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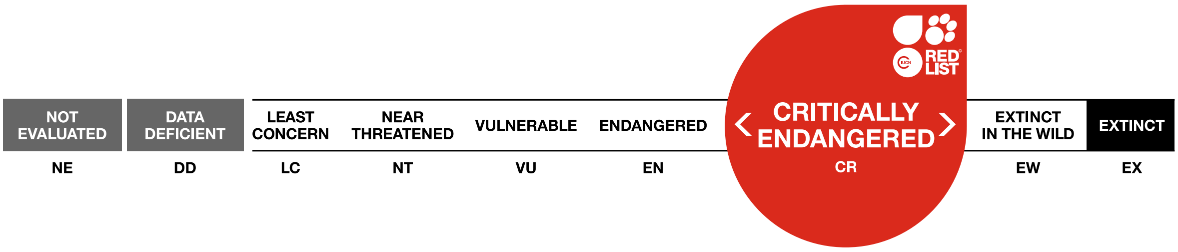
Galeorhinus galeus, Tope

Assessment by: Walker, T.I., Rigby, C.L., Pacoureau, N., Ellis, J., Kulka, D.W., Chiaramonte, G.E. & Herman, K.



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Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Chondrichthyes	Carcharhiniformes	Triakidae

Scientific Name: *Galeorhinus galeus* (Linnaeus, 1758)

Synonym(s):

- *Squalus galeus* Linnaeus 1758

Regional Assessments:

- Mediterranean
- Europe

Common Name(s):

- English: Tope, School Shark, Snapper Shark, Soupfin Shark
- French: Requin-hâ
- Spanish; Castilian: Cacao
- Italian: Can Negro
- Portuguese: Cacao Tope

Taxonomic Source(s):

Linnaeus, C. 1758. *Systema naturae per regna tria naturae, secundum classes, ordinus, genera, species, cum characteribus, differentiis, synonymis, locis. Tomus I. Editio decima, reformata*. Impensis Direct, Laurentii Salvii, Holmiae.

Assessment Information

Red List Category & Criteria: Critically Endangered A2bd ver 3.1

Year Published: 2020

Date Assessed: February 14, 2020

Justification:

Tope (*Galeorhinus galeus*) is a medium-sized (to 200 cm total length) bentho-pelagic shark, widespread in temperate waters in most oceans. It is present across the Northeast, Eastern Central, Southwest, and Southeast Atlantic, the Mediterranean Sea, the Eastern Indian, and across all of the Pacific, except in the Northwest Pacific. It occurs on continental shelves and upper to mid slopes from shallow inshore to well offshore to depths of 826 m, though most frequently to depths of 200 m. Genetic and tagging data support up to six separate subpopulations of Tope and while the species makes extensive movements within each of the subpopulations, there is no evidence of mixing between them. Tope has a particularly low biological productivity with a late age-at-maturity and triennial reproductive cycle. It is caught globally as target and bycatch in industrial and small-scale demersal and pelagic gillnet and longline fisheries, and to a lesser extent in trawl and hook-and-line fisheries. Tope is often retained for the meat and fins but is discarded or released in some areas, in line with regional management measures. Steep subpopulation and stock reductions of >80% over the past three generation lengths (79 years) have occurred in the Southwest Atlantic, southern Africa, and Australia. In the Northeast Atlantic, the subpopulation is estimated to have undergone a reduction of 76% over the past three generation lengths (79 years). The New Zealand stock is estimated to have undergone a reduction of 30–49% over the past three generation lengths (79 years). In the Northeast Pacific, a dramatic decline in the subpopulation occurred in the early 1940s, with no recovery until 1997–2004 when localized management led to a localized increase in abundance. The consistent steep subpopulation reductions across most of the analyzed subpopulations and stocks together with the lack of movement between the subpopulations are cause for serious concern. Management in Australia, probably aided by the immigration of large mature animals from New Zealand, appears to have stabilized that stock since 2000. The subpopulation in the Northeast Atlantic has been stable in recent years, possibly due to management measures, and there is some recovery in part of the Northeast Pacific. Release of this species is mandatory since 2011 off Canada. Release is mandatory in European Union waters for line-caught Tope. The global population is estimated to have undergone a reduction of 88% with the highest probability of >80% reduction over the last three generations (79 years) due to levels of exploitation, and Tope is assessed as Critically Endangered A2bd.

