

2. Angel shark (*Squatina squatina*)

Irish name: *Bráthair*



Figure 1: Angel shark *Squatina squatina* © Edward Farrell (IUCNredlist.org)

Background

The angel shark is a demersal species found on the continental shelf, from 1 – 150 m depth, in Europe and the Mediterranean (Ellis et al., 2021; Lapinski and Giovos, 2019; Morey et al., 2019). It is an ambush predator, possibly preferring sandy substrates where it can burrow into the sand, awaiting prey to swim past (Meyers et al., 2017; Morey et al., 2019), although it is found on a range of habitat types (Barker et al., 2022). In northern Europe, the species may make seasonal migrations into shallow warm coastal areas for pupping and/or mating (Barker et al., 2022), and Tralee Bay was a very important area for the species in Ireland (Shephard et al., 2019). Mark–recapture data for Angel sharks tagged in Ireland have shown that a high proportion of fish are recaptured from the original release location, although occasionally individuals can undertake longer-distance movements of up to 1,160 km (Quigley, 2006).

Angel sharks have a 2-year reproductive cycle with litter size of less than 7-25 pups, approximately 20-30 cm long at birth (Ellis et al., 2021; Morey et al., 2019). Gestation period is estimated at 8-10 months with pups born during the summer in Irish and UK waters (Compagno et al., 2005; OSPAR, 2008). Individuals may reach a maximum length of 2.4 m, and females and males reach maturity at approximately 1-1.5 m and 0.8-1.3 m respectively (Morey et al., 2019). The reproductive age, rate of reproductive and natural mortality are unknown, although similar species have a generation length of approximately 15 years (Cailliet et al., 1992).

Rationale for spatial protection in the western Irish Sea

Angel sharks have been almost completely removed from Irish waters due to overexploitation (Clarke et al., 2016; Shephard et al., 2019). They have been on the OSPAR List of Threatened and/or Declining Species and Habitats since 2008 (OSPAR, 2008). It is on the Irish red list of cartilaginous species, listed as critically endangered (Clarke et al., 2016), and the IUCN red list assesses the species as critically endangered globally and in Europe (Morey et al., 2019).

Angel sharks are currently managed under several national, European, and Global measures. Angel sharks are on the prohibited species list in the common fisheries policy. Angel shark was listed in Appendices I and II of the Convention on the Conservation of Migratory Species of Wild Animals (CMS) in 2017 (OSPAR, 2021).

Based on current knowledge angel sharks are amenable to spatial protection. Recent observations have recorded angel sharks in the Irish Sea. Historically, the species was apparently highly resident in Irish waters. Nearly 96% (179) of the recaptures were taken in Irish coastal waters and only 4% (8) were recaptured from abroad (Quigley, 2006). In addition, the species undertakes predictable migrations to suitable shallow coastal habitat for reproductive activities (Barker et al., 2022). These two factors make the species amenable to spatial protection.

Sensitivity assessment

The highest associated sensitivity scoring for angel sharks was in relation to its targeted and non-targeted removal (bycatch) by fishing (high confidence). The main threat to angel sharks is from fisheries, primarily through the non-targeted removal of the species. Angel sharks were reported as common throughout European shelf waters in the 19th and 20th centuries (OSPAR, 2021), including the Irish Sea (Morey et al., 2019). As a long lived and slow maturing species, the angel shark is assessed as highly sensitive to fishing pressure with a high degree of confidence. Following a precautionary approach, angel sharks were deemed sensitive to transition elements and organo-metal contamination (low confidence), hydrocarbon and PAH contamination (low confidence). Angel sharks were deemed to have a low sensitivity to heavy smothering and siltation changes which may result from bottom trawling activities (low confidence). As a coastal species with a historical distribution in shallow tidally energetic areas, the angel shark is unlikely to be impacted by water clarity changes and light siltation (low confidence).

Following a precautionary principle, angel sharks were assessed as sensitive to some shipping related pressures (low confidence). Due to their demersal or benthic nature, the angel shark is unlikely to be sensitive to collision, although quantitative evidence is lacking (low confidence). Angel sharks were assessed as Not Sensitive to underwater noise, however, the impacts of anthropogenic noise on elasmobranch species are very poorly understood. Lab based studies suggest noise can increase swimming activity (de Vincenzi et al., 2021), whereas research in the wild indicates an equivocal response to boat traffic (Rider et al., 2021). Hearing ability in demersal species seems to be most sensitive to low frequencies from nearby sources (Casper, 2006) suggesting sharks may not be sensitive to vessel-related noise (low confidence).

