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PLASTIC DEBRIS-INDUCED FIN DAMAGE IN THE SMOOTHHOUND, *MUSTELUS MUSTELUS*

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ABSTRACT

Marine debris is considered a serious threat to the survival of sharks and rays worldwide. Although entanglement with floating plastic debris has been reported in several shark species, this is the first report of this threat and the resulting mechanical trauma in the triakid shark Mustelus mustelus *from the Sea of Marmara.*

Key words: Plastic, entanglement, smoothhound, trauma, Sea of Marmara

DANNI ALLE PINNE INDOTTI DA DETRITI PLASTICI IN PALOMBO LISCIO, *MUSTELUS MUSTELUS*

SINTESI

I detriti marini sono considerati una grave minaccia per la sopravvivenza di squali e razze in tutto il mondo. Sebbene l'impigliamento con detriti di plastica galleggianti sia stato segnalato in diverse specie di squali, questa è la prima segnalazione di questa minaccia e del conseguente trauma meccanico nel palombo liscio Mustelus mustelus *nel Mar di Marmara.*

Parole chiave: plastica, impigliamento, palombo liscio, trauma, Mar di Marmara

INTRODUCTION

The Anthropocene has been defined as an epoch in which the most fundamental biochemical processes and biodiversity on Earth have undergone dramatic changes due to anthropogenic activities (Lewis & Maslin, 2015; Lipej *et al.*, 2022). During this epoch, species comprising the megafauna in particular have suffered major losses in terrestrial and marine ecosystems (Lewis & Maslin, 2015; Lipej *et al.*, 2022). According to Lewis and Maslin (2015), Anthropocene is also characterized by the unavoidable and increasingly severe pollution of all ecosystems. Among the pollutants that pose a serious threat to the health and sustainability of marine life are marine plastics (MaPs) (Gündoğdu *et al.*, 2020). According to Aytan *et al.* (2022) the impact of MaPs on ecosystems and organisms has increased rapidly in recent decades and is expected to increase in the future. Pollution caused by MaPs is now considered a global environmental problem that negatively affects marine biodiversity (Bottari *et al.*, 2024), and this hazardous situation is known to affect many different taxa in the sea via a plethora of different mechanisms (e.g., entanglement, ingestion, intoxication, etc.) (Lipej *et al.*, 2022). In a recent study, Gündoğdu *et al.*, (2020) reported that 2249 marine taxa are threatened by plastic pollution, including sharks and rays (Lipej *et al.*, 2022).

Here we report the first documented case of plastic strap entanglement causing fin damage in the smoothhound, *Mustelus mustelus* (Linnaeus, 1758) (Carcharhiniformes: Triakidae).

MATERIAL AND METHODS

A specimen of smoothhound shark was incidentally captured in a commercial trammel-net fishery with a stretched mesh size of 120 mm deployed for demersal bony fishes in the northern Sea of Marmara (Fig. 1). Although the smoothhound does not currently have protection status in Turkish seas, the present specimen was released back into the sea after being photographed and measured. Identification of the present specimen was based on the photographs sent by the fisherman and follows Ebert *et al.* (2021) and Barone *et al.* (2022). Photographs of the present specimen are preserved in the archive of the first author and can be made available upon receiving permission from the fisherman.

RESULTS AND DISCUSSION

A female specimen with a total length of 120 cm and weighing 8,000 g (Fig. 2), was caught during commercial trammel-net fishing at a depth of approximately 100 m off the coast of Silivri (40°57.494′ N, 28°19.190′ E) in the northern Sea of Marmara (SoM).