Previously Published Red List Assessments

2006 – Vulnerable (VU)
https://dx.doi.org/10.2305/IUCN.UK.2006.RLTS.T39352A10212764.en

2000 – Vulnerable (VU)

Geographic Range

Range Description:

Tope is widely distributed in cold to warm temperate waters of most oceans. It occurs in the Northeast, Eastern Central, Southwest and Southeast Atlantic, the Mediterranean Sea, the Eastern Indian, and in the Southwest, Southeast, Western Central, Eastern Central, and Northeast Pacific. It is absent from the Northwest and Western Central Atlantic, the Northwest Pacific, and the Western Indian (Ebert *et al*. 2013).

Country Occurrence:

Native, Extant (resident): Albania; Algeria; Angola; Argentina; Australia; Belgium; Bosnia and Herzegovina; Brazil; Canada; Chile; Croatia; Cyprus; Denmark; Ecuador; Egypt; Faroe Islands; France; Germany; Gibraltar; Greece; Iceland; Ireland; Israel; Italy; Lebanon; Libya; Malta; Mauritania; Mexico; Monaco; Montenegro; Morocco; Namibia; Netherlands; New Zealand; Norway; Palestine, State of; Peru; Portugal; Senegal; Slovenia; South Africa; Spain (Canary Is.); Sweden; Syrian Arab Republic; Tunisia; Turkey; United Kingdom; United States (Hawaiian Is.); Uruguay; Western Sahara

Native, Possibly Extant (resident): Benin; Cameroon; Congo; Congo, The Democratic Republic of the; Côte d'Ivoire; Equatorial Guinea; Gabon; Gambia; Ghana; Guinea; Guinea-Bissau; Liberia; Nigeria; Sierra Leone; Togo

FAO Marine Fishing Areas:

Native: Pacific - western central

Native: Atlantic - eastern central

Native: Pacific - southwest

Native: Indian Ocean - eastern

Native: Atlantic - southwest

Native: Atlantic - southeast

Native: Pacific - southeast

Native: Atlantic - northeast

Native: Pacific - northeast

Native: Pacific - eastern central

Native: Mediterranean and Black Sea

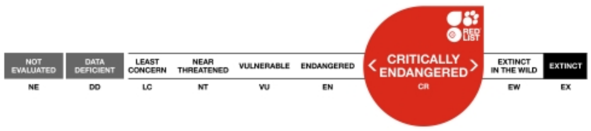
Distribution Map

Legend

EXTANT (RESIDENT)

Compiled by:

IUCN SSC Shark Specialist Group 2019



The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

Genetic and tagging data support up to six separate subpopulations of Tope (Ward and Gardner 1997, Chabot and Allen 2009, Chabot 2015, Hernández *et al*. 2015, Devloo-Delva *et al.* 2019): Northeast Atlantic (including the Mediterranean Sea), southern Africa (Namibia to East London, South Africa), Southwest Atlantic (southern Brazil to Patagonia), Northeast Pacific (British Columbia to southern Baja California including the Gulf of California), Southeast Pacific (Ecuador to Chile), and Australasia (Australia and New Zealand). There is evidence of some genetic similarity between the South American subpopulations (Bester-van der Merwe *et al.* 2017). Within each of the six subpopulations, the species makes extensive movements, but there is no evidence of mixing among the separate genetically-distinct subpopulations (Chabot 2015, Hernández *et al.* 2015).

