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PRACTICE AND POLICY

Insights from three decades of IUCN Red List assessments catalyzing shark, ray, and chimaera conservation

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Article impact statement: Three decades of shark red listing reveal extinction risk dynamics and highlight lessons learned, new methods, and future challenges.

Abstract

The International Union for Conservation of Nature (IUCN) Red List of Threatened Species is a critical measure of global aquatic and terrestrial biodiversity status. It is also the basis for the Red List Index, which tracks extinction risk over time. Sharks, rays, and chimaeras (Chondrichthyes) have now been comprehensively assessed twice (1996–2011 and 2012–2021) with hindcast assessments from 1970 onward, yielding an unprecedented extinction risk trajectory for an aquatic vertebrate class. The three-decade success of the IUCN Species Survival Commission (SSC) Shark Specialist Group (SSG) in providing updated and evidence-based assessments stems from sustained and coordinated activities by SSG members. We examined how a community of dedicated experts organized to fill gaps in key information to inform Red List assessments. From this evaluation, we identified six key lessons related to membership, taxonomic changes, implementation of the precautionary approach, information prioritization, assessment standardization, and policy efforts. However, existing challenges, including resource constraints and assessment discrepancies at different spatial scales, need to be addressed to ensure Red List assessments stay on pace with advances in conservation. With the second global assessment of chondrichthyans completed, it is appropriate to reflect on the evolution of the SSG and its achievements over three decades to highlight new tools and approaches to red listing and to identify priorities for the immediate future that are also applicable to other aquatic taxa with limited data, slow life histories, and exposure to high levels of fishing.

KEYWORDS

biodiversity targets, chondrichthyans, conservation assessment, extinction risk, IUCN Red List of Threatened Species, knowledge gaps, policy action

INTRODUCTION

The International Union for Conservation of Nature (IUCN) Red List of Threatened Species is the world's most comprehensive inventory of the global extinction risk for animal, plant, and fungi species (Butchart et al., 2025; Rodrigues et al., 2006). Sharks, rays, and chimaeras (hereafter chondrichthyans) are considered an indicator of global ocean health (Juan-Jorda et al., 2022) and were among the first marine taxa considered when IUCN was testing its 1994 Red List Categories and Criteria (version 2.3) (Hudson & Mace, 1996), a process that led to the release of version 3.1 in 2001 (IUCN, 2001). The IUCN Species Survival Commission (SSC) Shark Specialist Group (SSG) was set up in 1991, and since its establishment, 1266 chondrichthyans (>99% of described species) have been assessed at least once as part of the Red List assessment process (red listing) (Appendix S1). Most species are now being globally reassessed for the third time, and retrospective assessments to a baseline year of 1970 were created to establish the first Red List Index (RLI) for a comprehensively assessed class of aquatic vertebrates (Dulvy, Pacoureau, et al., 2024).

APPLICATION OF RED LISTING FOR CONSERVATION AND MANAGEMENT OUTCOMES

Since the initiation of the SSG's red-listing program, a series of publications and reports have summarized results of Red List assessments across taxonomic and thematic groups. These outputs have included comprehensive global reviews of extinction risk and trends (e.g., Dulvy et al., 2014; Dulvy, Pacoureau, et al., 2021; Dulvy, Pacoureau, et al., 2024), regional and national reviews (Cavanagh & Gibson, 2007; Cavanagh et al., 2003; Finucci et al., 2019; Jabado et al., 2018; Nieto et al., 2015), species groups reviews (Dulvy et al., 2016; Finucci et al., 2021; Finucci, Rigby, et al., 2024; Sherman et al., 2023), and the identification of priority threatened taxa (Kyne et al., 2020; Pacoureau et al., 2021; Yan et al., 2021) and families of highest conservation priorities (Dulvy et al., 2014, 2017). These outputs are among some of the most cited works in marine conservation.

National, regional, and international fora regularly use the IUCN Red List assessments to help prioritize species protection, management, and future research efforts. For example, governments are prioritizing national research efforts for the most threatened chondrichthyan groups, such as sawfishes (Pristidae) and angelsharks (Squatinidae) (CMS, 2024; Fordham et al., 2018). Red List assessments also motivate and underpin policy documents for international agreements, including the Convention on the Conservation of Migratory Species of Wild Animals (CMS) and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which in 2022 listed 104 species in the appendices based on the robust and updated Red List assessments (CITES, 2022) that highlighted substantial population declines driven in part by unregulated global trade.

Red List assessments are also used to track biodiversity targets set by the Convention on Biological Diversity (CBD) Kunming–Montreal Global Biodiversity Framework through the RLI (Butchart et al., 2025). The RLI is calculated from changes in species' Red List statuses and is used as an indicator of change in biodiversity state (Butchart et al., 2010). Finally, Red List assessments are also linked to conservation impact and recovery processes, including the IUCN's Green Status of Species (Grace et al., 2021), area-based conservation prioritizations including Important Shark and Ray Areas (ISRAs) (Hyde et al., 2022), and Species Threat Abatement and Restoration (STAR) (Turner et al., 2024).

On the basis of three decades of experience, we evaluated the progress of the SSG and identified key milestones and future priorities with a focus on lessons learned (Table 1). The six main lessons learned relate to membership, taxonomic changes, implementation of the precautionary approach, information prioritization, assessment standardization, and policy efforts. These findings are also relevant to the assessment of other understudied aquatic species with low productivity and widespread exposure to target and incidental fisheries capture.

MEMBERSHIP AND ENHANCED REPRESENTATION FOR GLOBAL ASSESSMENT

The SSG was established by the IUCN SSC in response to increasing global concern about the impacts of overfishing on chondrichthyans. Since 1991, the SSG has evolved into the leading scientific authority on shark, ray, and chimaera conservation (https://www.iucnssg.org/), expanding from approximately 60 members in 15 countries to almost 300 members across 93 countries and nine regions by 2026. SSG membership diversity has purposefully grown over time and now represents practitioners from government, research and academic institutions, nongovernmental organizations (including zoos and aquaria), and the private sector, ensuring broad expertise across biology, fisheries, social science, conservation, and policy. Including a wide range of perspectives ensures assessments are scientifically rigorous and contextually relevant globally, leading to more effective conservation outcomes. Today, the SSG faces the challenge of maintaining engagement among its voluntary membership while refreshing its ranks to remain dynamic, balancing institutional memory and expertise (∼30% of members are long-standing members) with new perspectives to ensure continuity and learning in addressing long-term conservation issues.

DYNAMIC NATURE OF CHONDRICHTHYAN TAXONOMY

The SSG is responsible for informing the IUCN Red List Unit of taxonomic changes and confirming species validity from globally recognized taxonomic sources (e.g., Eschmeyer's Catalog of Fishes) in consultation with leading taxonomists within and outside the SSG through the Integrative Taxonomy Working Group. Knowledge of chondrichthyan diversity is dynamic and has rapidly grown with increasing research. The number of recognized chondrichthyan species has increased by over 40% since 1991, from 891 to 1266 in 2023, with 160, 187, and 26 newly described species of sharks, rays, and chimaeras, respectively (Weigmann et al., 2024). It is expected there are still many species that are unresolved or new to science (White et al., 2022). Newly described species largely occur in the deep sea and previously unexplored regions (Weigmann et al., 2024). However, more complex taxonomic changes have also occurred, particularly in the rays (e.g., reclassification of the family Dasyatidae from nine to 18 genera [Last et al., 2016]).

