

Impact of recreational fishing on seagull (*Larus dominicanus*) rescued on the coast of the São Paulo state: case report

Impacto da pesca recreativa em gaivota (*Larus dominicanus*) resgatada no litoral do estado de São Paulo: relato de caso

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ABSTRACT: The seagull (*Larus dominicanus*) commonly can be observed near human fishing activities, as this species feeds on discards from fishing. This common interaction between a seabird and human fishing activity (both commercial and recreational), provides an easy source of food, but is not without risk for the birds. We report here clinical, radiographic and anatomopathological findings of an esophageal perforation caused by fishing gear in a specimen of *Larus dominicanus* found alive on a beach in the state of São Paulo which illustrated a harmful effect of stemming from recreational fishing. Clinical examination revealed a nylon thread in the oral cavity with the presence of caseous suggestive of ingestion of lost fishing gear, paralysis of the pelvic limbs and a decrease in the pain reflex associated with sternal decubitus, suggestive of food intoxication. Necroscopic examination revealed two hooks, one in the caudal portion of the esophagus with esophageal and pulmonary perforation, and the other in the muscular stomach. These injuries would have been expected to lead to the death of the bird. These anatomopathological findings confirmed the seriousness of the injuries. This reinforces the importance of studies focused on the interaction of recreational fishing artifacts (hooks, lines) with coastal birds on the Brazilian coast, in order to develop a preventative strategy.

KEYWORDS: Clinical examination; seagull; histopathological; necropsy; food intoxication.

RESUMO: A gaivota (*Larus dominicanus*) está intimamente relacionada às atividades pesqueiras, uma vez que possui hábitos generalistas e se alimenta dos descartes provenientes da pesca. Este processo de interação entre aves marinhas e a pesca apresenta efeitos positivos e negativos, porém, suas relações ecológicas ainda não são bem compreendidas. No presente trabalho, objetivou-se relatar achados clínicos, radiográficos e anatomopatológicos de uma perfuração esofágica ocasionada por petrecho de pesca em um espécime de *Larus dominicanus* no litoral do estado de São Paulo e levantar a problemática da pesca recreativa na região. Ao exame clínico, observou-se presença de fio de náilon em cavidade oral com presença de cêseo sugestivo de ingestão de petrecho de pesca, paresia de membros pélvicos e diminuição de reflexo doloroso associado a decúbito esternal, sugerindo um quadro de intoxicação alimentar. O exame necroscópico revelou a presença de dois anzóis, um em porção caudal do esôfago com perfuração esofágica e pulmonar, e outro em ventrículo. Os achados anatomopatológicos comprovaram a gravidade das lesões causadas pela interação com a pesca recreativa, o que reforça a importância de estudos referentes à interação de artefatos pesqueiros (anzóis, linhas) com aves costeiras do litoral brasileiro, atualmente escassos na literatura científica.

PALAVRAS-CHAVE: Gaivota; histopatológico; necropsia; exame clínico; intoxicação alimentar.

INTRODUCTION

This species of gull (*Larus dominicanus*) has a wide geographic distribution in the southern hemisphere (BRANCO, 2004) and is the most common species on the coast of Santa Catarina (BRANCO, 2000). In a food ecology study conducted in

Rio Grande do Sul by Silva-Costa and Bugoni (2013), the species shows a broad acceptance of different food items and opportunistic behavior (YORIO et al., 1998), which provides advantages in obtaining food sources such as the discards of the seven-barbe shrimp fishery (BRANCO, 2001; MIOTTO

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et al., 2017). This characteristic causes susceptibility to agonistic anthropic interactions, such as fishing activity (HUDSON; FURNESS, 1988).

Fishing is identified as the main cause of population decline observed in several species of other seabirds (CROXALL et al., 2012; LEWISON et al., 2004). In the case of albatross and petrel species, this is mainly due to accidental capture in long-line fishing (ANDERSON et al., 2011; PARDO et al., 2017). Alternatively, gill fishing mainly affects magellanic penguins (CARDOSO et al., 2011; EWBANK et al., 2020).

