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First record of *Odontesthes bonariensis* (Valenciennes 1835) captured live entangled in a plastic ring in a protected marine area of South America

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Abstract: Entanglement by plastics affects the survival of marine biota. Fish entanglements are reported in the literature, mostly by ghost nets. Here we recorded the staggering of the fish *Odontesthes bonariensis*, captured live entangled in a plastic ring from a terrestrial source.

Key words: Plastic debris, fish entanglement, sublethal effects.

Primeiro registro de *Odontesthes bonariensis* (Valenciennes 1835) capturado vivo em um anel plástico em uma área marinha protegida na América do Sul. Resumo: O emaranhamento por plásticos afeta a sobrevivência da biota marinha. Os peixes emaranhados são relatados na literatura, sendo que a maioria ocorre por redes fantasma. Registramos o peixe *Odontesthes bonariensis*, capturado vivo e emaranhado em um laço plástico de uma fonte terrestre.

Palavras-Chave: Resíduos plásticos, emaranhamento de peixes, efeitos subletais.

Pollution of marine environments by marine debris, including plastics, is a consequence of the development of the Anthropocene period on Earth (Rhodes 2018). Plastic pollution damages marine biota in a number of ways, through consumption and entanglement, accumulating on the sea floor and facilitating invasions by non-native species (Derraik 2002, Wilcox *et al*. 2018, Mascarenhas *et al*. 2004, Basto *et al*. 2019, Azevedo-Santos *et al*. 2019). Extensive scientific literature evidences this interaction between marine biota and plastic debris. About 340 original publications reported 693 species entangled with marine debris, mostly plastic debris (92%) including numerous direct and indirect consequences, with sublethal effects such as ingestion and entanglement (Gall & Thompson 2015). According to Derraik (2002), the principal threats to marine life interaction with plastic debris are mechanical due to ingestion and entanglement with packaging bands, synthetic ropes and lines, or drift nets. Once an animal is entangled it may drown, reduce its ability to catch food, to avoid predators, or suffer injuries due to the abrasive or cutting action of the attached debris (Laist 1987; 1997, Jones 1995, Blettler & Wantzen 2019). Entanglement can greatly reduce fitness, as it leads to a significant increase in energetic costs of travel (Derraik 2002). The negative consequences are increased when entanglement occurs with ghost nets, which in addition to causing injuries and infections increased predation rates and reduced growth (Bletter & Waitzen 2019). Entanglement has relevance and also affects the survival of endangered sea turtles, fishes, seabirds, and marine mammals such as seals, which are both curious and playful (Mattlin & Cawthorn 1986, Carr 1987, Sazima & D'Angelo 2016, Lenzi *et al*. 2016, Ryan 2018, Kowalski & Jenkins 2021). In this sense, entanglement accounts for 13–29% of the observed mortality of gannets (*Morus bassanus*) at Helgoland, German Bight (Schrey & Vauk 1987, Rodriguez *et al*. 2013), decline in the populations of the northern sea lion (*Eumetopias jubatus*), endangered Hawaiian monk seal (*Monachus chauinslandi*) (Henderson 1990, 2001) and northern fur seal (Fowler 1987), among many other examples (Mattlin & Cawthorn 1986, Weisskopf 1988, Croxall

et al. 1990). Marine mammals usually approach objects in the water and often stick their heads into rings and holes (Fowler 1987, Laist 1987). Though the plastic rings can easily slip onto their necks, the lie of the long guard hairs prevents the strapping from slipping off (Mattlin & Cawthorn 1986, Derraik 2002). Even several fish and crustacean species were found entangled in the region (south Brazil) with lethal and sublethal effects (Adelir-Alves 2016). Despite fish entanglement being registered in scientific literature mainly by "ghost nets" (DeGange & Newby 1980, Blem *et al*. 2002, Kowalski & Jenkins 2021), to date there is no regional evidence of marine fish's entanglement by plastics from terrestrial source. Fish physiognomy, size, and trophic habits might determine the interaction with plastic debris (Davison & Asch 2011, Lusher *et al*. 2013), including entanglement.

