## 3. Basking shark (*Cetorhinus maximus*)

**Irish name:** *An Liamhán Gréine*

Figure 1: Basking shark *Cetorhinus maximus* © Edward Farrell (IUCNredlist.org)

### Background

Basking sharks are the second largest fish species in the world , reaching 12 m and 4 tonnes (Compagno, 1984; Sims, 2008). They are named after their habit of "basking" on the surface (Sims et al., 2015). They are one of only three shark species in the world that filter feeds on planktonic prey and it is only in recent years, with the use of satellite tracking, that their ecology is being revealed (Sims et al., 2015). They are a pelagic species that occurs primarily in the temperate and boreal waters of the Atlantic, and the Mediterranean Sea (Compagno, 1984). Long distance migrations south of the equator and across the Atlantic have been recorded recently and indicate large variation in movement patterns amongst individual sharks (Gore et al., 2008; Sims et al., 2003; Witt et al., 2012). Most data from the Irish Sea related to sightings of sharks on the surface, however, they likely spend large amounts of time in deeper waters off the west coast feeding during the winter months (Sims et al., 2003). Basking sharks most likely share the reproductive traits of other lamoid shark species, bearing live young (Sims et al., 2015; Sims, 2008) after a long gestation period of 12 – 36 months (Compagno, 1984; Sims et al., 2015). Basking sharks reach maturity at approximately 5-7 m total length, with an estimated age of 12-16 years, reaching 8-10 m in length after 16-20 years (Compagno, 1984; Pauly,

1978). The maximum length is estimated at between 13 and 14 m (Holden, 1975; Parker and Stott, 1965), and maximum age is estimated at 40-50 years (García et al., 2008), with a generation time of 34 years.

## Rationale for spatial protection in the western Irish Sea

Basking sharks have a long history of exploitation in the Northeast Atlantic and the population was severely depleted in a short period by over fishing (Clarke et al., 2016). They have been on the OSPAR List of Threatened and/or Declining Species and Habitats since 2003 (OSPAR, 2008). It is on the Irish red list of cartilaginous species, listed as endangered (Clarke et al., 2016), and IUCN red list assess the species as endangered globally and in Europe (Sims et al., 2015). Basking shark were also added to the Irish Wildlife Act in 2022. Despite the protection conferred on the species and although there is some increase in sightings in recent years, there are large uncertainties over the population trend (OSPAR, 2008; Sims et al., 2015) and thus spatial protection is warranted.

**Basking sharks are currently managed under several national, European, and Global measures.** Basking shark are on the prohibited species list in the common fisheries policy. They are also included in the EU finning regulation, listed by Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Convention on Conservation of Migratory Species of Wildlife Animals (CMS).

**Based on current knowledge basking sharks are amenable to spatial protection.** Basking shark are recorded in the Irish Sea (Clarke et al., 2016). Basking sharks are filter feeders and are often associated with frontal systems which promote enhanced primary productivity and aggregate their zooplankton prey. In the Irish Sea, there are multiple fronts driven by riverine outputs, tides and seasonal difference in temperature and density (Hill et al., 2008; Le Fevre, 1987), many of which are predictable occurring in the same positions daily, monthly, or annually. These features present reliable feeding opportunities for basking sharks (Miller et al., 2015; Sims, 2008), and thus are amenable to spatial protection.

## Sensitivity assessment

**The highest associated sensitivity scoring for basking shark was in relation to its targeted and non-targeted removal (bycatch) by fishing (high confidence).** The main threat to basking sharks is from fisheries, primarily through the targeted removal of the species. Historically, landings of over 1000 individuals per year were recorded in Irish waters from 1951 to 1955, with peak landings of 5266 tonnes across the Northeast Atlantic in 1979 (ICES, 2016). The overall result of fishery efforts was thought to have reduced the basking shark population to less than half of its original size over a 100 year period (Sims et al., 2015). Basking sharks have a long generation time and slow maturity which makes them sensitive to exploitation and the population is still recovering from exploitation in the 19th and 20$^{th}$ centuries.

**Following a precautionary principle, basking sharks were assessed as sensitive to some shipping related pressures (low confidence).** Due to their feeding behaviour, remaining on the surface for long periods, basking sharks were assessed as having a medium sensitivity to death or injury by collision. In general sharks are resilient to injury, however, basking sharks are likely to be vulnerable to vessels of all sizes, particularly when travelling at high speed, however, the evidence of rates of injury, death and possibly recovery are poor, and this was assessed as low in confidence. Basking sharks were assessed as Not Sensitive to underwater noise (low confidence), 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 basking sharks may not be sensitive to vessel-related noise.

