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RESEARCH ARTICLE

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Shifts in the size and distribution of marine trophy fishing world records

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Abstract

1. The extensive nature of recreational angling makes it difficult to explore trends in global catches. However, trophy fishing world records may provide an insight into recreational fishing pressure on the largest species and size classes. Trophy fishing is promoted and recorded by the International Game Fish Association (IGFA), who manage an 80-year database on the largest individuals of a species caught – called all-tackle records (ATRs) – with information on the size and location of each record catch.
2. We analyse these data to explore temporal trends in the size of record-setting fishes, determine how past and present ATR catches are distributed globally, and examine trends in records for International Union for Conservation of Nature (IUCN) threatened species.
3. The number of ATRs, and the number of species awarded an ATR, have increased significantly over the past 80 years. New records are for increasingly smaller maximum-sized species of fish, with the average sized record shifting from 167.7 kg in the 1950s to 8.1 kg in the 2010s. ATRs for species listed as threatened (Vulnerable or higher) on the IUCN Red List have also declined by approximately 66% over the past two decades. Records were unevenly distributed around the world but have spread globally over time. Historically, ATRs were concentrated around the coastline of the USA but in recent decades more were reported in areas such as Japan and New Zealand.
4. These data either reflect a shift away from mainly targeting large taxa to targeting a wider variety of smaller species, or that there are now limited larger specimens and so fewer ATRs are being set. Additionally, the scarcity of new records for threatened species appears to support IUCN assessments of their poor stock status. The spread of ATRs suggests a growing pressure on the largest size classes in regions with previously little trophy fishing pressure. We encourage the greater use of catch-and-release initiatives and mandatory data collection for all near records to better quantify trophy fishing pressure and ensure sustainable practices.

KEYWORDS
angling, catch-and-release, fish conservation, marine conservation, recreational fishing, threatened species

1 | INTRODUCTION

Given the global declines in the abundance and diversity of many marine species, it has become increasingly important to understand spatial and temporal trends in fishing pressure (Cooke & Cowx, 2004; Pitcher & Hollingworth, 2002; Worm et al., 2009). Knowledge on the distribution of commercial fishing from sources such as the Food and Agriculture Organization of the United Nations Fisheries and Aquaculture Department are often used to inform fisheries management and policy (FAO, 2022). However, the extensive and dynamic nature of recreational fishing means that data are often limited, making it difficult to assess trends in catches. Though largely underutilized, recreational sea fishing records provide extensive information on catch size, location, and date for the largest individuals of a given species (Barbini, Lucifora & Figueroa, 2015; McClenachan, 2009; Thurstan, Game & Pandolfi, 2017). Assessing these data may provide valuable insights into how recreational fishing for the largest species and size classes has changed over time and offer an improved understanding of the pressures exerted by recreational anglers.

Recreational angling is primarily undertaken for leisure, as opposed to income or subsistence fishing (Pitcher & Hollingworth, 2002). Conservative estimates suggest that marine recreational anglers extract around 900,000 t of fishes per year, which accounts for <1% of total marine catches, the vast majority of which is from commercial activities (Freire et al., 2020). The marine angling industry creates an estimated annual global revenue of over $40 billion and employs approximately 1 million people, which provides significant socio-economic benefits (Cisneros-Montemayor & Sumaila, 2010; Pauly & Zeller, 2016). Anglers themselves benefit from a strong connection with nature and their cultural heritage, as well as sense of enjoyment (Arlinghaus et al., 2019).

A popular class of recreational angling is 'trophy fishing', where anglers attempt to catch and land the largest individual of a certain species (Shiffman et al., 2014). Trophy anglers use rod-and-line and target a broad range of taxa, from pelagic to demersal fishes, and exploit a variety of marine habitats (Pitcher & Hollingworth, 2002). Trophy anglers are often willing to pay large sums of money to hire boats, guides, and equipment to catch these large individuals (Hutt & Silva, 2019; Smith, Fedler & Adams, 2023). Historically, trophy anglers targeted charismatic species such as billfish, sharks, and groupers, famed for their large size and impressive fighting ability (Babcock, 2008; Luiz et al., 2016; Sadovy de Mitcheson et al., 2013; Silvano et al., 2017).

Although commercial fishing is the principal cause of population decline in many marine taxa, anglers that target larger bodied species, or the largest individuals, can impact fish populations (Coleman et al., 2004; Lewin et al., 2019; Lloret et al., 2018). The largest and oldest members of a population have higher levels of fecundity, larval quality, and survival rates, compared with younger, smaller individuals (Birkeland & Dayton, 2005; Hixon, Johnson & Sogard, 2014; Shiffman et al., 2014). For instance, one female Atlantic cod (*Gadus morhua*) weighing 30 kg produces more eggs than 28 individuals weighing 2 kg (Barneche et al., 2018). Removing these large fish has the potential to shift the age and size structure and affect the reproductive capacity of targeted populations (Birkeland & Dayton, 2005). Moreover, large-bodied species, such as sharks and groupers (Epinephelinae), typically have slow growth rates and late ages of maturity, as well as experience exploitation from commercial fisheries, meaning that they are particularly vulnerable to size-selective fishing (Frisk, Miller & Dulvy, 2005; Gallagher et al., 2014; Taylor et al., 2014). Despite the ecological and conservation implications of targeting large size classes or vulnerable species, fishing for these taxa recreationally is often not prohibited (Cooke et al., 2016).

Trophy fishing is promoted, recorded, and to some extent regulated by the International Game Fish Association (IGFA), the foremost global recreational angling organization. Established in 1939, the organization aims to promote trophy fishing, responsible angling practices, and the conservation of game fish species (IGFA, 2022a). The IGFA manage a comprehensive database on world record fish catches, including data on where, when, and how they were caught (IGFA, 2019). There are numerous record categories, with variations in line, tackle, and angler classes. Most records are based on weight and typically require the angler to weigh the fish at a weighing station on land, a practice that results in fish mortality in at least 70% of records (Schratwieser, 2015). All-tackle records (ATRs) are 'the heaviest fish of a species caught by any angler in any Line Class up to 60 kg', meaning that an ATR represents the largest individual of a species ever accredited by the IGFA (IGFA, 2022b). To be considered for an ATR, the fish must weigh at least 0.453 kg (1 lb) and be of 'trophy size', meaning that the catch is in the top half of the maximum weight reported for the species (IGFA, 2022b). Prior to 1984, ATRs were only certified for certain species; however, in 1984 the IGFA opened up ATRs to include all game fishes (IGFA, 2022c).

