boundaries (terrestrial and marine) of the UAE provided by the
UAE Ministry of Climate Change and Environment (MoCCaE)
revised based on Flanders Marine Institute (2019).

(b)

Number of species
per 865 km² hexagon

- 7 - 8
- 9 - 10
- 11 - 12
- 13 - 14
- 15 - 16

UAE Territorial Extent
UAE Marine Assessment Extent
No data

N

0 25 50 100
km

Coordinate system: WGS84.
National boundaries (terrestrial and marine) of the UAE provided by the
UAE Ministry of Climate Change and Environment (MoCCaE)
revised based on Flanders Marine Institute (2019).

(c)

Figure 10. *Overall (a), nationally threatened (b), and Data Deficient (c) richness of select bony fishes in the UAE.*

3.5. Major threats

The threats to each species were coded in the SIS database using the IUCN Threats Classification Scheme. In the UAE, the primary threats to reef–building corals include extreme and increasing temperature variability due to climate change, as well as direct destruction and increased turbidity caused by coastal construction (Riegl et al. 2012). Corals in the Arabian Gulf experience extreme environmental conditions (Bauman et al. 2010) and an array of human disturbances (Foster et al. 2011). Corals in the Gulf region are sensitive to environmental fluctuations, as the species are close to their environmental limits (Cheung et al. 2009, Buchanan et al. 2016). Temperature–driven climate change is predicted to cause declines in habitat suitability across the Gulf region, with heightened impacts in the south and southwestern Gulf (AGEDI 2015). In the Sea of Oman, UAE reefs have experienced major cyclones and harmful algal blooms that caused high coral mortality and shifted community structure (Bauman et al. 2010, Foster et al. 2011).

By far the most frequently coded threat for both cartilaginous and bony fishes is biological resource use, impacting 79 of the 80 cartilaginous fishes and 60 of the 126 bony fishes (Figure 11). Overall, the UAE's key fisheries resources are severely overexploited, with populations of several fishes (hamour, shaari, and farsh) reduced to less than 15% of their historical abundance (EAD 2018). The vast majority of fishermen (88%) and landings (83%) are from the emirates on the Gulf coast (UAE 2019, Table 6), suggesting that fishing pressure may be highest there.

The second most commonly coded threat for fishes is residential and commercial development, impacting 61 of the 80 cartilaginous fishes and 22 of the 126 bony fishes (Figure 11). The UAE, as with elsewhere in the Gulf, is rapidly replacing much of the natural shoreline with hardened structures, such as seawalls, breakwaters, jetties, and piers (Vaughan et al. 2019). Coastal infilling, dredging, and reclamation negatively affect nearshore habitats (Burt and Bartholomew 2019). For example, the

development of the Palm Islands all but destroyed the Jebel Ali reefs off Dubai, leading to near total mortality of the acroporid coral species (Reigl et al. 2012), with likely resultant effects on the local fauna.

The remaining coded threats, impacting fewer than 15 fishes each, include climate change and severe weather, pollution, natural systems modifications, transportation and service corridors, and invasive species (Figure 11). Climate change is expected to impact fisheries regionally, and UAE fisheries are considered moderately vulnerable to these impacts. Modelled climate change scenarios indicated declines in habitat suitability resulting from climate change that could lead to an overall reduction of catches >30% in the country (AGEDI 2015).

(a)

(b)
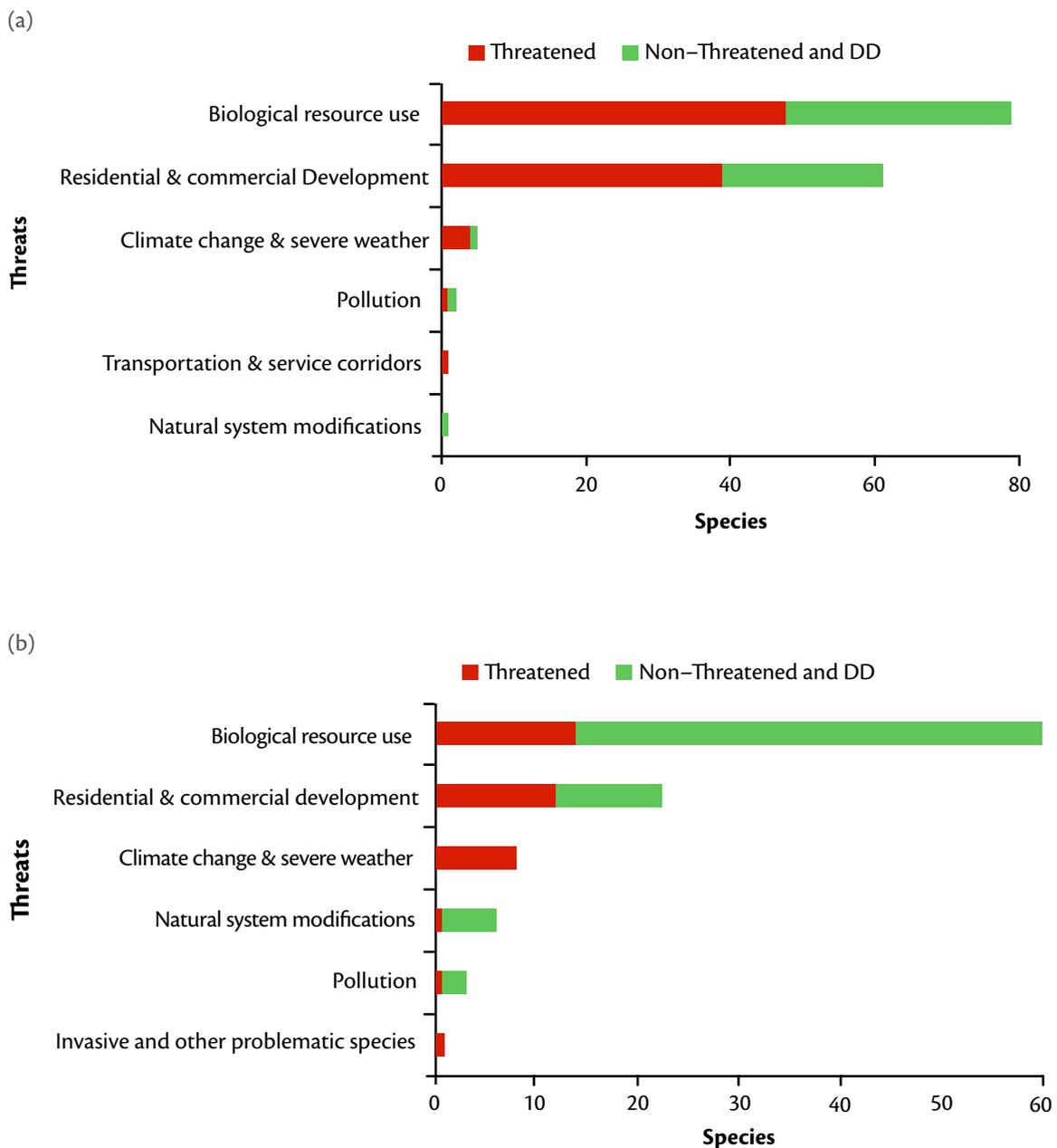
Figure 11. *Threats to (a) cartilaginous fishes and (b) select bony fishes of the UAE.*

