Short Communication:
Humpback whales demonstrate group protection response to killer whale harassment in Brazil

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ABSTRACT

Mixed species groups are usually associated with group protection to avoid predation. Reports of killer whale occurrence and attacks are scarce in Brazilian waters. Here we report the first case of an attack by killer whales on a mixed group of humpbacks (*Megaptera novaeangliae*) and a southern right whale (*Eubalaena australis*). This is also the first report of humpback whales possibly interfering with killer whales harassing right whales. The recent increase in humpback and southern right whale populations in Brazil may be influencing the presence of killer whales, which are known to attack humpback whales.

KEYWORDS: PREDATION; ORCINUS ORCA; EUBALAENA AUSTRALIS; MEGAPTERA NOVAEANGLIAE; CABO FRIO

The killer whale (*Orcinus orca*) is a cosmopolitan predator distributed throughout all ocean basins (Forney *et al*., 2006; Ford *et al*., 2009). Killer whales perform complex hunting behaviours, with distinct ecological specialisations. For example, ‘resident-type’ killer whales feed primarily on fish, while ‘transient-type’ killer whales prey on over 20 species of marine mammals around the world, including humpback whales (*Megaptera novaeangliae*) and right whales (*Eubalaena australis* and *Eubalaena glacialis*) (Jefferson *et al*., 1991; Sironi *et al*., 2008). In the north Pacific, ‘resident’ killer whales are better studied (e.g., Bigg *et al*., 1990; Krahn *et al*., 2002; Durban & Volker, 2011; Ford *et al*., 2011; Hanson *et al*., 2021), whereas ‘transient’ killer whales are still little understood because they travel long distances with no apparent site fidelity. In the southwest Atlantic, records of killer whales are rare in both coastal and offshore waters (Lodi & Hetzel, 1998; Secchi & Vaske Jr., 1998; Siciliano *et al*., 1999; Iñíguez, 2001; Dalla Rosa *et al*., 2002; Di Tullio *et al*., 2016; Ott *et al*., 2017; Sucunza *et al*., 2022), especially in southeastern and southern Brazil where research efforts are concentrated. Despite the lack of obvious seasonal patterns in Brazilian waters (Dalla-Rosa *et al*., 2002), sightings have been more common in austral spring and summer from opportunistic observations (Lodi & Hetzel, 1998; Siciliano *et al*., 1999; Santos & Netto, 2005; Santos & Silva, 2009; Lodi & Farias, 2011; Ott *et al*., 2017; Sucunza *et al*., 2022; Athayde *et al*., 2023) and systematic cetacean surveys (Di Tullio *et al*., 2016; Martins *et al*., 2023).

Killer whale occurrence in Brazilian waters is still little understood. Reports of attacks are globally scarce (Hucke-Gaete *et al*., 2004; Reeves *et al*., 2006; Alava *et al*., 2013) and even more so in Brazil, with significant...
knowledge gaps on predator-prey strategies, attacked species and temporal patterns (Sucunza et al., 2022). As a transient-like ecotype, the killer whales in Brazilian waters are expected to prey primarily on mammals. For example, there are reports of attacks on franciscana dolphins (*Pontoporia blainvillei*) (Santos & Netto, 2005), minke whales (*Balaenoptera spp.*) (Troina et al., 2020) and harassment of sperm whales (*Physeter macrocephalus*) (Sucunza et al., 2022). Here we report the first case of a killer whale attack on a mixed group of humpback whales and a southern right whale.

Both humpback and southern right whales use the coast of Brazil during their winter migrations. The humpback whale is a migratory species of baleen whale found in oceans around the world (Fleming & Jackson, 2011; Jackson et al., 2014). The ‘A’ stock breeds in Brazil from late austral fall to late austral spring and has been recovering rapidly in recent years, reaching more than 90% of its pre-exploitation population size (Bortolotto et al., 2016; Zerbini et al., 2019). In Brazil, its breeding area reaches from Rio de Janeiro State in southeastern Brazil to northeastern Brazil (Zerbini et al., 2019). Southern right whales (‘right whales’ hereafter) also perform seasonal migration, breeding in southern Brazil from winter to spring. Historically, this breeding occurred from southern to northeastern Brazil, but due to intense whaling efforts, its breeding range is now concentrated in southern Brazil (Groch, 2017). Rapid population recovery (Groch et al., 2005; Romero et al., 2022) has recently resulted in sporadic right whale records in southeastern Brazil (Figueiredo et al., 2017). For example, Siciliano et al. (2006) report right whales accompanying groups of humpback whales during migration in the Campos Basin.

Our record was made during a long-term cetacean monitoring study off the coast of Rio de Janeiro State, southeastern Brazil. Between 1 and 5 August 2023, we conducted systematic surveys in the waters of Arraial do Cabo, Cabo Frio and Armação dos Búzios municipalities to investigate cetaceans’ ecological, acoustic and behavioural features. From spring to summer, an upwelling phenomenon in the region, driven by north-northeastern wind and the formation of meanders and cyclones offshore, enhances local productivity (Carbonel, 1998; Coelho-Souza et al., 2012). We conducted boat surveys under Beaufort condition ≤3, with boat speeds between 15–20 km/h (8–10 knots), following haphazard routes to cover the study area. Every time we spotted a cetacean group, we slowed down, photographed their individual marks and features using a CANON EOS 70D with 75–300 mm lens, georeferenced the individuals with a GARMIN MAP 78 and collected behavioural data in a standardised spreadsheet (Tardin et al., 2017). We also recorded acoustic data using a Sound Trap ST300HF with a sampling rate of 576 kHz/16 bit.