There can be important conservation implications of taxonomic reorganization. Although some taxonomic revisions (e.g., species' reallocation from one genus to another) have little influence on a species' conservation status, other changes in taxonomic concept (e.g., splits or lumps) can dramatically affect extinction risk of the new taxonomic concepts. When a species split occurs, new species need to be assessed, and the parent

TABLE 1 Summary of six key lessons from three decades of IUCN red listing for chondrichthyans.

Theme	Lesson	Learning process	Why it matters
Membership	Broad, diverse, and globally representative membership ensures robust and credible scientific outputs (e.g., Red List assessments, resulting from regional peer-reviewed manuscripts)	Expansion of membership enabled improvements in data inputs and engagement with a broad range of data holders and experts	Ensures assessments incorporate local expertise, fishery realities, and sociopolitical contexts, increasing scientific rigor, legitimacy, and uptake by decision-makers
Taxonomic changes	Taxonomic change fundamentally alters extinction risk assessments and must be dynamically managed	Ongoing species discoveries, reclassifications, and taxonomic splits required reassessment of ranges, populations and their trends, and threats	Failure to track taxonomic change can underestimate extinction risk; proactive taxonomy integration ensures assessments reflect true biological units and conservation needs
Precautionary approach	A precautionary approach better accounts for potential extinction risk for data-limited species with long generation lengths	Shift from evidentiary to precautionary assessments reduced data deficiency and indicated that many species were likely already at risk before formal recognition	Prevents systematic underestimation of extinction risk, prompts earlier conservation action, and aligns the Red List process with the biology of species with long generation lengths
Information prioritization	Not all biological information is relevant to extinction risk	Experience showed that lengthy assessments diluted focus, whereas concise, standardized assessments improved clarity and consistency	Focusing on reporting information directly linked to extinction risk improves assessment efficiency, comparability, and usability for decision-makers
Assessment standardization	Standardized analytical tools (e.g., JARA) can reduce subjectivity and inconsistency	Development and application of tools resolved recurring debates about trend estimation (particularly for broad-ranging species or fragmented stocks), model choice, and data inclusion	Standardization increases transparency, repeatability, and confidence in assessments, particularly for policy-relevant decisions such as fisheries management and trade regulations
Closing the policy gap	Global assessments alone are insufficient to drive effective local or regional conservation action	Mismatches between global, regional, and national risk status highlighted limitations of single-scale assessments	Integrating global assessments with national processes can improve policy relevance, prevent misinterpretation of risk, and strengthen conservation implementation

species requires a new assessment, which may involve a redefined smaller range and, ultimately, a smaller population and range size (Dulvy, Pacoureau 2021). For example, the whitespotted eagle ray (*Aetobatus narinari*, assessed as Near Threatened in 2006) was previously presumed to be circumglobally distributed in tropical and warm-temperate waters (Last & Stevens, 2009). Taxonomic, molecular, and parasite studies indicated the species was a taxonomic complex comprising at least three species and possible regional subpopulations. The revised taxonomic concept of *A. narinari* (Endangered in 2020 [Dulvy, Carlson, et al., 2021]) is now restricted to the eastern and western Atlantic (White & Sommerville, 2010), with the spotted eagle ray (*Aetobatus ocellatus*, Endangered in 2023 [Finucci, Rigby, et al., 2024]) in the Indo-West Pacific and the Pacific eagle ray (*Aetobatus laticeps*, Vulnerable in 2019 [Pollom et al., 2021]) in the eastern Pacific. This taxonomic split revealed narrower distributions, varying regional threats, and heightened species' extinction risk.

IMPROVED KNOWLEDGE AND THE PRECAUTIONARY APPROACH TO ASSESSMENT

Knowledge of chondrichthyans and their distribution, population status, habitat and ecology, use and trade, threats, conservation measures, and, ultimately, extinction risk status has vastly improved over time. This improvement has been achieved in part by the increased coherence in taxonomy and distribution maps in species catalogs and field guides (e.g., Ebert et al., 2021; Last et al., 2016; Weigmann, 2016), enhanced accuracy in identifying species and their ranges, and improved species-level monitoring. The high degree of data deficiency (46.8% in 2014; Dulvy et al., 2014) had been concerning because these species tend to be excluded from conservation legislation and policy yet may be threatened (Cazalis et al., 2023). Through new information, particularly on fishing impacts, increased IUCN Red List expertise, predictive trait modeling, and broader geographic representation (Dulvy et al., 2014; Dulvy, Pacoureau, et al., 2021; Walls & Dulvy, 2020), data deficiency of assessed species declined from 46.8% in 2014 ($n = 487/1041$) to 12.9% in 2021 ($n = 155/1199$) (Figure 1).

Chondrichthyan data deficiency is now comparable to other tetrapod vertebrates (except for birds, 0.3%): 13% for mammals, 16% for reptiles, and 11% for amphibians (IUCN, 2026). Importantly, the SSG changed from an evidentiary (high risk tolerance) to a precautionary (low risk tolerance) approach based on both updated guidance on risk tolerance and the considerable weight of evidence showing that IUCN Red List Criteria were aligned with fish stock assessment reference points (Dulvy, Pacoureau, et al., 2021), which shifted some high-risk species (e.g., hammerheads, Sphyrnidae) into threatened categories (Dulvy et al., 2014; Dulvy, Pacoureau, et al., 2021). As a result of this shift in approach, almost all status changes from 2014 to 2021 were considered nongenuine

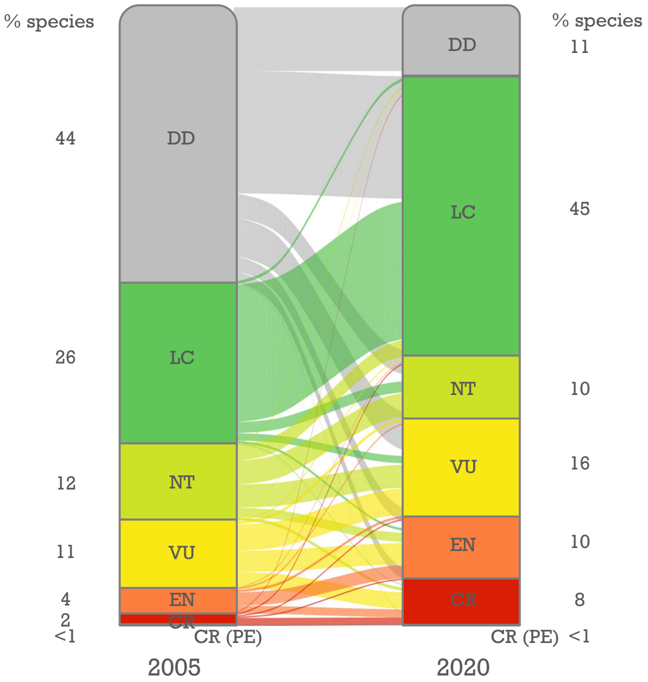

FIGURE 1 Published International Union for Conservation of Nature (IUCN) Red List of Threatened Species extinction risk status for all sharks, rays, and chimaeras ($n = 1021$) that have undergone at least two rounds of assessment between 2005 and 2020. Status changes may be genuine or nongenuine. Percentage of chondrichthyan species in each category listed on the sides. IUCN Categories are as follows: CR (PE), Critically Endangered (Possibly Extinct); CR, Critically Endangered; EN, Endangered; VU, Vulnerable; NT, Near Threatened; LC, Least Concern; and DD, Data Deficient.