3.6. Population trends

Limited information is available regarding the current population trends of many marine species. The population trend is unknown for almost 50% of these species, including 76% of the bony fishes assessed (Figure 12). All threatened species (except *Pocillopora damicornis*, a reef–building coral known only from the east coast of the UAE) are thought to be decreasing. Within the bony fishes, nine species are thought to have increasing or stable populations; none of the reef–building corals or cartilaginous fishes are known to have increasing or stable populations.
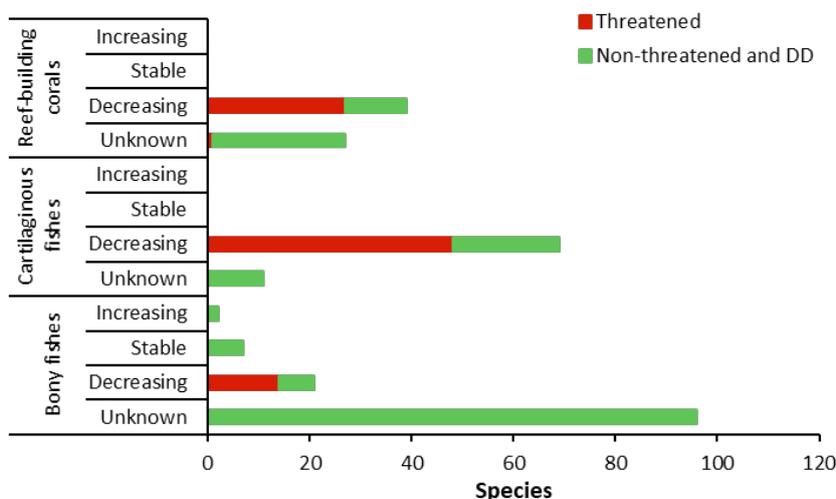
Figure 12. *Population trends for reef–building corals, cartilaginous fishes, and select bony fishes.*

3.7. Red List Index datapoint

The Red List Index (RLI) score of the 2019 assessment of the select marine species (including all reef–building corals, cartilaginous fishes, and select bony fishes) of the UAE is 0.71. Across these taxa, the RLI score was higher for select bony fishes (0.88) than cartilaginous fishes and reef–building corals (Figure 13). The RLI scores for cartilaginous fishes (0.60) and reef–building corals (0.54) were similar to marine mammals (0.64: Mallon et al. 2019).

Global Red List Indices for marine species are limited. The reef–building corals were one of the first taxonomically complete clades of marine species (beyond seabirds: Croxall et al. 2012) to be assessed using the RLI. A higher proportion of reef–building corals in the UAE are threatened with extinction than they are globally, based on the 2008 assessments (Carpenter et al. 2008). However, threats to corals globally have increased over the past decade, and global reassessments, currently in progress, may show the current status of corals to be similar to the status in the UAE.
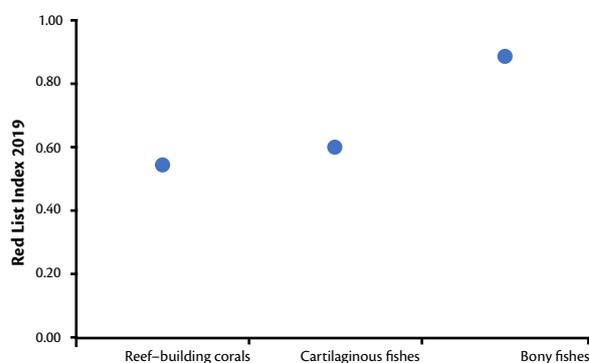
Figure 13. *Red List Index (RLI) datapoint for reef–building corals, cartilaginous fishes, and select bony fishes of the UAE for 2019. An RLI value of one equates to all species being categorised as Least Concern (LC), and hence, none are expected to go Extinct in the near future. An RLI of zero indicates that all species have gone Extinct. N = non–Data Deficient extant species at the start of the period in 2019.*

4. Conservation and research priorities

4.1. Decline of reef–building corals

Across species, reef–building corals in the UAE are in an extremely fragile state (Burt et al. 2019). Corals in the Arabian Gulf experience extreme environmental conditions, an array of human disturbances, and are sensitive to environmental fluctuations, as species are close to their environmental limits (Cheung et al. 2009, Buchanan et al. 2016). The most recent temperature anomaly event (2015–2017) resulted in severe coral bleaching and mass mortality (Burt et al. 2019). Even relatively stress–tolerant species, such as those in the families Faviidae, Merulinidae, and Poritidae, experienced bleaching and mortality. Given the present dominance of stress–tolerant species in the southern Gulf, the extensive mortality experienced in 2017 is concerning (Burt et al. 2019). In addition, the loss of coral reef has implications for the many marine species that utilise it for habitat, and will likely exacerbate projected climate change–associated declines in habitat suitability throughout the region (AGEDI 2015). The protection of habitat–forming species, such as reef–building corals, by reducing local stressors and establishing and managing protected areas, has the potential to mitigate climate change impacts (AGEDI 2015, Abelson 2019). As the decline of reef–building

corals has knock–on effects on other taxa (e.g., Buchanan et al. 2016), research and conservation initiatives aimed at improving the status of the UAE's corals are urgently needed.

4.2. Research needs for commercially exploited fisheries species

4.2.1. Bony fishes

All threatened bony fishes are experiencing regional population declines that are at least partially attributable to fishing pressure, yet not all threatened fishes have undergone stock assessment. Eleven of the 14 species assessed as threatened (79%) have undergone stock assessments that were considered during the regional UAE Red List Assessment process. Most threatened bony fishes (71%) for which stock assessments were available were assessed as overfished in Abu Dhabi, or are highly migratory and were assessed as overfished at the regional scale by international management agencies (e.g., *Thunnus albacares*). The results of these assessments can and should inform local conservation and management efforts for these species of conservation concern (Figure 14).
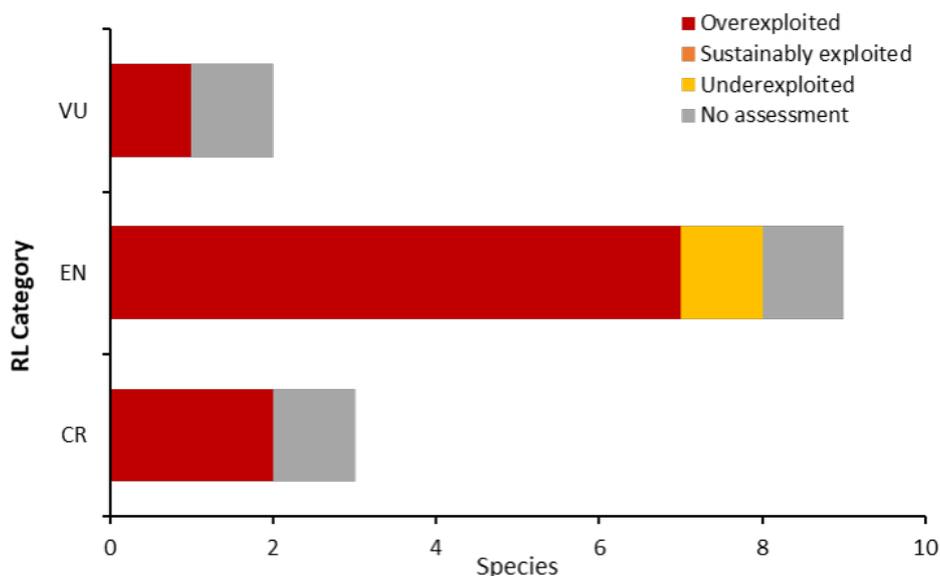
Figure 14. *Stock assessment effort and results for bony fishes assessed as threatened (Vulnerable, Endangered, Critically Endangered) in the UAE. Only species in commercially exploited families were assessed in this workshop (see Table 2).*

However, not all species assessed as threatened have undergone a formal stock assessment process at local, national, or regional scales. For example, two commercially important groupers (family Epinephelidae: *Epinephelus aerolatus*, assessed as EN; and *E. bleekeri*, assessed as VU) and one commercially important snapper (family Lutjanidae: *Lutjanus malabaricus*, assessed as CR) were assessed as threatened but have yet to undergo formal stock assessment in the UAE. These are highly valued and heavily fished species in the country's waters, and have exhibited prolonged declines in catches from 30 to 90% under stable or increasing fishing effort scenarios. They also exhibit intrinsic life history and behavioural characteristics that make them more susceptible to population declines resulting from high fishing pressure, including longevity, late maturity, and aggregation behaviour.