Obtaining a certified ATR is a source of prestige within the angling community; however, it has also been suggested to incentivize anglers to catch rarer or threatened species (Cooke et al., 2016; Shiffman et al., 2014). Shiffman et al. (2014) noted that 85 species for which the IGFA issues records are listed as Vulnerable or Critically Endangered, according to the International Union for the Conservation of Nature (IUCN) Red List. It was suggested that certifying records for these species incentivises anglers to target the largest individuals, thereby reducing the resilience and sustainability of their populations. In a rejoinder, Schratwieser (2015) noted that ATR submissions for these taxa are rare events and account for low proportions of the overall catch of threatened species, most of which come from commercial fishing. Moreover, these species have only been certified as threatened within the past two decades, and only 15 ATR applications have been submitted to IGFA during that time. However, quantifying the impact of trophy fishing is difficult and more data are required to explore trends in catches (Shiffman et al., 2015).

Angler interviews and historical photographs have successfully been used to explore changes in trophy catches and fishing pressure over time; however, no attempts have been made using ATR catch data (Arterburn, Kirby & Berry, 2002; McClenachan, 2009). One issue with using records to infer angler behaviour is that it does not track all fishing effort, only effort that resulted in a fish found to be large enough to qualify for a record. Trophy angler catches of large individuals that are still smaller than the current record (i.e. 'near misses') will not be recorded, nor will any catch of species of conversation concern that do not break the current record. As a result, the IGFA ATR database should be viewed as a conservative underestimate of trophy fishing effort rather than an accurate indicator. Nevertheless, these data can still provide useful insights into how trophy fishing pressure has developed over time. For instance, areas with particularly high numbers of ATRs may indicate an established or growing trophy fishing industry, as much as they suggest actual presence of unusually large fishes. Likewise, changes in the weight or number of species awarded an ATR may indicate shifts in the species targeted by trophy anglers. Trends in the records for threatened marine species may also supplement species assessments and provide an insight into the health of these at-risk populations.

Although the IGFA ATR database is easily available online, we are not aware of any previous attempts to use world record catches to map and analyse global spatial and temporal trends in trophy fishing practice and pressure. In this study, we aim to use ATR data to determine: (i) whether there are temporal trends in the number and size of record-setting fishes; (ii) how IGFA records for IUCN threatened species have changed over time; and (iii) how past and present ATR catches are distributed around the world.

2 | METHODS

2.1 | Data collection and preparation

The ATRs for saltwater species caught in marine or estuarine environments between 1939 and 31 December 2018 were extracted from the IGFA world record database (IGFA, 2019). This included records that were set and subsequently broken by a heavier fish. For example, if a record was set for a species in one year and then broken a few years later, we would include both ATRs. Two records from 1928 and 1938 were not included as they were recorded before the creation of the IGFA, in 1939. Where possible, for each ATR we recorded the species name, weight of the fish caught (kg), location (without site-specific coordinates), and date of the catch. ATRs were assigned approximate coordinates using Google Maps (https://maps.google.com), based on the location details provided in the IGFA world record database.

The ATRs were assigned an IUCN Red List conservation status of Vulnerable, Endangered, or Critically Endangered (collectively referred to as 'threatened') by cross-referencing with Shiffman et al. (2014) and updating with IUCN Red List assessments available in 2019. Only those species currently assessed as being threatened were retained (for a full list of threatened species, see Table 1 in the Appendix). This method was selected owing to the available resources; however, we acknowledge that it means that any species assessed as Vulnerable, Endangered, or Critically Endangered by the IUCN since 2014 have not been classified as such in this study.

The ATRs extracted from the IGFA world records database with missing information regarding the weight of catch ($n = 1$), location of catch ($n = 2$), or that were recorded before 1939 or after 2018 ($n = 5$) were removed from our analysis. No records were found between 1939 and 1940. Our final database consisted of 77 years of data and contained 2,701 individual ATRs from 1,035 different species with 2,699 ATRs assigned geographical coordinates (Data S1 and S2).

2.2 | Temporal and spatial trends

To identify temporal patterns, we analysed the total number (count) of ATRs per year from 1941 to 2018 and used a Mann–Kendall trend test to determine trends in records over time. As a result of non-normality in the data, the nonparamteric Kruskal–Wallis test with a *post hoc* Bonferroni-corrected Dunn's test was used to determine significant differences in the mean weights of ATR between decades. All statistical analysis was conducted using R 4.1.2 (R Core Team, 2021). A map of kernel density estimation was created in QGIS 3.16 (QGIS Development Team, 2021) to explore the global distribution and density of ATRs between decades.

3 | RESULTS

3.1 | Temporal trends

The IGFA ATR count grew over time along with the number of species granted record eligibility. The number of ATRs has increased significantly over time (Mann–Kendall trend test, $P = <0.05$, $T = 0.812$), but has plateaued in recent years (Figure 1a). Between 1941 and 1981, the number of ATRs remained low ($n \leq 15$ per year) but increased quickly from the early 1980s and peaked in 2012 ($n = 116$) and 2013 ($n = 117$). The number of ATRs awarded in the 1980s grew by 517% compared with the number awarded in the 1970s. There was a notable drop in ATR count in 2009 ($n = 38$). The number of different species awarded an ATR per decade consistently increased over time, from seven species in the 1940s to 482 species between 2010 and 2018 (Figure 1b).