(i.e., a change resulting from taxonomic changes, new knowledge, and improvements in the application of criteria). Only 15 changes were genuine: 12 species experienced a decline in status, and three species experienced an improvement in status (Dulvy, Pacoureau 2021; Dulvy, Pacoureau, et al., 2024), suggesting many populations were already in decline before threat status was formally recognized (Walker, 1998).

KNOWLEDGE GAPS AND INFORMATION PRIORITIZATION

Information included in Red List assessments is now limited to that which is relevant to extinction risk. Data collected on chondrichthyans have increased substantially since the 1990s, largely due to increased research interest, conservation concerns, and advancements in technology. Despite scientific advancements, many critical species-specific knowledge gaps remain (Jorgensen et al., 2022; Temple et al., 2025). Initial assessments often included available information on species' life-history parameters, biology, and ecology, particularly for species where this information was unpublished. Although much of this is important for understanding ecological roles and informing Green Status assessments (Grace et al., 2021), only certain details (e.g., generation length) are directly relevant to assessing extinction risk. Assessments are now typically much shorter and concise, following a strict template for consistency and clarity. Still, knowledge gaps remain, and addressing these through the identified data collection and research priorities below will enhance future Red List assessments, providing a stronger foundation for effective conservation, management, and policy decisions.

Geographic and depth range distribution

Information on chondrichthyan distribution continues to increase as more aquatic environments are explored (Weigmann et al., 2024). The countries where a species occurs as provided in Red List assessments are often reflected in country checklists that are used for local management and conservation purposes. Reported depth ranges are now used to define Red List maps. This information is essential for understanding species' overlap with past and current threats (Walls & Dulvy, 2020) and assisting multitaxon conservation planning (Turner et al., 2024). Spatial and bathymetric range expansions are routinely updated for chondrichthyans. These new data need to be in verified sources for use in assessments and are most useful when coupled with visual representation (maps) and locality data (latitude and longitude). The increasing prevalence of distribution maps in taxonomic literature is helpful to visualize species' distributions. However, one primary challenge to developing these maps is that species' countries of occurrence were previously populated independently of the mapping process, leading to difficult-to-detect inconsistencies (e.g., overseas territories or island nations in close proximity). Furthermore, no process for coding exists for recording occurrences in the high seas and areas beyond national jurisdiction, which is the largest ecosystem on the planet (Roberts et al., 2025).

Habitat use within the water column is poorly defined for most species (Andrzejaczek et al., 2022) but is essential for understanding exposure to fishing. A species may have spatial overlap with fisheries operating across its range, but if the reach of these fisheries does not extend to depths where the species occurs, then these fisheries are unlikely to be a threat; thus, a species may be at low risk of overexploitation and extinction (Murua et al., 2021). Conversely, if the fishery overlaps with the species' known depth distribution, then the species may be highly exposed to capture (and threat) (Finucci, Pacoureau, et al., 2024; Madigan et al., 2022). There are many examples of species reported to occur across vast depth ranges, but it is unclear where these species spend most of their time in the water column. For example, the southern lanternshark (*Etmopterus granulosus* [Günther 1880]) is reported from a depth range of 220–1500 m. However, data from New Zealand fishery-independent research trawl surveys suggest most species' occurrences are at 900–1000 m in depth (Anderson et al., 1998), beyond the depth range of most regional fishing effort. Thus, the species is only partially exposed to fishing threat and was assessed as Least Concern in 2018.

Life-history gaps

Arguably, the most pressing knowledge gap for chondrichthyans is the lack of information on key life-history traits: age, annual reproductive output, and natural mortality (Cortés et al., 2024). These traits are necessary for calculating the intrinsic rate of population increase (r_{max}) but are estimated for only ∼10% of chondrichthyans (CITES Secretariat, 2024). Species-specific age and growth data, particularly age at maturity and longevity, are required to calculate generation lengths, the time period used to measure population decline (over the longer of either three generation lengths or 10 years), while accounting for the slower recovery of long-lived species facing increased mortality. These data are also fundamental parameters in fishery, stock, and demographic assessments and critical for understanding a species' susceptibility to exploitation. However, species-specific age data are only available for ∼10% of chondrichthyans (CITES Secretariat, 2024). Much of the existing age structure data were likely generated from exploited populations, which can lead to generation lengths that are shorter than those of unexploited populations (Harry, 2018; Hudson & Mace, 1996). However, the near-complete absence of such information for a species, and in some cases whole families, currently means that estimates must be inferred from proxies, creating uncertainties that may mischaracterize true extinction risk.

Additionally, existing species-specific age and growth data may be outdated, represent a small part of the population of a widely distributed species, and, most importantly, be unvalidated (i.e., not confirmed against a known age) (Harry, 2018). Entire families of chondrichthyans (e.g., deepwater catsharks [Pentanchidae] and pygmy skates [Gurgesiellidae]) have no measured or estimated life-history parameters. Reasons for this lack of information for these families include challenges in sampling some habitats (e.g., deepwater), small sample sizes or a lack of representative samples, the requirement for lethal sampling, or a lack of visible growth bands in age structures (e.g., vertebrae and spines). Additionally, age and growth studies present challenges (i.e., the need for validation) and are not considered groundbreaking research suitable for publication in high-impact scientific journals, which may discourage their uptake (Harry et al., 2022; Temple et al., 2025). Nonetheless, the need for age and growth data is a substantial knowledge gap in our understanding of chondrichthyans. Although current chondrichthyan aging methods need refinement (Natanson et al., 2018), emerging alternatives, including elemental and isotopic characterization and epigenetics (Lewis et al., 2025; Weber et al., 2024), show promise for filling knowledge gaps but may still require validation against known-age individuals.

Species-specific population trend data

Population trends are the most important metric for assessing change in chondrichthyan extinction risk over time. Population reduction (Criterion A) is the primary Red List criterion that chondrichthyans are assessed against (95% of threatened species; Dulvy, Pacoureau, et al., 2021). Few species have been assessed under restricted geographic range (Criterion B; $n = 12$), small population size and decline and very small or restricted population (Criteria C and D, respectively; $n = 8$), or quantitative analysis (Criterion E; no species). Fishery catches and landings have historically been recorded using coarse reporting codes (e.g., sharks and rays, dogfish), if reported at all. Without these data, species can undergo unreported population declines and localized extinctions, especially when catches of other similar but more productive species remain stable (Dulvy et al., 2000). Substantial improvements in more refined species reporting have been observed through improved taxonomic resolution and knowledge of species' distributions, as well as fisheries management and reporting requirements, which have improved the quality of data available over time. However, inferences must still be used to determine impacts of past fishing effort, particularly for species that have long generation lengths.