Fisheries in the UAE are considered artisanal and utilise a variety of gears, including traps (gargoor, hadha), hand lines (hadaq), and nets (defara, ghazal, and nesaab). The unique characteristics of these gears affect the composition of the target and non–target species taken. Abu Dhabi recently banned gargoor (effective 1 May 2019), as it targets highly valued fishes, such as hamour; effects on non–target species, such as sea turtles, are also likely (Yaghmour et al. 2018). The various trade–offs regarding allowable gear and effort limits should be considered to minimise the negative impacts on both target and non–target species.

A substantial number of Data Deficient species are components of regional and national fisheries. Of the 52 bony fishes assessed as DD, 42 (81%) are fished in some capacity in the UAE, and at least 25 of those are heavily fished. Only 13 of the 42 fished species assessed as DD (31%) have undergone formal stock assessment; of these, four were considered overexploited by regional fisheries, and nine were considered sustainably/fully exploited or underexploited (Figure 15). These results highlight the need for increased fisheries management and monitoring

efforts: fisheries–dependent information, such as catch composition; size, age, and reproductive condition; location and effort data; and fisheries–independent information, particularly stock structure (Hurst and Bagley 2017).

Nearly half of the fished DD species have been flagged as research and conservation priorities for the UAE (Table 7). These species display a suite of characteristics that are likely to increase their susceptibility to high fishing pressure, such that additional data may result in them qualifying as threatened or Near Threatened in the UAE in future assessments. These species have exhibited substantial catch declines over the last 10–20 years, often in excess of 80%, that are unaccounted for by existing knowledge of fishing effort and environmental trends in the region. Many are considered highly valued food fishes. Furthermore, several species are associated with sensitive habitats, such as coral reefs, estuaries, and seagrass beds; these species are likely experiencing non–additive effects of habitat degradation and overexploitation.
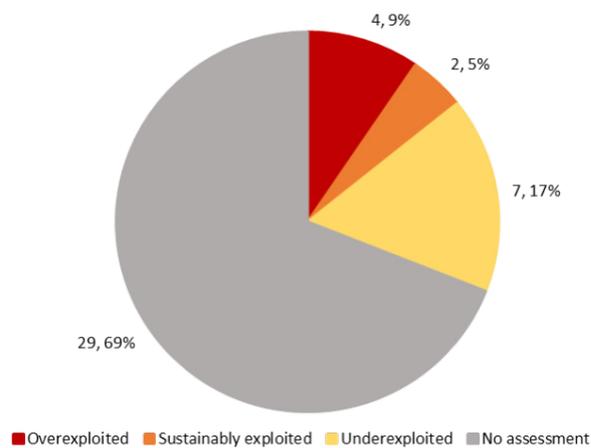
Figure 15. *Stock assessment effort and results for bony fishes assessed as Data Deficient in the UAE. Only species in commercially exploited families were assessed in this workshop (see Table 2).*

| Family	Species	Stock status	Taxonomic issues	Highly valued	Catch declines	Habitat vulnerability
Carangidae	*Atule mate*	underexploited			> 90%	
Carangidae	*Carangoides bajad*	overexploited			unquantified	
Carangidae	*Gnathanodon speciosus*	overexploited		x	>80%	
Carangidae	*Carangoides fulvoguttatus*	NA		x	>90%	
Carangidae	*Carangoides malabaricus*	NA		x	>90%	
Carangidae	*Caranx heberi*	NA		x	>90%	
Carangidae	*Caranx ignobilis*	NA		x	>80%	
Carangidae	*Parastromateus niger*	NA			unquantified	
Carangidae	*Seriola dumerili*	NA		x	>90%	
Clupeidae	*Sardinella longiceps*	NA			unquantified	
Epinephelidae	*Aethaloperca rogaa*	NA			unquantified	reef–associated
Haemulidae	*Plectorhinchus gaterinus*	underexploited			>90%	
Haemulidae	*Pomadasys argenteus*	NA			unquantified	
Haemulidae	*Pomadasys stridens*	NA			unquantified	estuary–associated
Lethrinidae	*Lethrinus lentjan*	underexploited			>90%	
Lethrinidae	*Lethrinus microdon*	underexploited			>75%	reef–associated
Lethrinidae	*Lethrinus borbonicus*	sustainable			>80%	reef–associated
Lutjanidae	*Pristipomoides filamentosus*	NA			>90%	reef–associated
Mugilidae	*Moolgarda seheli*	sustainable	x		>80%; family	estuary–associated
Mugilidae	*Ellochelon vaigiensis*	NA	x		>80%; family	estuary–associated
Mugilidae	*Osteomugil cunnesius*	NA	x		>80%; family	estuary–associated
Scombridae	*Thunnus tonggol*	overexploited			regionally	
Sparidae	*Acanthopagrus arabicus*	underexploited	x		unquantified; congener >80%	estuary–associated
Sparidae	*Rhabdosargus haffara*	overexploited	x		unquantified; congener overexploited	
Sparidae	*Sparidentex hasta*	NA		x	unquantified	
Sphyraenidae	*Sphyraena barracuda*	underexploited			>90%	
Sphyraenidae	*Sphyraena putnamae*	NA			unquantified; congener >90%	

Table 7. *List of Data Deficient species flagged as research priorities based on a suite of characteristics likely to increase their susceptibility to exploitation, with stock assessment status (when available) and documented issues of concern.*

4.2.2. Cartilaginous fishes

Fishing emerged as a major threat to cartilaginous fishes in the UAE. Many cartilaginous fishes share intrinsic characteristics that render them susceptible to overfishing – they are often long–lived, mature at late ages, have long gestation periods, give live birth to often large offspring, and reproduce intermittently (Dulvy et al. 2014). Cartilaginous fisheries are largely unmonitored globally and in the UAE (e.g., Jabado et al. 2014, 2015; Jabado and Spraet 2017). Monitoring of fisheries landing sites in the country provides some national–level data on cartilaginous fishes; however, limitations remain, as much of the catch is not reported, aggregated by family, or included in an 'other' category (UAE MOCCAE 2018). As overfishing remains widespread in the region, current exploitation levels for most cartilaginous fishes are likely unsustainable (Jabado et al. 2014, 2015; Jabado and Spaet 2017). The UAE has been a significant regional and international hub for the re–export of shark and ray products, including meat and fins (Shea and To 2017, Lau and To 2019, Okes and Sant 2019). However, progress is being made to improve catch and effort data collection, and expand protection for many species. Recent legislation reduced the country's role in the international trade in shark products. For example, the Ministerial Resolution No. 43 of 2019 regulates shark fishing and trade, including permanent bans on protected species

(e.g., those listed in CITES, CMS and earlier national legislation), spatial and seasonal closures, and bans on import and re–export of shark fins (excluding those intended for scientific purposes with appropriate permits).

Cartilaginous fishes form an important component of UAE fisheries, with at least 50 species, representing over half (60%) of all cartilaginous species recorded in the country's waters, being landed in UAE fishing ports and/or sold in markets. Some species are explicitly targeted, while many others are taken as bycatch and retained rather than discarded at sea. Shark–like batoids (order Rhinopristiformes), lamnid sharks (order Lamniformes), and ground sharks (order Carcharhiniformes) are among the most highly valued and frequently landed cartilaginous fish species in the country (Figure 16), and have been traded locally, regionally, and globally (Jabado and Spaet 2017).

