

A shark louse from a porbeagle shark stranded near Arbroath, Scotland

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The Scottish Marine Animal Stranding Scheme (SMASS) is responsible for examining stranded whales, dolphins, seals, marine turtles and basking sharks on Scotland's shores (SMASS, 2016). Post mortem investigations are carried out on a number of the stranded animals to establish a cause of death and to monitor and report on the species in Scottish waters.

On 4th August 2019 a porbeagle shark (*Lamna nasus*) was found washed ashore near Arbroath, Angus, Scotland (NO6390840173) (Fig. 1). The specimen, a 214 cm male weighing 70 kg, was reported to SMASS. This species is currently not part of SMASS's remit, and instead the stranding was attended by curators of the National Museum of Scotland. During the examination a single shark louse (a parasitic copepod) found attached to the shark was removed for deposition in the museum (Reg. NMSZ 2019.70). Necropsy samples were also taken and the carcass was returned to the museum and frozen for further study.

Parasitic copepods are well known as external parasites on fishes in British seas with nearly 130 species known from British waters (Kabata, 1979, 1992). Perhaps the most widely known species are the sea louse (*Caligus elongatus*) and salmon louse (*Lepeophtheirus salmonis*), both serious pests of farmed salmon (*Salmo* spp.), and the gill maggot (*Lernaeocera branchialis*), which attaches to the gills of over a dozen fish species. Different copepod species have different host affinities but some utilise a wide variety of hosts. The common sea louse (*C. elongatus*) has been found on over 100 fish species and has also been found on whales (O'Reilly, 1998; Ólafsdóttir & Shinn, 2013). However, there is a problem with many *C. elongatus* host records since molecular data suggest it comprises two cryptic species (Øines & Heuch, 2005).

Six different parasitic copepod species are recorded from porbeagles in British waters. Two of these - *Nemesis robusta* and *Phyllothyreus cornutus* - attach



Fig. 1. Stranded porbeagle shark (*Lamna nasus*), 214 cm in length, on the shore near Arbroath, Angus, Scotland. (Photo: G. Hantke)

only to the gill filaments. One - *Anthosoma crassum* - lives half embedded in the skin of its host with only the posterior protruding. Another species - *Ommatokoita elongata* - always attaches to the eye of its host, which is usually the Greenland shark (*Somniosus microcephalus*), and has only very rarely been found on porbeagles. The remaining two species - *Dinemoura producta* and *Echthrogaleus coleoptratus* - attach to the body or fins of their host, particularly to the trailing edge of the fins. They are both in the family Pandaridae with the adult females in the size range 10-18 mm. *D. producta* is up to 18 mm in length with an elongate two-segmented abdomen; *E. coleoptratus* is up to 14 mm in length with a shorter one-segmented abdomen.

The copepod collected from the porbeagle shark was 18 mm long (Fig. 2) and was found attached laterally, about 40 cm anterior to the tail fluke. It has a rounded shield-like cephalothorax with a pair of medial eyes and an elongated posterior trunk. Although slightly damaged, its trunk structure indicated it to be an adult female *D. producta*.

Scott & Scott (1913) describe *D. producta* as a common finding from porbeagles with Scottish records from Shetland, Moray Firth, Aberdeen (fish market), south to Berwick-upon-Tweed Bay off the Scottish Borders, and an English record from Cornwall. They also cite a record from a thresher shark (*Alopias*



Fig. 2. Dorsal view of female shark louse (*Dinemoura producta*), 18 mm in length, from the stranded porbeagle shark (*Lamna nasus*). (Photo: R. Eustace)

vulpinus) in the Firth of Tay. The Plymouth Marine Fauna cites its occurrence on basking sharks (*Cetorhinus maximus*) (Marine Biological Association, 1957). Kabata (1992) refers to it as common in all sea areas of Britain, indicating its hosts in British waters include the spurdog (*Squalus acanthias*) and also the thresher, blue (*Prionace glauca*), porbeagle, shortfin mako (*Isurus oxyrinchus*), and basking sharks. *D. producta* is well known to occur on basking sharks off the coast of Scotland (Matthews & Parker, 1951) and Ireland (Scott, 1963). Adult female copepods carry a pair of egg sacs which are usually white when laid but become darker as they near hatching. Ovigerous female *D. producta*, bearing white eggs strings several centimetres long, may be quite conspicuous on basking sharks in U.K. waters and can sometimes be seen on video clips of slow swimming basking sharks on television documentaries or posted on the internet. An encounter with a basking shark off the Isle of Man, filmed with a pole-mounted camera by a kayaker (Rathore, 2018), shows numerous ovigerous copepods attached to the trailing edge of the large dorsal fin and

the pelvic fins and also on the upper body between the dorsal fin and the tail fluke.

Stranded sharks are relatively unusual, although even an occasional basking shark has been found on beaches (BBC, 2016). The accurate identification of ectoparasites on British sharks requires careful examination. Given that observations are relatively scarce and hosts are difficult to sample, sourcing specimens for study relies on the sampling of sharks stranded on the shore or accidentally by-caught in fisheries.

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