Population trend data are available from five sources: (1) standardized catch-per-unit-effort (CPUE) in the Northeast Atlantic and Mediterranean Sea (ICES 2019); (2) nominal CPUE in the Southwest Atlantic (G. Chiaramonte unpubl. data 2019); (3) stock assessment biomass from South Africa (Winker *et al.* 2019. H. Winker pers. comm. 21 January 2020); (4) stock assessment biomass from Australia (Thomas and Punt 2009); and, (5) standardized CPUE from longline and gillnet in New Zealand (Dunn and Bian 2018). The trend data from each source were analyzed over three generation lengths using a Bayesian state-space framework (Sherley *et al.* 2019, Winker and Sherley 2019). This analysis yields an annual rate of change, a median change over three generation lengths, and the probability of the most likely IUCN Red List Category percent change over three generations (see the Supplementary Information).

First, in the Northeast Atlantic and Mediterranean Sea, three fishery-independent survey standardized CPUE were available from the northern (2005–2018) and southern areas (1997–2016) of the Celtic Seas Ecoregion (all trawl data) and from the Azores (1990–2015) (longline data) (ICES 2019). An exploratory trend analysis was undertaken that included these three surveys and additional trawl survey data from the North Sea (1992–2016; ICES 2019). However, given that ICES (2019) identified likely taxonomic confusion between Tope and Smooth-hound (*Mustelus* spp.) in some of the North Sea trawl survey data, the North Sea data were excluded from the present assessment. The three fishery-independent datasets were used to also represent the Mediterranean Sea, as that is part of the Northeast Atlantic Tope subpopulation (Colloca *et al.* 2019). Data from the MEDITS trawl survey program in the Mediterranean Sea (1994–2015) was not reported as CPUE and as such, was not able to be included in the trend analyses, however it indicated that Tope has a low frequency of occurrence (Ramírez-Amaro *et al.* 2020). The Northeast Atlantic survey data may not be fully representative of stock status due to the low catchability of Tope in these fishery-independent surveys and annual peaks associated with large catches of individual hauls; as such, caution is advised in interpretation of these data (ICES 2019). The combined data indicate declining catches till the 2000s when catches began to slowly increase. The trend analysis of these survey data combined for 1990–2018 (29 years) revealed annual rates of reduction of 1.7%, consistent with an estimated median reduction of 76.6% over three generation lengths (79 years), with the highest probability of >80% reduction over three generation lengths. This trend is largely driven by higher catch rates at the start of the time-series, with data from the latter part of the time-series indicating more stable trends (ICES 2019). The exploratory analyses that included the North Sea data resulted in a reduction of 91.5% over three generation lengths, yet the differences in the trend analyses for this subpopulation between inclusion and exclusion of the North Sea data did not affect the likely status of the overall global trend analysis.

Second, in the Southwest Atlantic, Tope declined dramatically in importance in the commercial chondrichthyan catch in Argentina, declining from 40% to 2% during 1984–2015, where the Tope fishery also collapsed at the end of the century (Chiaramonte *et al.* 2016). A matrix population model of data from Bahía San Blas found a decrease in the subpopulation at an average annual rate of 6.7% to 12.8% from 1998–2001 (Lucifora 2003). The nominal CPUE from Argentina for 1992–2015 (24 years) was available from demersal trawl fisheries (referred to as 'coastal' and 'ice' trawlers in Argentina) (G. Chiaramonte unpubl. data 2019). The trend analysis revealed annual rates of reduction of 5.9%, consistent with an estimated median reduction of 99.3% over three generation lengths (79 years), with the highest probability of >80% reduction over three generation lengths.

Third, in South Africa, a JABBA stock assessment indicated declining stocks for 1952–2016 (65 years) (Winker *et al.* 2019). The current biomass is 10–14% of pre-exploitation levels (Winker *et al.* 2019). The data used for the assessment was from scientific surveys and commercial catches in the demersal shark longline, line, and trawl fisheries (Winker *et al.* 2019). The trend analysis of the biomass estimates from the stock assessment (H. Winker pers. comm. 21 January 2020) revealed annual rates of reduction of 3.1%, consistent with an estimated median reduction of 91.4% over three generation lengths (79 years), with the highest probability of >80% reduction over three generation lengths.