All 10 species of Rhinopristiformes, an order which includes sawfishes and guitarfishes, that are known to occur in UAE waters, are also landed in the country (Jabado 2018). These animals are captured with a variety of fishing gears, including gillnets, seine nets, and hook and line. Species–specific or even pooled landing statistics for these fishes are rarely collected by management agencies in the UAE or in the region, while market surveys and interviews with fishermen indicate
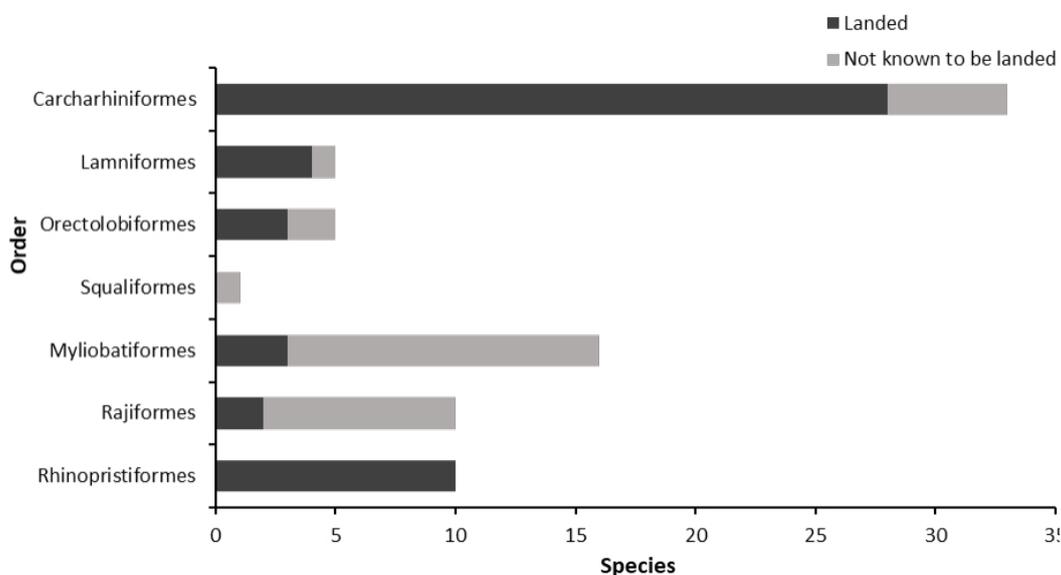
Figure 16. Landing status of cartilaginous fish species in UAE markets and ports.

that nearly all species have substantially declined throughout the region (Jabado et al. 2017; Jabado 2018).

The Green Sawfish, *Pristis zijsron* (CR), is an iconic sawfish that was historically abundant in UAE waters. It has drastically declined in the country, regionally, and throughout its global range, though interactions with these animals still occur in the UAE (Jabado et al. 2017). Further understanding of their life history characteristics, including growth, reproduction, and mortality, as well as investigation into the scale of their spatial and temporal movements, are needed to identify and protect hotspots where these animals are still being sighted by fishermen (Jabado et al. 2017). Immediate conservation actions are required to secure the long–term survival of the green sawfish and other Rhinopristiformes in the country.

Despite their ubiquity in UAE landings, and their local and regional commercial importance, no stock assessments of cartilaginous fishes have been undertaken at the national or regional scale (Jabado and Spaet 2017). Among the 50 cartilaginous fishes that are known to be landed in the UAE, 72% were assessed in a threatened category, while only 40% of non–commercially important species were assessed as threatened. Therefore, further

exploration of the effects of exploitation on the UAE's cartilaginous fishes is needed.

4.3. Marine Protected Areas

The UAE has reported 16 unique coastal and marine protected areas (PAs), as listed on the World Database on Protected Areas (https://protectedplanet.net; see Figure 17 and Table 8). The total marine area covered by these is 6,936 km², representing approximately 12.53% of the country's waters. Individual sites range in size from under 0.1 km² to 4,268.4 km². All UAE's PAs are designated as no–take reserves to their full marine extent.

High–resolution data on the distribution of most marine species are unavailable, as relatively few detailed surveys of marine species exist in the country, and misidentifications and taxonomic uncertainty plague many species groups. As a result, it is difficult to evaluate the biodiversity of marine PAs or to determine how many marine species occur in at least one protected area. However, as most marine PAs are found in nearshore waters and are fully no–take, it is likely that many species, especially those that prefer coastal and inshore habitats, derive some benefit from the PAs.
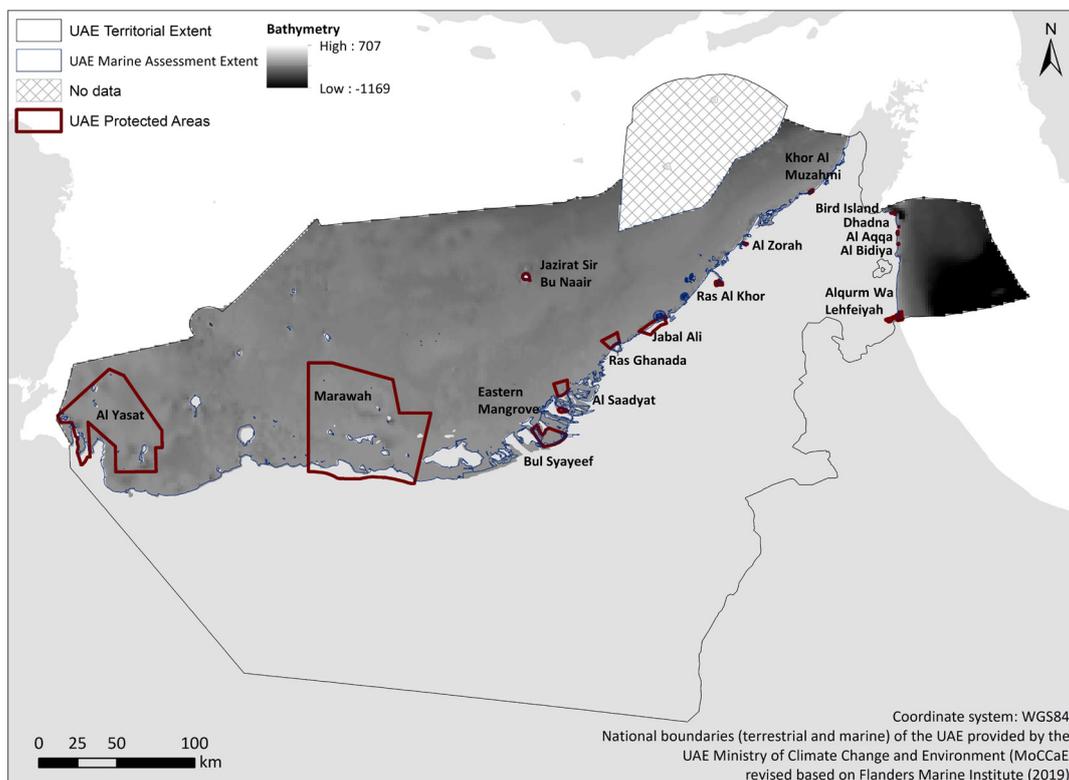
Figure 17. *Location of coastal and marine protected areas (PAs) in the UAE. Source: MOCCAE.*

Name	Marine Area (km²)	Year Established	Management Authority
Marawah	4,259.24	2001	EAD
Al Yasat	2,256.00	2009	EAD
Bul Syayeef	145.18	2014	EAD
Jabal Ali	76.69	1998	Dubai Municipality
Al Saadyat	59.25	2014	EAD
Ras Ghanada	54.61	2014	EAD
Jazirat Sir Bu Na'air	32.63	2000	EPAA
Alqurm Wa Leh-feiyah	23.77	2012	EPAA
Ras Al Khor	10.13	1998	Dubai Municipality
Eastern Mangrove	9.90	2014	EAD
Khor al Muzahmi	3.00	2018	EPDA
Al Zorah	1.93	2004	Ajman Municipality and Planning Department
Bird Island (Jazeraat Al Tuyur)	1.44	1995	Dibba Fujairah Municipality
Al Aqqa	1.06	1995	Dibba Fujairah Municipality
Al Bidiya	0.46	1995	Dibba Fujairah Municipality
Dhadna	0.08	1995	Dibba Fujairah Municipality

Table 8. *List of coastal and marine protected areas in the UAE with the year designated and the reported marine extent. All coastal and marine PAs in the UAE are designated as no–take.*

4.4. National legislation, international environmental agreements, and fisheries management

The UAE has a variety of policies and legislation that can be applied to conservation challenges within territorial waters and regionally (Table 9). The country is a signatory to several international agreements focused on marine conservation, biodiversity, and sustainable development, including the United Nations Convention for the Law of the Sea, CBD, the Convention on Migratory Species, the Convention for the International Trade in Endangered Species (CITES), and the Memorandum of Understanding on the Conservation of Migratory Sharks (Table 10).