There are also possibilities of entanglement in discarded fishing lines with hooks and sinkers (DAU et al., 2009) and bait ingestion with the hook (BAKER et al., 2002; DAU et al., 2009). Additionally, there is a shortage of fish resources due to overfishing (GRÉMILLET et al., 2018), which reduces the supply of available food and promotes interest in fish rests available from humans.

In this sense, this work reports the ingestion of two recreational fishing artifacts in a specimen of *Larus dominicanus* rescued alive on the coast of the state of São Paulo.

CASE REPORT

An adult female gull (*Larus dominicanus*), weighing 0.605 kg, was rescued on beach in August/2019, in the city of Mongaguá (Lat: -24.132522, Long: -46,690216), coast of the state of São Paulo, Brazil, during the execution of the Santos Basin Beach Monitoring Project (PMP-BS), an activity developed to meet the federal environmental licensing condition for Petrobras' activities of production and flow of oil and natural gas in the Santos Basin, conducted by Ibama (ABIO 640/2015 1ª Renewal 4699418).

The animal was sent to the Wild Animal Rehabilitation Center Instituto Biopesca (CRAS-IBP, Process SMA 110/2018), located in the municipality of Praia Grande, São Paulo, Brazil, which is part of the veterinary facilities net that serves the PMP-BS.

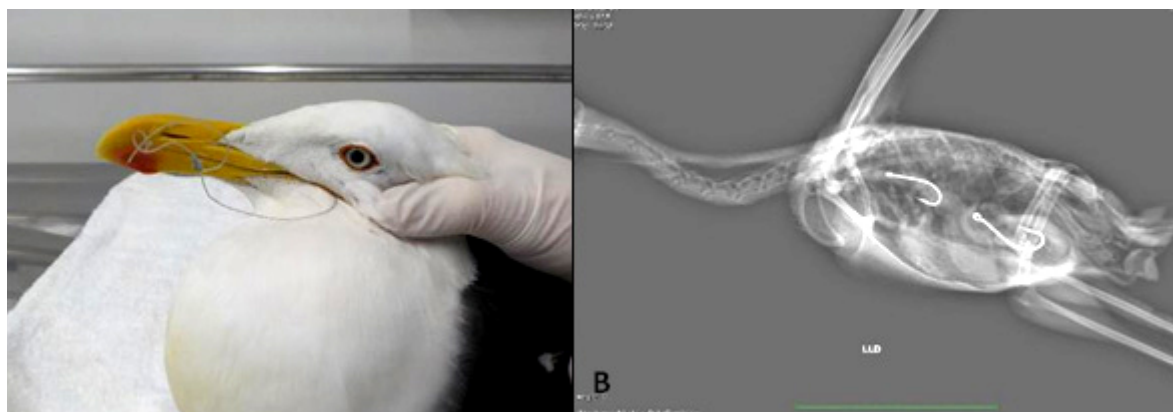
At the initial physical examination, the animal presented cachectic body score, congested cloacal, ocular and oral mucosa, rales on respiratory auscultation in the right lung lobe region, dehydration (6%), body temperature 38.9°C and alert state of consciousness. A nylon thread was observed in the oral cavity, associated with multifocal caseous foci (Figure 1A). Additionally, the patient was in sternal decubitus, with flaccid paralysis and decreased pain reflex in the hind limbs, suggestive of food intoxication.

The radiographic examination, which was performed on the same day as the animal was admitted, showed two metallic radiopaque structures with a defined shape (hooks), one located in the caudal esophagus and the other in the muscular stomach (Figure 1B). A high cavity contrast was also noted due to the presence of free gaseous content and opacification of the lung fields, with greater evidence in the right lung field.

The therapeutic approach applied was clinical stabilization of the animal with the use of antimicrobial (Enrofloxacin 15mg/kg 25mg/ml IM), analgesic (Tramal 10mg/kg 50mg/ml IM), anti-inflammatory (Meloxicam 1mg/kg 2mg/ml IM), Fluid Therapy (Ringer with Lactate 70ml/kg associated with Mercepton 0.2ml/kg SC) and Nebulization (Aminophylline 24mg/ml 3mg/ml, Enrofloxacin 100mg/ml 10mg/ml and Saline Solution 0.9% 10ml) associated with Oxygen Therapy constant (5l/min).