As more species have been granted IGFA eligibility, the average size of new records has changed significantly over the past eight

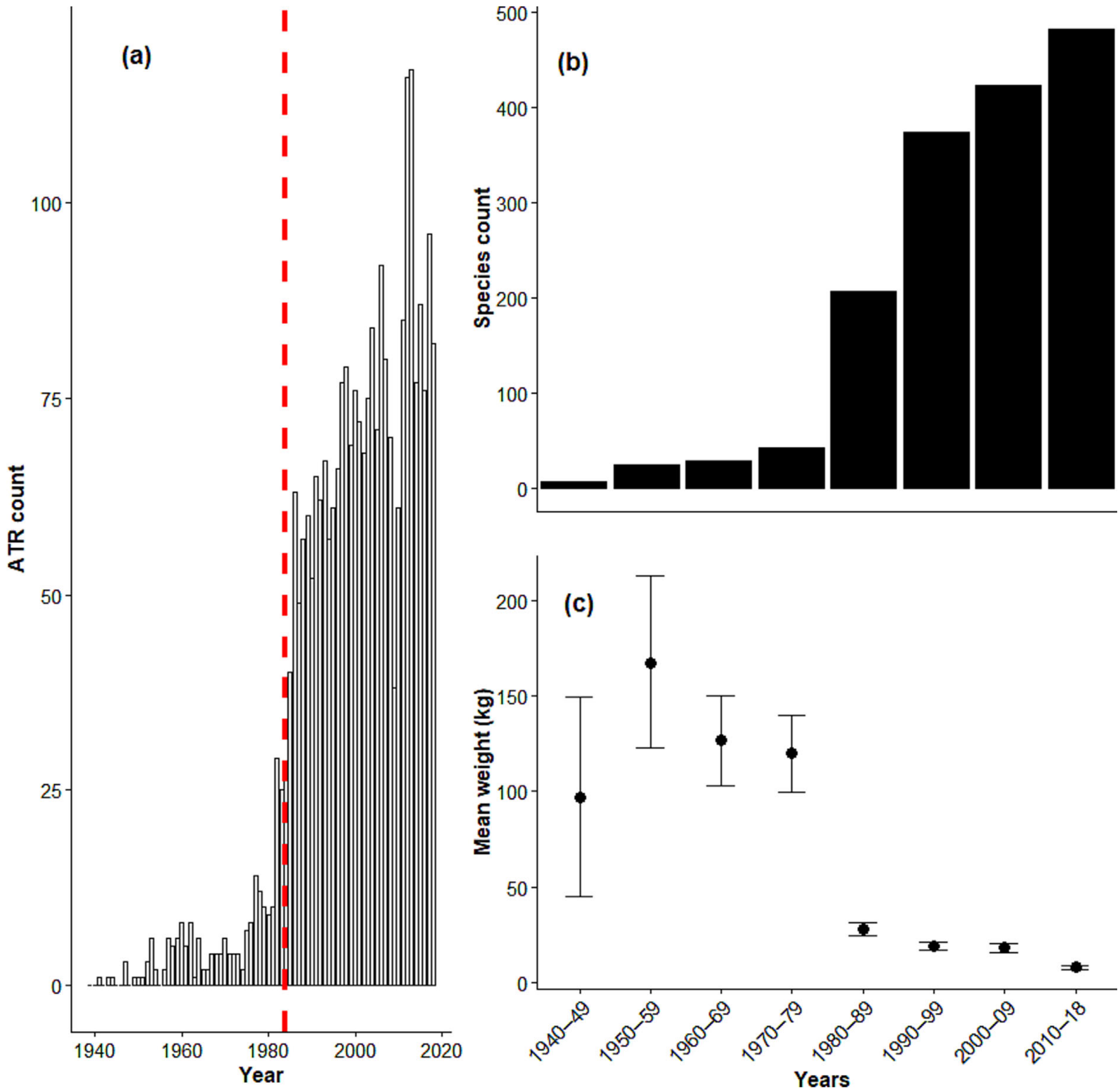

FIGURE 1 (a) All-tackle record (ATR) count over time. The red dashed line signifies the year that the International Game Fish Association (IGFA) opened ATRs for all game fishes (1984). (b) Number of species per decade awarded an ATR. (c) Mean weight of ATRs per decade with standard error.

decades (Kruskal–Wallis rank sum test, $\chi^2(7) = 593.69$, $P = <0.05$; Figure 1c). *Post hoc* tests revealed that the mean weight of ATRs did not significantly differ among the decades from the 1940s (mean ± SE, 96.9 ± 52.3 kg), 1950s (167.7 ± 45.3 kg), 1960s (126.5 ± 23.7 kg), to the 1970s. However, significant differences were found between the weight of records between the 1970s and 1980s (Dunn's test with Bonferroni correction, $P < 0.05$). In the 1970s the records were on average 119.7 kg (± 20.1 kg), and declined to 28 kg (± 3.7 kg) in the 1980s. Over the 1990s (19.2 ± 1.8 kg) and 2000s (18.2 ± 2.2 kg), the size of the records continued to decline, reaching the lowest average weight in the 2010s (8.11 ± 1.02 kg). Notably, the average weight significantly differed between the 1980s and the 2010s (Dunn's test with Bonferroni correction, $P < 0.05$).

The number of world record catches for species currently reported as threatened by the IUCN Red List recorded by the IGFA increased steadily from the 1940s ($n = 2$) and peaked in the 1990s ($n = 51$) (Figure 2). The occurrence of ATRs subsequently fell in the 2000s and then declined rapidly thereafter to the present day (Figure 2). No records were awarded in 2018, whereas the number of records from 2010–2018 were approximately 66% lower than in the 2000s.

3.2 | Spatial trends

The ATR catches between 1941 and 2018 were widely distributed across the globe, with high concentrations found along the coastlines