Legislation	Title	Year
Federal Law 23	on the Exploitation and Protection of Living Aquatic Resources in the UAE	1999
Federal Law 24	on the Protection and Development of the Environment	1999
Ministerial Decree No. 18	on Declaring Marawah as a Protected Marine Area	2001
Federal Law 11	Concerning Regulating and Controlling the International Trade in Endangered Species of Wild Fauna and Flora	2002
Ministerial Decree No. 33	on Declaring Al Yasat as a Protected Marine Area	2005
Ministerial Decree No. 470	on Migratory Pelagic Fishing (Al Helag fishing system)	2012
Ministerial Decree No. 372	on Temporary Suspension of New Fishing Boat Registration	2013
Ministerial Decree No. 500	on Regulating the Fishing and Trading of Sharks	2014
Ministerial Decree No. 598	on Amendment of Decree No. 695 of 2016 on Migratory Pelagic Fishing (Al Helag fishing system)	2014
Federal Law 7	on the Protection and Development of Bio–aquatic Resources in the UAE and related regulations	2015
Ministerial Decree No. 471	on Migratory Pelagic Fishing (Al Helag fishing system)	2016
Ministerial Decree No. 90	Ban on recreational shark fishing	2016
Ministerial Decree No. 115	on Regulation of Fishing by Fixed Equipment (Hadhra) in Abu Dhabi	2017
Ministerial Decree No. 135	on Prohibition of Fishing and Marketing of Longtail Silver Biddy Fish in Abu Dhabi	2017
Ministerial Resolution No. 43	Regulating Shark Fishing and Trade	2019
Ministerial Resolution No. 82	Ban on the use of gargoor nets in Abu Dhabi	2019
Ministerial Decree No. 468	on Regulating Fishing of Pelagic Fish Using Encircling Nets	2019

Table 9. List of existing national legislation (federal laws and ministerial decrees) specific to marine conservation in the UAE with year of entry into force.

Title	Year
Arab League	1971
Regional Organization for the Protection of the Marine Environment (ROPME)	1978
Convention on International Trade in Endangered Species (CITES)	1980
Gulf Cooperation Council (GCC)	1981
United Nations Convention for the Law of the Sea* (UNCLOS)	1982
Indian Ocean Rim Association (IORA)	1999
Convention on Biological Diversity (CBD)	2000
Regional Commission for Fisheries (RECOFI)	2001
Memorandum of Understanding on the Conservation of Migratory Sharks	2014
Convention on Migratory Species (CMS)	2016

Table 10. *List of international agreements, Regional Fishery Bodies (RFB), and Regional Fisheries Programmes (RFP) specific to marine conservation in the UAE. * signed but not ratified.*

5. Conclusions and recommendations

5.1. General recommendations

The following general recommendations emerged during the process of developing the UAE National Red Lists.

- **MANAGE LOCAL STRESSORS**, such as overfishing, destructive fishing, sedimentation from coastal construction, and hypersaline discharges from desalination projects (Burt and Bartholomew 2019) to minimise, mitigate, or prevent damage to the marine environment. Impacts of climate change on marine biodiversity can be moderated by managing local stressors (AGEDI 2015, Abelson 2019). In addition to addressing localised threats in the UAE, continued movement towards achieving climate neutrality by leaders in government, business, and civil society may benefit biodiversity and conservation initiatives.

- **IDENTIFY GAPS IN MPA COVERAGE AND MANAGEMEN**T to support and improve ecosystem functioning. The UAE leads the region in total area and percentage of EEZ protected by MPAs (Burt et al. 2016), however, while some coral reefs in the country are in MPAs, many are not and remain under threat from localised human activities (Grizzle et al. 2016). Additionally, not all MPAs have management plans.

- **CONTINUED INVESTMENT IN AWARENESS AND EDUCATION INITIATIVES** across the country to increase future capacity for conservation and resource management.

- **IMPROVED ENFORCEMENT** of existing environmental and conservation legislation is needed across the emirates (Tables 9 and 10).

5.2. Taxa–specific recommendations

5.2.1. Reef–building corals

The following additional recommendations emerged during the process of developing the UAE National Red List of Reef–Building Corals.

- **EXPAND CONTEMPORARY REEF SURVEYS** to comprehensively map the occurrence of corals across the country, particularly those found at depths > 10 m. Corals that are now established on coastal infrastructure and those located within the boundaries of offshore facilities should be considered for inclusion in these surveys (Grizzle et al. 2016).

- **IDENTIFY GAPS IN MPA COVERAGE** of coral refuge areas (Grizzle et al. 2016) and prioritise these areas for conservation. Protection and local management can help maintain healthy reefs in the face of climate change impacts (Abelson 2019).

- **DEVELOP A NATIONWIDE REEF MONITORING NETWORK** to support data–driven management and conservation of reef–building corals (Grizzle et al. 2016).

- **PROMOTE ECOLOGICAL ENGINEERING OPPORTUNITIES** to enhance the ecological benefits of existing and planned coastal infrastructure (Burt and Bartholomew 2019). Due to rapid regional expansion of development in coastal areas, more than half of the Arabian Gulf's coastline consists of artificial structures, such as seawalls, breakwaters, jetties, and piers (Burt and Bartholomew 2019), which may result in degraded natural coral reefs.

5.2.2. Bony and cartilaginous fishes

Fishing emerged as a major threat for both bony and cartilaginous fishes; as a result, many recommendations apply to both taxa.

- **IMPROVE FISHERIES DATA COLLECTION AND DISSEMINATION** to reduce inconsistencies across the emirates and regionally. Conservation of bony and cartilaginous fishes will benefit from improved methods of fisheries data collection and reporting on a species–specific level. The continuation and expansion of fisheries–independent surveys utilising multiple gears (e.g., Hurst and Bagley 2017), ideally annually, will vastly enhance the fisheries management capacity in the UAE.

- **DEVELOP SCIENCE–BASED QUANTITATIVE TARGETS** for inclusion in national action plans, including the National Plan of Action for the Conservation and Management of Sharks in the UAE, the National Biodiversity Strategy and Action Plan (2014–2021), and The UAE National Framework Statement for Sustainable Fisheries (2019–2030).

- **EXPAND CRITICAL HABITAT RESEARCH** to ensure that the existing protected areas network covers and protects essential habitat for threatened fishes. Additional research to identify essential habitat for species that aggregate in nearshore areas for mating or breeding is needed to inform conservation actions.

- **SUPPORT CAPACITY BUILDING** to strengthen border inspection points, record illegal trade, understand trade dynamics, and evaluate impact of trade controls, particularly for internationally traded cartilaginous fishes.

5.3. Application of project outputs

The main outputs of this assessment are: 1. a baseline Red List Index (RLI) for selected marine taxa in the UAE; 2. national assessments of the extinction risk of 272 native species; and 3. compilation of comprehensive species data and distribution maps. The UAE National Red List and accompanying distribution maps can and should be used to:

- **IDENTIFY IMPORTANT SITES FOR BIODIVERSITY,** such as Key Biodiversity Areas (Langhammer et al. 2007, IUCN 2016b).