However, after radiography was performed, there was a worsening of the respiratory condition, such as severe dyspnea, agonizing breathing, respiratory noise and a decrease in the 3º eyelid reflex. Euthanasia was then performed, with Ketamine 15mg/kg associated with Xylazine 4mg/kg IM, in accordance with Resolution N° 1000/2012 of the Federal Council of Veterinary Medicine and with the Brazilian Guide of Good Practices for Euthanasia in Animals (2013).

The information obtained during the necropsy was registered by photodocumentation and described in a specific pathological examination form. Samples from all organs were



Source: Instituto Biopesca, 2019.

Figure 1. Image of clinical (A) and radiographic (B) examination of *Larus dominicanus* rescued and sent to the Instituto Biopesca in August/2019, São Paulo, Brazil. A) *Larus dominicanus* with fishing gear (nylon thread) in the oral cavity. B) Latero-lateral projection with hooks evidencing.

fixed in a 10% formalin solution and sectioned and processed according to routine techniques used in the Histology Laboratory of Instituto Biopesca.

At necroscopic examination, macroscopic analysis revealed free fluid in a celomic cavity compatible with transudate; caseous foci in the oral cavity, multifocal, mild to moderate; caseous in coracoid bone, on the right side, extending to its interior. The glandular and muscular stomach were empty, and gallbladder engorged. It was found that the hook present in the caudal esophageal region caused a transmural perforation of 0.7 cm in diameter in the cranial direction, with involvement of the right lung lobe and associated caseous granuloma (Figure 2A). The second hook, present in the muscular stomach, caused granulomatous gastritis (Figure 2B). The kidneys, adrenals and spleen were congested.

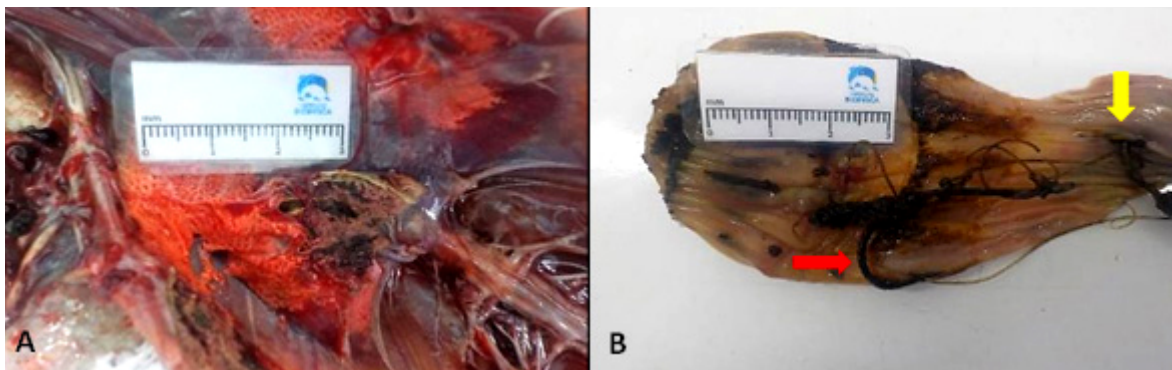
In the histopathological analysis, the following alterations were observed: in the right lung lobe in the parabronchi and interstitial, multifocal areas with abundant bacterial cocci, necrosis and heterophilic inflammatory infiltrate (Figure 3B) with the presence of macrophages (Figure 3A); in the contralateral lobe, extensive focal hemorrhage was noted inside

the parabronchi; in skeletal musculature, hemorrhagic areas associated with myocyte necrosis; presence of esophagitis and multifocal granulomatous gastritis with bacterial colonies; moderate enteritis with multifocal lymphocytic infiltrate; moderate nephrolithiasis; and organs such as liver, brain and adrenal showed passive congestion.

