

Fish-Hook Ingestion in Seals (*Phoca vitulina* and *Halichoerus grypus*): The Scale of the Problem and a Non-Invasive Method for Removing Fish-Hooks

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Abstract

From 1975 to 2005, the Seal Rehabilitation and Research Centre (SRRC) in Pieterburen was confronted with 12 cases of seals that had ingested a fish-hook. During the autopsy on ten seals, perforations were found in the oesophagus, stomach, and intestines. Two seals survived the ingestion of a fish-hook by being fed cotton wool, which prevented a perforation. Most hooks were identified as hooks used in fisheries around wrecked vessels to catch cod. Fishermen are therefore advised to take preventive measures.

Key Words: *Phoca vitulina*, common seal, *Halichoerus grypus*, grey seal, rehabilitation, necropsy, fish-hook, foreign object, non-invasive treatment, The Netherlands

Introduction

Fish-hooks pose a threat to marine wildlife. Ingestion of a fish-hook may lead to perforation of the oesophagus, stomach, or intestines and may consequently be the cause of death of the affected animal. For birds and reptiles, as well as mammals, interactions with fish-hooks have been reported. Also, the severe threat of long-line fisheries to sea turtles and birds is well-documented, recently by Hilterman (2004). In seals, Goldstein et al. (1999) reviewed the human-related injuries in live-stranded pinnipeds along the central California coast. Ten cases of fish-hook ingestion in common seals (*Phoca vitulina*) were reported, and 36 cases in California sea lions (*Zalophus californianus*). For the same area, Colgrove et al. (2005) mentioned ten cases of the category "fisheries interaction" in common seals, which includes fish-hook ingestion. They also reported on four cases in the same category for elephant seals (*Mirounga angustirostris*). Hanni et al. (1997) described the findings of autopsies on Guadalupe fur seals (*Arctocephalus townsendi*). One seal had fish-hooks with attached monofilament line in its throat, muzzle, and right

foreflipper. Anonymous (2005) described the surgical removal of a fish-hook from the oesophagus of a Hawaiian monk seal (*Monachus schauinslandi*). Experience in The Netherlands shows that fish-hooks pose a threat in the North Sea and in the adjacent waters as well. The Seal Rehabilitation and Research Centre (SRRC) admitted several seals that had ingested fish-hooks. Due to the poor health of many stranded seals, surgery was not a viable option; therefore, a non-invasive method for removing fish-hooks was developed.

Materials and Methods

The SRRC in Pieterburen rehabilitates seals from the Wadden Sea, North Sea, and Zeeland waters. Approximately 200 seals enter the centre each year. The seals that undergo rehabilitation are orphaned pups and sick or injured seals, most often common seals and grey seals (*Halichoerus grypus*). Rehabilitation reports are kept for all seals rehabilitated by the centre. Autopsies are performed on animals that wash-up dead on the seashore and on seals that die in the centre. The stranding, rehabilitation, and autopsy data are collectively stored in the "Seal Database."

In June 2004, a common seal washed-up on the beach of the island of Vlieland. The seal had ingested a fish-hook and died soon after arrival at the centre. Autopsy revealed that the hook had perforated the stomach (Figures 1A & 1B). This case prompted questions about the extent of this type of incident. To get an idea, the "Seal Database" was researched for similar cases. The database contains rehabilitation data on 3,300 seals and records of 1,800 autopsies performed on seals that stranded dead on the Dutch coast.

Results

In total, 12 seals were found to have ingested a fish-hook in the period from 1975 to 2005 (Table 1). It is difficult to determine the extent of the number of seals that ingest fish-hooks since it is

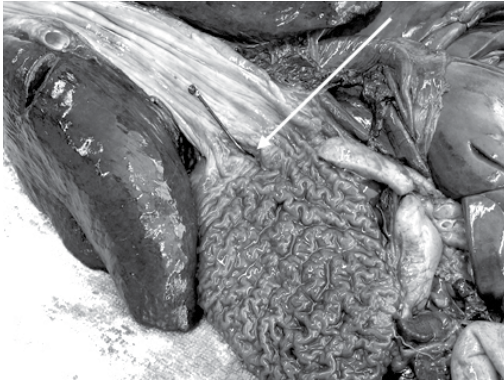


Figure 1A. Fish-hook perforation in the stomach found during a necropsy of a male common seal from Vlieland (Case #11)