- **SET BIODIVERSITY TARGETS AND ENHANCE NATIONAL REPORTING** for the UAE's commitments to MEAs, such as CITES, CBD, and SDGs, including:

  o CBD Aichi Biodiversity Targets 1, 2, 3, 5, 6, 10, 12, 14, 17, 19

  o SDG Targets 12.2, 14.4, 14.6, 14.C, 15.5, 15.5.1, 15.9, 15.c

- **INFORM NATIONAL LEGISLATION AND PRIORITY–SETTING,** including:

  o Reporting on relevant targets of the National Biodiversity Strategy and Action Plan (2014–2021).

  o Compiling national lists of species of conservation concern.

  o Assessing the attainment of strategic objectives outlined in The UAE National Framework Statement for Sustainable Fisheries (2019–2030).

  o Reporting on relevant goals of the National Plan of Action for the Conservation and Management of Sharks in the UAE (2018–2021).

  o Developing plans, strategies, and policies by the Environment Agency – Abu Dhabi (EAD), MOCCAE, and competent authorities and stakeholders.

- **INFORM THE PRIVATE SECTOR** through mechanisms such as the International Finance Corporation's Performance Standards and Environmental Safeguards. Civil society can play a key role in research, monitoring, conservation planning and action, and education and outreach.

The continued integration and coordination of environmental policy in the UAE across the emirates and across sectors, including extractive industries, urban planning, energy, and agriculture, will unify regulatory objectives and ensure the consistency of financial initiatives.

5.4. Additional resources and future opportunities with IUCN

Training in the application of biodiversity datasets to species– and site–based management and enforcement activities is available through the IUCN Conservation Planning Specialist Group, the IUCN Species Monitoring Specialist Group, and the IUCN World Commission on Protected Areas / Species Survival Commission Joint Task Force on Biodiversity and Protected Areas.

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Appendices

Appendix 1. List of participants in the UAE National Red List Assessment Workshop, Dubai, 2019.

Name	Organisation	Working Group(s)
Mahmoud Abd Al Mubdi Sulaiman	ADNOC	Corals/Sharks
Syde Magdoom	Ajman Municipality	Corals/Sharks
Fatima Al Hantoobi	Dibba Fujairah	Corals
Nestor Cordero Deatras	Dubai Municipality	Bony Fishes
Daniel Mateos	Emirates Nature–WWF	Corals
Mona Moller	Emirates Nature–WWF	Corals
Rita Bento	Emirates Nature–WWF	Corals
Stanley Hartmann	Environment Agency – Abu Dhabi (EAD)	Bony Fishes
Wadeema Ali Al Ahbabi	Environment Agency – Abu Dhabi (EAD)	Corals
Noora Al Balooshi	Environment Agency – Abu Dhabi (EAD)	Sharks
Ahmed Tarish Al Shamsi	Environment Agency – Abu Dhabi (EAD)	Bony Fishes
Franklin Francis	Environment Agency – Abu Dhabi (EAD)	Bony Fishes
Fadi Yaghmour	Environment and Protected Area Authority	Bony Fishes
Abdul Nasser Obeidat	Fujairah Municipality	Sharks
Obaid Al Shamsi	Ministry of Climate Change and Environment	Sharks
Nahla Noobi	Ministry of Climate Change and Environment	Sharks
Reem Al Mheiri	Ministry of Climate Change and Environment	Sharks
Jaishinimol Bhargavan	Ministry of Climate Change and Environment	Corals
Tee–Jay San Diego	Ministry of Climate Change and Environment	Bony Fishes
Rumaitha Al Shehhi	Ministry of Climate Change and Environment	Sharks
John A. Burt	New York University Abu Dhabi	Corals
Marwa Al Mahmoud	Sharjah Aquarium	Bony Fishes
Ismail Abbas Al Balushi	Sharjah Aquarium	Bony Fishes

Appendix 2. National and global Red List status of reef–building corals, cartilaginous fishes, and select bony fishes.

Table A2.1 Red List status of reef–building corals in the UAE.

Name	Organisation	Binomial	National RL Status	Global RL Status
Scleractinia	Acroporidae	*Acropora arabensis*	CR	NT
Scleractinia	Acroporidae	*Acropora clathrata*	CR	LC
Scleractinia	Acroporidae	*Acropora downingi*	CR	LC
Scleractinia	Acroporidae	*Acropora florida*	DD	NT
Scleractinia	Acroporidae	*Acropora horrida*	DD	VU
Scleractinia	Acroporidae	*Acropora khayranensis*	DD	DD
Scleractinia	Acroporidae	*Acropora nasuta*	DD	NT
Scleractinia	Acroporidae	*Acropora paragemmifera*	DD	DD
Scleractinia	Acroporidae	*Acropora pharaonis*	CR	VU
Scleractinia	Acroporidae	*Acropora tenuis*	DD	NT
Scleractinia	Acroporidae	*Acropora valenciennesi*	DD	LC
Scleractinia	Acroporidae	*Acropora valida*	DD	LC
Scleractinia	Acroporidae	*Montipora danae*	DD	LC
Scleractinia	Acroporidae	*Montipora monasteriata*	DD	LC
Scleractinia	Agariciidae	*Pavona decussata*	EN	VU
Scleractinia	Dendrophylliidae	*Turbinaria mesenterina*	DD	VU
Scleractinia	Dendrophylliidae	*Turbinaria peltata*	LC	VU
Scleractinia	Dendrophylliidae	*Turbinaria reniformis*	EN	VU
Scleractinia	Faviidae	*Barabattoia amicorum*	DD	LC
Scleractinia	Faviidae	*Cyphastrea microphthalma*	VU	LC
Scleractinia	Faviidae	*Cyphastrea serailia*	VU	LC
Scleractinia	Faviidae	*Favia favus*	VU	LC
Scleractinia	Faviidae	*Favia matthaii*	DD	NT
Scleractinia	Faviidae	*Favia pallida*	VU	LC
Scleractinia	Faviidae	*Favia rotumana*	VU	LC
Scleractinia	Faviidae	*Favia speciosa*	VU	LC
Scleractinia	Faviidae	*Favites abdita*	DD	NT

Name	Organisation	Binomial	National RL Status	Global RL Status
Scleractinia	Faviidae	*Favites acuticollis*	VU	NT
Scleractinia	Faviidae	*Favites chinensis*	DD	NT
Scleractinia	Faviidae	*Favites complanata*	DD	NT
Scleractinia	Faviidae	*Favites flexuosa*	DD	NT
Scleractinia	Faviidae	*Favites pentagona*	VU	LC
Scleractinia	Faviidae	*Favites spinosa*	DD	VU
Scleractinia	Faviidae	*Leptastrea inaequalis*	DD	NT
Scleractinia	Faviidae	*Leptastrea pruinosa*	DD	LC
Scleractinia	Faviidae	*Leptastrea purpurea*	VU	LC
Scleractinia	Faviidae	*Leptastrea transversa*	VU	LC
Scleractinia	Faviidae	*Parasimplastrea sheppardi*	DD	EN
Scleractinia	Faviidae	*Platygyra crosslandi*	DD	NT
Scleractinia	Faviidae	*Platygyra daedalea*	VU	LC
Scleractinia	Faviidae	*Platygyra lamellina*	VU	NT
Scleractinia	Faviidae	*Platygyra sinensis*	DD	LC
Scleractinia	Faviidae	*Plesiastrea versipora*	VU	LC
Scleractinia	Merulinidae	*Hydnophora exesa*	DD	NT
Scleractinia	Mussidae	*Acanthastrea echinata*	VU	LC
Scleractinia	Mussidae	*Acanthastrea hillae*	DD	NT
Scleractinia	Mussidae	*Blastomussa merleti*	DD	LC
Scleractinia	Pectiniidae	*Echinophyllia aspera*	DD	LC
Scleractinia	Pocilloporidae	*Pocillopora damicornis*	EN	LC
Scleractinia	Pocilloporidae	*Stylophora danae*	DD	LC
Scleractinia	Pocilloporidae	*Stylophora pistillata*	VU	NT
Scleractinia	Poritidae	*Porites harrisoni*	EN	NT
Scleractinia	Poritidae	*Porites lobata*	NT	NT
Scleractinia	Poritidae	*Porites lutea*	NT	LC
Scleractinia	Poritidae	*Porites mayeri*	DD	LC
Scleractinia	Poritidae	*Porites nodifera*	EN	LC
Scleractinia	Poritidae	*Porites solida*	DD	LC