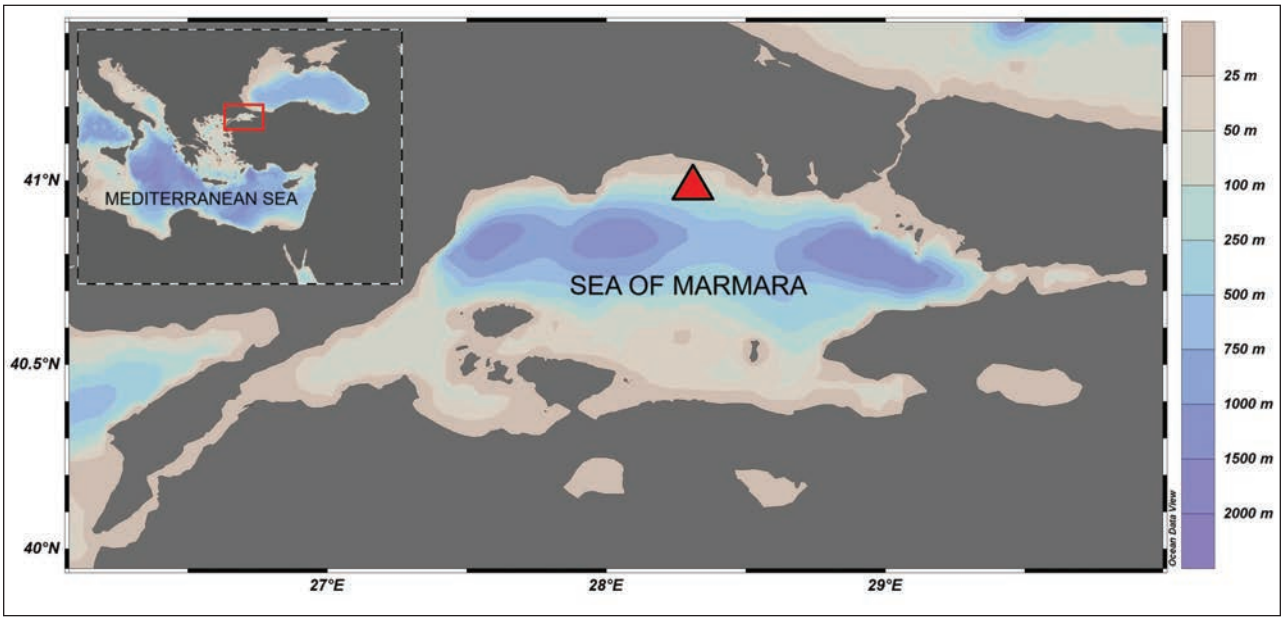

Fig. 1: Map showing the approximate locality (red triangle) of the capture of the specimen of smoothhound. Red rectangle in the small map shows the geographical position of the Sea of Marmara in the Mediterranean ecosystem. Sl. 1: Zemljevid, ki prikazuje približno lokacijo (rdeči trikotnik) ujetega osebka navadnega morskega. Rdeči pravokotnik na majhnem zemljevidu prikazuje geografski položaj Marmarskega morja v sredozemskem ekosistemu.

