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SHORT COMMUNICATION

# Mass Ingestion Of Gastroliths And Other Foreign Bodies In Three Juvenile Hooded Seals (*Cystophora cristata*) Stranded In North-Western Iberian Peninsula

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**Abstract**

We present here three clinical cases involving mass ingestion of foreign bodies in Hooded seals (*Cystophora cristata*) stranded in north-western Iberian Peninsula. Although the presence of gastroliths is considered to be normal in pinnipeds, the cases presented here highlight how an excessive presence of them as well as other foreign bodies could result in rapid onset of a potentially lethal gastrointestinal stasis syndrome, which has to be quickly resolved, medically or surgically. Ultrasound examinations and posterior X-ray confirmation have demonstrated their utility to a rapid detection of gastric bodies, and have to be taken into account in Hooded seal routine clinical protocols. Finally, we conclude that it is particularly important to avoid the use of loose stones or sand over resting areas and to take extreme precautions with small items near the rehabilitation pools when dealing with this seal species.

The Hooded seal (*Cystophora cristata*) is an abundant ice-breeding pinniped species distributed throughout the subarctic and arctic regions of the North Atlantic Ocean [1,2]. The southern limit of distribution for this species in European waters has been established at the west of the British Isles [3]. Nevertheless, since the 1970s, sporadic strandings of juvenile Hooded seals have been reported on the western coast of Europe (from Denmark to southern Spain), with higher reported frequencies in some years [4-7]. The special clinical and management considerations to take into account to ensure successful rehabilitation of these arctic seals have become a new challenge to veterinary clinicians of southern North-Atlantic stranding monitoring networks.

Consequences of starvation, dehydration, weakness, external traumas, and overall the quick establishment of heat stroke, are the most important clinical challenges when dealing with individual Hooded seals much further south of their normal distribution area. The presence of gastroliths and other foreign bodies in the stomach of this arctic seal species has also been described as a frequent necropsy finding [8,9], even producing complete impactation and has been considered as the primary cause of death in some specimens [10].

During the summers of 2001, 2002 and 2006, a total of nine juvenile Hooded seals were found stranded along the northern Spanish coast [6]. In three of them, mass ingestion of gastroliths and other gastric foreign bodies was observed and considered able to produce pathological consequences. In two cases, the seals were found dead, and the presence of gastric foreign bodies was observed during the necropsy. Gastric chamber contained only sand in the seal CCR29072006, filling the entire stomach volume (Fig. 1a). This seal was observed eating sand before dying on the beach. The Hooded seal CCR06082006 presented 2/3 of the stomach occupied by a little amount of sand, 34 rounded stones from 1 to 3 cm in diameter, a sea snail of 1.5 cm in diameter, a plastic piece of 20 x 14 cm and 2 adult Anisakids (Fig. 1b). In both cases, the primary cause of death was related to the consequences of heat stroke.

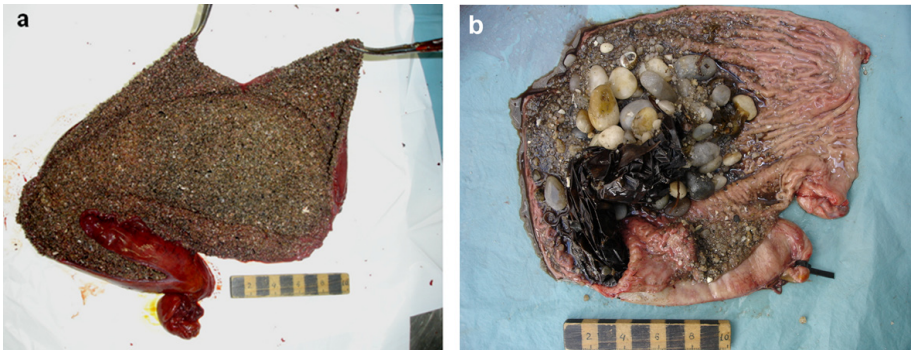


Fig. 1: Two cases of foreign bodies into the stomach of dead juvenile Hooded seals, found dead in Galician coasts (North-Western Iberian Peninsula) during the summer of 2006. (**a**): CCR29072006 and (**b**): CCR06082006.

To illustrate the importance of quick action when mass ingestion of foreign bodies is suspected in living animals, we describe here the third case CCR04092001, which involved a juvenile male Hooded seal with a total body length of 90 cm found stranded alive on a rocky shore. After clinical examination and treatment for hyperthermia, dehydration, weakness, loss of weight and a light respiratory infection, the animal was placed in a pool with two other Hooded seals undergoing rehabilitation. The pool had two different resting zones: one with a flat surface and another one with a layer of small stones (from 1 to 5 cm of diameter) over the surface. One month later, the seal suddenly stopped his normal food intake and general activity.

