

MORTALITY FROM PLASTIC INGESTION AND NET ENTANGLEMENT IN MARINE BIRDS – DESCRIPTION OF THREE CASES

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Abstract

Plastic debris is a significant threat to marine ecosystems, notably affecting seabird populations globally. In this report, the authors document deaths related to plastic ingestion in a Northern Gannet (*Morus bassanus*, Linnaeus, 1758) and net entanglement in a Yellow-Legged Gull (*Larus michabellis*, Naumann, 1840) and a Northern Gannet (*M. bassanus*, Linnaeus, 1758) in Northern Portugal. All three animals died as a result of either plastic entanglement or ingestion. While this report highlights just three cases, it emphasizes the severe negative impacts of plastic on seabirds, ultimately leading to the deaths of these animals.

Key Words: birds, entanglement, ingestion, marine bird, plastic

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CASE PRESENTATION

Marine plastic pollution has increased in the last few years and has become a worldwide environmental issue (O'Hanlon et al., 2017). It poses a serious threat to marine ecosystems, particularly impacting seabird populations worldwide (Acampora et al., 2017). These birds often mistake floating plastic debris for food, which leads to ingestion and typically fatal consequences. The sharp edges of plastic fragments can perforate their digestive tracts, causing internal injuries and impeding proper nutrient absorption (O'Hanlon et al., 2017). Additionally, ingested plastics can create a false sense of fullness, resulting in malnutrition and starvation (Jâms et al., 2020). Moreover, plastics can accumulate harmful environmental chemicals that could leach into the birds' bodies upon ingestion, leading to toxic effects and hormonal disruptions (Avery-Gomm et al., 2013; Basto et al., 2019). Although plastic ingestion has been documented in several species (Laist, 1997), cases where seabird mortality is directly linked to plastic ingestion are rarely reported (Van Pelt & Piatt, 1995).

Discarded fishing nets, often lost or abandoned, transform into ghost traps in the water, ensnaring unsuspecting birds in a lethal web. Once entangled, birds futilely struggle to free themselves, frequently resulting in severe injuries or drowning. These nets can wrap around their bodies, wings, or beaks, impairing their ability to swim, fly, or feed. In some cases, entanglement can lead to deep wounds, infections, or even amputations, ultimately causing the bird's death. Furthermore, entangled birds can become more vulnerable to predation or starvation as their ability to escape or forage is compromised (Ryan, 2018).

In this report, the authors described three cases of mortality linked to plastic ingestion in a Northern Gannet (*Morus bassanus*) and two additional cases of net entanglement, which resulted in the amputation of a posterior limb in both a Northern Gannet (*M. bassanus*) and a Yellow-Legged Gull (*Larus michabellis*). These seabirds were admitted to a Wildlife Rehabilitation Center (WRC) in Northern Portugal (Vila Nova de Gaia), during October and November 2016, where they succumbed to death.

Case one:

A juvenile female Northern Gannet (*M. bassanus*) was admitted to the WRC exhibiting extreme emaciation, weakness, dehydration, and lethargy. Unfortunately, the animal died on the same day, shortly after initiation of supportive treatment. During the post-mortem examination, a rigid structure inside the proventriculus was noted, deforming the organ (Fig. 1A). Further dissection showed that the proventriculus contained a 20×3 cm piece of blue rope (Fig. 1B, C). Dark red lesions with sunken centers and irregular black-tinged margins of various sizes, consistent with ulcers, were observed on the proventricular mucosa (Fig. 1C). Additionally, enteritis and a pale, friable liver were noted during the necropsy.



Figure 1: A – distended proventriculus in a juvenile Northern Gannet (*M. bassanus*); B – opened proventriculus; C – 20×3 cm blue rope removed from the proventriculus; D – hemorrhagic content due to proventricular ulcer.

Case two:

A juvenile female Northern Gannet (*M. bassanus*) was admitted to the WRC displaying signs of extreme emaciation, weakness, and dehydration. The clinical examination revealed an amputation of the right hind limb below the ankle joint in the tarsometatarsus, with evident signs of infection (Fig. 2A). Unfortunately, the animal succumbed on the day of admission. The post-mortem examination showed a low body condition with no fat reserves, thickening of the air sacs, and the presence of nematodes of the suborder Ascaridomorpha in the proventriculus (Fig. 2B). Additionally, ventricular ulceration and hemorrhagic enteritis were noted.



Figure 2: A – amputation of the right hind limb below the ankle joint in the tarsometatarsus (arrow) with signs of infection in a Northern Gannet (*Morus bassanus*); B – nematodes of the suborder Ascaridomorpha in the proventriculus (arrow) and hemorrhagic content in the bird.