Fourth, in Australia, stock assessments indicated that the current biomass is <20% of unexploited levels and the stock is considered overfished (Patterson *et al.* 2018). Trawl CPUE available since ~1994 is considered a poor indicator of the abundance of Tope in southern Australia because the catch is predominantly large males mostly taken in small numbers from a small part of the species' range in deep water. Changes in targeting practices by the fishers since 2001 create the same issue of bias as for gillnet CPUE. Since 2001, catches of Tope have been managed with a low total allowable catch (TAC) and this catch has been stable, albeit at a very low level. The biomass is classed by the Australian government as overfished at a level below 20% of the pre-fishing level and the fishing mortality is classed uncertain (Patterson *et al.* 2018). The trend analysis of the stock assessment abundance for 1927–2000 (74 years) revealed annual rates of reduction of 2.8%, consistent with an estimated median reduction of 90.1% over three generation lengths (79 years), with the highest probability of >80% reduction over three generation lengths.

Fifth, in New Zealand, standardized catch-per-unit-effort was available for longline from 5 areas and for gillnet from 4 areas (Dunn and Bian 2018). The combined data show a general decline during the 1990s followed by a rise in catches in the early 2000s and then fluctuations in catches across areas and gear (Dunn and Bian 2018). The high fluctuations in these data may be due to varying patterns of fishing and/or migration of Tope both spatially and temporally. The trend analysis of the combined longline and gillnet data from 1990–2016 (27 years) revealed annual rates of reduction of 0.5%, consistent with an estimated median reduction of 29.8% over three generation lengths (79 years), with the highest probability of 30–49% reduction over three generation lengths. Whilst Australia and New Zealand are part of the same subpopulation, they are treated as separate stocks for the purposes of fisheries and conservation management, and risk assessments within Australia and New Zealand. The exchange of large mature animals between the two stocks of Australia and New Zealand has been established by tag release-recapture (Hurst *et al.* 2008, Walker *et al.* 2008), and some interbreeding between the two stocks established by genetic studies (Hernández *et al.* 2015). However, most animals in the two stocks are too small to move across the Tasman Sea and there are separate pupping grounds in Australia and New Zealand.

In addition, in the Northeast Pacific, in California, a historic targeted Tope fishery collapsed due to overfishing from 1938–1944 (Pondella and Allen 2008). This dramatic decline occurred ~76 years ago, almost three generation lengths (79 years). The subpopulation did not show any signs of recovery until prohibitions in 1994 on the use of inshore gillnets and trammel nets. The prohibitions were for the White Sea Bass (*Atractosciaon nobilis*) and Giant Sea Bass (*Stereolepis gigas*) but also reduced the catch of inshore Tope. Gillnet surveys in the southern California Bight showed an increasing trend of Tope during 1977–2004 (Pondella and Allen 2008). Given there was no increase in the total Californian commercial landings of Tope during 1997–2004 (Pondella and Allen 2008), the rise in the CPUE during the surveys is more consistent with a localized increase in the abundance from the combined effects of improved survival of young animals inshore and older animals recolonizing inshore waters, rather than indicative of a widespread increase in abundance of Tope in all Californian waters. It does indicate, however, that localized stocks can recover following management that prohibits catch.

Across the regions with analysed subpopulation and stock trends, Tope was estimated to have steeply declined in the Southwest Atlantic, southern Africa, Australia, and to a lesser extent in the Northeast Atlantic and New Zealand. All of these subpopulations and stocks, with the exception of New Zealand, are estimated to have the highest probability to have undergone a reduction of >80% over three generation lengths (79 years). In New Zealand, the stock is estimated to have undergone a reduction of 30–49% over three generation lengths (79 years). The data quality used for the trend estimates varies from robust stock assessments in Australia and South Africa, to standardized CPUE in Northeast Atlantic (noting the caveats above) and New Zealand, and nominal CPUE in Southwest Atlantic; the CPUEs may not fully represent actual abundances but are the best available data. In the Northeast Pacific, the subpopulation collapsed in the early 1940s, with no recovery until 1997–2004 when localized management led to localized increase in abundance. The consistent steepness of decline across most of the analyzed time-series over the past three generation lengths together with the lack of movement between the subpopulations is cause for serious concern. The trend data were used for the estimation of a global population trend; the estimated three generation subpopulation trend for each region was weighted according to the relative size of each region. The overall estimated median reduction was 88%, with the highest probability of a >80% reduction over three generation lengths (79 years).

