16. Tope shark *(Galeorhinus galeus)*

Irish name: Gearrthóir

Figure 1. Tope shark, *Galeorhinus galeus* (Linnaeus, 1758), Chile © L. Ignacio Contreras, Laboratorio de Zoología de Vertebrados, Facultad de Ciencias, U. de Chile. Retrieved from *https://www.shark-references.com/species/view/Galeorhinus-galeus*

Background

The tope shark is a medium-sized shark in the Class Chondrichthyes. Tope are a bentho-pelagic species with a broad habitat range between 0-826 m depth and is most frequently to depths of 200 m (Walker et al. 2020). The maximum size varies regionally ranging from 155 cm total length in the Southwest Atlantic (Peres and Vooren, 1991) to 200 cm in the Mediterranean Sea (Capapé and Mellinger 1998). Size-at-maturity, size-at-birth and reproductive cycle varies regionally, but in totality this is a slow maturing species that gives birth to live young (litter size averages between 20-35 pups; Walker et al. 2020). Tope are distributed 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 (Walker et al. 2020). Tagging and genetic data suggests that there are up to six separate subpopulations of tope globally, and while tope exhibit large-scale movements there is no evidence of population mixing (Walker et al. 2020). In the northeast Atlantic region, there is believed to be a single stock (ICES 2012). Inland Fisheries Ireland data suggests wide migrations between the North Sea, west of Scotland and Ireland south towards the Canary Islands, the Azores, the western Mediterranean and northwest Africa (Fitzmaruice et al. 2003). It should be noted that the northeast Atlantic and Mediterranean stock is thought to be isolated from other global subpopulations, with no genetic mixing between these two stocks (Chabot and Allen, 2009).

Rationale for spatial protection in the western Irish Sea

Tope were nominated for inclusion with particular reference to its conservation listing under OSPAR and/or listing as Near Threatened or greater (Irish, EU or Global Red List). Tope are listed as Vulnerable by the IUCN Red List, Irish and European Red List. Tope is also listed as Critically Endangered globally. Data on tope are limited given landings are often included as “dogfishes and hounds” (Dureuil, 2013). In the Northeast Atlantic, the subpopulation has experienced a 76% decline over the past 79 years (three generation lengths; Walker et al. 2020). There is conflicting evidence as to whether the Northeast Atlantic subpopulation is stable (Walker et al. 2020) or declining (exploratory assessment of catch per unit effort trends

from 20 y trawl survey data, Dureuil, 2013). Tope are protected or conserved in the Irish Sea by the Common Fisheries Policy (2015). However, given discards can not be quantified (ICES, 2019) we recommend a precautionary approach is applied and spatial protection of this species is considered.

Fishing restrictions are in place under the Common Fisheries Policy (2015) whereby catch and release is mandatory in EU waters for line-caught tope. Given discards cannot be quantified by ICES (2019) we advise a precautionary principle is applied and spatial management is considered.

It is not known whether the western Irish Sea is a significant part of its range. Data on the distribution of this species in the Irish Sea is limited, with data primarily from mark-recapture programs led by Inland Fisheries Ireland. In the western Irish Sea, juvenile and adult tope (including pregnant females) are caught recreationally across the southeast coast of Ireland along the Wicklow-Arklow coastline, with possible temporal separation between these cohorts.

Based on current knowledge tope are amenable to spatial protection. Owing to its documented use of near-shore breeding areas, useful management measures for tope could include closed areas to capture pupping areas of pregnant females. For example, acoustic tracking data generated in the Southern Hemisphere suggests juvenile young-of-the-year (YOY) tope use shallow nearshore areas, with few YOY returning within their first 1-2 y (McAllister et al. 2015). This finding is also supported by McMillan et al. (2021).