Where possible, quantitative data collected from fishery-independent sources provide the most robust sources of species-specific population trends (Pacoureau et al., 2023), but these data are available for only a small proportion (13%) of species (Mull et al., 2022). Fortunately, qualitative data and fishery-dependent data can also be informative. Sources of population trend data may include commercial catches, fishery-independent observer programs, research surveys, underwater visual censuses, remote video techniques, market or fish landing site surveys, trade values, and local ecological knowledge. The last source can be particularly useful for understanding fishing pressure and artisanal fishing impacts, where chondrichthyan monitoring programs are not available (Haque et al., 2022; Karnad et al., 2020). Often these data are unavailable to the public, are published in gray literature (e.g., fisheries stock assessments), or have restricted access. The SSG has always been reliant on its members and network to locate this knowledge and assist in ensuring the information is translatable for red-listing purposes.

Threats from fisheries

Overfishing is the primary threat to chondrichthyans, and almost every species is threatened by targeted or incidental capture (bycatch) (Dulvy, Ellis, et al., 2024; Dulvy, Pacoureau, et al., 2021). Thus, information on fisheries and trends in fisheries over time will always be needed for assessing extinction risk. This need also underscores the importance of SSG members with strong fisheries expertise that can interpret and apply such information effectively. Data on target capture (whether chondrichthyan or other species), gear type, depth fished, fishing intensity (e.g., seasonality), and fishing effort (e.g., number of vessels in the fleet), as well as changes over time, provide important information for understanding threats to chondrichthyans (Walker, 2004). Mitigation measures implemented to reduce chondrichthyan mortality and that of other incidentally caught species from fishing are also important to note. For example, retention bans are becoming an increasingly used management tool, particularly within Regional Fisheries Management Organizations (RFMOs) (e.g., Feitosa et al., 2025). Although this is a step in the right direction, information on postrelease survival of species is also needed to determine the extent to which these measures reduce total mortality.

Other threats

Although fishing is the primary threat to chondrichthyans, other threats can compound the effects of fishing or have greater effects in some environments (e.g., freshwater). These threats include habitat loss and degradation, climate change, and pollution (Dulvy, Pacoureau, et al., 2021). The effects of these processes, particularly climate change, and the mechanisms through which they may exacerbate other existing threats are not well defined or understood (Dulvy, Ellis, et al., 2024). The Red List assessments will need to incorporate vulnerability to nonfishing threats and quantify them using both expert analysis of species' ecological and biological traits and model outputs projecting changes in populations and distribution ranges (Foden & Young, 2016; Mancini et al., 2024; Walker et al., 2021).

ASSESSMENT STANDARDIZATION

Assessment tools and resources to assist with red listing

The SSG has collated vast amounts of data that have supported the development of new tools and resources and advanced red listing. For example, Sharkipedia.org is a curated, open-access database of chondrichthyan life-history traits and abundance time series from published sources, collated during the Red List assessment process (Mull et al., 2022). There are 871 population time series from 202 species, and many ($n = 111$) of these time series were considered sufficiently robust to incorporate into the decision-support tool Just Another Red List Assessment (JARA) (Winker et al., 2019).

JARA is a Bayesian state–space model that averages relative abundance indices to calculate population reduction and is designed to standardize Red List assessments, increase objectivity, and lower the risk of misclassification (Winker et al., 2019). JARA can incorporate any standardized, representative time-series data that span an appropriate length of time (at least 10 years). To date, JARA has mostly been applied to species with robust data monitoring, often from resource-sufficient nations or regional management bodies, or to species with high economic value (e.g., pelagic sharks; Pacoureau et al., 2021). JARA may become increasingly important for chondrichthyan and other marine fish assessments with increasingly standardized data collection, particularly for those species monitored at landing sites. JARA has also been applied to other taxa, including African seabirds and vultures (McClure et al., 2023; Sherley et al., 2019, 2020). The use of JARA has reduced debates that previously affected assessment outcomes in relation to start and end points, model use (linear versus log-linear), time-series inclusion, and approaches to incorporate parts of a species' range without time-series data (Sherley et al., 2020). However, the reliability of JARA ultimately depends on the availability of consistent, high-quality data to inform the model.

Assessment discrepancies at different spatial scales

A global Red List assessment may not always reflect a species' national or regional status (IUCN, 2022). Some species occur in countries with large territorial seas and relatively limited fishing effort, or species are relatively well managed in countries with strong management and monitoring capacity. For example, well-enforced governance and science-based effective limits on fishing have reduced the extinction risks for many wide-ranging coastal sharks in the northwestern Atlantic compared with their high extinction risk in the southwestern Atlantic (Pacoureau et al., 2023). However, globally, these species are facing high extinction risk and are thus assessed as threatened. For these categories of species, national or regional assessments, whether through the IUCN process or a similar means of extinction risk assessment (e.g., Australia [Kyne et al., 2021]), may provide a more informative assessment for management, conservation, and recovery at a national scale. Mismatches in assessment scale can distort extinction risk. Downscaling may overlook broader regional or global declines and underestimate national level risk, whereas upscaling could dilute local threats within more stable global trends (Finucci et al., 2019; Jabado et al., 2018). Conversely, risk may be overestimated if local declines are assumed to reflect the species' entire range or if limited data from one area are erroneously extrapolated more widely. Increased collaboration between the SSG and countries using similar listing criteria could enhance chondrichthyan reassessments and prevent duplication of effort. National Species Specialist Groups, an SSC initiative composed of experts across all taxa from the same country, may be a useful mechanism for sharing country-specific information and catalyzing national conservation and recovery efforts (Xie & Rodriguez, 2023).

CLOSING THE POLICY GAP

Aligning Red List assessment frequency, species recovery, and conservation momentum

The pace at which the development of new chondrichthyan knowledge is advancing far exceeds the rate of Red List assessments. Although this advance in knowledge is encouraging and a necessary driver for conservation, it also highlights the challenge of ensuring that Red Lists keep pace and remain up to date. Although Red List assessments for all species of flora and fauna are valid for up to 10 years, important new data (e.g., distribution, life history, and population trends) often emerge within that period but are not reflected unless Red List status updates are published more frequently. Fortunately, there is not only a once-in-a-decade opportunity to capture new information on taxonomic changes, species' ranges, and population data; the

10-year cycle mandated in the IUCN Guidelines is also the maximum period before assessments will be classified as out of date. More frequent reassessments may be required for species with available information that is likely to change their status (including nongenuine changes) and for species under consideration for management action, such as through international conservation processes. For example, mako sharks (Lamnidae), wedgefishes (Rhinidae), and gulper sharks (Centrophoridae) are some of the species with reassessments that were prioritized to inform CITES and CMS listing proposals.

The slow life histories and protracted population recovery times of chondrichthyans do not align with Red List assessment timelines and resulting changes in Red List categories; whether improvement or decline, changes may not be detectable for decades. Continued monitoring of highly threatened species, particularly those with limited species-specific data, is essential to track effectiveness of conservation interventions, species' population stabilization, and, ultimately, recovery. An emerging issue is the shifting baseline of assessments for highly threatened species with short generation lengths. The Green Status of Species helps address this issue (Akçakaya et al., 2026), though its implementation must account for practical limitations in resources and capacity. Highly threatened species with shorter generation lengths that have shown no sign of improvement (which may be due to a lack of contemporary data) or with declines that are likely to continue (i.e., fishing threat still occurs) may still be highly threatened. Conversely, according to IUCN Criteria and Guidelines, this seemingly stable state may result in these species no longer qualifying as a highly threatened category. In such cases, a continued precautionary approach to assessment is recommended.