For further information about this species, see Supplementary Material.

Current Population Trend: Decreasing

Habitat and Ecology (see Appendix for additional information)

Tope is bentho-pelagic in temperate waters on continental and insular shelves and upper to mid slopes from shallow inshore to well offshore to depths of 826 m, though it most frequently occurs to depths of 200 m (Walker *et al.* 2006, Wiegmann 2016, Thorburn *et al.* 2019). Some large individuals travel long oceanic distances offshore well away from the continental shelves and slopes, but they do not cross ocean basins (Walker 1999, Walker *et al.* 2008, Colloca *et al.* 2019). Tope sometimes moves diurnally from shallow water at night to deep water by day, and usually occurs in schools, partially segregated by size and sex (Walker *et al.* 2008). The species has pupping and nursery areas in shallow, protected bays and estuaries where the young can remain for up to two years (Stevens and West 1997, Walker 1999, Walker *et al.* 2006, Bovcon 2018, McMillan *et al*. 2018).

The maximum size varies regionally with the largest maximum size of 200 cm total length (TL) in the Mediterranean Sea (Capapé and Mellinger 1998) and the smallest maximum size of 155 cm TL in the Southwest Atlantic (Peres and Vooren 1991). There is also regional variation in size-at-maturity: males mature at 107–170 cm TL and females mature at 118–185 cm TL (Walker *et al.* 2006, Ebert 2013). Reproduction is aplacental viviparous with litter sizes 6–52 (average 20–35), a reproductive cycle that reportedly varies regionally from annual to triennial, although studies with intensive sampling indicate triennial cycles, and a gestation period of ~12 months and size-at-birth that varies regionally from 26–40 cm TL (Peres and Vooren 1991, Walker 1999, Walker 2005, Ebert *et al.* 2013). Female age-at-maturity varies from 10–15 years (average 12.5 years) and maximum age is estimated as 40 years (tag returns suggest a possible maximum age of 60 years); generation length is therefore 26.3 years (Olsen 1954, Ferriera and Vooren 1991, Freer 1992, Francis and Mulligan 1998, Walker 1999).

Systems: Marine

Use and Trade

Tope is used for its meat and fins, and historically for the liver oil (Walker *et al*. 2006, Dent and Clarke 2015, Fields *et al.* 2018).

Threats **(see Appendix for additional information)**

Tope has a long history and ongoing capture as target and bycatch globally in industrial, small-scale, and recreational demersal and pelagic gillnet and longline fisheries, and to a lesser extent in trawl, hook-and-line, troll lines, trammel nets, and traps. Tope is generally retained for the meat, fins, and liver oil (Dent and Clarke 2015). Where it is taken as bycatch, it is mainly retained (as byproduct) but when released, at-vessel-mortality varies by gear: in gillnets, it ranges from 2–73% and on longlines it is reported as 0% (Ellis *et al*. 2017).

In the Northeast Atlantic, Tope is a bycatch that is discarded in some fisheries but retained in others and is an important target species for recreational fisheries in some areas (ICES 2019). The International Council for the Exploration of the Sea (ICES) recommended landings be limited to 376 t annually in 2018 and 2019 (ICES 2019). Landings data are incomplete, as some landings are reported in aggregated landings categories, for example, 'Dogfish and Hounds', and not all range states report species-specific data. The annual reported species-specific Tope landings of the Northeast Atlantic subpopulation (2005–2018) across ICES areas were 542–715 t (ICES 2019). In the western Mediterranean Sea and northwest Africa, the species is a bycatch of a range of fisheries, with landings of 300 t in 2011 (McCully *et al*. 2015).