DISCUSSION

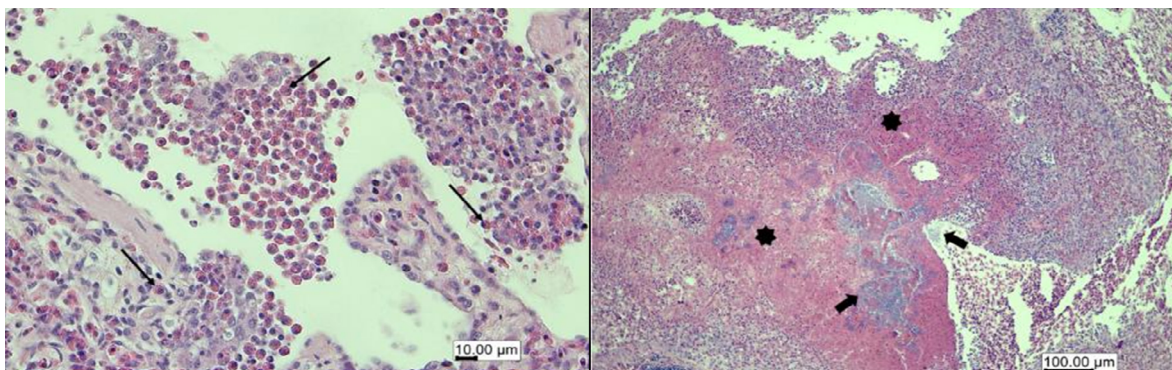
Fishing negatively affects, in addition to ichthyofauna, numerous species of tetrapods, from mammals and birds to marine turtles (BUGONI; KRAUSE; PETRY, 2001; PHILLIPS et al., 2016; SECCHI; OTT; DANILEVICZ, 2002). Although the fishing problem related to marine tetrapods is known, as in the case of birds (LEWISON et al., 2004), few comprehensive assessments of their effects have been conducted. It is estimated that 267 marine species have already been affected by fishing, either by entanglement in fishing line, hook injuries and/or ingestion of fishing gear (DAU et al., 2009).

The identification of foreign body ingestion in these animals is difficult to diagnose (WERNECK et al., 2005). Here, the presence of the nylon thread exteriorized in the oral



Source: Instituto Biopesca, 2019.

Figure 2. Images of macroscopic lesions found in the necropsy of *Larus dominicanus* rescued and sent to the Instituto Biopesca in August/2019, São Paulo, Brazil. A) Caseous granuloma in the right pulmonary lobe. B) Presence of two hooks, one in the caudal esophageal region (yellow arrow) and the other in the muscular stomach (red arrow).



Source: Instituto Biopesca, 2019.

Figure 3. Images of microscopic lesions found in histopathological evaluation. A) Lung parenchyma shows a focally extensive necrotic area (asterisk), interspersed with bacterial colonies (arrow) with heterophilic inflammatory infiltrate and macrophages present. HE, 10x, μm . B) Predominance of heterophilic inflammatory infiltrate in the lung parenchyma (arrow). HE, 40x, μm .

cavity was suggestive of ingestion of fishing gear, which was confirmed by radiographic examination. The clinical diagnosis recommended the removal of the hook through a surgical procedure; however, the unstable clinical condition of the animal made the surgical intervention counterproductive.

In the macroscopic analysis, the ingestion of two fishing gear was confirmed, an impact already described by Yorio et al. (2014). The two hooks found were of the simple hook type, which is used in recreational fishing, a common practice in the region where the animal was rescued. Both are in accordance with Silva et al. (2016), which characterized amateur fishing in the sustainable development reserve of Barra do Una, in Peruíbe (São Paulo, Brazil), and demonstrated that fisherfolk used simple hooks as equipment for their activities.

