Porbeagle shark *(Lamna nasus)*

Irish name: Craosaire

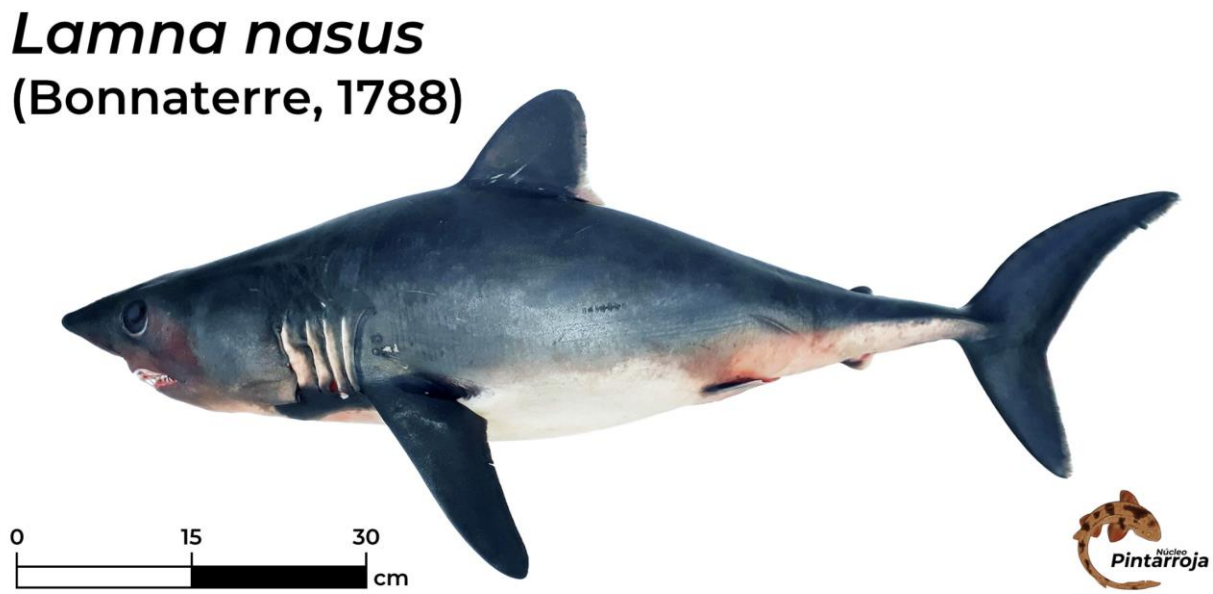

Figure 1: A juvenile porbeagle shark (*Lamna nasus*) © L. Ignacio Contreras, Laboratorio de Zoología de Vertebrados, Facultad de Ciencias, U. de Chile.

Background

The porbeagle shark is a large cartilaginous fish species in the Class Chondrichthyes. It is a highly migratory coastal and oceanic species distributed within temperate and cold-temperate waters, occurring in the North and southern Atlantic, Indian and Pacific Oceans (Ebert et al., 2013). It is also a species which is associated with cool shelf waters, potentially due to productive upwellings and preferred sea temperatures (Campana et al., 2010). The porbeagle is found within a family of regionally endothermic (warm-blooded) sharks (Bernal et al., 2001). Keeping regions of the body warm is thought to support energetically demanding behaviours such as fast, sustained swimming (Watanabe et al., 2015; Harding et al., 2021). Porbeagle sharks have a documented temperature range of between 1 and 26°C (Compagno 2002, Francis et al. 2008, Skomal et al. 2009). Size-at-maturity varies regionally, however, overall it is a slow maturing species that gives birth to live young (usually 4 pups of 68–81 cm in TL) with a likely once-every-other-year breeding cycle (Jensen et al. 2002; Francis and Stevens 2000, Francis et al. 2008, Ebert et al. 2013; Hennache and Jung, 2010). Maximum recorded lengths are over 340 cm TL (Templeman, 1963; Kohler et al., 2002), with males in the Northeast Atlantic reaching maturity at 190 cm TL and females at above 223 cm TL (Hennache and Jung, 2010). Porbeagles in the Northwest Atlantic are estimated to live up to 25 and 24 years old for males and females, respectively (Natanson et al. 2002) with a generation time of around 18 years (Campana et al. 2002; Natanson et al. 2002). In contrast, maximum age is thought to be 46 years old in an unfished population (Campana et al. 2002; Natanson et al. 2002). The North Atlantic and Southern Hemisphere populations are considered

separate stocks with limited gene flow between northern and southern hemispheres, but with high gene flow within hemispheres (Haugen, 2020).