General exploration showed signs of abdominal pain with no gastrointestinal sounds and an increased body temperature (38.7ºC). A blood sample was collected and complete haematology and blood chemistry analysis were immediately carried out. Moderate leukocytosis (14.000 cells/mm$^3$) was the most remarkable finding. A complete ultrasound examination was performed using a 3.5 MHZ probe of a portable device (SONOVET 600, Medison). A longitudinal sonogram of the gastric area

showed at least 5 hyperecoic ultrasound images with marked acoustic shadowing into the stomach (Figs. 2a and 2b). Immediately, dorso-ventral radiographs were performed to obtain more information about the stomach contents. Radiographs demonstrated the presence of seven round stones ranging from 2 to 4 cm in diameter and one square stone of 5 x 3 x 1 cm (Fig. 2c). All of them were in the pyloric area of the stomach. A large amount of air in the stomach and intestine was also observed in the radiographs.

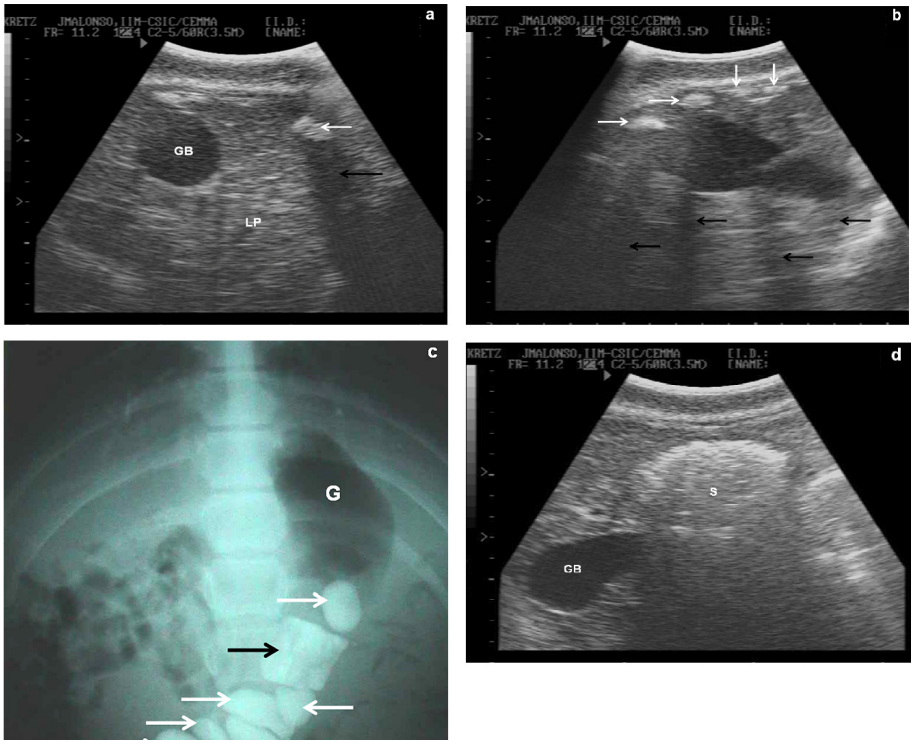


Fig. 2: (**a**): Ultrasound image of the hepatic and gastric area (3.5 MHZ) of the seal CCR04092001. Position of the probe: ventro-lateral (left) and longitudinal. GB: gallbladder, LP: liver parenchyma. White arrow: hyperechoic foreign body. Black arrow: acoustic shadowing. (**b**): Ultrasound image of the gastric area (3.5 MHZ) of the seal CCR04092001. Position of the probe: ventro-lateral (left) and longitudinal, slightly posterior to 1A. White arrows: hyperechoic foreign bodies. Black arrows: acoustic shadowings. (**c**): Ventro-dorsal radiography of the seal CCR04092001. White arrows: rounded stones into the stomach. Black arrow: squared stone. G: gas into the proximal stomach. (**d**): Ultrasound image of the hepatic and gastric area (3.5 MHZ) of the seal CCR29072006. Position of the probe: ventro-lateral (left) and longitudinal. GB: gallbladder, S: sand in the stomach.