Offshore energy impacts on elasmobranchs are poorly understood at present, however, the angel shark is likely to be sensitive to certain changes to the seabed because of some ORE related pressures. This species, due to its apparent high seasonal residency and the importance of coastal areas to important young/juvenile life history stages, is deemed sensitive at high and medium level to some seabed changes which may occur during ORE construction (low confidence). Angel sharks were deemed not sensitive or as having low sensitivity to most other physical and chemical pressures, although the confidence in these assessments is low and, in some instances, there is little or no evidence available. For instance, although sharks in general are considered electrosensitive and angel sharks are not considered an exception, they are deemed to have a low sensitivity to electromagnetic fields (EMF) (low confidence). Other similar species are affected by electromagnetic fields from high voltage cables (Gill et al., 2009; Hutchison et al., 2020), therefore, some impact on angel sharks is possible. The cumulative long-term impacts of large offshore energy developments are unknown currently. Post construction, wind farms may provide refugia and artificial reef communities which could prove beneficial to some species of elasmobranch. Construction activities may displace some species; however, quantitative data is absent.

Further research needs

Further work is required to identify population size, population trends, migrations and movements, essential habitats, spawning and nursery areas. Equally, discard quantity and survival require further investigation. In addition, evidence to identify the potential effect of multiple pressures was insufficient to form an assessment, or relied heavily on expert judgement. These pressures included the effects of changes in suspended solids (water clarity), smothering and siltation changes (light and medium), electromagnetic energy, death or injury by collision, transition elements and organo-metal contamination, hydrocarbon and PAH contamination, synthetic compound contamination, introduction of other substances and the introduction or spread of invasive non-indigenous species.