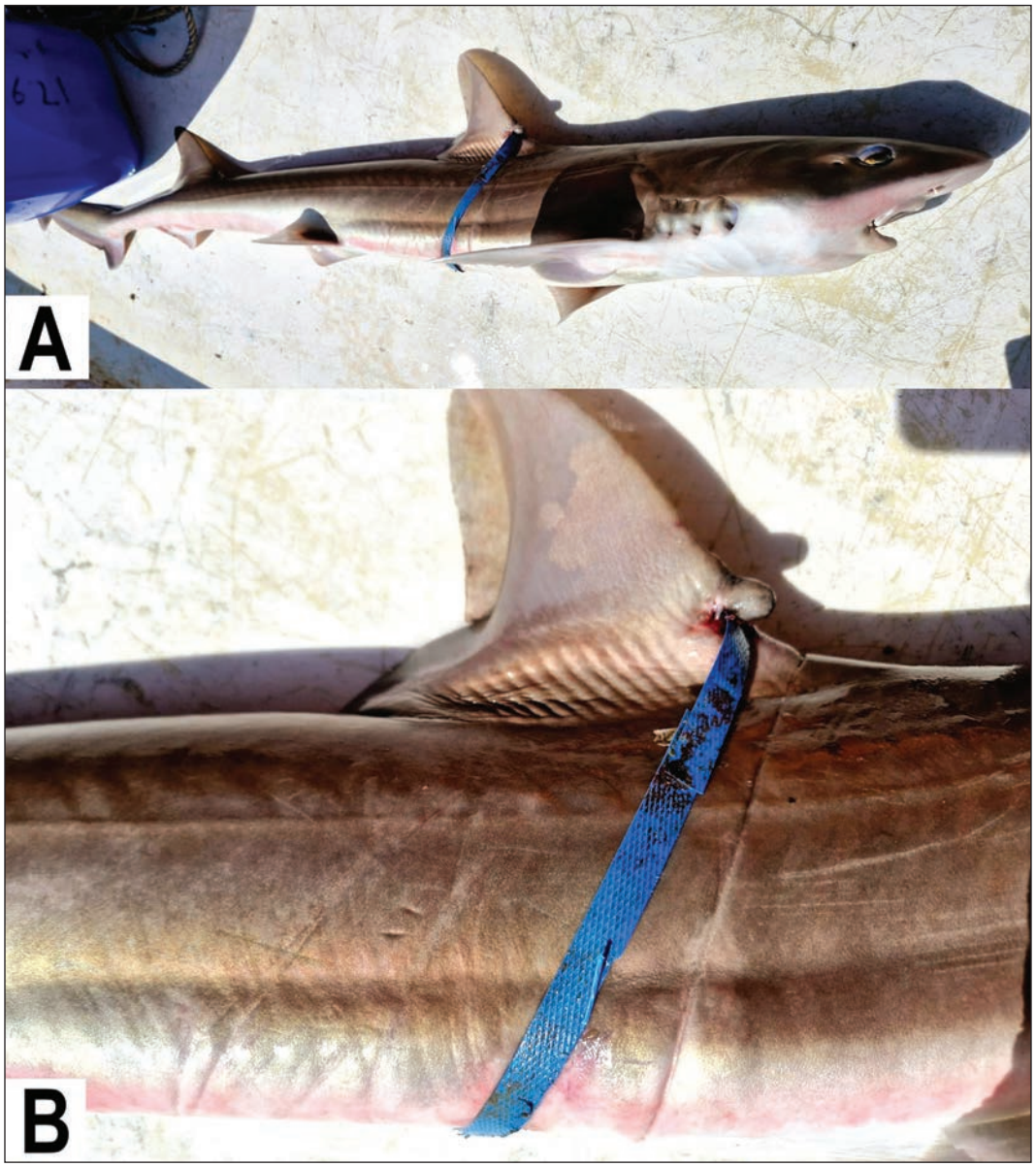

Fig. 2: A: The smoothhound** (Mustelus mustelus) **entangled in a plastic strap, and B: Close-up of the deep laceration on the anterior edge of the shark's first dorsal fin. (Photo: B. Köksalan)
Sl. 2: Navadni morski pes** (Mustelus mustelus)**, zapleten v plastični trak (A), in B: bližnji pogled na globoke raztrganine na sprednjem robu prve hrbtne plavuti morskega psa. (Foto: B. Köksalan)

It was a medium to moderately large-sized shark with a short head and snout. The posterior edges of the dorsal fins, which were large and almost equal in height, were not fringed. The pectoral and pelvic fins were moderately large. The dorsal colouration was uniformly grey to grey-brown and lighter below, without any dark or bright spots on flanks. This brief description of the present specimen is consistent with those provided by Ebert *et al.* (2021) and Barone *et al.* (2022), thus the present specimen was identified as *Mustelus mustelus*.

The specimen was entangled in a plastic strap. According to the fisherman's statement, the plastic strap was tightly wrapped around the shark's trunk, damaging the main cartilaginous skeletal elements at the anterior margin of the first dorsal fin and causing haemorrhagic trauma in this area. Abnormal tissue growth occurred where the plastic strap had damaged the anterior margin of the first dorsal fin. It was also observed that the upper part of the dorsal fin was permanently bent due to the pressure exerted by the plastic strap. The tight fit of the plastic strap on the first dorsal fin and

tissue damage suggest that the entanglement occurred a considerable time ago.

According to Afonso and Fidelis (2023), long-term (≥9 months) entanglement of sharks in plastic straps can increase their post-release mortality, even following strap removal, indicating that freeing sharks from such entanglements may often prove ineffective in ensuring their survival. The trauma caused by the mechanical stress of the plastic strap tightly wrapping the shark's body, causing deep lacerations in the dermis and underlying muscle mass, compromises the health and fitness of the shark in the short to medium term (Afonso & Fidelis, 2023). Therefore, although the shark in this case was released alive, the deep haemorrhagic laceration on its first dorsal fin strongly suggests it would have subsequently died.

The majority of the research on the effects of marine plastics on sharks and rays (elasmobranchs) has focused on microplastic ingestion and its aftereffects; however, entanglement in marine debris has also received attention as an important cause of morbidity and mortality in these vulnerable meso- and mega-predators (Lipej *et al*., 2022). Parton *et al*. (2019) reviewed 26 scientific articles related to 47 entanglement events involving 34 elasmobranch species in different marine regions, but the smoothhound was not among them. Although there has been a significant increase in the number of studies on the effects of plastic debris on elasmobranchs, which include some of the flagship species of marine ecosystems, in recent years (reviewed in Lipej *et al*., 2022), studies on the effects of MaPs on marine organisms in Turkish seas have mostly focused on commercial fish species (Gündoğdu *et al*., 2020; Aytan *et al*., 2022). Pollution is now considered one of the main threats contributing to the extinction crisis of one third of all sharks and rays worldwide (Dulvy *et al*., 2021), which have an evolutionary history of at least 400 million years and play crucial roles in the marine ecosystem (Compagno, 1990). It is therefore necessary to regularly monitor the effects of MaPs on sharks and rays in Turkish waters. Despite being a small marine basin, the SoM is severely affected by pollution and anthropogenic impacts, which threaten the biodiversity of the region (İşinibilir *et al*., 2024). Due to the frequent occurrence of mega-spawning individuals of *M. mustelus* in the coastal waters of the SoM (Kabasakal *et al*., 2025), monitoring the potential impacts of MaPs represents a critical consideration for regional conservation strategies targeting vulnerable species such as sharks. In line with this, the incident described in this study – photographed by a commercial fisherman and reported to the researchers with related information – highlights the value of cooperation between citizen scientists and professional researchers in tracking the effects of MaPs on sharks and rays in Turkish seas.

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POŠKODBE PLAVUTI PRI NAVADNEM MORSKEM PSU, *MUSTELUS MUSTELUS*, ZARADI PLASTIČNIH ODPADKOV

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POVZETEK

Morski odpadki resno ogrožajo preživetje morskih psov in raž po vsem svetu. O zapletanju s plavajočimi plastičnimi odpadki so poročali že pri več vrstah morskih psov, pričujoči prispevek pa prvo poročilo o tej grožnji in posledični mehanski poškodbi pri navadnemu morskemu psu, Mustelus mustelus *(družina Triakidae) iz Marmarskega morja.*

Ključne besede: plastika, zapletanje, navadni morski pes, travma, Marmarsko morje

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