Capacity and resource limitations

The red-listing process and assessments underpin chondrichthyan conservation efforts but remain resource-intensive and heavily dependent on volunteer contributions. The 2021 comprehensive reassessment process engaged 244 experts from 71 countries and territories across 17 regional (e.g., South America and Australia) and thematic workshops (e.g., sawfishes and chimaeras) (Dulvy, Pacoureau, et al., 2021). Paid staff-time totaled >4300 staff-days in addition to extensive volunteer input (CITES, 2022). Similar efforts were needed for the 2014 assessments, which involved 302 experts from 64 countries across 17 workshops from 1996 to 2011 (Dulvy et al., 2014). Since 2019, to improve efficiency and consistency, the SSG has required all lead assessors to be trained in applying the Red List Categories and Criteria (TNC, 2025), increasing the number of chondrichthyan specialists contributing to the assessment process and improving assessment quality.

A range of meeting options exists, but they are limited in their feasibility. The workshops allowed collaborative, intensive efforts in a short time, but they were constrained by adequate and dedicated funding. Regional meetings can reduce costs, but the assessment of wide-ranging species (e.g., pelagic sharks) requires experts from across the globe. Virtual workshops proved effective during the COVID-19 pandemic. However, time zone considerations, language barriers, and facilitation of active participation from large groups of participants virtually are difficult to manage and limit full engagement. Although the SSG operates largely through volunteer effort, sustained financial support is essential to cover core costs. Securing recurring funding is challenging as donors often prefer novel initiatives over ongoing, yet essential, processes like maintaining and updating Red List assessments. Sustained funding to support this work is key, and commitments from the private sector or through partnerships are required to maintain momentum and engagement across the global network. The IUCN SSC Bird Red List Authority's integrated partnership with BirdLife International effectively leverages a global network of experts and institutional capacity to deliver consistent assessments through a dedicated red-listing team (Burfield, 2025). Establishing a similar collaboration with a marine-focused global organization could provide the SSG with the financial stability and human resources required to maintain Red List assessments, while also enabling the group to expand into complementary activities like conservation planning.

Thus, developing new tools and building capacity are essential to the SSG's continued success with red listing. Partnerships with platforms such as Sharkipedia.org may complement published Red List assessments where decision-makers require updated data. Although automation tools exist for other taxa—like the Rapid Least Concern app for plants (https://spbachman.shinyapps.io/rapidLC/; Bachman et al., 2019)—creating one for chondrichthyans is more complex due to their mobility, diverse life histories, and dynamic threats. Public data sources like Global Biodiversity Information Facility (GBIF) and iNaturalist offer the potential to complement red listing; however, these observations are heavily reliant on species (and location) verification by recognized experts.

Over the past three decades, the IUCN SSC SSG has built a globally recognized, evidence-based framework for assessing extinction risk in sharks, rays, and chimaeras, transforming the global understanding of their extinction risk status. These efforts have led to substantial reductions in data deficiency, the development of innovative tools, and an increased use of Red List outputs to guide policy, trade regulation, and conservation action. A precautionary approach to assessment facilitates the incorporation of uncertainty and provides a robust foundation for informed decision-making. However, challenges persist, including resource limitations, regional status discrepancies, mismatches between assessment timelines and biological recovery, and the pace of taxonomic change. To continue advancing chondrichthyan conservation, it is critical to secure sustained red-listing support, enhance regional capacity, and integrate complementary tools that capture emerging data between assessment cycles. A dynamic, collaborative, and well-resourced approach will ensure that Red List assessments remain a cornerstone of global chondrichthyan conservation and continue to drive effective management in the face of accelerating environmental change.

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REFERENCES

Akçakaya, H. R., Milner-Gulland, E. J., Hoffmann, M., Regan, H. M., Naujokaitis-Lewis, I., Punt, A. E., Gaston, K. J., Keith, D. A., Butchart, S. H. M., Stuart, S. N., Collar, N. J., Di Marco, M., Böhm, M., Berryman, A. J., Mallon, D., Hochkirch, A., Dulvy, N. K., Rivers, M., Brooks, T., … Linardich, C. (2026). Three decades of classifying threatened species: Lessons learned from and about the IUCN Red List criteria for quantifying extinction risk. *Proceedings of the Royal Society B: Biological Sciences*, *291*, Article 20260316. https://rs.figshare.com/articles/journal_contribution/Supplementary_Material_from_Three_decades_of_classifying_threatened_species_Lessons_learned_from_and_about_the_IUCN_Red_List_Criteria_for_quantifying_extinction_risk/32397696?file=64922304

Anderson, O. F., Bagley, N. W., Hurst, R. J., Francis, M. P., Clark, M. R., & McMillan, P. J. (1998). Atlas of New Zealand fish and squid distributions from research bottom trawls (NIWA Technical Report No. 42). National Institute of Water and Atmospheric Research.

Andrzejaczek, S., Lucas, T. C. D., Goodman, M. C., Hussey, N. E., Armstrong, A. J., Carlisle, A., Coffey, D. M., Gleiss, A. C., Huveneers, C., Jacoby, D. M. P., Meekan, M. G., Mourier, J., Peel, L. R., Abrantes, K., Afonso, A. S., Ajemian, M. J., Anderson, B. N., Anderson, S. D., Araujo, G., … Curnick, D. J. (2022). Diving into the vertical dimension of elasmobranch movement ecology. *Science Advances*, *8*(33), Article eabo1754.

Bachman, S. P., Field, R., Reader, T., Raimondo, D., Donaldson, J., Schatz, G. E., & Nic Lughadha, E. (2019). Progress, challenges and opportunities for Red Listing. *Biological Conservation*, *234*, 45–55.

Burfield, I. (2025). 2024-2025 Report of the Bird Red List Authority. In *Species: Annual Report of the IUCN Species Survival Commission and Secretariat 2024–2025*. IUCN SSC and Secretariat.

Butchart, S. H., Akçakaya, H. R., Berryman, A. J., Brooks, T. M., Burfield, I. J., Chanson, J., Dias, M. P., Donaldson, J. S., Hermes, C., Hilton-Taylor, C., & Hoffmann, M. (2025). Measuring trends in extinction risk: A review of two decades of development and application of the Red List Index. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *380*(1917), Article 20230206.

Butchart, S. H., Walpole, M., Collen, B., Van Strien, A., Scharlemann, J. P., Almond, R. E., Baillie, J. E., Bomhard, B., Brown, C., Bruno, J., & Carpenter, K. E. (2010). Global biodiversity: Indicators of recent declines. *Science*, *328*(5982), 1164–1168.

Cavanagh, R. D., & Gibson, C. (2007). Overview of the conservation status of cartilaginous fishes (Chondrichthyans) in the Mediterranean Sea (IUCN Technical Report No. 3). IUCN.