We registered the offbeat record of the entanglement of a fish, *Odontesthes bonariensis* (Atheriniformes, Atherinopsidae), commonly known as Pejerrey, captured live with a floating plastic ring from a terrestrial source, in the protected marine area Cerro Verde and Coronilla islands. The species has a fine and elongated body, measuring about 50 cm and has no external difference between males and females (Mancini *et al.* 2016). It is piscivorous and inhabits euryhaline coastal areas. The fish was collected from coastal waters (depth < 15m) in La Coronilla, Rocha-Uruguay (33°50´ S; 53°27´ W), during a biodiversity monitoring activity using small mesh gill nets that target small fishes (mesh size 5 cm).

The fish length was 30.4 cm and a width of 6.2 cm. The plastic piece was circular in shape, white colour and 5 cm in diameter (Fig. 1). The plastic ring was associated with the construction sector, as it was identified as the cover of a Teflon tape.

The plastic ring width is 1.2 cm smaller than the fish's width (6.2 cm). The injuries caused by the plastic item suggests that the entanglement happened when the fish had a smaller size. Evidently, the fish's body growth did not stop due to entanglement, although biological performance could have been negatively affected. This interaction did not affect its survival, at least at medium term. In particular, the affected area is close to the urogenital tract, which may have had negative consequences on the reproductive functions. Sublethal effects of plastic and animals´ interaction might allow animals to survive but with obviously negative consequences (Fig. 2). While there is evidence of a live fish caught, trapped in a plastic bottle in southern Brazil (Azevedo-Santos *et al*. 2021), this is the first record of a live marine fish with signs of growth, entangled in a plastic ring of terrestrial origin.

Reporting occasional impacts of plastic pollution on marine biota is relevant to enlarge our understanding of the entanglement problem. In this sense, if the event is reported in a marine protected area far from urban centers, it becomes even more relevant. Although the plastic waste that enters the oceans comes from diverse and diffuse sources, it is estimated that 80% of them have a terrestrial origin (Sherrington *et al*. 2016). In this context, the rivers and streams that connect the land with the ocean are truly routes for transporting plastic waste (Small & Nicholls 2003). Within the protected area Cerro Verde and La Coronilla, an artificial channel, Canal Andreoni with 86 km of total length flows, discharges freshwater into the Atlantic Ocean, on the SW extreme of the 22 km exposed sandy beach located near La Coronilla resort. The Canal

Figure 1. Entangled marine fish *Odontesthes bonariensis*, in a floating plastic ring, collected from coastal waters (z < 15m) in La Coronilla, Rocha-Uruguay (33°50´ S; 53°27´ W).

Figure 2. Sublethal effects of plastic entanglement of fish collected from coastal waters (z < 15m) in La Coronilla, Rocha-Uruguay (33°50´ S; 53°27´ W).

Andreoni not only transports large amounts of waste to the sea (Limongi per. obs.), but also causes a variety of environmental problems in the area (Sauco *et al.* 2010, Lercari *et al* 2002, 2010, Lercari & Defeo 2003; 2006, Lozoya & Defeo 2006). The plastic object stuck in the fish body corresponds to a Teflon tape cover. According to a report by DINAMA (Limongi 2020), the Uruguayan construction sector sells about 20.694,6 tons of plastic per year. Due to an inefficient waste collection system, part of this plastic debris might escape and could be indirectly reaching the Uruguayan seafront (Lozoya *et al.* 2015). The concerned concentration of plastic pollution in the area, and the particularly fine and elongated body shape of *O. bonariensis*, might be the plausible mechanisms to explain this offbeat record. Although there is no monitoring conducted in the area, recent works on nearby beaches evidence the presence of plastic waste on the Uruguayan Atlantic coastal zone (Rodriguez *et al.* 2020, Lozoya *et al.* 2016), as well as plastic consumption by coastal fish (Limongi *et al.* 2019) and birds (Lenzi *et al.* 2016). A broader geographical effort in collection and reporting entanglement data will aid our efforts to pinpoint priority mitigation measures.

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Ethics statement

Collection and manipulation of specimens during this investigation fulfilled all applicable regulations regarding animal welfare and were approved by the responsible authorities.

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