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Bugs R All
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Ghost fishing of the Atlantic Ghost Crab

Scientists are concerned about fishery impacts on marine life. Ghost fishing occurs when lost or abandoned fishing gear continues to catch organisms. Annually, approximately 640,000 tons of fishing gear are lost in the marine environment (Macfayden et al. 2009).

Atlantic Ghost Crab *Ocypode quadrata* at Grussaí Beach in southeastern Brazil. © Danilo Rangel.

Ghost fishing occurs mainly with cage traps, gillnets, trammel nets and small seine nets (Matsuoka et al. 2005). Lost traps are conjectured to last for a relatively short period of time in shallower waters, but depending on the fishing gear, they can maintain their capture for years (Matsuoka et al. 2005).

Ghost Crabs *Ocypode quadrata* entangled in a derelict fishing gear on the beach sand in southeastern Brazil. A burrow was constructed on the side of a trunk and net. © Leonardo Costa.

Consequently, well-known disastrous effects of this 'ghost fishing' include high mortality rates of charismatic marine fauna, including marine turtles, seabirds, and mammals on coastal areas. Part of lost fishing gears

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achieves sandy beaches. From marine to terrestrial zones of this ecotone, a teeming of microscopic and macroscopic organisms coexists. The spectrum of life in the sand includes transitional nesting turtles, birds, surf zone fishes, and endemic clams, whelks, worms, sand hoppers, sand dollars, and crabs, all of them threatened by marine litter. Carcasses of large animals entangled with fishing gears commonly strand on sandy beaches. Nevertheless, endemic fauna has also been reported to interact with marine litter (Gusmão et al. 2016; Costa et al. 2018, 2019a, 2019b). A bulk of knowledge about interaction of beach invertebrates with marine litter is now available in the literature, including direct interaction by confusion, ingestion and risk of trophic transfer (Lourenço et al. 2017; Costa et al. 2019a, 2019b). However, although ghost fishing can potentially exert mortality of surface-active organisms on sandy beaches, the occurrence of these events is underexplored.

The Ghost Crab *Ocypode quadrata* (Fabricius, 1787) is an endemic crustacean from Atlantic sandy beaches. The species usually has nocturnal activity and feed on wrack, carrion, macroinvertebrates and vertebrates' eggs or hatchlings (Tewfik et al. 2016). One of their most conspicuous characteristics is the construction of semi-permanent burrows on the sand. It is common to find burrows around freshly deposited food as an opportunistic behavior (Schlacher et al. 2013). Although ghost crabs visually detect objects and predators at tens of meters, their ability to visualize objects around their usage area is limited and chemical senses are more commonly used to detect food (Lucrezi & Schlacher 2014). For this reason, ghost crabs interact with odorized marine debris, misidentifying them as food sources (Costa et al. 2019).

Here, we present the first report of 'ghost fishing' of an endemic species from sandy beaches, the Atlantic Ghost Crab *O. quadrata*. This impact was found at Grussaí Beach (-21.723^{0} S, -41.024^{0} W), northern Rio de Janeiro State, Brazil on November 2017. Two individuals were found entangled in a derelict fishing gear on the sand. The construction of a burrow on the side of a trunk represents a common behaviour that probably benefits the ghost crab with higher sediment and burrow stability and/or spatial memorization (Lucrezi & Schlacher 2014). In addition, the presence of a carrion (i.e., dead animals) represents a feeding opportunity (Schlacher et al. 2013) and may have induced the crabs to construct a burrow around the gillnet. As ghost crabs use mainly chemical senses to recognize potential food, it is possibly that the first crab was randomly entangled and the next ones were captured during the feeding on the first crab. Otherwise, all the crabs might have been

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randomly entangled. Due to limited short-distance vision, it is unlikely that ghost crabs are able to avoid entanglement in fishing gears on the sand. Derelict nets can act as a barrier for movement not only of crabs, but also of sea turtles' hatchlings and nesting females and any surface-active species (Triessnig et al. 2012; Battisti et al. 2019). Therefore, ghost fishing can impose a further mortality source to fauna on sandy beaches.

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