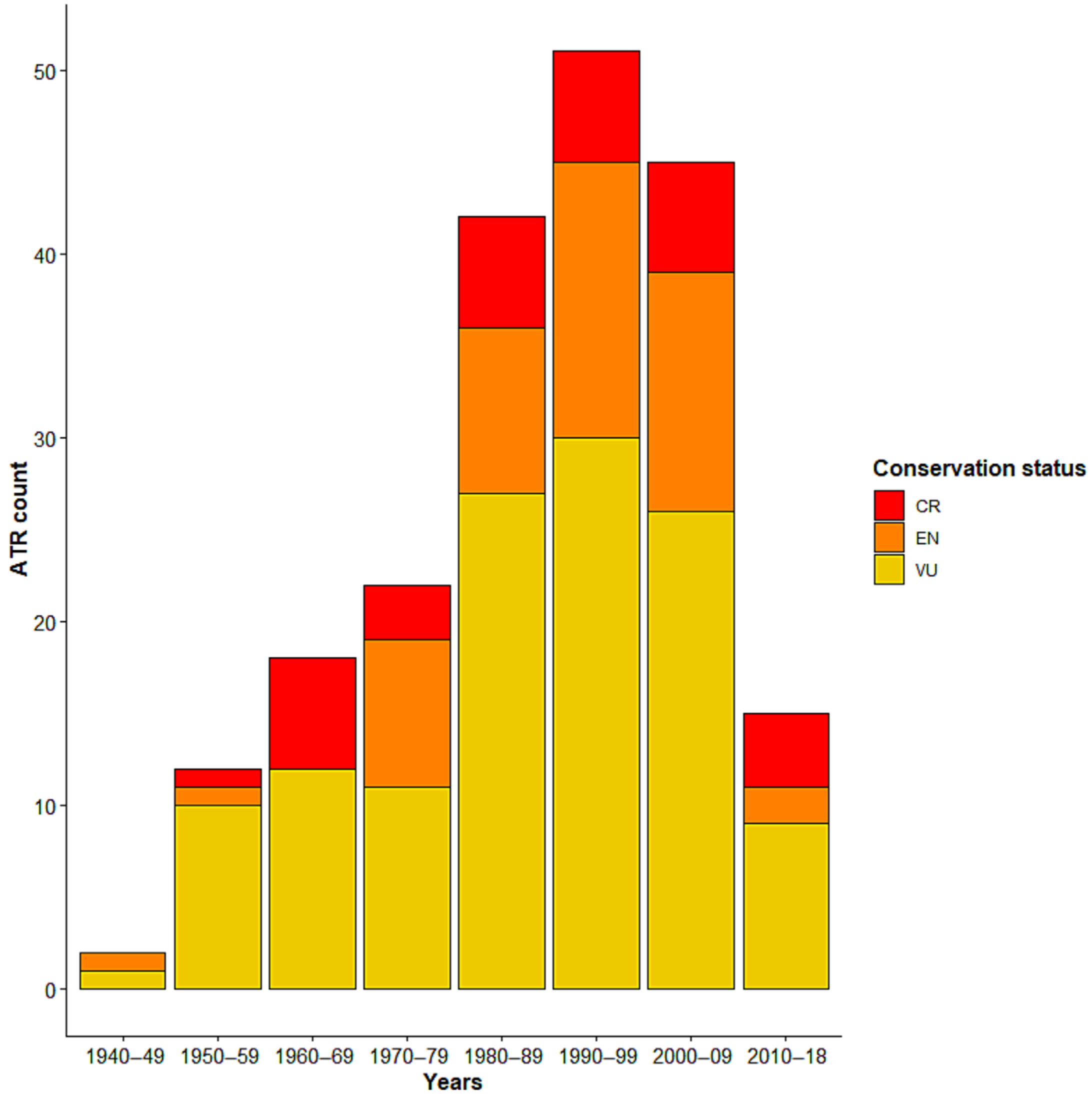

FIGURE 2 All-tackle record (ATR) counts for species currently listed as Critically Endangered (CR), Endangered (EN), or Vulnerable (VU) on the International Union for Conservation of Nature (IUCN) Red List.

of the USA, Japan, and New Zealand (Figure 3). Between the years of 1941 and 1989, records were concentrated in North America, particularly Southern Florida (Figure 4). From the 1990s onwards, the ATRs were predominantly recorded in Japan and New Zealand (Figure 5). The USA ($n = 1034$), Japan ($n = 478$), Mexico ($n = 136$), New Zealand ($n = 161$), and Australia ($n = 104$) had the highest number of ATRs over the eight decades. The proportion of smaller ATRs (0–2 kg) increased over time in all these hotspots, being the most common weight category from 2010 to 2018 (Figure 6). Notably, in the USA, ATRs for the size class of 0–2 kg were not recorded in the period 1941–1979, after which smaller records steadily increased in occurrence, making up 58.9% ($n = 151$) of all records in 2010–2018. Records were first documented in Japan in the 1980s, but did not increase substantially until the 2000s. Of all the ATRs in Japan, 45% were <2 kg and 91% were <15 kg. ATRs were first reported in New Zealand in the 1960s and increased notably in the 2010s, primarily from records of <2 kg (Figure 6c). ATRs peaked in Mexico in the 2000s ($n = 38$) and have since declined ($n = 32$). Similarly, Australia reported the most ATRs in the 1990s and declined by approximately 47% in 2010–2018 ($n = 17$).

4 | DISCUSSION

Although the IGFA record database should be viewed as a conservative underestimate of trophy fishing effort, our results show that over the past 80 years trophy anglers are reporting records for a wider variety of smaller species. This could represent a shift away from mainly targeting large taxa and anglers now catching a wider variety of smaller species, or that there are now limited larger specimens so fewer ATRs are being set. Moreover, the marked reduction in the number of records for threatened species appears to support the IUCN assessments of their poor stock status. Historically, the coastline of the USA, particularly