The possibility of vomit induction was rejected to prevent possible oesophageal injuries because of the size and rough surface of the square stone, and a surgical approach to the stomach, involving a gastrotomy to remove the stones, was considered the best option. A combination of Ketamine (Imalgene, Merial) (4 mg/kg) and Midazolam (Dormicum, Roche Farma) (0.2 mg/kg) was used for sedation (I.M.) and 20 minutes later the same dosage was administered as a pre-anaesthesia (I.V.). An endotracheal tube was inserted 15 min after administrating pre-anaesthesia and the

surgical plane was maintained with halothane (3%). The seal was placed in dorsal recumbency and the abdomen opened along the midline with a 15 cm incision from the sternum in a backwards direction. The stomach was placed outside the abdominal cavity to prevent spilling gastric contents into the cavity. The gastrotomy was made midway between the greater and lesser curvature of the stomach and the eight stones were removed with atraumatic forceps. All of them were clearly identified as being stones from the resting platforms in the rehabilitation pool. Severe congestion and some pre-necrotic areas were observed along the intestinal tube and mesentery, being removed when considered necessary. The mesenteric lymphatic nodes were enlarged and congested. A simple interrupted suture (with synthetic absorbable material, Vicryl 3/0) through all layers of the stomach wall was used to close the incision. The fur layer and skin were closed separately with a simple interrupted suture with synthetic absorbable material, Vicryl 2/0. Intravenous fluid therapy of saline solution was given to the seal during and after surgery. Enrofloxacine, (Baytril, Bayer), at a dosage of 5 mg/kg, was administered intravenously at the end of the surgical procedures. The seal recovered consciousness and mobility one hour after the removal of the endotracheal tube. However, the animal died twenty-five hours later.

The most plausible cause of death was directly related with the infection established in the gastrointestinal tract. The presence of the stones was determined to have played a primary role in the gastrointestinal stasis, proceeding to an abnormal proliferation of enteric bacteria, gas production and accumulation, and finally, fatal toxaemia and necrosis of bowel tissue. The fast and ultimately lethal case presented here, highlights how a mass presence of foreign bodies in the digestive tract of a seal can result in gastrointestinal stasis syndrome, which must be quickly resolved, medically or surgically. Although a medical approach has to be considered the first option, when minimal symptomatology of gastrointestinal stasis or obstruction is present, surgical correction could be needed to avoid the fast and negative evolution of these processes.

Although some references about the presence of gastric foreign bodies (stones/gastroliths, gravel or sand) in this arctic seal species can be found in the scientific literature [8-10], the primary cause of the mass ingestion of the foreign bodies remains unclear. The presence of gastroliths in other pinniped species has been frequently reported, i.e. [11-16], and it has been traditionally attributed to aid the digestion process [13,15] or buoyancy control [11].

The amount of stones or sand in all the three cases described here seemed to be excessive for any possible physiological role or accidental ingestion. Additionally, the presence of foreign bodies did not correlate with gastric ulcers or intense parasitism. On the other hand, ice eating has been described as a normal behaviour in arctic seal species [17,18], thus confused and stressed animals could swallow bright stones and sand instead of ice. Furthermore, this behaviour could be exacerbated in a strange environment or under stressful conditions, becoming a bizarre behaviour which includes swallowing of many foreign bodies. In this manner, the three cases described here might be the result of a confluence of factors such as: stress associated to pathological conditions (at least hyperthermia) and/or strange environment (warm waters, different prey species) and/or human handling (rehabilitation attempt), boredom associated to captivity (in the third case), or neurological disorders due to final consequences of hyperthermia and dehydration.

Concerning clinical protocols, it seems to be important to periodically monitor the stomach contents when dealing with this species in captivity, especially at the beginning of the rehabilitation attempt and also during the rehabilitation period. Gastric endoscopy has been used traditionally to visualize foreign bodies in the gastrointestinal tract of pinniped species [19,20], as well as to attempt retrieval of them [21]. Furthermore, the use of portable ultrasound and X-ray devices has also been described in other animal species as very useful to diagnose foreign bodies into the gastrointestinal tract [22]. The utility of both techniques has been demonstrated in our case. Specifically, ultrasound has proved to be an ideal technique for the rapid diagnosis of the presence of gastroliths (Figs. 2a, 2b) and sand (Fig. 2d), and it is clearly less stressful and less invasive than X-ray and endoscopy examinations, which often require sedation or general anaesthesia, especially when dealing with nervous wild animals. On the other hand, radiology and endoscopy offer better definition image of stomach contents and facilitate a more accurate diagnosis.

Finally, although general recommendations for designing marine mammal facilities give special attention to the presence of any materials that seals can swallow [23], it is extremely important to avoid the use of loose stones or sand over resting areas and to take extreme precautions with small items near the rehabilitation pools when dealing with Hooded seals.

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