Distribution Map

Squatina squatina

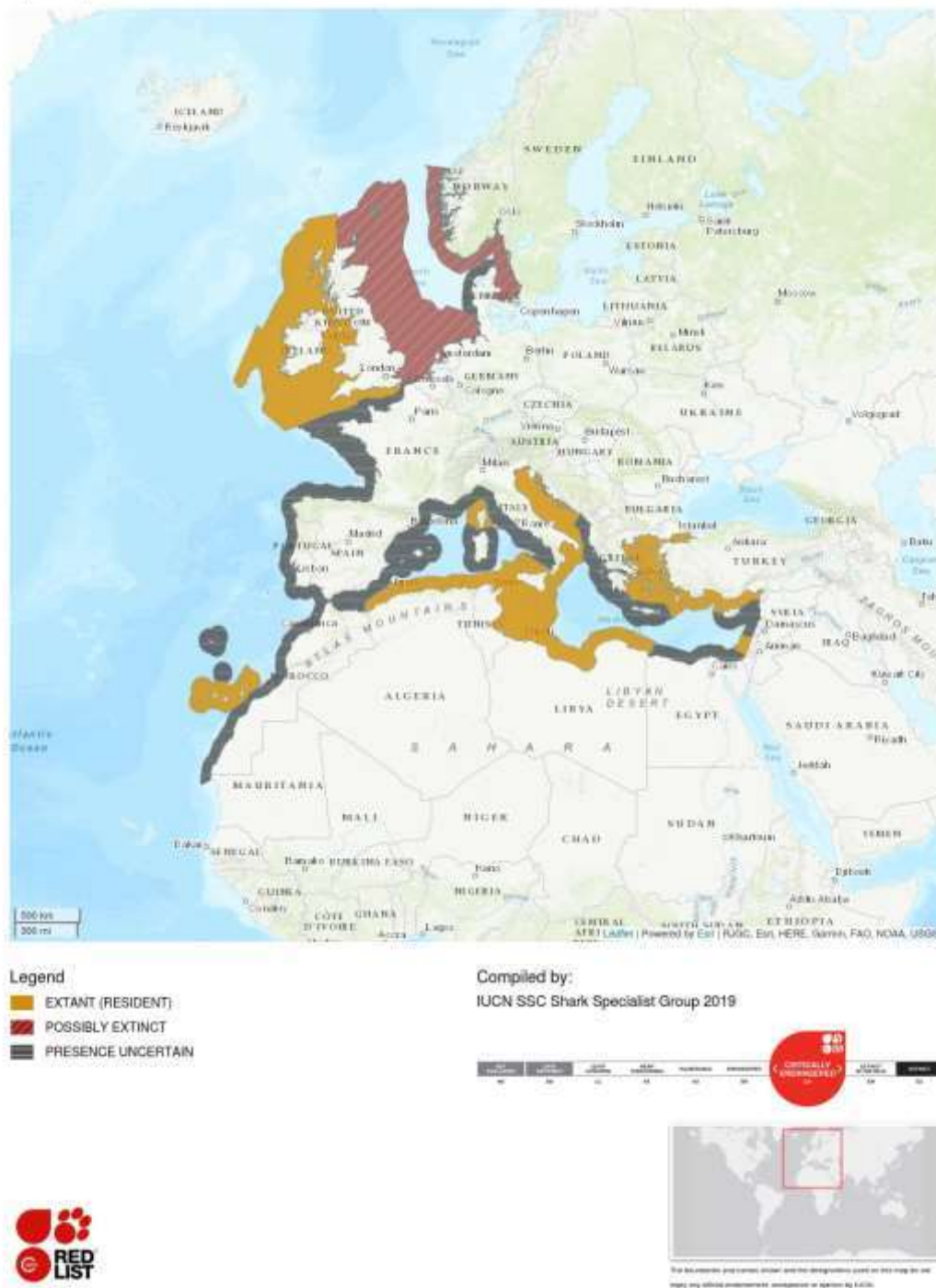


Figure 3. Geographic distribution of Angel sharks in the northeast Atlantic (<https://www.iucnredlist.org/species/39332/117498371#geographic-range>)

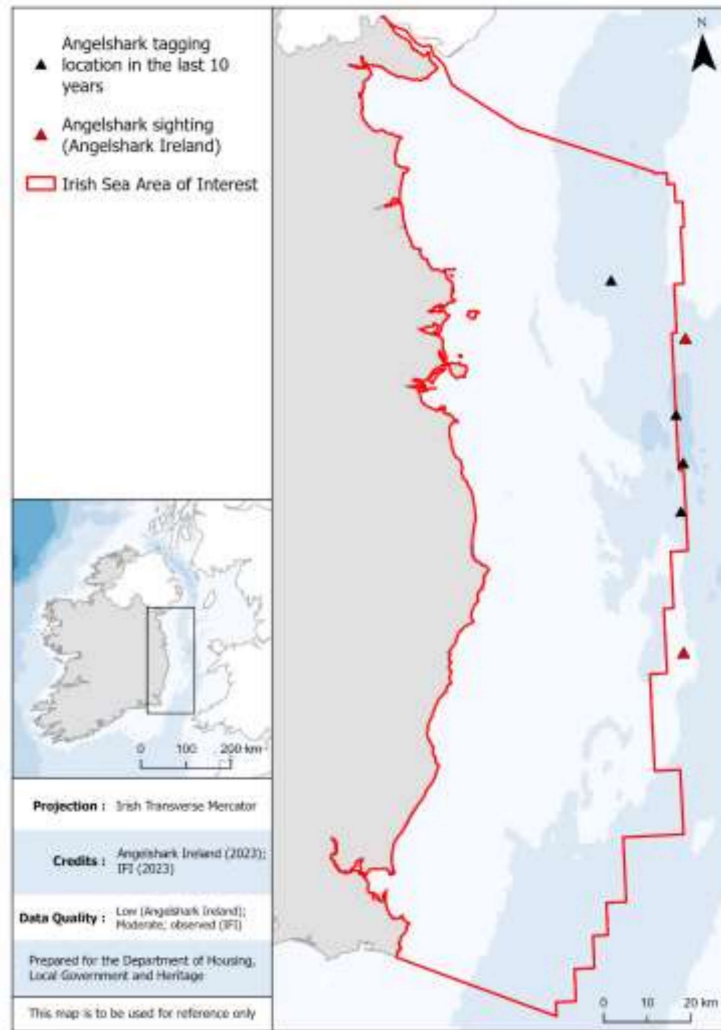


Figure 2. Angel shark sightings recorded in the Irish Sea using data from Inland Fisheries Ireland and the Angel shark Ireland project.

Data sources and quality

Dataset Name	Data Owning Organisation	Dataset Quality	Metadata URL	Comments
Angel Shark Locations	Angel Shark Ireland	Low/Insufficient for SCP		Anecdotal, low spatial resolution
Inland Fisheries Ireland Tag and Recapture	Inland Fisheries Ireland	Moderate; observed		Data is sparse for this species

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