Recreational fishing has a definition described in Brazilian legislation:

Recreational or amateur fishing is defined as a noncommercial activity, and the trade of the fishery resource is prohibited. You can use handling, simple reed, reed with reel or reel, diving rifle or speargun with any type of propulsion and any type of arrow, in addition to a manual suction pump for capturing baits or crab puddle (Normative Instruction Interministerial MPA/MMA n°9 of July 13, 2015).

According to Freire et al. (2020) it is estimated that a national total of 435,000 people engage in recreational fishing activities, which is equivalent to 0.41% of Brazil's total population of 191 million inhabitants in 2010. The importance of this type of fishing has been growing in countries with an economy in transition, such as Brazil (FREIRE et al., 2018). However, data

collection and research on this fishery in the country is still in its infancy and further studies are needed (BARCELLINI et al., 2013) in order to develop a preventative strategy.

The devices were associated with esophageal and pulmonary perforation and histopathological findings are compatible with the cachexia presented by the animal and corroborate with that of Jerdy et al. (2017), who described the main impacts of ingestion of solid waste and/or lines and hooks on sea turtles, such as obstruction and/or rupture of the gastrointestinal tract, which can lead to lethal effects, such as immediate death of the animal, and sub-lethal, related to diseases in the enteric tract, such as ulcers and necrosis.

Additionally, the animal presented flaccid paralysis of the pelvic limbs, muscle weakness and decreased painful reflexes, which corroborates with Friend and Franson (1999) and suggests a relationship of reduced animal metabolism, predisposing the search for more easily obtainable foods. These foods are mostly characterized by foods or water with decaying organic matter (HOQUE et al., 2010), which can lead to food intoxication (NEIMANIS et al., 2007).

CONCLUSION

The anatomopathological findings confirmed the seriousness of the injuries caused by interacting of the animal with recreational fishing, which reinforces the importance of studies regarding the interaction of fishing artifacts (hooks, lines) with coastal birds of the Brazilian coast, which are currently scarce in the scientific literature.

The interaction of birds with recreational fishing gear affects their health and survival. This problem needs to be understood by society with studies on casuistry, prevalence and impacts on individuals and populations of seabirds.

REFERENCES

- ANDERSON, O. R. J. et al. Global seabird bycatch in longline fisheries. **Endangered Species Research**, v. 14, p. 91–106, 2011.
- BAKER, G. B. et al. Albatrosses and petrels in Australia: a review of their conservation and management. **EMU**, v. 102, p. 71–97, 2002.
- BARCELLINI, V. C. et al. Recreational anglers and fishing guides from an estuarine protected area in southeastern Brazil: Socioeconomic characteristics and views on fisheries management. **Ocean & Coastal Management**, v. 76, p. 23–29, 2013.
- BRANCO, J. O. Aves marinhas das Ilhas de Santa Catarina. In: **Aves marinhas e insulares brasileiras: bioecologia e conservação**. Editora da UNIVALI, Itajaí, SC, p. 15–36, 2004.
- BRANCO, J. O. Descartes da pesca do camarão sete-barbas como fonte de alimento para aves marinhas. **Revista Brasileira de Zoologia**, v. 18, n. 1, p. 293–300, 2001.
- BRANCO, J. O. Avifauna associada ao estuário do Saco da Fazenda, Itajaí, Santa Catarina, Santa Catarina. **Revista Brasileira de Zoologia**, v. 17, n. 2, p. 387–394, 2000.
- BUGONI, L.; KRAUSE, L.; PETRY, M. V. Marine debris and human impacts on sea turtles in Southern Brazil. **Marine Pollution Bulletin**, v. 42, p. 1330–1334, 2001.
- CARDOSO, L. G. et al. Gillnet fisheries as a major mortality factor of Magellanic penguins in wintering areas. **Marine Pollution Bulletin**, v. 62, p. 840–844, 2011.
- CROXALL, J. P. et al. Seabird conservation status, threats and priority actions: a global assessment. **Bird Conservation International**, v. 22, p. 1–34, 2012.
- DAU, B. K. et al. Fishing gear-related injury in California marine wildlife. **Journal of Wildlife Diseases**, v. 45, p. 355–362, 2009.