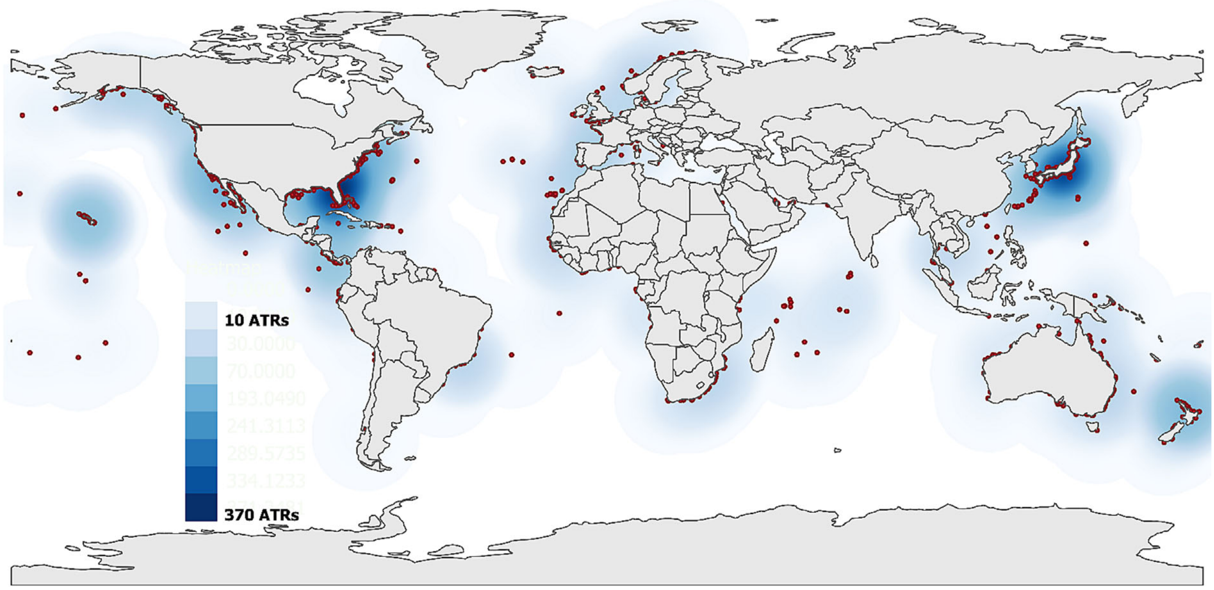

FIGURE 3 Kernel density heat map of the global distribution of all-tackle records (ATRs) between 1940 and 2018 ($n = 2701$). Red dots represent individual records.

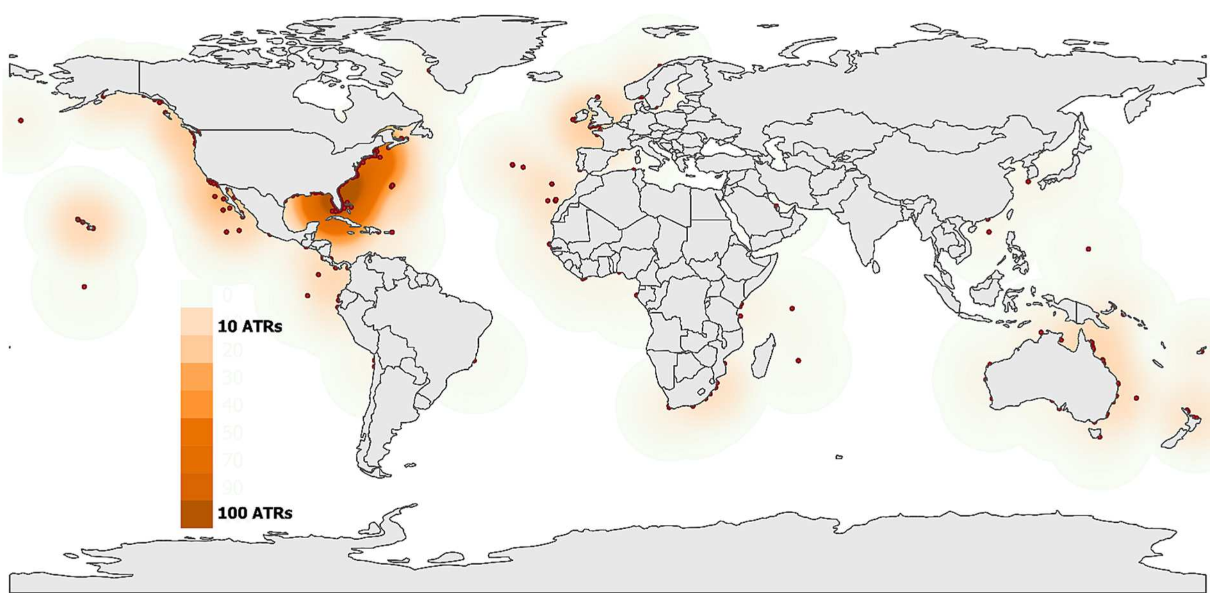

FIGURE 4 Kernel density heat map of the global distribution of all-tackle records (ATRs) between 1940 and 1989 ($n = 521$). Red dots represent individual records.

South Florida, reported the most ATRs. However, more recently Japan and New Zealand reported high numbers of records, indicating growing trophy fishing pressure in these regions. Importantly, the IGFA record database alone cannot be used to draw conclusions about trophy fishing pressure on larger specimens. Mandatory data collection for all 'near miss' records is also needed to better quantify trophy fishing pressure, whereas sustainable trophy fishing practices are needed to reduce pressure on the largest species and size classes in record hotspots.

4.1 | Temporal trends

The number of certified ATRs awarded per year has increased significantly, particularly from the 1980s onwards, whereas the size of record-setting fishes has decreased. This is because new species were made eligible for record certification by the IGFA in 1984 and more people are participating in recreational or trophy fishing globally (Bohnsack, 2011; IGFA, 2022c). Although all game fishes were made eligible for certification in the early 1980s, we found a consistent