Cavanagh, R. D., Kyne, P. M., Fowler, S. L., Musick, J. A., & Bennett, M. B. (2003). *The conservation status of Australasian chondrichthyans*. The University of Queensland.

Cazalis, V., Santini, L., Lucas, P. M., González-Suárez, M., Hoffmann, M., Benítez-López, A., Pacifici, M., Schipper, A. M., Böhm, M., Zizka, A., & Clausnitzer, V. (2023). Prioritizing the reassessment of data-deficient species on the IUCN Red List. *Conservation Biology*, *37*(6), Article e14139.

CITES Secretariat. (2024). *Variability of life history parameters and productivity in elasmobranchs and other commercially exploited aquatic species*. Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). (2022, November 14–25). Highly credible shark assessments underpin CITES decision [Conference presentation]. CoP19 Inf. 87. Nineteenth Meeting of the Conference of the Parties, Panama City, Panama.

Convention on the Conservation of Migratory Species (CMS). (2024). *Single species action plan for the angelshark (Squatina squatina) in the Mediterranean Sea* (UNEP/CMS/COP14/Doc.27.7.1). https://cms.int/:cms_cop14_draft-report_day3_e

Cortés, E., Grant, M. I., Dureuil, M., & Ellis, J. R (2024). Life history characteristics. In R. W. Jabado, A. Z. A. Morata, R. H. Bennett, B. Finucci, J. R. Ellis, S. L. Fowler, M. I. Grant, A. P. Barbosa Martins, & S. L. Sinclair (Eds). *The global status of sharks, rays, and chimaeras* (pp. 33–38). IUCN.

Dulvy, N. K., Carlson, J., Charvet, P., Ajemian, M. J., Bassos-Hull, K., Blanco-Parra, M. P., Chartrain, E., Derrick, D., Dia, M., Diop, M., Doherty, P., Dossa, J., De Bruyne, G., Herman, K., Leurs, G. H. L., Mejía-Falla, P. A., Navia, A. F., Pacoureau, N., Pérez Jiménez, J. C., … Williams, A. B. (2021). *Aetobatus narinari (amended version of 2021 assessment)*. The IUCN Red List of Threatened Species 2021: e.T42564343A201613657. https://doi.org/10.2305/IUCN.UK.2021-2.RLTS.T42564343A201613657.en

Dulvy, N. K., Davidson, L. N., Kyne, P. M., Simpfendorfer, C. A., Harrison, L. R., Carlson, J. K., & Fordham, S. V. (2016). Ghosts of the coast: Global extinction risk and conservation of sawfishes. *Aquatic Conservation: Marine and Freshwater Ecosystems*, *26*(1), 134–153.

Dulvy, N. K., Ellis, J. R., Finucci, B., Grant, M. I., Ruiz-Garcia, D., Carlson, J. K., Charvet, P., Cerutti-Pereyra, F., Rummer, J. L., Bakiu, R., & Karnad, D. (2024). Threats. In R. W. Jabado, A. Z. A. Morata, R. H. Bennett, B. Finucci, J. R. Ellis, S. L. Fowler, M. I. Grant, A. P. Barbosa Martins, & S. L. Sinclair (Eds). *The global status of sharks, rays, and chimaeras* (pp. 75–86). IUCN.

Dulvy, N. K., Fowler, S. L., Musick, J. A., Cavanagh, R. D., Kyne, P. M., Harrison, L. R., Carlson, J. K., Davidson, L. N., Fordham, S. V., Francis, M. P., & Pollock, C. M. (2014). Extinction risk and conservation of the world's sharks and rays. *eLife*, *3*, Article e00590.

Dulvy, N. K., Metcalfe, J. D., Glanville, J., Pawson, M. G., & Reynolds, J. D. (2000). Fishery stability, local extinctions and shifts in community structure in skates. *Conservation Biology*, *14*, 283–293.

Dulvy, N. K., Pacoureau, N., Matsushiba, J. H., Yan, H. F., VanderWright, W. J., Rigby, C. L., Finucci, B., Sherman, C. S., Jabado, R. W., Carlson, J. K., Pollom, R. A., Charvet, P., Pollock, C. M., Hilton-Taylor, C., & Simpfendorfer, C. A. (2024). Ecological erosion and expanding extinction risk of sharks and rays. *Science*, *386*(6726), Article eadn1477.

Dulvy, N. K., Pacoureau, N., Rigby, C. L., Pollom, R. A., Jabado, R. W., Ebert, D. A., Finucci, B., Pollock, C. M., Cheok, J., Derrick, D. H., & Herman, K. B. (2021). Overfishing drives over one-third of all sharks and rays toward a global extinction crisis. *Current Biology*, *31*(21), 4773–4787.

Dulvy, N. K., Simpfendorfer, C. A., Davidson, L. N., Fordham, S. V., Bräutigam, A., Sant, G., & Welch, D. J. (2017). Challenges and priorities in shark and ray conservation. *Current Biology*, *27*(11), R565–R572.

Ebert, D. A., Dando, M., & Fowler, S. (2021). *Sharks of the world: A complete guide*. Princeton University Press.

Feitosa, L. M., Caughman, A. M., D'Costa, N. G., Orofino, S., Burns, E. S., Schiller, L., Worm, B., & Bradley, D. (2025). Retention bans are beneficial but insufficient to stop shark overfishing. *Fish and Fisheries*, *26*(3), 473–487.

Finucci, B., Cheok, J., Ebert, D. A., Herman, K., Kyne, P. M., & Dulvy, N. K. (2021). Ghosts of the deep: Biodiversity, fisheries, and extinction risk of ghost sharks. *Fish and Fisheries*, *22*(2), 391–412.

Finucci, B., Duffy, C. A., Francis, M. P., Gibson, C., & Kyne, P. M. (2019). The extinction risk of New Zealand chondrichthyans. *Aquatic Conservation: Marine and Freshwater Ecosystems*, *29*(5), 783–797.

Finucci, B., Pacoureau, N., Rigby, C. L., Matsushiba, J. H., Faure-Beaulieu, N., Sherman, C. S., VanderWright, W. J., Jabado, R. W., Charvet, P., Mejía-Falla, P. A., & Navia, A. F. (2024). Fishing for oil and meat drives irreversible defaunation of deepwater sharks and rays. *Science*, *383*(6687), 1135–1141. https://doi.org/10.1126/science.ade9121

Finucci, B., Rigby, C. L., Armstrong, A. O., & Rezaie-Atagholipour, M. (2024). *Aetobatus ocellatus*. The IUCN Red List of Threatened Species 2024: e.T42566169A124549514. https://doi.org/10.2305/IUCN.UK.2024-1.RLTS.T42566169A124549514.en

Foden, W. B., & Young, B. E. (2016). *IUCN SSC guidelines for assessing species' vulnerability to climate change*. https://portals.iucn.org

Fordham, S. V., Jabado, R. W., Kyne, P. M., Charvet, P., & Dulvy, N. K. (2018). Saving sawfish: Progress and priorities. IUCN Shark Specialist Group.