Name	Organisation	Binomial	National RL Status	Global RL Status
Scleractinia	Siderastreidae	*Anomastraea irregularis*	VU	VU
Scleractinia	Siderastreidae	*Coscinaraea columna*	DD	LC
Scleractinia	Siderastreidae	*Coscinaraea monile*	VU	LC
Scleractinia	Siderastreidae	*Psammocora albopicta*	DD	DD
Scleractinia	Siderastreidae	*Psammocora contigua*	DD	NT
Scleractinia	Siderastreidae	*Psammocora stellata*	VU	VU
Scleractinia	Siderastreidae	*Psammocora superficialis*	DD	LC
Scleractinia	Siderastreidae	*Pseudosiderastrea tayami*	DD	NT
Scleractinia	Siderastreidae	*Siderastrea savignyana*	VU	LC

Table A2.2 Red List status of cartilaginous fishes in the UAE.

Name	Organisation	Binomial	National RL Status	Global RL Status	CITES Listing	CMS Listing	Landed in UAE
Carcharhiniformes	Carcharhinidae	*Carcharhinus albimarginatus*	EN	VU			
Carcharhiniformes	Carcharhinidae	*Carcharhinus altimus*	VU	DD			y
Carcharhiniformes	Carcharhinidae	*Carcharhinus amblyrhynchoides*	VU	NT			y
Carcharhiniformes	Carcharhinidae	*Carcharhinus amblyrhynchos*	EN	NT			y
Carcharhiniformes	Carcharhinidae	*Carcharhinus amboinensis*	VU	DD			y
Carcharhiniformes	Carcharhinidae	*Carcharhinus brevipinna*	VU	NT			y
Carcharhiniformes	Carcharhinidae	*Carcharhinus dussumieri*	EN	EN			y
Carcharhiniformes	Carcharhinidae	*Carcharhinus falciformis*	NT	VU	II	II	y
Carcharhiniformes	Carcharhinidae	*Carcharhinus leiodon*	EN	EN			y
Carcharhiniformes	Carcharhinidae	*Carcharhinus leucas*	EN	NT			y
Carcharhiniformes	Carcharhinidae	*Carcharhinus limbatus*	VU	NT			y
Carcharhiniformes	Carcharhinidae	*Carcharhinus longimanus*	DD	CR	II	I	y
Carcharhiniformes	Carcharhinidae	*Carcharhinus macloti*	NT	NT			y
Carcharhiniformes	Carcharhinidae	*Carcharhinus melanopterus*	VU	NT			y
Carcharhiniformes	Carcharhinidae	*Carcharhinus plumbeus*	EN	VU			y
Carcharhiniformes	Carcharhinidae	*Carcharhinus sorrah*	VU	NT			y
Carcharhiniformes	Carcharhinidae	*Galeocerdo cuvier*	CR	NT			y
Carcharhiniformes	Carcharhinidae	*Loxodon macrorhinus*	NT	LC			y
Carcharhiniformes	Carcharhinidae	*Negaprion acutidens*	EN	VU			y

Name	Organisation	Binomial	National RL Status	Global RL Status	CITES Listing	CMS Listing	Landed in UAE
Carcharhiniformes	Carcharhinidae	*Prionace glauca*	DD	NT		II	y
Carcharhiniformes	Carcharhinidae	*Rhizoprionodon acutus*	NT	LC			y
Carcharhiniformes	Carcharhinidae	*Rhizoprionodon oligolinx*	NT	LC			
Carcharhiniformes	Carcharhinidae	*Scoliodon laticaudus*	DD	NT			
Carcharhiniformes	Carcharhinidae	*Triaenodon obesus*	DD	NT			
Carcharhiniformes	Hemigaleidae	*Chaenogaleus macrostoma*	VU	VU			y
Carcharhiniformes	Hemigaleidae	*Hemipristis elongata*	VU	VU			y
Carcharhiniformes	Hemigaleidae	*Paragaleus randalli*	VU	NT			y
Carcharhiniformes	Sphyrnidae	*Eusphyra blochii*	CR	EN			
Carcharhiniformes	Sphyrnidae	*Sphyrna lewini*	EN	CR	II	II	y
Carcharhiniformes	Sphyrnidae	*Sphyrna mokarran*	EN	CR	II	II	y
Carcharhiniformes	Sphyrnidae	*Sphyrna zygaena*	EN	VU	II	II	y
Carcharhiniformes	Triakidae	*Iago omanensis*	LC	LC			
Carcharhiniformes	Triakidae	*Mustelus mosis*	LC	NT			y
Lamniformes	Alopiidae	*Alopias pelagicus*	EN	EN	II	II	y
Lamniformes	Alopiidae	*Alopias superciliosus*	EN	VU	II	II	y
Lamniformes	Lamnidae	*Isurus oxyrinchus*	NT	EN	II	II	y
Lamniformes	Lamnidae	*Isurus paucus*	NT	EN	II	II	
Lamniformes	Odontaspididae	*Carcharias taurus*	CR	VU			
Myliobatiformes	Aetobatidae	*Aetobatus flagellum*	EN	EN			
Myliobatiformes	Aetobatidae	*Aetobatus ocellatus*	VU	VU			
Myliobatiformes	Dasyatidae	*Brevitrygon walga*	NT	NT			
Myliobatiformes	Dasyatidae	*Himantura leoparda*	VU	VU			
Myliobatiformes	Dasyatidae	*Himantura uarnak*	VU	VU			
Myliobatiformes	Dasyatidae	*Maculabatis gerrardi*	EN	VU			
Myliobatiformes	Dasyatidae	*Maculabatis randalli*	LC	LC			
Myliobatiformes	Dasyatidae	*Pastinachus ater*	NT	LC			
Myliobatiformes	Dasyatidae	*Pastinachus sephen*	NT	NT			
Myliobatiformes	Dasyatidae	*Pateobatis fai*	NT	VU			
Myliobatiformes	Dasyatidae	*Pateobatis jenkinsii*	NT	VU			