Case three:

A juvenile female, Yellow-Legged Gull (*L. michabellis*), was admitted to the WRC and died upon admission. During the external examination, a black lash line was found wrapped around the posterior portion of the tarsometatarsus, resulting in partial amputation of the foot (Fig. 3). The bird was emaciated and exhibited dark discoloration in the tissues of the affected leg. The post-mortem examination revealed poor body condition, with no fat reserves and an empty gastrointestinal tract.



Figure 3: A black lash line wrapped around the posterior portion of the tarsometatarsus of a Yellow-Legged Gull (*Larus michabellis*), with partial amputation of the foot (arrow).

DISCUSSION

In the first case described, the rope appeared to obstruct the passage of food into the small intestine, preventing the animal from obtaining sufficient calories and leading to increasing weakness and eventual death by starvation. Pierce et al. (2004) reported a similar incident, where plastic caps were found blocking the pylorus of two adult *M. bassanus* in the USA (Pierce et al., 2004).

In moribund seabirds admitted to the WRC, the plastic was not initially detectable by radiograph or physical examination. Only necropsy or surgery can confirm the presence of this material in their stomachs. Unfortunately, necropsies are not conducted regularly at WRC, making it difficult to ascertain the exact number of animals that succumb to plastic ingestion. Many carcasses quickly sink into the ocean or are consumed by scavengers, further complicating these efforts (Stephen and Burger, 1994; Van Pelt and Piatt, 1995; Wiese, 2003). Plastic debris can remain in the digestive system for six

months to two years (Ryan and Jackson, 1987). It is unclear where the birds encounter this debris and when they ingest it.

In cases two and three, as well as other instances, amputation of the hind limbs was noted, associated with entanglement in fishing nets. Such leg amputations can have profound and often devastating effects on aquatic birds, severely compromising their ability to survive in their natural habitats (Kühn et al., 2015). For birds that depend on their legs for swimming, walking, hunting, and nesting, limb loss can significantly impair their mobility and coordination. Without full leg functionality, birds can struggle to maintain balance, navigate through water or on land, and perform essential behaviors crucial for survival. This impairment can hinder their ability to chase prey, dive for food, or evade predators, making them more vulnerable to starvation or predation. Additionally, reduced mobility can affect their ability to migrate or find suitable nesting sites, further impacting their reproductive success and long-term survival (Rodríguez et al., 2013; Ryan, 2018). Upon admission, both animals were severely debilitated, and the loss of a hind limb had likely impeded their ability to feed. Furthermore, leg amputation can lead to secondary health issues, including infections, tissue damage, and chronic pain, which further compromise the bird's overall well-being.

Plastic ingestion and entanglement have been observed in several species of aquatic birds. Although this report describes only one case of ingestion and two cases of entanglement, it underscores the significant negative consequences of plastic on seabirds, which led to the deaths of all three animals involved. While plastic ingestion has previously been documented in Portugal (Basto et al., 2019), this is the first case directly linked to mortality. Future studies should examine the carcasses of seabirds from beach strandings and bycatch to assess the full impact of plastic ingestion on these populations. On the other hand, it is important to report these cases to draw the much needed attention of the academic community and the general public to this modern-day problem that threatens animal populations and, indirectly, humanity.

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Authors' contributions

All authors contributed equally to the preparation of this case.

Competing interests

The authors declare that they have no competing interests.

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UGINUĆA MORSKIH PTICA USLED KONZUMIRANJA PLASTIKE I UPETLJAVANJA U MREŽE – PRIKAZ TRI SLUČAJA

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Kratak sadržaj

Plastični otpad predstavlja značajnu pretnju morskim ekosistemima, posebno utičući na populacije morskih ptica širom sveta. U ovom radu, autori dokumentuju slučajeve uginuća povezane s konzumiranjem plastike severnog gnjurca (*Morus bassanus*, Linnaeus, 1758) i upetljanošću u mreže žutonoge galebice (*Larus michabellis*, Naumann, 1840) i severnog gnjurca (*M. bassanus*, Linnaeus, 1758) u severnom Portugalu. Sve tri jedinke su uginule usled upetljanosti u plastiku ili njenog konzumiranja. Iako ovaj rad opisuje samo tri slučaja, naglašava ozbiljne negativne posledice plastike na morske ptice, koje u krajnjem slučaju dovode do uginuća.

Ključne reči: ptice, upetljanost, konzumiranje, morska ptica, plastika