

## Short Note

### Technique Used by Killer Whales (*Orcinus orca*) When Hunting for Dolphins in Patagonia, Argentina

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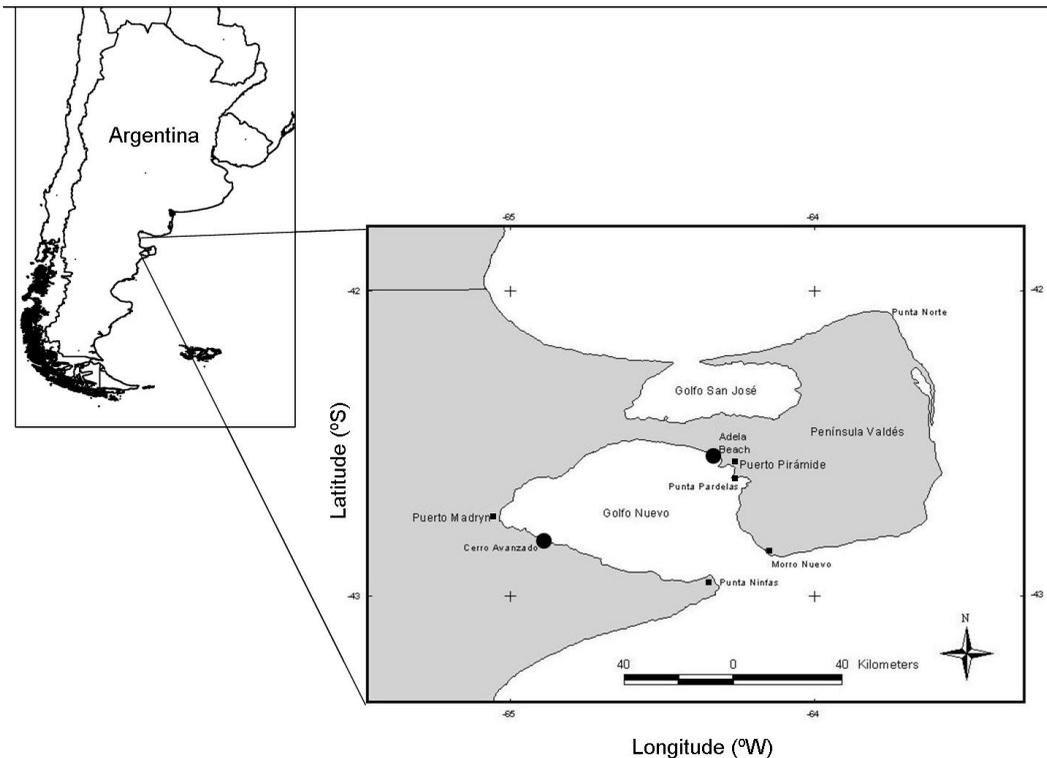
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Killer whales are long-lived social animals and the largest apex predators in the ocean. Their predatory habits have been linked to the dynamics of prey populations as well as whole ecosystems through cascade effects (Estes et al., 2004, 2009; Williams et al., 2004). Understanding the complexity of this regulation by a top predator on sea food webs requires much information on the relationship among the involved species, including their population sizes and diets. This kind of information is seldom available for marine ecosystems (Isbell & Loreau, 2013). As killer whales have been reported to prey on a large diversity of marine animals, including squid, fish, sea turtles, birds, and other mammals (Jefferson et al., 1991; Alava et al., 2013), unravelling their role in the sea food webs is even more challenging.

In Patagonia, in the Península Valdés area (Figure 1), a group of marine mammal eating killer whales has been studied since the mid-1970s. This group achieved international fame because some individuals developed an intentional stranding technique while hunting South American sea lions (*Otaria flavescens*) or elephant seals (*Mirounga leonina*) on the beach (López & López, 1985; Hoelzel, 1991). Killer whales are known to increase both their presence and numbers from March to May in the area when the South American sea lions pups start entering the water (Iñiguez, 2001; Vila et al., 2008). They also are sighted from October to December, the period in which the elephant seals are weaned (Ferrari et al., 2013). The diet of these killer whales is unknown for the rest of the year, although some identified individuals from this group have been

reported hunting sevengill sharks (*Notorhynchus cepedianus*) (Reyes & García-Borboroglu, 2004). The total number of killer whales in this area is currently unknown, but it may be around 30 individuals, and only some of them perform the intentional stranding hunting technique (Hoelzel, 1991). Besides these reports, we are not aware of any diet study regarding this particular group of killer whales. It was always hypothesized that Patagonian killer whales fed on dolphins inhabiting Patagonian gulfs (Garaffo et al., 2007), but there have been no published reports of it up to this date.