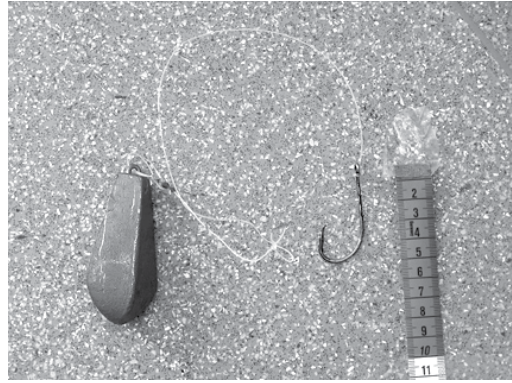


Figure 1B. Fish-hook with sinker attached after removal from the body of a male common seal from Vlieland (Case #11)

unknown how many affected seals actually wash ashore and are brought to the SRRC. The locations of these strandings were along the Dutch North Sea coastline, and they occurred over the months February to August. Eight of these seals were already dead when they washed-up, two died soon after arrival at the centre, and two seals survived. All were common seals, except three were grey seals. Fish-hook ingestion occurred in both males and females; however, the three seals that washed-up during June and July were all males. Seals give birth during these months, and males

and females have a different distribution (Van Bommel, 1956).

Twelve seals were found with ingested fish-hooks. In eight, the hook was lodged in the stomach. In two of these eight seals (Cases #5 and #12), the stomach wall was not yet perforated, and these seals were treated successfully. In the remaining four cases, hooks were lodged in other parts of the body. One seal suffered from a perforation of the oesophagus (Case #4); two from a perforation of the intestines (Cases #1 and #9); and in one seal, fish-hooks were found in the mouth and hind flippers (Case #8). The extent of the damage in this

Table 1. Seals with ingested fish-hooks, which were treated by the SRRC, and necropsied seals with fish-hooks as the primary cause of death

Case number	Date of stranding	Location of stranding	Province	Species	Sex	Stranded alive/dead	Diagnosis
1	22 May 1983	Petten	Noord-Holland	Common seal	Female	Dead	Intestinal perforation
2	16 February 1984	Walcheren	Zeeland	Common seal	Female	Dead	Stomach perforation
3	7 June 1994	Rottumerplaat	Groningen	Common seal	Male	Dead	Stomach perforation
4	9 April 1996	Noorderhaaks	Noord-Holland	Grey seal	Male	Alive; died	Oesophageal perforation
5	9 April 1999	Terschelling	Friesland	Common seal	Female	Alive; survived	Fish-hook free in stomach cavity
6	9 May 1999	Oostvoorne	Zuid-Holland	Common seal	Female	Dead	Stomach perforation
7	14 July 2000	Schiernonnikoog	Friesland	Common seal	Male	Dead	Stomach perforation
8	1 March 2003	Krabbendijke	Zeeland	Common seal	Female	Dead	Fish-hooks in mouth and hind flippers
9	25 May 2004	Ameland	Friesland	Grey seal	Female	Dead	Intestinal perforation
10	28 June 2004	Vlieland	Friesland	Common seal	Male	Alive; died	Stomach perforation
11	14 April 2005	Grevelingenmeer	Zeeland	Grey seal	Female	Dead	Stomach perforation
12	26 August 2005	Oosterscheldekering	Zeeland	Common seal	Male	Alive; survived	Fish-hook in stomach

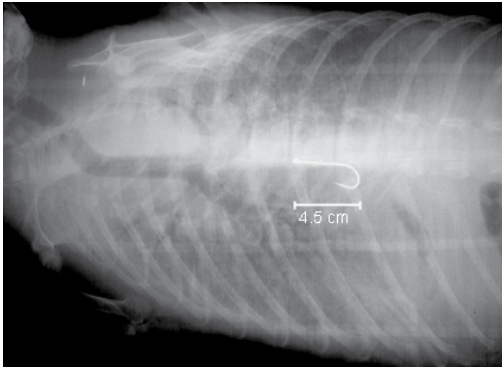


Figure 2. Dorsoventral radiograph showing the ingested fish-hook in the female common seal (Case #5), which stranded on 9 April 1999 at Terschelling

case could not be determined due to an advanced state of decomposition.

On 11 April 2003, a subadult male common seal was found dead in the Grevelingenmeer, Zeeland, in good nutritional condition, probably having drowned in a fishing net. Two fish-hooks were found in its pharynx and stomach. Fibrosis was associated with the hook in the stomach; therefore, it was thought that the hooks were present for a longer time and not the primary cause of the seal's death.