In the Southwest Atlantic, the species has been subject to periods of intensive fishing in its entire area of distribution since about the mid-1940s, that includes increasing artisanal fishing pressure (Walker *et al.* 2006). In Uruguay, artisanal fisheries targeting Tope with gillnet and longline were significant fisheries during 1940–1980 but severely declined after 2000 with the disappearance of the Tope targeted with longline (Marín *et al*. 2020). It is still landed as bycatch of several other fisheries; in Argentina, for example, in 2015 it represented ~2% of the 30,000 t of total chondrichthyan landings, that is ~ 600 t of Tope was landed (Chiaramonte *et al*. 2016).

In southern Africa, Tope is both targeted and a byproduct with catches of 100–400 t annually in demersal and pelagic line, trawl, gillnet, and recreational fisheries (da Silva *et al*. 2015, Winker *et al*. 2019).

In the Northeast Pacific, Tope is taken as bycatch at low levels with the main fisheries in which it is taken declining in effort due to implementation of management measures (Walker *et al.* 2006, COSEWIC 2007). Demersal trawl and trammel net fisheries targeting groundfish landed small quantities of Tope in California during 1876–1936. In response to a demand for shark liver oil beginning in 1937, a gillnet fishery expanded rapidly throughout Californian Pacific waters and south along the Baja Peninsular in Mexico and into the Gulf of California (Ripley 1946, Walker 1999), and subsequently north to Canadian waters off British Columbia (Fisheries and Oceans Canada 2012). The catch peaked at >4,000 t (live mass) in 1939 and then rapidly fell to 287 t by 1944 with the depletion of stocks (Walker 1999). About 840,000 individuals, primarily large adults, were killed for their livers from 1937–1949, of which ~40,000 were landed in Canadian ports and an additional unknown number were caught off, but landed outside, Canada (Fisheries and Oceans Canada 2012). Recent Canadian bycatch has averaged 0.5 t/year and 1.8 t/year since 2006 in the trawl and hook and line fisheries, respectively, with mandatory release since 2011. During 1976–1994, of 100–380 t of Tope landed on the US west coast, most was landed in California, but during 1990–2004 catch levels in California were about half those during 1977–1989 (Cailliet *et al*. 1993, Pondella and Allen 2008). Landings in US waters for 1990–2016 totalled 840 t, of which 816 t was caught in California (NOAA 2018). Estimates of the catches during a long history of recreational fishing are unavailable (Ebert 2001).

In Australia, the fishing effort on this species is mainly in the Shark Gillnet and Shark Hook sectors of the Southern and Eastern Scalefish and Shark Fishery (SESSF). Tope was historically the main target species, but since its biomass was reduced by 1990, it is now a byproduct of targeting Gummy Shark (*Mustelus antarcticus*), with the take of Tope strictly managed to reduce catch and to support its recovery through a total allowable catch (TAC) of 225 t, closed areas, and trip limits; annual catches are now ~150–200 t (Woodhams and Curotti 2018). Catches across the rest of Australia are much lower at ~24 t annually (Woodhams and Curotti 2018). In New Zealand, catches of this species peaked in 1984 and have been ~3,000 t annually with a current TAC of 3,107 t.