Sensitivity assessment

The highest associated sensitivity scoring for tope was in relation to its targeted and non-targeted removal (bycatch) by fishing. Tope are caught globally as a target species and by bycatch in industrial and small-scale demersal and pelagic gillnet and longline fisheries, and less commonly caught by trawl and hook-and-line fisheries (Walker et al. 2020). Tracking data suggests behavioural plasticity, and potential habitat expansion of adult tope into mesopelagic layers of the high seas, which increases their risk of incidental fisheries capture (Schaber et al. 2022). Tope are not targeted by commercial fisheries in Irish waters and catch-and-release is mandatory in EU waters for line-caught tope (Common Fisheries Policy, 2015). Tope are targeted by sport and recreational fishers in Irish waters, and may be caught as bycatch owing to using both the lower and mesopelagic layers of the water column. The most recent ICES assessment (2019) covering ICES region VIIa states, “discarding is known to take place, but ICES cannot quantify the corresponding catch. Discard survival, which is likely to occur, has also not been estimated”.

Following a precautionary principle, tope were identified as sensitive to some shipping related pressures. It is thought that elasmobranchs are vulnerable to environmental pollutants (Dulvy et al. 2017) such as transition elements given they are long-lived and occupy a high trophic level. Elasmobranchs are thought to tolerate high metal levels in their tissues; however, a precautionary approach is applied and tope were deemed sensitive to chemical pollutants including transition elements and organo-metal contamination, and hydrocarbon and PAH contamination. The impacts of vessel noise on elasmobranch species are poorly understood. Lab based studies suggest noise can increase swimming activity (de Vincenzi et al., 2021), whereas research in the wild indicates an unclear response to boat

traffic (Rider et al., 2021). Hearing ability in demersal elasmobranch species seems to be most sensitive to low frequencies (Casper, 2006), however, hearing range varies depending on the species (Popper and Fay, 1977). Tope occupies the bentho-pelagic zone, therefore limited water depth in the western Irish Sea makes vessel sound unavoidable. Ship strike is deemed not to be a significant pressure.

Offshore energy impacts on elasmobranchs are poorly understood, however, based on existing knowledge tope was sensitive to some of the associated sectoral pressures. As detailed above, a precautionary approach was followed for chemical pollutants and therefore tope were deemed sensitive to chemical pollutants including transition elements and organo-metal contamination, and hydrocarbon and PAH contamination. Construction activities may displace some species, however, quantitative data is absent. Bruce et al. (2018) found that seismic survey sounding in Australia led to a significant reduction in tope catch using demersal gillnets. Given tope are very mobile and can exhibit behavioural plasticity, they were deemed not sensitive to underwater noise or electromagnetic fields produced by offshore cabling.

Further research needs

Key knowledge on the distributions of tope in the western Irish Sea remains limited and requires further investigation. In addition, evidence to identify the potential effect of multiple pressures was insufficient to form an assessment. These pressures included chemical (transition elements and organo-metal contamination, hydrocarbon and PAH contamination, synthetic compound contamination and introduction of other substances) and physical pressures (abrasion/disturbance of substratum surface or seabed, penetration or disturbance of substratum subsurface and barriers to species movement).

Figure 2. Global geographic distribution of tope shark, *Galeorhinus galeus,* from Walker et al. (2020).