Name	Organisation	Binomial	National RL Status	Global RL Status	CITES Listing	CMS Listing	Landed in UAE
Myliobatiformes	Dasyatidae	*Taeniurops meyeni*	NT	VU			
Myliobatiformes	Dasyatidae	*Urogymnus asperrimus*	VU	VU			
Myliobatiformes	Gymnuridae	*Gymnura poecilura*	NT	NT			
Myliobatiformes	Mobulidae	*Mobula birostris*	VU	VU		I/II	
Myliobatiformes	Mobulidae	*Mobula eregoodootenkee*	NT	NT		I/II	
Myliobatiformes	Mobulidae	*Mobula kuhlii*	NT	DD		I/II	
Myliobatiformes	Mobulidae	*Mobula mobular*	VU	EN		I/II	
Myliobatiformes	Mobulidae	*Mobula thurstoni*	VU	EN		I/II	
Myliobatiformes	Myliobatidae	*Aetomylaeus maculatus*	DD	EN			
Myliobatiformes	Myliobatidae	*Aetomylaeus milvus*	EN	EN			
Myliobatiformes	Myliobatidae	*Aetomylaeus nichofii*	VU	VU			
Myliobatiformes	Rhinopteridae	*Rhinoptera javanica*	VU	VU			
Myliobatiformes	Rhinopteridae	*Rhinoptera jayakari*	VU	NE			
Orectolobiformes	Ginglymostomatidae	*Nebrius ferrugineus*	NT	VU			Y
Orectolobiformes	Hemiscylliidae	*Chiloscyllium arabicum*	NT	NT			
Orectolobiformes	Hemiscylliidae	*Chiloscyllium griseum*	NT	NT			
Orectolobiformes	Rhincodontidae	*Rhincodon typus*	EN	EN	II	I/II	y
Orectolobiformes	Stegostomidae	*Stegostoma tigrinum*	VU	EN			y
Rhinopristiformes	Glaucostegidae	*Glaucostegus granulatus*	EN	CR	II		
Rhinopristiformes	Glaucostegidae	*Glaucostegus halavi*	VU	CR	II		
Rhinopristiformes	Pristidae	*Pristis zijsron*	CR	CR	I	I/II	
Rhinopristiformes	Rhinidae	*Rhina ancylostoma*	VU	CR	II		
Rhinopristiformes	Rhinidae	*Rhynchobatus australiae*	EN	CR	II	II	
Rhinopristiformes	Rhinidae	*Rhynchobatus djiddensis*	EN	CR	II		
Rhinopristiformes	Rhinidae	*Rhynchobatus laevis*	EN	CR	II		
Rhinopristiformes	Rhinobatidae	*Acroteriobatus omanensis*	DD	DD			
Rhinopristiformes	Rhinobatidae	*Rhinobatos annandalei*	NT	DD			
Rhinopristiformes	Rhinobatidae	*Rhinobatos punctifer*	NT	NT			
Squaliformes	Echinorhinidae	*Echinorhinus brucus*	VU	DD			
Torpediniformes	Torpedinidae	*Torpedo panthera*	DD	DD			
Torpediniformes	Torpedinidae	*Torpedo sinuspersici*	DD	DD			

Table A2.3 Red List status of select bony fishes in the UAE.

Order	Family	Binomial	National RL Status	Global RL Status
Clupeiformes	Clupeidae	*Anodontostoma chacunda*	LC	LC
Clupeiformes	Clupeidae	*Herklotsichthys lossei*	LC	LC
Clupeiformes	Clupeidae	*Herklotsichthys quadrimaculatus*	DD	LC
Clupeiformes	Clupeidae	*Nematalosa nasus*	LC	LC
Clupeiformes	Clupeidae	*Nematalosa persara*	LC	DD
Clupeiformes	Clupeidae	*Nematalosa resticularia*	DD	DD
Clupeiformes	Clupeidae	*Sardinella albella*	LC	LC
Clupeiformes	Clupeidae	*Sardinella gibbosa*	LC	LC
Clupeiformes	Clupeidae	*Sardinella longiceps*	DD	LC
Clupeiformes	Clupeidae	*Sardinella sindensis*	DD	LC
Clupeiformes	Clupeidae	*Spratelloides delicatulus*	DD	LC
Mugiliformes	Mugilidae	*Ellochelon vaigiensis*	DD	LC
Mugiliformes	Mugilidae	*Moolgarda seheli*	DD	NE
Mugiliformes	Mugilidae	*Osteomugil cunnesius*	DD	NE
Mugiliformes	Mugilidae	*Planiliza carinata*	DD	NE
Mugiliformes	Mugilidae	*Planiliza klunzingeri*	DD	NE
Mugiliformes	Mugilidae	*Planiliza persica*	DD	DD
Mugiliformes	Mugilidae	*Planiliza subviridis*	DD	NE
Perciformes	Carangidae	*Alectis ciliaris*	LC	LC
Perciformes	Carangidae	*Alectis indica*	LC	LC
Perciformes	Carangidae	*Alepes djedaba*	LC	LC
Perciformes	Carangidae	*Alepes melanoptera*	LC	LC
Perciformes	Carangidae	*Alepes vari*	LC	LC
Perciformes	Carangidae	*Atule mate*	DD	LC
Perciformes	Carangidae	*Carangoides bajad*	DD	LC
Perciformes	Carangidae	*Carangoides chrysophrys*	LC	LC
Perciformes	Carangidae	*Carangoides coeruleopinnatus*	DD	LC
Perciformes	Carangidae	*Carangoides equula*	DD	LC

Order	Family	Binomial	National RL Status	Global RL Status
Perciformes	Carangidae	*Carangoides ferdau*	LC	LC
Perciformes	Carangidae	*Carangoides fulvoguttatus*	DD	LC
Perciformes	Carangidae	*Carangoides gymnostethus*	DD	LC
Perciformes	Carangidae	*Carangoides malabaricus*	DD	LC
Perciformes	Carangidae	*Carangoides praeustus*	LC	LC
Perciformes	Carangidae	*Caranx heberi*	DD	LC
Perciformes	Carangidae	*Caranx ignobilis*	DD	LC
Perciformes	Carangidae	*Caranx sexfasciatus*	LC	LC
Perciformes	Carangidae	*Decapterus macarellus*	LC	LC
Perciformes	Carangidae	*Decapterus macrosoma*	LC	LC
Perciformes	Carangidae	*Decapterus russelli*	LC	LC
Perciformes	Carangidae	*Elagatis bipinnulata*	LC	LC
Perciformes	Carangidae	*Gnathanodon speciosus*	DD	LC
Perciformes	Carangidae	*Megalaspis cordyla*	LC	LC
Perciformes	Carangidae	*Naucrates ductor*	LC	LC

Appendix 3. Species considered Not Applicable for the UAE National Red List. Unconfirmed species.

REEF–BUILDING CORALS

Sixty–seven species of reef–building corals were listed as occurring in the Arabian Gulf and/or the Sea of Oman by various authors (e.g., Sheppard and Sheppard 1991, Wallace 1999, Veron 2000, Riegl et al. 2012, R. Bento pers. comm. 2019); however, the presence of these species in UAE waters could not be verified during the expert consultation.

CARTILAGINOUS FISHES

Oman Numbfish (*Narcine atzi*)

This species has a patchy distribution in the northern Indian Ocean from the Sea of Oman to the Gulf of Mannar (Last et al. 2016). It may occur in UAE waters in the Sea of Oman, but there are no confirmed records. The nearest known range is the Iranian coast of the Sea of Oman.

Spottail Sleeper Ray (*Narke dipterygia*)

This species is widely distributed in the Indo–West Pacific (Last et al. 2016). It may range into UAE waters in the Sea of Oman, but there are no confirmed records.

Narrow Sawfish (*Anoxypristis cuspidate*)

This species was historically widespread in the Indo–West Pacific, likely including the Arabian Gulf, Sea of Oman, Pakistan, and India (Moore 2015). However, its range has been greatly reduced, and there are no confirmed records from the UAE.

BONY FISHES

Seventeen species listed as occurring in the UAE (Froese and Pauly 2018) were based on The Living Marine Resources of Kuwait, Eastern Saudi Arabia, Bahrain, Qatar and the United Arab Emirates (Carpenter et al. 1997), but there are no confirmed records from the UAE. Seven species listed as occurring in the UAE (Froese and Pauly 2018) – six species of Snapper (family Lutjanidae: Allen 1985) and one grouper (family Epinephelidae: Craig et al. 2011) – were based on family–level overviews; however, no confirmed records of these species could be found from UAE waters. Iwatsuki et al. (2015) reviewed the distribution of the *Gerres filamentosus* species complex (family Gerreidae), and concluded that records of *G. filamentosus* from the Red Sea and Arabian Gulf refer to *G. infasciatus*; however, the presence of *G. infasciatus* in UAE waters could not be confirmed during the consultation with national experts.