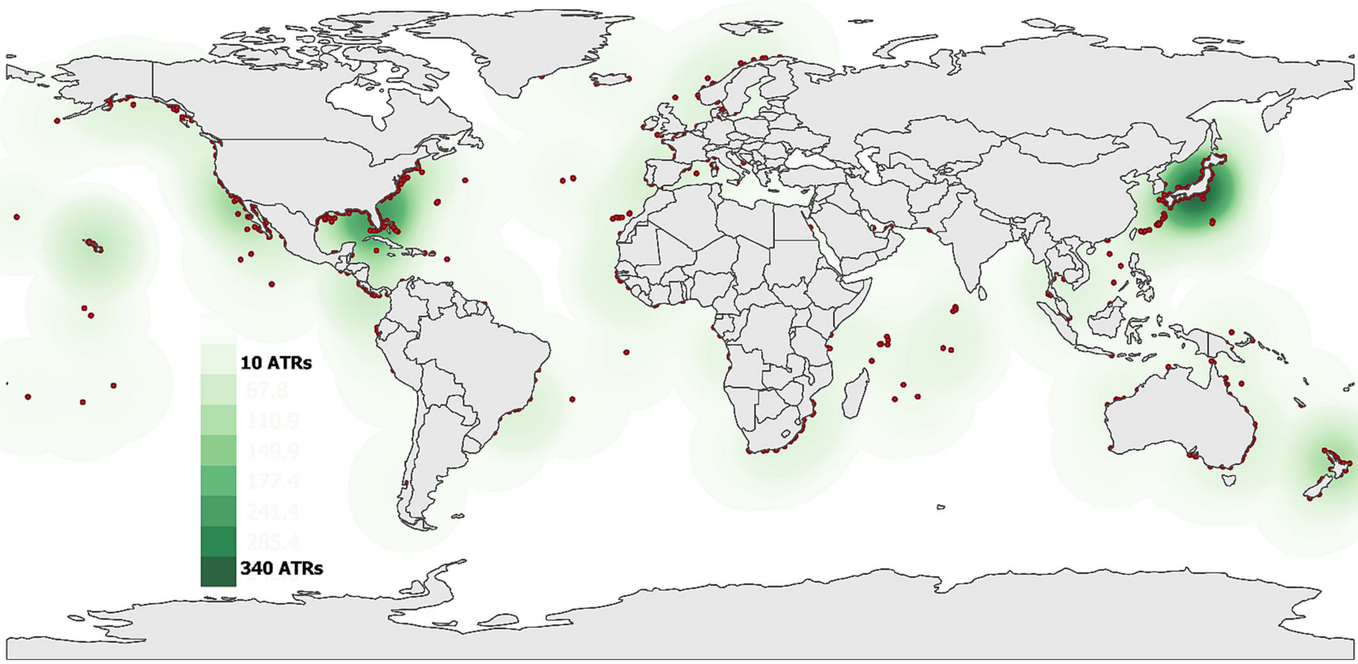

FIGURE 5 Kernel density heat map of the global distribution of all-tackle records (ATRs) between 1990 and 2018 ($n = 2180$). Red dots represent individual records.

increase in the number of species awarded a record over the decades, which indicates that trophy anglers are persistently targeting new species. The size of record-setting fishes has decreased over the past 80 years, reflecting a shift from targeting only the largest, most charismatic taxa, and towards catching a wider variety of smaller species. Global declines in the abundance of large predatory fishes since the mid-20th century (Myers & Worm, 2003) have likely made it harder for anglers to catch these 'trophy-sized' individuals. It is important to note that ATRs for large trophy fish species were still recorded in recent years but represent a lower proportion of the total records. Trophy anglers confronted with the reduced likelihood of catching large-bodied species may shift their effort to smaller bodied, low trophic level taxa. McClenachan (2009) showed that the average trophy fish in Florida had declined in size from 19.9 kg in 1956 to 2.3 kg in 2007. Their study reported that landings in 1956 were primarily of large pelagic fishes, such as jacks (*Seriola* spp.), whereas in 2007, the catches were dominated by smaller reef fishes, such as snappers (*Lutjanus* spp.). Pauly et al. (1998) described this process of targeting fishes of higher to lower trophic levels as fishing down the food web, evidence of which is well documented in commercial fisheries (Ainley & Pauly, 2014; Liang & Pauly, 2017; Sala et al., 2004), and may also be occurring in recreational trophy fishing.

Interestingly, in 2009 there was a notable decline in the number of ATRs, which went against the general trend. This could reflect the global financial crisis of 2008, which saw the economies of many developed countries fall into recession. Trophy fishing requires enough income to hire boats, guides, and equipment, so the decline in household wealth and spending may have reduced participation rates. Further research into the IGFA database may identify similar effects from the recent COVID-19 pandemic and the continuing current global economic uncertainty.

The ATRs for species listed as threatened by the IUCN declined sharply over the past decade, which could reflect the increased scarcity of larger bodied threatened species, as their conservation status would suggest. Whether the decline in records for threatened species represents a greater awareness of conservation issues surrounding trophy fishing or indicates that fewer large individuals of these species remain because of high recreational fishing pressure is unclear. These results should be viewed with caution, as we did not include information on when these species were initially listed as threatened or how many ATRs have been submitted in all record categories since that time. Nevertheless, the fact that these species are currently threatened and can still be awarded an ATR might still incentivize anglers to catch the largest individuals in these threatened populations, limiting population resilience or recovery (Shiffman et al., 2015). A recommendation for further research is to unpick these trends between historical IUCN listings and IGFA records.

4.2 | Spatial trends

The USA accounted for the largest proportion of ATRs (37.87%), which is unsurprising given its well-established trophy fishing industry, high levels of disposable income, and large coastline (Coleman et al., 2004; Cooke & Cowx, 2006). Heat maps revealed that South Florida contained particularly high numbers of records. This region is considered one of the most popular sea fishing destinations in the world, with a multibillion angling industry and sophisticated