On 3 August 2023, we sighted a pair of mother-calf right whales but no humpback whales. On 4 August, a group of citizen scientists informed us that a mixed group of humpback and right whales was sighted in the area (Figure 1). When we sighted the group at ca. 500 m distance, we observed intense surface activity, including humpback whales breaching, with fluke and flipper slaps. During our approach, we sighted a mixed group of five humpback whales (four adults and a calf) and one adult right whale swimming in a diamond formation, keeping the right whale in the centre of this group. All whales kept a close distance from each other – no more than one body length apart. No killer whales were observed at this point. Our photo-ID data revealed that it was a different adult right whale from the day before. After this initial observation, we moved away (~200 m) to collect acoustic data. In these recordings, we identified right whale calls, and even though we had not yet seen killer whales, we also detected killer whale whistles. In the last two minutes of this recording, we observed the mixed group swimming fast with erratic movements, intense surface activity, including fluke slaps, flipper slaps and strong loud blows. At the end of this five-minute recording, humpback whales swam away from the right whale. Humpback whale calls were only detected when we observed the mixed group separating, just before we ended the recording. As we approached the right whale, we observed three killer whales, two females and a calf, chasing the former, who increased its speed towards the coast. A sequence of attack attempts by the adult killer whales then began, lasting seven minutes. The two adult killer whales swam parallel to the right whale, one at each side, and attempted to bite its abdomen multiple times while approaching the right whale by the flanks, forcing it to swim faster in a sideways position during these bite attempts (Figure 1). The killer whale calf, despite being present in the group, did not attempt any attack but remained next to its potential mother. As a probable anti-predatory behaviour, the right whale increased its speed when the killer whales were close and tail-slapped
to avoid the killer whales’ attacks. After seven minutes of harassment, the killer whales abandoned the chase and swam towards offshore waters. Meanwhile, the right whale was observed again close to shore where it approached the research vessel. No bite or blood was observed. On the next day (5 August), citizen scientists observed a pair of mother-calf right whales about 4 km from the position of the attack and we observed multiple humpback whales at ~7 km from the shore. After we left the right whale mother-calf pair, we observed a pod of nine killer whales closer to the coast in the same area where the first attack occurred. This pod comprised a male, seven females and a calf, exhibiting foraging behaviour close to an island while emitting several echolocations clicks. We observed the pod for approximately five hours, during which time they conducted long dives (~5 minutes) and kept foraging along the region where the attack had occurred the previous day. Afterwards, the pod travelled north and was observed by tourists in Armação dos Búzios, an adjacent town ~40 km in linear distance.

‘Transient’-type killer whales are poorly understood, especially in the southwest Atlantic Ocean. Reports of harassment or attacks in Brazilian waters are scarce and indicate that franciscana dolphins (Santos & Netto, 2005), minke (Troina et al., 2020) and sperm whales (Sucunza et al., 2022) were already targeted. Worldwide, humpback whales are more frequently reported to be preyed upon or harassed by killer whales, especially in the Northern Hemisphere (Jefferson et al., 1991). However, little is known about killer whale attacks on southern right whales and their anti-predatory behaviour(s). In Argentina’s Patagonia, Sironi et al. (2008) suggest that right whales have

Figure 1. Schematic drawing representing the event of killer whale harassment of a mixed group of humpback whales and a southern right whale in Brazil: (I) mixed group in diamond formation; (II) separation of the mixed group; (III) group of orcas chasing the southern right whale; (IV) adult orcas attempt to bite the right whale’s abdomen; (V) georeferenced sightings between 3–5 August 2023.
shifted their core habitat use over three decades, possibly due to predator pressure. They also report similar anti-predatory behaviours to the tail slap and diving in shallow waters which we observed. Zhe et al. (2022) propose that mother and calf pairs of southern right whales prefer shallow waters as nursery sites, where sound propagation is lower, to reduce the chance of being detected by predators, especially killer whales. A similar situation was also observed in Cabo Frio, where mother-calf pairs were seen in shallow and sheltered waters (Figure 1).

Humpback whales are known to interfere with killer whales’ harassment of other marine mammals. Pitman et al. (2017) reviewed 115 accounts of interactions between killer whales and humpback whales. In 89% of these cases, humpback whales helped 10 other species rather than co-specifics. On numerous occasions, humpback whales approached other species in an attempt to separate them from killer whales. They exhibited vigorous surface behaviours, such as the tail and pectoral fin slaps, as observed in the present case. It is also worth noting that, to the best of our knowledge, our study is the first to report humpback whales possibly interfering with killer whales harassing right whales.

Humpback whales appear to have displayed group protection behaviour to protect the right whale from orcas. This was evidenced by the formation of the mixed group swimming at less than one body length apart and the intense surface activity of humpback whales at the beginning of the harassment, similar to the events compiled by Pitman et al. (2017).

The significant increase in humpback whale stock ‘A’ in recent years is noteworthy (Zerbini et al., 2019). In Rio de Janeiro (~110 km south of Arraial do Cabo), humpback whales have been increasingly observed in large numbers travelling through a migratory corridor about 10 km from the coast (Lodi et al., 2020). In Arraial do Cabo, where the harassment occurred, newborn humpback whale calves and male competing groups have been observed more often in the last three years by citizen scientists and our research group (R. Tardin, pers. comm.). These observations were not common 10 years ago in the same area (Tardin et al., 2020). The intense and recurring presence of humpback whales in the region may be influencing the presence of killer whales as they are known to attack humpback whales (Naessig & Lanyon, 2004; Mehta et al., 2007, Steiger et al., 2008). More data are needed to corroborate this hypothesis and future studies should be directed towards answering these questions.

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