**Offshore energy impacts on elasmobranchs are poorly understood with the species deemed either not sensitive to relevant pressures, or those pressures deemed not relevant.** An expansion of offshore energy development will likely result in increased vessel traffic in specific areas, and this sensitively is mentioned in the previous section. Basking sharks are deemed not sensitive to most physical, chemical, and biological pressure (low confidence), or there is not enough evidence available to assess their sensitivity. For instance, although sharks in general are considered electrosensitive and basking sharks are not considered an exception, they are deemed not sensitive to electromagnetic fields (EMF) due to their pelagic nature (low confidence). This assessment has low confidence, as all research to date has studied EMF and demersal, benthic, including catsharks and skates/rays (Gill et al., 2009; Hutchison et al., 2020).

## 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 relieved heavily on expert judgment. 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.


Figure 2. Geographic distribution of the basking shark (https://www.iucnredlist.org/species/4292/166822294#geographic-range)

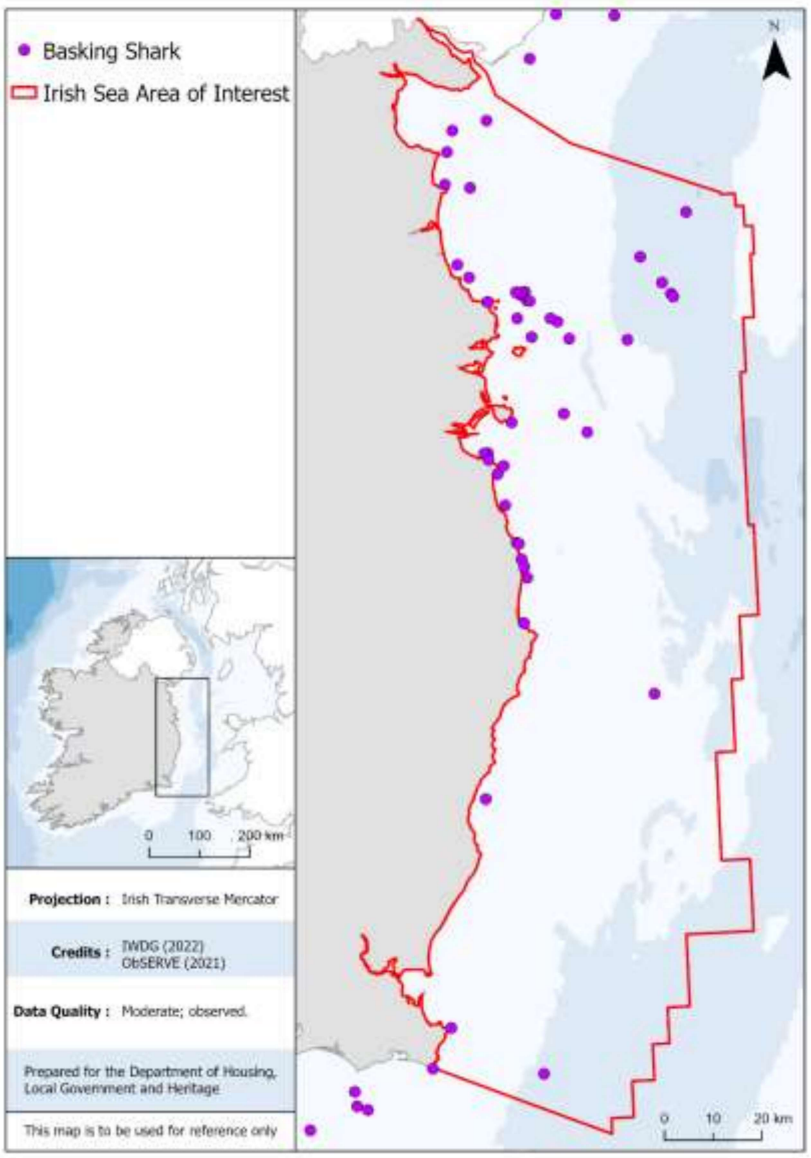


Figure 3. Basking shark sightings in the Irish Sea using data from the IWDG and the OBSERVE project.

## Data sources and quality

| Dataset Name | Data Owning Organisation | Dataset Quality | Metadata URL | Comments |
|---|---|---|---|---|
| Irish Whale & Dolphin Group (IWDG) Basking Shark Sightings | Irish Whale & Dolphin Group | Moderate; observed | | |
| OBSERVE Megafauna Sightings | University College Cork | Moderate; observed | | |

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| ObSERVE predicted Basking Shark Distribution | University College Cork | Modelled from moderate data | | |

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