The porbeagle shark is targeted and caught as bycatch in longline, gillnet and purse seine net ("IUCNredlist.org", n.d.). The Northeast Atlantic stock has the longest history of commercial overexploitation (1930s and 1950s) and is overfished although certain biomass is difficult to obtain due to underreporting and misidentification ("IUCNredlist.org", n.d.; ICCAT, 2010; ICES, 2024). It is estimated that over 3 generation lengths (58.5 years), the highest reduction of the biomass is 50 – 79% ("IUCNredlist.org", n.d.). Since 2010, there has been zero Total Allowable Catch, however ICES advises a MSY catch in 2023 – 2024 as 219 and 231 tons, respectively (ICES, 2022). Currently, in the Northeast Atlantic, it is prohibited to land porbeagles in by EU vessels (ICES, 2019). The post release morality estimates from commercial fisheries range from 10-75% (Campana et al., 2016) and recreational catch and release mortality estimates of 0% of juvenile porbeagle sharks, although the effects of this fishery on sub-lethal behaviours are not quantified (Anderson et al., 2021).

Rationale for consideration for spatial protection in the South Celtic Sea

Porbeagles were nominated for inclusion with reference to its conservation listing as Critically Endangered (Ireland), Critically Endangered (Europe) and Vulnerable (globally). They are also listed on several international treaties such as Appendix II of the Convention on Migratory Species, several Fisheries Commission's, the International Commission for the Conservation of Atlantic Tunas and OSPAR Commission.

Porbeagle sharks are known to display seasonal residency, meaning they spend a prolonged period in one area (in shallow waters during spring and summer the Northeast Atlantic) and site fidelity, meaning they return to an area at least one year later (Cameron et al., 2019, Pade et al., 2009; Saunders et al., 2011; Biais et al., 2017, Serre et al., 2024). Through biologging and photo identification studies, adults and juveniles are known to display site fidelity to one area, with returns to the same location within 12 km of an original tagging site a year later (Jung et al., 2024; Cameron et al., 2019, Pade et al., 2009; Saunders et al., 2011; Biais et al., 2017). The habitats where these sharks reside or return to are thought to facilitate important for life history events such as breeding, pupping or for periods of feeding away from predatory adults in the juvenile stage. It is thought that the porbeagle stock in the Northeast Atlantic have a pupping ground within temperate waters, with the St. Georges Channel being a likely candidate due to the catch rate of juveniles within this area (Haugen et al., 2022). There are records of pregnant females with full-term pups South of Ireland (at the Irish EEZ boundary; Hennache and Jung, 2010), porbeagles showing site fidelity to Irish waters and juvenile porbeagles are found within our study area.

Rationale for exclusion decision for spatial protection in the South Celtic Sea

Although the porbeagle shark displays behaviours that would make them suitable for spatial protection, such as site fidelity and there appears to be a trend of catching juveniles in the South Celtic Sea, there is a lack of data within our study site to confirm this. Without this data, it is not possible to identify discrete spatial areas to protect within our large study site. If discrete areas for juveniles could be identified, an area could be protected as a nursery. However, to define an area as a shark nursery three conditions need to be met; (1) young-of-the-year sharks are more commonly encountered in the area than other areas; (2) sharks must remain or return for weeks or months; and (3) the area is used

repeatedly each year (Heuple et al., 2007). Although these conditions are biased towards coastal species (Heuple et al., 2018), the available data for this species are not sufficient to investigate the possibility of a porbeagle shark nursery in our study area. As such, a suitable area for protection for this species could not be identified. We also did not have enough reports of mature females, who are known to display site fidelity, to designate discrete areas as pupping grounds. For this species, or any other migratory shark species, to be considered for spatial protection, additional research is needed in Irish waters to monitor their short and long-term movements through methods such as collecting accurate catch data from fisheries, and deploying spaghetti, acoustic and satellite tags.

Figure 2. Global distribution of the porbeagle shark (*Lamna nasus*) from Rigby et al. (2019) (https://www.iucnredlist.org/species/203364219/203375487).

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