In the Southeast Pacific, catches of Tope throughout the waters of Ecuador, Peru, and Chile are low despite intensive and diverse fisheries, including the widespread use of gillnets of mesh sizes 50–200 mm (Reyes and Oporto 1994, Doherty 2014), which are particularly efficient for the capture of the species. In Ecuador and Peru, there is no mention of Tope in chondrichthyan species reported to the Food and Agriculture Organization of the United Nations (Martinez 1999, Anon. 2014). In Chile during 1976–1995, reported annual catches were often zero but increased from zero to 11 ton in 1979, to a peak of 36 ton in 1980, and then decreased to 6 ton in 1992, and subsequently to zero (Pequeño and Lamilla 1997). Since that time, official landings statistics to 2017 include only 1 ton for 2009. As an unimportant fishery product, much of the catch is likely unreported (F. Concha, Biología y Conservación de Condrictios, Universidad de Valparaíso, Chile, pers. comm. 20 January 2020). Visual inspection and DNA testing of landed shark fins in Chile also indicate low catches of Tope (Sebastian *et al*. 2008).

Indirect and sublethal sources of mortality are habitat degradation in potential nursery areas that can negatively affect recruitment, and installation of high voltage direct current sub-sea cables across their migration lanes that may affect feeding and navigation (Walker *et al.* 2006).

Conservation Actions (see Appendix for additional information)

There are some regulations in place for Tope. In 2020, Tope was listed on Appendix II of the Convention on Migratory Species (CMS), which obligates Parties to work regionally toward conservation, specifically through the CMS Memorandum of Understanding for Migratory Sharks.

In the Northeast Atlantic, European Union vessels are prohibited to land Tope captured on longlines over a large part of its northern European range in International Council for the Exploration of the Sea (ICES) waters (ICES 2019). In the United Kingdom, since 2008, it has been prohibited to fish for Tope other than using rod and line (with anglers fishing using rod and line from boats not allowed to land their catch) with bycatch of Tope caught in other commercial gears limited to 45 kilograms per day (ICES 2019). In the Mediterranean Sea, the General Fisheries Commission for the Mediterranean (GFCM) in 2012 banned retention and mandated careful release for Tope and 23 other elasmobranch species listed on the Barcelona Convention Annex II.

In the Southwest Atlantic, seasonal no-take areas provide some protection to Tope. Like other large sharks, Tope is protected by regional, national, and provincial legislation in Argentina whereby all sharks larger than 160 cm TL (the largest Tope in Southwest Atlantic is 155 cm TL) must be discarded alive and cannot be landed in any Argentinean port (Undersecretariat of Fisheries, Ministry of Environment, Ministry of Foreign Affairs 2009). The Province of Buenos Aires prohibits the landing of Tope in recreational fisheries (Ministry of Agrarian Affairs, Province of Buenos Aires 2007). However, enforcement is difficult and large sharks are still landed.

In Australia, the species was listed as Conservation Dependent in 2009 on the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and there is a species-specific School Shark Rebuilding Strategy and other management measures to reduce catch (DEE 2009, AFMA 2015, Woodhams and Curtotti 2018). These measures in southern Australia include: all live-caught Tope to be released, limited entry for the use of gillnets and longlines, total allowable catch, gear restrictions, and permanent and seasonal closures for nursery and breeding areas (Walker 1999, Walker and Gason 2007, Woodhams and Curtotti 2018). Spatial closures to the Shark Gillnet Sector were implemented in all Victorian coastal waters (within 3 nautical miles of shore) since 1988, and in South Australia implemented since 2003 (Penney *et al.* 2014). The Commonwealth South-East and South-West Marine Park Networks implemented since 2013 provide refuge for Tope.

In New Zealand, Tope are managed under the Quota Management System with Individual Transferable Quotas (Finucci *et al.* 2019). They are also included in recreational bag limits of 20–30 fish per day.

In the mortheast Pacific, Tope was designated as Special Concern by COSEWIC in 2007 and was listed under Canada's Species at Risk Act, Schedule 1 as Special Concern in 2009. Careful mandatory release in Canada since 2011 and 100% observer cover to monitor release has resulted in a very low level of mortality. A management plan for Tope was created by Fisheries and Oceans Canada in 2012, calling for more research on the species' ecology and biology in Canadian waters, in addition to ongoing improvements to bycatch information.

Further research is required on population size and trends, and catch rates should be monitored.