- EWBANK, A. C. et al. Postmortem findings in Magellanic penguins (*Spheniscus magellanicus*) caught in a drift gillnet. **BMC Veterinary Research**, v. 16, n. 1, 2020.
- FREIRE, K. et al. The offshore recreational fisheries of northeastern Brazil. **Latin American journal of aquatic research**, v. 46, p. 765–778, 2018.
- FREIRE, K. M. F. et al. Estimating global catches of marine recreational fisheries. **Frontiers in Marine Science**, v. 7, 2020.
- FRIEND, M.; FRANSON, J. C. Field manual of wildlife diseases. General field procedures and diseases of birds. **Geological Survey Biological Resources Division**, 1999.
- GRÉMILLET, D. et al. Persisting worldwide seabird-fishery competition despite seabird community decline. **Current Biology**, v. 28, p. 4009–4013, 2018.
- HOQUE, M. A. et al. Factors limiting traditional household duck production in Bangladesh. **Tropical Animal Health and Production**, v. 42, p. 1579–1587, 2010.
- HUDSON, A. V.; FURNESS, R. W. Utilization of discarded fish by scavenging seabirds behind whitefish trawlers in Shetland. **Journal of Zoology**, v. 215, p. 151–166, 1988.
- JERDY, H. et al. Pathologies of the digestive system caused by marine debris in *Chelonia mydas*. **Marine pollution bulletin**, v. 116, n. 1–2, p. 192–195, 2017.
- LEWISON, R. L. et al. Understanding impacts of fisheries bycatch on marine megafauna. **Trends in Ecology and Evolution**, v. 19, p. 598–604, 2004.
- MIOTTO, M. L. et al. Does the closed fishing season influence the ichthyofauna consumed by *Larus dominicanus*? **Brazilian Journal of Oceanography**, v. 65, p. 9–18, 2017.
- NEIMANIS, A. et al. An outbreak of type C botulism in herring gulls (*Larus argentatus*) in southeastern Sweden. **Journal of Wildlife Diseases**, v. 43, p. 327–336, 2007.
- Portaria Interministerial MPA/MMA nº 5, de 1 de setembro de 2015. **Regulamenta o Sistema de Gestão Compartilhada do uso sustentável dos recursos pesqueiros**. 2015.
- PARDO, D. et al. Additive effects of climate and fisheries drive catastrophic declines in an albatross community. **Proceedings of the National Academy of Sciences**, v. 114, p. 10829–10837, 2017.
- PHILLIPS, R. A. et al. The conservation status and priorities for albatrosses and large petrels. **Biological Conservation**, v. 201, p. 169–183, 2016.
- SECCHI, E. R.; OTT, P. H.; DANILEVICZ, D. Report of the fourth workshop for the coordinated research and conservation of the Franciscana dolphin (*Pontoporia blainvillei*) in the Western South Atlantic. **Latin American Journal of Aquatic Mammals**, v. 1, p. 11–20, 2002.
- SILVA, L. F. et al. Aspectos socioeconômicos e etnoecológicos da Pesca Esportiva praticada na Barra do Una, Peruíbe/SP. **Unisanta BioScience**, v. 5, p. 129–142, 2016.
- SILVA-COSTA, A.; BUGONI, L. Feeding ecology of Kelp Gulls (*Larus dominicanus*) in marine and limnetic environments. **Aquatic Ecology**, v. 47, p. 211–224, 2013.
- WERNECK, R. M. et al. Relato de caso de ingestão e liberação de anzol por tartaruga verde (*Chelonia mydas*). **Fundação Protamar**, Ubatuba, SP, p. 1–2, 2005.
- YORIO, P. et al. Kelp gulls *Larus dominicanus* breeding on the Argentine coast: population status and relationship with coastal management and conservation. **Marine Ornithology**, v. 26, p. 11–18, 1998.
- YORIO, P. et al. Kelp Gulls (*Larus dominicanus*) killed and injured by discarded monofilament lines at a marine recreational fishery in northern Patagonia. **Marine Pollution Bulletin**, v. 85, p. 186–189, 2014.