This is the first report of attacks and predation on dolphins by this marine mammal eating group and, to our best knowledge, in all Patagonia. On 22 February 2013 at 1107 h, a group of six killer whales was found near Cerro Avanzado (Figure 1). The group was comprised of an adult male, four juveniles (female), and one calf. The killer whales were socializing and interacting with the 12-m semi-rigid hull, 225 hp twin outboard engines boat. At 1114 h, at about 5 m away from the boat, a partial carcass of a dolphin (including the head) was sighted. As the boat maneuvered to get a better view of the dolphin's remains, one killer whale swam beneath the boat and took the dolphin in its mouth. No species determination of the remains was possible, and the other killer whales continued to socialize with the boat. A few minutes later, the boat left the group. While no actual hunting was observed in this instance, this observation may provide additional evidence of dolphin predation by multiple killer whales in this area.



**Figure 1.** Map of Península Valdés showing the locations where killer whales (*Orcinus orca*) are regularly sighted

Near the same location, on 3 March 2013 at 1125 h, a group of five killer whales was spotted using the same boat. The group was composed of one calf and four females. One of the females was identified as “Maga” (PTN-004), a well-known adult female that usually performs the intentional stranding while hunting South American sea lions at Punta Norte. At 1142 h, at 5 m away from the boat, a great shearwater (*Puffinus gravis*) was seen picking in the middle of a blood stain; Maga and her presumed calf were swimming nearby. The killer whales were interacting with the boat and, at 1158 h, one killer whale approached the boat holding a piece of meat of unknown origin in its mouth. At 1204 h, at 200 m away from the boat, a herd of 50 dusky dolphins (*Lagenorhynchus obscurus*) was seen traveling towards the killer whales. Maga started to jump out of the water, and at the same time, a dusky dolphin was spotted escaping from her. Maga chased the dolphin and, at 1206 h, the dolphin suddenly changed direction 180° because Maga had cut in front of its path. The rest of the killer whales were swimming far behind, towards Maga and the dolphin. Two of those killer whales swam faster and positioned themselves facing the escaping dolphin. Suddenly, at 1207 h, Maga hit the dolphin with its head from beneath, tossing

it into the air about 5 m high. The dolphin was severely injured, and its intestines were popping out of a bleeding cut on its belly. The injured dolphin tried to swim away, but Maga took it with her mouth and gently brought it to the calf, which, at times, repeated the same “tossing the prey up into the air” behavior (Figure 2). The rest of the group was swimming nearby, and Maga performed several tail slaps. At 1208 h, Maga took the (presumably dead) dolphin and dove. Less than a minute later, Maga approached the boat and spy-hopped while holding a piece of the dolphin in her mouth. This behavior was repeated three times in a 15-min span, with Maga coming back to the boat with and without the pieces of meat in her mouth. At 1230 h, the boat left the killer whales, while the group continued to socialize. The boat returned to the same area at 1430 h, and a herd of 50 dusky dolphins was seen feeding, but this time no killer whales were spotted. This observation demonstrates that the dusky dolphins do not abandon an area after a predation event takes place.

The last event took place on 24 March 2014 at 1050 h. A group of about 20 killer whales, including at least three calves, was spotted from a boat nearshore off Adela Beach (Figure 1). The killer whales were socializing, and lobtailing, slap-



**Figure 2.** Maga is tail slapping, while the calf is tossing the already injured dusky dolphin into the air. Part of the intestines of the dolphin can be seen near its tail fluke.

ping, and breaching behaviors were recorded. The group approached the boat (8-m fiberglass hull, with one 115-hp outboard engine), swimming along for a few minutes. After this, the group started swimming towards the South American sea lion rookery near Puerto Pirámides. At this moment, the group split, and 13 to 15 killer whales were in sight, while the rest were not visible. At 1120 h, the pod arrived at the rookery, and a second boat arrived (12.7 m, semi-rigid hull equipped with two outboard engines, 225 hp each). South American sea lion pups were in the water, and the killer whales remained milling around until 1200 h, but no attempt to catch a pup was recorded. At this moment, the pod started to move while swimming towards Punta Pardelas (Figure 1). The killer whales were followed from Adela Beach to Punta Pardelas; and during this period of about 1 h, they swam under the boats and approached two scuba divers that were near-shore. The pod split and rejoined several times, with synchronized swimming and groups of four to five killer whales surfacing together.