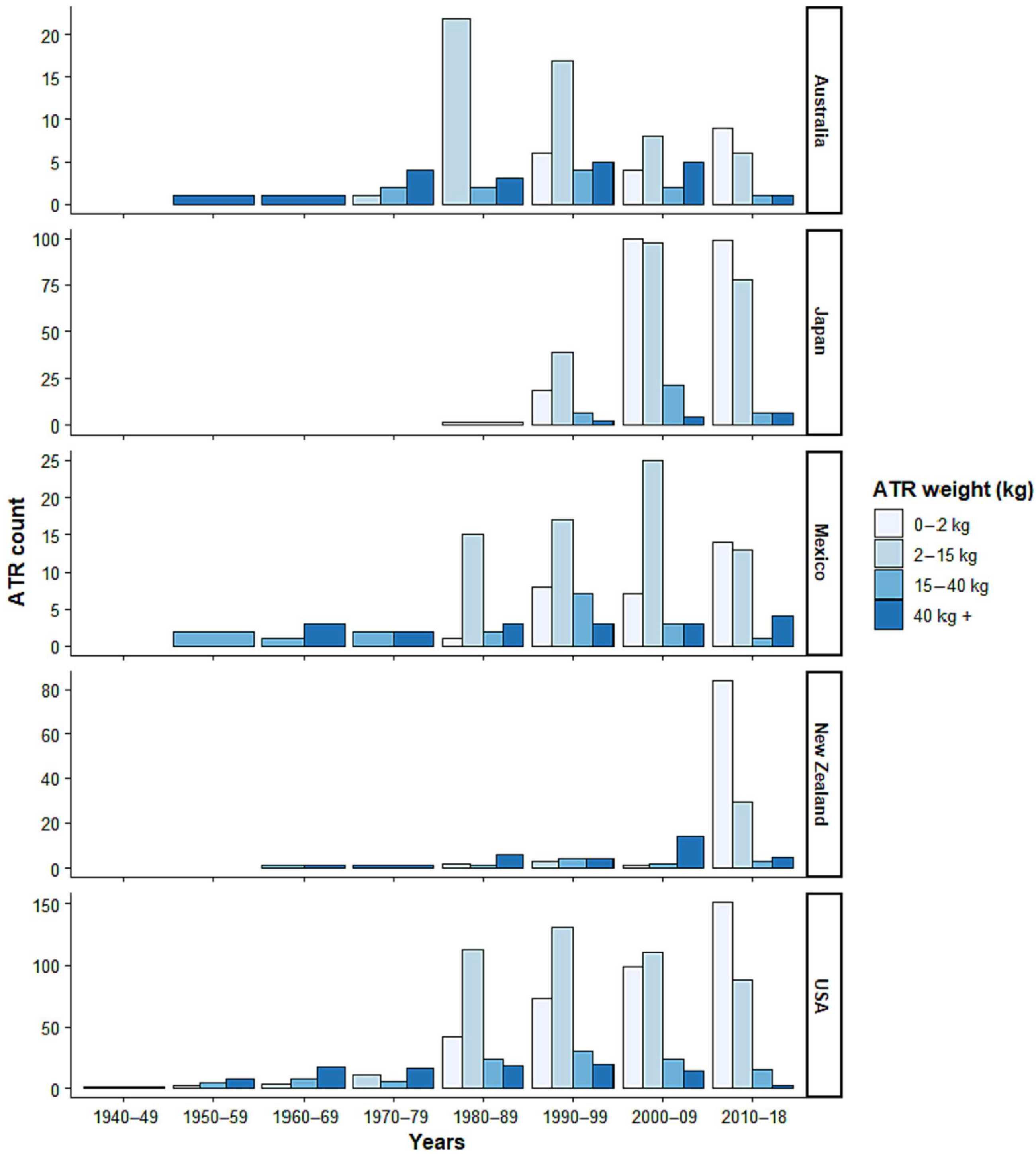

FIGURE 6 The number of all-tackle records (ATRs) across decades categorized by weight for hotspot countries. Note the different scales on the *y*-axis.

angling infrastructure, with high volumes of chartered fishing boats and guides (Johns et al., 2001). Records from the USA follow the same trends seen across the record dataset, where smaller records are most common in recent decades. These results seem to support those of McClenachan (2009), and suggest that the abundance of the largest specimens in the USA has continued to decline. Despite this, participation rates and the cost of sport fishing trips have not significantly changed in the region, which might reflect a shifted baseline in the trophy fishing community and a decoupling of the health of fish stocks and the value of trophy fishing (McClenachan, 2009). Interestingly, marine recreational fishing rates in the USA are estimated to be approximately 3.26% of the total population, which is considerably less than reported in Australia (20%) and New Zealand (17%) (Henry & Lyle, 2003; Wynne-Jones et al., 2014). This discrepancy highlights that trophy fishing effort cannot be estimated through creel surveys and voluntary participation reporting alone, but also requires perspectives from additional data sources such as world record catches.

The ATRs from Japan and New Zealand have seen a marked increase over the past two decades. Recreational marine fishing has been historically popular in both Japan, with an estimated 4.88 million anglers (Nakamura, 2019), and New Zealand, with an estimated 600,000 marine anglers, although from much smaller populations (Wynne-Jones et al., 2014). Therefore, these trends do not suggest an increase in recreational fishing pressure, but instead are likely to reflect an increased focus on setting IGFA records in both countries and a growth in the popularity of trophy fishing. For instance, fishing for IGFA records might have only become established in Japan in the 1980s, explaining the sudden increase in records in the following years. In comparison, New Zealand has long been popular for trophy fishing, with IGFA records reported from as early as the 1960s, suggesting that the growth in records is primarily linked with an increase in the number of new smaller species certified.

In contrast, the number of ATRs reported in Australia and Mexico has declined over recent decades. Both countries have long histories of reporting IGFA records, with both regions documenting ATRs as early as the 1950s. It might be expected that in the future, ATRs will become increasingly difficult to break, meaning anglers will be required to exploit new regions and target new species. This is evident in the increasing number of new species awarded an ATR and the spread of records to new locations. A growth in game fishing infrastructure in new locations may provide key opportunities for socio-economic growth and benefit local stakeholders (Smith, Fedler & Adams, 2023), but may also result in increased pressure on the largest size classes or threatened species in new locations that were previously only lightly exploited.

4.3 | Conservation implications

Although the IGFA is not responsible for managing or regulating recreational fisheries, it can and has set an important example as a globally recognized association that aims to promote ethical and responsible angling practices. To this end, there have been some promising recent developments. Most prominently, the IGFA introduced an 'all-tackle length' category IGFA (2022d) in 2011. This involves measuring the length, instead of weight, of a fish once it is caught, which can then be released alive without the need of transporting it to an on-land weighing station. Other angling associations are promoting similar practices: for example, the Shark Angling Club of Great Britain (http://www.sharkanglingclubofgreatbritain.org.uk) has only permitted catch-and-release fishing since 1998. Likewise, flats fisheries in the Bahamas and Florida are now almost entirely catch-and-release, with the landing of potential world record tarpon in Florida requiring the purchase of a harvest tag (Smith, Fedler & Adams, 2023). Catch-and-release practices are not guaranteed to ensure the survival of the individual but can be strengthened through modified angling practices (Brownscombe et al., 2017). For instance, appropriate hook removal techniques, such as unhooking devices or the use of circular hooks, can allow for rapid hook removal and reduce handling time, tissue damage, and post-release mortality (Cooke & Sneddon, 2007; Fobert et al., 2009; Pelletier, Hanson & Cooke, 2007). Moreover, to limit the impacts of air exposure, length-based measurement could be conducted in the water, using suitably sized landing nets or bump boards (Brownscombe et al., 2017), or using proxies (e.g. the relationship between distance between the nose and dorsal fin and total length). Assessing fish condition for physical injuries or stress and allowing suitable recovery time is also needed to maximize post-release survival (Brownscombe et al., 2017). Such techniques could be a prerequisite for length-based certifications, especially in the record hotspot regions, where fishing pressure on the largest size classes may be greatest.

In contrast, in the USA in particular, game fishing tournaments that require fishes to be killed and weighed are still very popular and can offer extremely lucrative prizes (e.g. Bisbees https://www.bisbees.com). These tournaments are not connected to the IGFA or aimed at catching IGFA records, but instead aim to catch the most or the heaviest game fishes during the tournament period. We strongly recommend the phasing out of such tournaments in favour of more enlightened catch-and-release approaches.