Grace, M. K., Akçakaya, H. R., Bennett, E. L., Brooks, T. M., Heath, A., Hedges, S., Hilton-Taylor, C., Hoffmann, M., Hochkirch, A., Jenkins, R., & Keith, D. A. (2021). Testing a global standard for quantifying species recovery and assessing conservation impact. *Conservation Biology*, *35*(6), 1833–1849.

Haque, A. B., Cavanagh, R. D., & Spaet, J. L. (2022). Fishers' tales—Impact of artisanal fisheries on threatened sharks and rays in the Bay of Bengal, Bangladesh. *Conservation Science and Practice*, *4*(7), Article e12704.

Harry, A. V. (2018). Evidence for systemic age underestimation in shark and ray ageing studies. *Fish and Fisheries*, *19*(2), 185–200.

Harry, A. V., Smart, J. J., & Pardo, S. A. (2022). Understanding the age and growth of chondrichthyan fishes. In J. C. Carrier, C. A. Simpfendorfer, M. R. Heithaus, & K. E. Yopak (Eds.), *Biology of sharks and their relatives* (pp. 177–202). CRC Press.

Hudson, E., & Mace, G. M. (1996). *Marine fish and the IUCN Red List of threatened animals: Report of the workshop*. Zoological Society of London.

Hyde, C. A., Notarbartolo di Sciara, G., Sorrentino, L., Boyd, C., Finucci, B., Fowler, S. L., Kyne, P. M., Leurs, G., Simpfendorfer, C. A., Tetley, M. J., & Womersley, F. (2022). Putting sharks on the map: A global standard for improving shark area-based conservation. *Frontiers in Marine Science*, *9*, Article 1660.

International Union for Conservation of Nature (IUCN). (2001). IUCN Red List categories and criteria: Version 3.1. IUCN Species Survival Commission.

International Union for Conservation of Nature (IUCN). (2022). Guidelines for appropriate uses of IUCN Red List data (Version 4.0). Author.

International Union for Conservation of Nature (IUCN). (2026). The IUCN Red List of Threatened Species (Version 2025–2). www.iucnredlist.org

Jabado, R. W., Kyne, P. M., Pollom, R. A., Ebert, D. A., Simpfendorfer, C. A., Ralph, G. M., Al Dhaheri, S. S., Akhilesh, K. V., Ali, K., Ali, M. H., & Al Mamari, T. M. (2018). Troubled waters: Threats and extinction risk of the sharks, rays and chimaeras of the Arabian Sea and adjacent waters. *Fish and Fisheries*, *19*(6), 1043–1062.

Jorgensen, S., Micheli, F., White, T., Van Houtan, K., Alfaro-Shigueto, J., Andrzejaczek, S., Arnoldi, N., Baum, J., Block, B., Britten, G., Butner, C., Caballero, S., Cardeñosa, D., Chapple, T., Clarke, S., Cortés, E., Dulvy, N., Fowler, S., Gallagher, A., … Ferretti, F. (2022). Emergent research and priorities for shark and ray conservation. *Endangered Species Research*, *47*, 171–203.

Juan-Jordá, M. J., Murua, H., Arrizabalaga, H., Merino, G., Pacoureau, N., & Dulvy, N. K. (2022). Seventy years of tunas, billfishes, and sharks as sentinels of global ocean health. *Science*, *378*(6620), Article eabj0211.

Karnad, D., Sutaria, D., & Jabado, R. W. (2020). Local drivers of declining shark fisheries in India. *Ambio*, *49*(2), 616–627.

Kyne, P. M., Heupel, M. R., White, W. T., & Simpfendorfer, C. A. (2021). The action plan for Australian sharks and rays 2021. National Environmental Science Program, Marine Biodiversity Hub.

Kyne, P. M., Jabado, R. W., Rigby, C. L., Dharmadi, Gore, M. A., Pollock, C. M., Herman, K. B., Cheok, J., Ebert, D. A., Simpfendorfer, C. A., & Dulvy, N. K (2020). The thin edge of the wedge: Extremely high extinction risk in wedgefishes and giant guitarfishes. *Aquatic Conservation: Marine and Freshwater Ecosystems*, *30*(7), 1337–1361.

Last, P. R., Naylor, G., Séret, B., White, W., de Carvalho, M., & Stehmann, M. (Eds.). (2016). *Rays of the world*. CSIRO Publishing.

Last, P. R., & Stevens, J. D. (2009). *Sharks and rays of Australia* (2nd ed.). CSIRO Publishing.

Lewis, H. M. K., Grant, M. I., Alard, O., Kyne, P. M., Huang, H., Gréau, Y., Harry, A. V., Johnson, G., Kirke, A., & Mahan, B. (2025). Challenging traditional methods of age estimation: Elemental and isotopic characterisation of speartooth shark *Glyphis glyphis* vertebrae. *Marine Ecology Progress Series*, *771*, 105–121.

Madigan, D. J., Devine, B. M., Weber, S. B., Young, A. L., & Hussey, N. E. (2022). Combining telemetry and fisheries data to quantify species overlap and evaluate bycatch mitigation strategies in an emergent Canadian Arctic fishery. *Marine Ecology Progress Series*, *702*, 1–17.

Mancini, G., Santini, L., Cazalis, V., Akçakaya, H. R., Lucas, P. M., Brooks, T. M., Foden, W., & di Marco, M. (2024). A standard approach for including climate change responses in IUCN Red List assessments. *Conservation Biology*, *38*(3), Article e14227.

McClure, C. J., Rolek, B. W., Kemp, R., & Wolter, K. (2023). Combining trends from disparate monitoring programs to inform Red List assessments: The case of the Cape Vulture (*Gyps coprotheres*). *Biological Conservation*, *284*, Article 110175.

Mull, C. G., Pacoureau, N., Pardo, S. A., Ruiz, L. S., García-Rodríguez, E., Finucci, B., Haack, M., Harry, A., Judah, A. B., VanderWright, W., & Yin, J. S. (2022). Sharkipedia: A curated open access database of shark and ray life history traits and abundance time-series. *Scientific Data*, *9*(1), Article 559.

Murua, H., Griffiths, S. P., Hobday, A. J., Clarke, S. C., Cortés, E., Gilman, E. L., Santiago, J., Arrizabalaga, H., de Bruyn, P., Lopez, J., & Aires-da-Silva, A. M. (2021). Shark mortality cannot be assessed by fishery overlap alone. *Nature*, *595*(7866), E4–E7.

Natanson, L. J., Skomal, G. B., Hoffmann, S. L., Porter, M. E., Goldman, K. J., & Serra, D. (2018). Age and growth of sharks: Do vertebral band pairs record age? *Marine and Freshwater Research*, *69*(9), 1440–1452.

Nieto, A., Ralph, G. M., Comeros-Raynal, M. T., Heessen, H. J. L., & Rijnsdorp, A. D. (2015). *European Red List of marine fishes*. Publications Office of the European Union.

Pacoureau, N., Carlson, J. K., Kindsvater, H. K., Rigby, C. L., Winker, H., Simpfendorfer, C. A., Charvet, P., Pollom, R. A., Barreto, R., Sherman, C. S., & Talwar, B. S. (2023). Conservation successes and challenges for wide-ranging sharks and rays. *Proceedings of the National Academy of Sciences*, *120*(5), Article e2216891120.