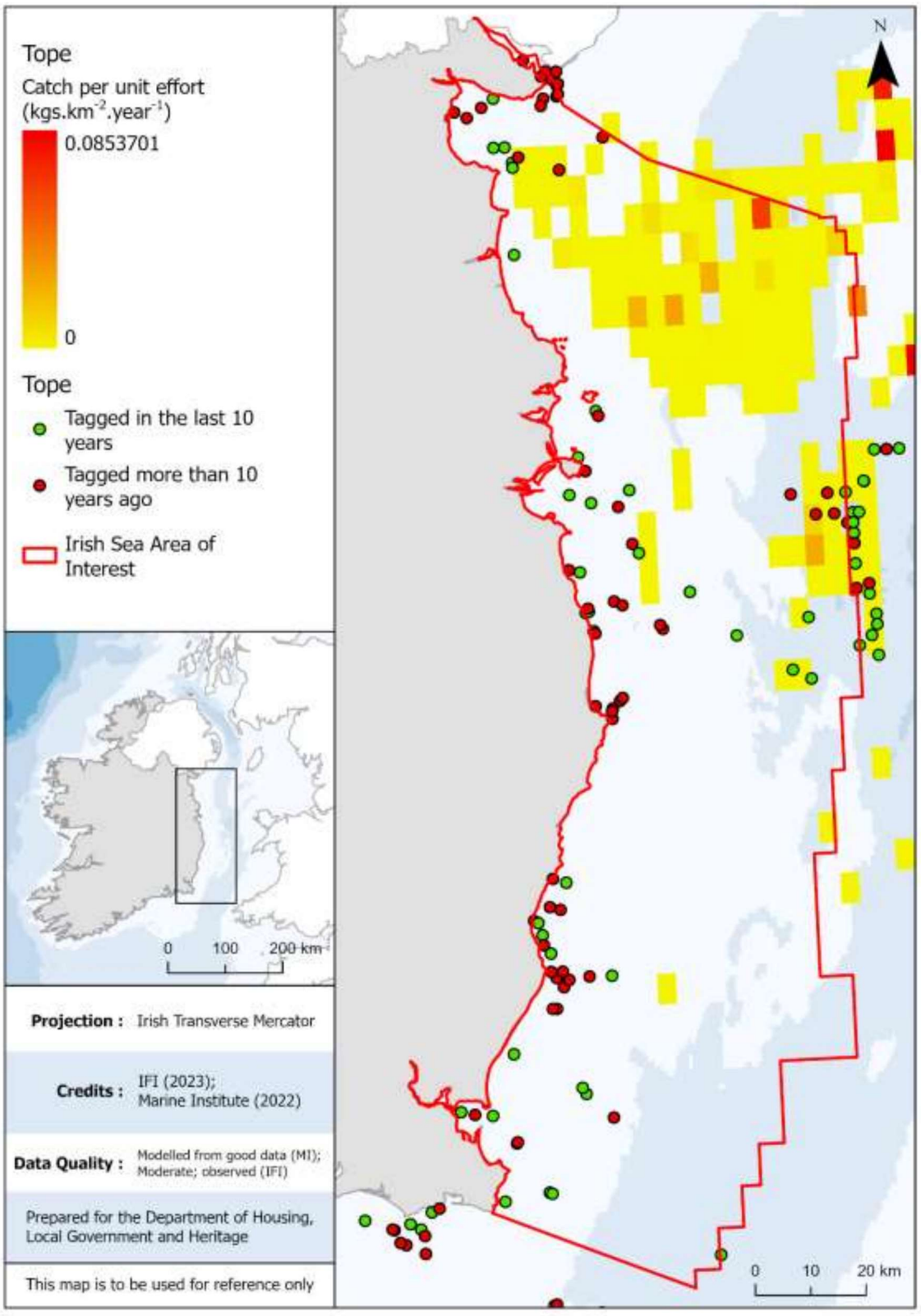

Figure 3. Data available for tope shark, *Galeorhinus galeus* in the western Irish Sea. Points show Inland Fisheries Ireland Tag and Recapture data and shaded areas indicate ICES internationship fishing effort and swept area ratios.

Data sources and quality

Dataset Name	Data Owning Organisation	Dataset Quality	Metadata URL	Comments
ICES international fishing effort and swept area ratios; VMS	International Council for the Exploration of the Seas	Modelled from good data		
Inland Fisheries Ireland Tag and Recapture	Inland Fisheries Ireland	Moderate; observed		
International Bottom Trawl Survey (IBTS) Fisheries Database of Trawl Surveys (DATRAS)	International Council for the Exploration of the Seas	Good; observed	IE-IGFS and NIGFS	Data is sparse for this species

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