At 1245 h, near Punta Pardelas, a group of five to 10 common dolphins (*Delphinus delphis*) were seen porpoising towards the pod of about 15 killer whales that was still around the boats. It was not clear if the dolphins were being chased by killer whales at this time. From this later pod, three known female killer whales from the group that is regularly seen feeding on sea lions in Punta Norte (“Jazmín,” PTN-002; “Llen,” PTN-010; and “Valen,” PTN-009) started to jump and

moved away from the main pod (Figure 3). At this point in time, the rest of the pod was out of sight, while the three killer whales took turns jumping and splashing next to the dolphin. As the dolphin breached to breathe, one of the killer whales repeatedly tried to hit it by jumping next to its side, swimming alongside the dolphin. During this maneuver, Jazmín jumped in the opposite direction, hitting the dolphin with her head, thrusting the dolphin from beneath, and lifting it about 1.5 to 2 m high over the surface. She just hit it once, leaving the dolphin presumably unconscious; the other killer whales were then able to catch it and eat it. After hitting the dolphin, Jazmín did not join the rest of the killer whales to feed but started to chase another individual. Using the same technique, Jazmín tried to hit the dolphin, jumping and splashing very close to it, but it escaped by swimming under the boat. The hunting lasted 10 min and took place 20 m from the boat. After the remains of the dolphin disappeared, all of the killer whales (about 15 again) headed towards Morro Nuevo (located in the mouth of the Golfo Nuevo). The boats lost contact with the killer whales at 1400 h.

This report may be an indication of the importance of dolphins in the diet of this particular group of killer whales outside the South American sea lion hunting season (February through April). Besides this well-known stranding behavior, virtually nothing is known about the diet of killer whales in Patagonia. Analyzing the movements of the pods, we can get a clear picture of the way



**Figure 3.** One of the killer whales flanking a common dolphin while herding it towards the catcher (see text for explanation); it is possible to see the trail of jumps and slaps produced by the killer whale.

this hunting technique is performed by these killer whales. It is a coordinated hunt in which the hunters herd the dolphin towards an individual that finally catches the prey, in a similar way as chimpanzees (*Pan troglodytes*) hunt on red colobus (*Procolobus* spp.) (Watts & Mitani, 2002). In this particular case, Maga and Jazmín, both females that regularly strand in Punta Norte (probably kin related; MLG pers. obs.), act as the “catchers,” while at least two others herd the dolphin towards them. This kind of herding-catching coordinated behavior has to our knowledge not been observed in other social predators that usually catch in packs such as canids or lions (*Panthera leo*).

This is the first record of this kind of cooperative hunting in the South Atlantic Ocean of which we are aware, and different pods of the same group of Punta Norte killer whales use the same technique for hunting different dolphin species. Herding on dusky dolphins has been reported in New Zealand (Constantine, 1998), and one of the two attacks reported is similar to the behavior described herein. Three New Zealand killer whales surfaced along with a single dusky dolphin, and one female killer whale tossed the dolphin in the air with its rostrum (Constantine, 1998). Dusky dolphins in Kaikura also remained in the area where the attacks took place, similar to the dusky dolphins in Patagonia, reinforcing the idea that this dolphin species does not have other protection tactics from predation other than hiding or fleeing.

The fact that the hunt was shared with the rest of the pod supports the belief that sharing the prey is a common practice within the population because the same killer whales have been recorded sharing sea lions after they were caught by a single individual (Hoelzel, 1991). Sharing the prey is important to maintain the social relationships within the pods (Möller, 2011) and the coherence among the individuals. Furthermore, the individuals that usually are seen in Jazmín’s pod are related to her. Also, the fact that Maga handed the dolphin to the calf in the pod suggests that this technique is being taught to the calves, much like how the calves are taught to strand on the beach (Guinet & Bouvier, 1995; Bender et al., 2009).