The archives of world record catches are not fully representative of the scale of the impacts of recreational trophy fishing and can be incomplete and glitchy, and therefore we stress the conservative underestimate of the ATR database. Importantly, the number of records awarded is not representative of the number of awards sought, as a far greater proportion of large individuals will have been removed from the populations than is indicated. The IGFA and other regional organizations could improve trophy fishing effort estimates by ensuring that the locations and size of all potential record catches are recorded, with a wider roll-out of devices such as creel cards and angler diary programmes (Cooke & Cowx, 2004; Hyder et al., 2021). Mandatory data collection from catches that are measured in the hope of a new record but fall short would increase the accuracy of participation and effort estimations, and compliment scientific surveys, which could improve stock assessments and guide future management efforts to improve national data reporting of recreational catches (Cooke & Cowx, 2004; Freire et al., 2020).

5 | CONCLUSIONS

To conclude, we present the first effort to describe global spatial and temporal patterns of marine recreational world record catches. Results suggest that trophy anglers have moved away from targeting only a select few large-bodied species to a wider range of smaller bodied species. Threatened species have shown notable decreases in records in the past decade, potentially highlighting their scarcity. ATRs have spread globally since the formation of the IGFA in the mid-20th century, with hotspot areas identified in Southern Florida, Japan, and New Zealand. The IGFA world record database provides a wealth of information that can be used to analyse trends in catches from an angle that no other data source can. We encourage further analysis of this information, particularly in relation to threatened species and catches from hotspots, and suggest that these data can be used in conjunction with commercial data to help inform management for the largest size classes present in a population.

AUTHOR CONTRIBUTIONS

All authors contributed to conceptualization of the research; James S. Boon led the data collection and data analysis with support from all authors; James S. Boon and Bryce D. Stewart wrote the first manuscript draft; all authors edited the manuscript.

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None.

CONFLICT OF INTEREST STATEMENT

The authors have no relevant financial or nonfinancial interests to disclose.

DATA AVAILABILITY STATEMENT

All of the data generated or analysed during this study are available in Data S1 and S2.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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APPENDIX

TABLE 1 International Union for Conservation of Nature (IUCN) assessed Critically Endangered, Endangered, and Vulnerable marine species in our International Game Fish Association (IGFA) world record dataset, based on 2014 IUCN assessments ($n = 63$).

Common name	Scientific name	IUCN status
Speckled hind	*Epinephelus drummondhayi*	CR
Goliath grouper	*Epinephelus itajara*	CR
Japanese huchen	*Hucho perryi*	CR
Warsaw grouper	*Hyporthodus nigritus*	CR
Large-tooth sawfish	*Pristis perotteti*	CR
European monkfish	*Squatina squatina*	CR
Southern bluefin tuna	*Thunnus maccoyii*	CR
Giant sea bass	*Stereolepis gigas*	CR
Beluga sturgeon	*Huso huso*	CR
Longheaded eagle ray	*Aetobatus flagellum*	EN
Kob	*Argyrosomus hololepidotus*	EN
Humphead wrasse	*Cheilinus undulatus*	EN
Daisy stingray	*Dasyatis margarita*	EN
Hong Kong grouper	*Epinephelus akaara*	EN
Dusky grouper	*Epinephelus marginatus*	EN
Nassau grouper	*Epinephelus striatus*	EN
Atlantic halibut	*Hippoglossus hippoglossus*	EN
Island grouper	*Mycteroperca fusca*	EN
Gulf grouper	*Mycteroperca jordani*	EN
Undulate ray	*Raja undulata*	EN
Blackchin guitarfish	*Rhinobatos cemiculus*	EN
African wedgefish	*Rhynchobatus luebberti*	EN
Shortspine thornyhead	*Sebastolobus alascanus*	EN
Scalloped hammerhead shark	*Sphyrna lewini*	EN
Great hammerhead shark	*Sphyrna mokarran*	EN
Bluefin tuna (atlantic)	*Thunnus thynnus*	EN
Bigeye thresher shark	*Alopias superciliosus*	VU
Thresher shark	*Alopias vulpinus*	VU
Oceanic whitetip shark	*Carcharhinus longimanus*	VU
Dusky shark	*Carcharhinus obscurus*	VU
Sandbar shark	*Carcharhinus plumbeus*	VU
Night shark	*Carcharhinus signatus*	VU
White shark	*Carcharodon carcharias*	VU
Gulf weakfish	*Cynoscion othonopterus*	VU
Longtooth grouper	*Epinephelus bruneus*	VU
Giant grouper	*Epinephelus lanceolatus*	VU
Atlantic cod	*Gadus morhua*	VU
Tope shark	*Galeorhinus galeus*	VU
Spiny butterfly ray	*Gymnura altavela*	VU
Yellowedge grouper	*Hyporthodus flavolimbatus*	VU
Snowy grouper	*Hyporthodus niveatus*	VU
Mako shark	*Isurus oxyrinchus*	VU
White marlin	*Kajikia albida*	VU

TABLE 1 (Continued)

Common name	Scientific name	IUCN status
Hogfish	*Lachnolaimus maximus*	VU
Porbeagle shark	*Lamna nasus*	VU
Cubera snapper	*Lutjanus cyanopterus*	VU
Blue marlin	*Makaira nigricans*	VU
Tarpon	*Megalops atlanticus*	VU
Haddock	*Melanogrammus aeglefinus*	VU
Yellowmouth grouper	*Mycteroperca interstitialis*	VU
Leopard grouper	*Mycteroperca rosacea*	VU
Sicklefin lemon shark	*Negaprion acutidens*	VU
Sand tiger shark	*Carcharias taurus*	VU
Fanray	*Platyrhina sinensis*	VU
Blacksaddled coral grouper	*Plectropomus laevis*	VU
Thorny skate	*Raja radiata*	VU
Giant guitarfish	*Rhynchobatus djiddensis*	VU
California sheephead	*Semicossyphus pulcher*	VU
Smooth hammerhead shark	*Sphyrna zygaena*	VU
Spiny dogfish	*Squalus acanthias*	VU
Tautog	*Tautoga onitis*	VU
Bigeye tuna	*Thunnus obesus*	VU
Itoyoridai	*Nemipterus virgatus*	VU