Credits

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Authority/Authorities:	IUCN SSC Shark Specialist Group (sharks and rays)

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External Resources

For Supplementary Material, and for Images and External Links to Additional Information, please see the Red List website.

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
9. Marine Neritic -> 9.1. Marine Neritic - Pelagic	Resident	Suitable	Yes
9. Marine Neritic -> 9.3. Marine Neritic - Subtidal Loose Rock/pebble/gravel	Resident	Suitable	Yes
9. Marine Neritic -> 9.4. Marine Neritic - Subtidal Sandy	Resident	Suitable	Yes
9. Marine Neritic -> 9.5. Marine Neritic - Subtidal Sandy-Mud	Resident	Suitable	Yes
9. Marine Neritic -> 9.6. Marine Neritic - Subtidal Muddy	Resident	Suitable	Yes
9. Marine Neritic -> 9.10. Marine Neritic - Estuaries	Resident	Suitable	Yes
10. Marine Oceanic -> 10.1. Marine Oceanic - Epipelagic (0-200m)	Resident	Suitable	Yes
10. Marine Oceanic -> 10.2. Marine Oceanic - Mesopelagic (200-1000m)	Resident	Suitable	Yes
11. Marine Deep Benthic -> 11.1. Marine Deep Benthic - Continental Slope/Bathyl Zone (200-4,000m)	-	-	-

Use and Trade

(http://www.iucnredlist.org/technical-documents/classification-schemes)

End Use	Local	National	International
Food - human	No	No	No

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.1. Intentional use: (subsistence/small scale) [harvest]	Ongoing	Majority (50-90%)	Slow, significant declines	Medium impact: 6
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.2. Intentional use: (large scale) [harvest]	Ongoing	Majority (50-90%)	Slow, significant declines	Medium impact: 6
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.3. Unintentional effects: (subsistence/small scale) [harvest]	Ongoing	Majority (50-90%)	Slow, significant declines	Medium impact: 6
	Stresses:	2. Species Stresses -> 2.1. Species mortality		

5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Slow, significant declines	Medium impact: 6
	Stresses:	2. Species Stresses -> 2.1. Species mortality		

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place research and monitoring
Action Recovery Plan: Yes
Systematic monitoring scheme: No
In-place land/water protection
Conservation sites identified: Yes, over part of range
Area based regional management plan: Yes
Occurs in at least one protected area: Yes
Invasive species control or prevention: Not Applicable
In-place species management
Harvest management plan: Yes
Successfully reintroduced or introduced benignly: No
Subject to ex-situ conservation: No
In-place education
Subject to recent education and awareness programmes: No
Included in international legislation: Yes
Subject to any international management / trade controls: No

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed
1. Land/water protection -> 1.1. Site/area protection
3. Species management -> 3.1. Species management -> 3.1.1. Harvest management
3. Species management -> 3.1. Species management -> 3.1.2. Trade management
3. Species management -> 3.2. Species recovery
5. Law & policy -> 5.1. Legislation -> 5.1.2. National level

Conservation Action Needed
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.2. National level

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
1. Research -> 1.2. Population size, distribution & trends
1. Research -> 1.3. Life history & ecology
1. Research -> 1.4. Harvest, use & livelihoods
2. Conservation Planning -> 2.1. Species Action/Recovery Plan
3. Monitoring -> 3.1. Population trends
3. Monitoring -> 3.2. Harvest level trends
3. Monitoring -> 3.3. Trade trends

Additional Data Fields

Distribution
Lower depth limit (m): 826
Upper depth limit (m): 0
Habitats and Ecology
Generation Length (years): 26.3

The IUCN Red List Partnership

The IUCN Red List of Threatened Species™ is produced and managed by the IUCN Global Species Programme, the IUCN Species Survival Commission (SSC) and The IUCN Red List Partnership.

The IUCN Red List Partners are: Arizona State University; BirdLife International; Botanic Gardens Conservation International; Conservation International; NatureServe; Royal Botanic Gardens, Kew; Sapienza University of Rome; Texas A&M University; and Zoological Society of London.