Finally, if these killer whales prey mainly on marine mammals (e.g., fur seals, sea lions, elephant seals, and dolphins), their influence on the population dynamics and habitat use of cetaceans in the southern South Atlantic may have been neglected until now (Garaffo et al., 2007; Estes et al., 2009). There are no estimates for the number of common dolphins in the Península Valdés area, and there exists an estimate of around 4,500 dusky dolphins for a larger area (Schiavini et al., 1999). The killer whales of Punta Norte (*sensu* Hoelzel, 1991) have been observed throughout the area where the population estimate for dusky dolphins was performed (Coscarella, pers. obs.; Reyes & García-Borboroglu, 2004). Although it is not possible to estimate an attack rate for either of the

dolphin species regularly sighted in the area, the average size of three individuals in the observed killer whale groups (Iníiguez, 2001) fits well with a marine mammal hunter strategy to maximize the encounter rate with other cetaceans (Saulitis et al., 2000). Even though southern right whales (*Eubalaena australis*) are present in high numbers in the area, the attack rate is low, and killer whales do not seem to use the southern right whale as a regular food source. Sironi et al. (2008) calculated the attack rate using anecdotal records and suggested that the presence of adult males in the killer whale group increased the chance of an attack. In addition, the attacks are directed towards full-sized southern right whale individuals. The attacks are more likely to occur during the time window when the killer whales are in the area hunting for elephant seals, and the southern right whales are in the peak of their breeding season (Sironi et al., 2008).

The food habits and diet of the Punta Norte killer whale group should be further studied, and more data are needed on their diet and hunting techniques to be compared with the transient pods regularly seen off the British Columbia coast (Baird & Whitehead, 2000). Nevertheless, their social organization resembles more that of the marine mammal eating groups than the fish eating ones (Baird & Whitehead, 2000; Williams & Lusseau, 2006), and, thus, general patterns governing the relationship between social structures and feeding habits could be studied by comparing both populations.

### Endnote

- <sup>1</sup> Every killer whale was identified in the photographs taken by MB and GB. Identifications were done by MLG using the *Punta Norte Orca Research* catalogue available from [www.pnor.org/site/wp-content/uploads/2014/05/Pnor.pdf](http://www.pnor.org/site/wp-content/uploads/2014/05/Pnor.pdf).

### Acknowledgments

The authors wish to acknowledge Juan Benegas, Pablo Fioramonti, Claudio Nicolini, and Kieke van Maarschalkerwaart for their help in the field and the photographs they provided, and Whales Argentina for letting us use their boat. We also want to thank two anonymous reviewers who made valuable comments.

### Literature Cited

- Alava, J. J., Smith, K. J., O'Hern, J., Alarcón, D., Merlen, G., & Denkinger, J. (2013). Observations of killer whale (*Orcinus orca*) attacks on Bryde's whales (*Balaenoptera edeni*) in the Galápagos Islands. *Aquatic Mammals*, 39(2), 196-201. <http://dx.doi.org/10.1578/AM.39.2.2013.196>
- Baird, R. W., & Whitehead, H. (2000). Social organization of mammal-eating killer whales: Group stability and dispersal patterns. *Canadian Journal of Zoology*, 78, 2096-2105. <http://dx.doi.org/10.1139/z00-155>
- Bender, C. E., Herzing, D., & Bjorklund, D. (2009). Evidence of teaching in Atlantic spotted dolphins (*Stenella frontalis*) by mother dolphins foraging in the presence of their calves. *Animal Cognition*, 12(1), 43-53. <http://dx.doi.org/10.1007/s10071-008-0169-9>
- Constantine, R. (1998). Killer whale (*Orcinus orca*) predation on dusky dolphins (*Lagenorhynchus obscurus*) in Kaikoura, New Zealand. *Marine Mammal Science*, 14(2), 324-330. <http://dx.doi.org/10.1111/j.1748-7692.1998.tb00721.x>
- Estes, J. A., Doak, D. F., Springer, A. M., & Williams, T. M. (2009). Causes and consequences of marine mammal population declines in southwest Alaska: A food-web perspective. *Philosophical Transactions of the Royal Society B*, 364, 1647-1658. <http://dx.doi.org/10.1098/rstb.2008.0231>
- Estes, J. A., Danner, E. M., Doak, D. F., Konar, B., Springer, A. M., Steinberg, P. D., . . . Williams, T. M. (2004). Complex trophic interactions in kelp forest ecosystems. *Bulletin of Marine Science*, 74(3), 621-638.
- Ferrari, M., Campagna, C., Condit, R., & Lewis, M. (2013). The founding of a southern elephant seal colony. *Marine Mammal Science*, 29(3), 407-423. <http://dx.doi.org/10.1111/j.1748-7692.2012.00585.x>
- Garaffo, G., Dans, S. L., Pedraza, S. N., Crespo, E. A., & Degradi, M. (2007). Habitat use by dusky dolphin in Patagonia: How predictable is their location? *Marine Biology*, 152(1), 165-177. <http://dx.doi.org/10.1007/s00227-007-0686-0>
- Guinet, C., & Bouvier, J. (1995). Development of intentional stranding hunting techniques in killer whale (*Orcinus orca*) calves at Crozet Archipelago. *Canadian Journal of Zoology*, 73, 27-33. <http://dx.doi.org/10.1139/z95-004>
- Hoelzel, A. R. (1991). Killer whale predation on marine mammals at Punta Norte, Argentina: Food sharing, provisioning and foraging strategy. *Behavioral Ecology and Sociobiology*, 29(3), 197-204. <http://dx.doi.org/10.1007/BF00166401>
- Iníiguez, M. (2001). Seasonal distribution of killer whales (*Orcinus orca*) in Northern Patagonia, Argentina. *Aquatic Mammals*, 27(2), 154-161.
- Isbell, F., & Loreau, M. (2013). Human impacts on minimum subsets of species critical for maintaining ecosystem structure. *Basic and Applied Ecology*, 14, 623-629. <http://dx.doi.org/10.1016/j.baae.2013.09.001>
- Jefferson, T., Stacey, P. J., & Baird, R. W. (1991). A review of killer whale interactions with other marine mammals: Predation to co-existence. *Mammal Review*, 21(4), 151-180. <http://dx.doi.org/10.1111/j.1365-2907.1991.tb00291.x>
- López, J. C., & López, D. (1985). Killer whales (*Orcinus orca*) of Patagonia, and their behavior of intentional stranding