The first seal that survived the ingestion of a hook (Case #5) was found in very bad condition on the coast of the island of Terschelling on 9 April 1999. Radiographs showed an ingested fish-hook (Figure 2). Surgical removal was considered but not carried out because of the poor health of the animal. Instead, a new treatment was applied, in which the seal was fed cotton wool. The procedure requires small bits of loose cotton wool to be administered, using a tube inserted in the oesophagus, with ample oral rehydration salts. This is usually done once; however, the procedure was repeated if the cotton wool was recovered from the faeces of the seal. The cotton wool finally encapsulates the hook, preventing it from perforating the stomach. From the seal rehabilitated in 1999, radiographs were initially taken every other day, reducing the interval to every other two weeks. After approximately two weeks, the hook was seen decaying and falling apart in the acidic stomach environment. The cotton wool and the remains of the hook were defecated on 30 May, and the seal was successfully released on 6 August 1999.

In 2004, the SRRC advised on the treatment of a stranded young grey seal in Portugal. The seal was treated successfully with the SRRC cotton wool procedure.

Another seal (Case #12) was found on 26 August 2005, shortly after he was seen ingesting fishing gear.

Treatment started with extracting the metal parts which hold the hooks of the main fishing line. It was determined with an endoscope that no damage was inflicted to the oesophagus. Radiographs showed that the hook was still present in the stomach. The same procedure was applied as for the previous seal in 1999. The cotton wool procedure again proved to be successful. The hook was defecated intact after three weeks on 14 September 2005.

Discussion

Most of the hooks were identified as the types used to catch cod (*Gadus morhua*) and had lengths of around 5 cm. Young cod is one of the main target species in "wreck-fishing," a type of recreational fishery practiced in The Netherlands. Fishing on wrecks increases the chance that fishing equipment becomes entangled on the wreck, and equipment is frequently lost in this way. Hooks with bait or hooked-fish might attract seals. Hooks, knots, and lines recovered during necropsies were studied, which led to the belief that a contributing factor to the loss of recovered gear had been the careless use of fishing gear, probably by inexperienced recreational fishermen.

Although it is realised that the loss of hooks cannot be prevented entirely, there are some measures that might help reduce the problem. In wreck-fishing, a sinker, typically a piece of lead, is attached to the main fishing line. The sinker is used as a weight, and it is the most likely component to get entangled and cause the loss of fishing gear. If the main line can be freed from the sinker after it has been entangled, then the main line with hooks can be recovered. To this end, a "break point" can be added by tying a thinner line between the main line and the sinker. When doing so, in the case of entanglement, only the sinker will be lost and the hooks still would be attached to the main line. Furthermore, it is always important that knots used to fasten any component of the fishing gear are made in a professional way to minimise the loss of hooks. It is needless to say that old fishing gear that has become useless should not be thrown overboard. It is also recommended to reel-in fishing lines when seals are sighted to proactively avoid accidents.

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Literature Cited

- Anonymous. (2005). *National Oceanic & Atmospheric Administration (NOAA) releases rare Hawaiian monk seal back to the wild following successful surgery to remove fish-hook*. Available online: www.noaa.gov/stories/2004/s2257.htm. Retrieved 1 December 2005.
- Colegrove, K. M., Greig, D. J., & Gulland, F. M. D. (2005). Causes of live strandings of northern elephant seals (*Mirounga angustirostris*) and Pacific harbor seals (*Phoca vitulina*) along the central California coast, 1992-2001. *Aquatic Mammals*, 31(1), 1-10.
- Goldstein, T., Johnson, S. P., Phillips, A. V., Hanni, K. D., Fauquier, D. A., & Gulland, F. M. D. (1999). Human-related injuries observed in live stranded pinnipeds along the central California coast 1986-1998. *Aquatic Mammals*, 25(1), 43-51.
- Hanni, K. D., Long, D. J., Jones, R. E., Pyle, P., & Morgan, L. E. (1997). Sightings and strandings of Guadalupe fur seals in central and northern California, 1988-1995. *Journal of Mammalogy*, 78, 684-690.
- Hilterman, M. (2004). Long-line visserij en zeeschildpad-den. *Ecologie & Ontwikkeling*, 12(66), 6-7.
- Van Bemmelen, A. C. V. (1956). Planning a census of the harbour seal (*Phoca vitulina L.*) on the coast of The Netherlands. *Beaufortia*, 54, 121-132.