Pacoureau, N., Rigby, C. L., Kyne, P. M., Sherley, R. B., Winker, H., Carlson, J. K., Fordham, S. V., Barreto, R., Fernando, D., Francis, M. P., & Jabado, R. W. (2021). Half a century of global decline in oceanic sharks and rays. *Nature*, *589*(7843), 567–571.

Pollom, R., Avalos, C., Bizzarro, J., Burgos-Vázquez, M. I., Cevallos, A., Espinoza, M., González, A., Herman, K., Mejía-Falla, P. A., Morales-Saldaña, J. M., Navia, A. F., Pérez Jiménez, J. C., & Sosa-Nishizaki, O. (2021). *Aetobatus laticeps*. The IUCN Red List of Threatened Species 2021: e.T104021731A104021771. https://doi.org/10.2305/IUCN.UK.2021-1.RLTS.T104021731A104021771.en

Roberts, C. M., Dyer, E., Earle, S. A., Forrest, A., Hawkins, J. P., Hoegh-Guldberg, O., Meeuwig, J. J., Pauly, D., Pimm, S. L., Sumaila, U. R., & Rockström, J. (2025). Why we should protect the high seas from all extraction, forever. *Nature*, *642*(8066), 34–37.

Rodrigues, A. S., Pilgrim, J. D., Lamoreux, J. F., Hoffmann, M., & Brooks, T. M. (2006). The value of the IUCN Red List for conservation. *Trends in Ecology & Evolution*, *21*(2), 71–76.

Sherley, R. B., Crawford, R. J. M., de Blocq, A. D., Dyer, B. M., Geldenhuys, D., Hagen, C., Kemper, J., Makhado, A. B., Pichegru, L., Tom, D., & Upfold, L. (2020). The conservation status and population decline of the African penguin deconstructed in space and time. *Ecology and Evolution*, *10*(15), 8506–8516.

Sherley, R. B., Crawford, R. J. M., Dyer, B. M., Kemper, J., Makhado, A. B., Masotla, M., Pichegru, L., Pistorius, P. A., Roux, J. P., Ryan, P. G., & Tom, D. (2019). The status and conservation of the Cape gannet *Morus capensis*. *Ostrich*, *90*(4), 335–346.

Sherman, C. S., Simpfendorfer, C. A., Pacoureau, N., Matsushiba, J. H., Yan, H. F., Walls, R. H. L., Rigby, C. L., VanderWright, W. J., Jabado, R. W., Pollom, R. A., Carlson, J. K., Charvet, P., Bin Ali, A., Fahmi, Cheok, J., Derrick, D. H., Herman, K. B., Finucci, B., Eddy, T. D., … Dulvy, N. K. (2023). Half a century of rising extinction risk of coral reef sharks and rays. *Nature Communications*, *14*(1), Article 35091.

Temple, A. J., Cochran, J. E., Pirog, A., Dulvy, N. K., Cortés, E., Weigmann, S., Booth, H., Wheeler, C. R., Finucci, B., Haque, A. B., & Heithaus, M. R. (2025). Opportunities to enhance conservation success for sharks. *npj Ocean Sustainability*, *4*(1), Article 24.

The Nature Conservancy (TNC). (2025). IUCN Red List Assessor Training. https://www.conservationtraining.org/course/index.php?categoryid=23

Turner, J. A., Starkey, M., Dulvy, N. K., Hawkins, F., Mair, L., Serckx, A., Brooks, T., Polidoro, B., Butchart, S. H., Carpenter, K., & Epps, M. (2024). Targeting ocean conservation outcomes through threat reduction. *npj Ocean Sustainability*, *3*(1), Article 4.

Walker, T., Day, R., Awruch, C., Bell, J., Braccini, M., Dapp, D., Finotto, L., Frick, L., Garces, K., Guida, L., Huveneers, C., Martins, C., Rochowski, B., Tovar-Ávila, J., Trinnie, F., & Reina, R. (2021). Ecological vulnerability of the chondrichthyan fauna of southern Australia to the stressors of climate change, fishing and other anthropogenic hazards. *Fish and Fisheries*, *22*(5), 1105–1135.

Walker, T. I. (1998). Can shark resources be harvested sustainably? A question revisited with a review of shark fisheries. *Marine and Freshwater Research*, *49*(7), 553–572.

Walker, T. I. (2004). Elasmobranch fisheries management techniques. In J. A. Musick & R. Bonfil (Eds.), *Elasmobranch fisheries management techniques* (pp. 285–322). APEC Secretariat.

Walls, R. H. L., & Dulvy, N. K. (2020). Eliminating the dark matter of data deficiency by predicting the conservation status of Northeast Atlantic and Mediterranean Sea sharks and rays. *Biological Conservation*, *246*, Article 108459.

Weber, D., Wyffels, J. T., Buckner, C., George, R., Latson, F. E., LePage, V., Lyons, K., & Portnoy, D. S. (2024). Noninvasive, epigenetic age estimation in an elasmobranch, the cownose ray (*Rhinoptera bonasus*). *Scientific Reports*, *14*, Article 26261.

Weigmann, S. (2016). Annotated checklist of the living sharks, batoids and chimaeras (Chondrichthyes) of the world, with a focus on biogeographical diversity. *Journal of Fish Biology*, *88*, 837–1037.

Weigmann, S., Didier, D. A., Finucci, B., Nakaya, K., Naylor, G. J. P., Séret, B., Straube, N., & Vaz, D. F. B. (2024). Biodiversity, taxonomy, and systematics of extant chondrichthyan fishes. In R. W. Jabado, A. Z. A. Morata, R. H. Bennett, B. Finucci, J. R. Ellis, S. L. Fowler, M. I. Grant, A. P. Barbosa Martin, & S. L. Sinclair (Eds). *The global status of sharks, rays, and chimaeras* (pp. 7–30). IUCN.

White, W. T., O'Neill, H. L., & Naylor, G. J. (2022). Taxonomy and diversity of extant elasmobranchs. In J. C. Carrier, C. A. Simpfendorfer, M. R. Heithaus, & K. E. Yopak (Eds.), *Biology of sharks and their relatives* (pp. 31–57). CRC Press.

White, W. T., & Sommerville, E. (2010). Elasmobranchs of tropical marine ecosystems. In J. C. Carrier, J. A. Musick, & M. R. Heithaus (Eds.), *Sharks and their relatives II: Biodiversity, adaptive physiology, and conservation* (pp. 159–239). CRC Press.

Winker, H., Pacoureau, N., & Sherley, R. B. (2019). JARA: Just Another Red-List Assessment. bioRxiv. https://doi.org/10.1101/672899

Xie, Y., & Rodriguez, J. P. (2023). China Species Specialist Group: Piloting a new initiative for expansion of the IUCN Species Survival Commission. *Oryx*, *57*(4), 418.

Yan, H. F., Kyne, P. M., Jabado, R. W., Leeney, R. H., Davidson, L. N., Derrick, D. H., Finucci, B., Freckleton, R. P., Fordham, S. V., & Dulvy, N. K. (2021). Overfishing and habitat loss drive range contraction of iconic marine fishes to near extinction. *Science Advances*, *7*(7), Article eabb6026.

SUPPORTING INFORMATION

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

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