- while hunting nearshore. *Journal of Mammalogy*, 66(1), 181-183. <http://dx.doi.org/10.2307/1380981>
- Möller, L. M. (2011). Sociogenetic structure, kin associations and bonding in delphinids. *Molecular Ecology*, 23(3), 745-764. <http://dx.doi.org/10.1111/j.1365-294X.2011.05405.x>
- Reyes, L. M., & García-Borboroglu, P. (2004). Killer whale (*Orcinus orca*) predation on sharks in Patagonia, Argentina: A first report. *Aquatic Mammals*, 30(3), 376-379. <http://dx.doi.org/10.1578/AM.30.3.2004.376>
- Saulitis, E., Matkin, C., Barrett-Lennard, L., Heise, K., & Ellis, G. (2000). Foraging strategies of sympatric killer whale (*Orcinus orca*) populations in Prince William Sound, Alaska. *Marine Mammal Science*, 16(1), 94-109. <http://dx.doi.org/10.1111/j.1748-7692.2000.tb00906.x>
- Schiavini, A. C. M., Pedraza, S. N., Crespo, E. A., González, R., & Dans, S. L. (1999). Abundance of dusky dolphins (*Lagenorhynchus obscurus*) off north and central Patagonia, Argentina, in spring and comparison with incidental catch in fisheries. *Marine Mammal Science*, 15(3), 828-840. <http://dx.doi.org/10.1111/j.1748-7692.1999.tb00845.x>
- Sironi, M., López, J. C., Bubas, R., Carribero, A., García, C., Harris, G. G., . . . Payne, R. (2008). *Predation by killer whales (Orcinus orca) on southern right whales (Eubalaena australis) off Patagonia, Argentina: Effects on behavior and habitat choice* (Report to the Scientific Committee of the International Whaling Commission, SC/60/BRG29). 18 pp.
- Vila, A., Campagna, C., Iñiguez, M., & Falabella, V. (2008). South American sea lions (*Otaria flavescens*) avoid killer whale (*Orcinus orca*) predation. *Aquatic Mammals*, 34(3), 317-330. <http://dx.doi.org/10.1578/AM.34.3.2008.317>
- Watts, D., & Mitani, J. (2002). Hunting behavior of chimpanzees at Ngogo, Kibale National Park, Uganda. *International Journal of Primatology*, 23(1), 1-28. <http://dx.doi.org/10.1023/A:1013270606320>
- Williams, R., & Lusseau, D. (2006). A killer whale social network is vulnerable to targeted removals. *Biology Letters*, 2, 497-500. <http://dx.doi.org/10.1098/rsbl.2006.0510>
- Williams, T., Estes, J. A., Doak, D. F., & Springer, A. M. (2004). Killer appetites: Assessing the role of predators in ecological communities. *Ecology*, 85(12), 3373-3384. <http://dx.doi.org/10.1890/03-0696>