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Killer whale (*Orcinus orca*) predation on a shortfin mako shark (*Isurus oxyrinchus*) in New Zealand waters

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Abstract

Observations of killer whale (*Orcinus orca*) predation on elasmobranchs are not common. We report on a group of seven killer whales in New Zealand waters capturing a shortfin mako shark (*Isurus oxyrinchus*), a species previously not reported as prey of killer whales. Elasmobranchs have been suggested as a main prey item for New Zealand killer whales and the addition of this species to the prey list helps to support this theory.

Key words: Killer whale, *Orcinus orca*, elasmobranch, shortfin mako shark, *Isurus oxyrinchus,* predation.

Introduction

Killer whale (*Orcinus orca*) predation on elasmobranchs (sharks, skates, and rays) was reviewed by Fertl *et al*. (1996). They concluded that elasmobranchs are probably taken more often by killer whales than reported. Since this review, additional killer whale interactions with elasmobranchs have been reported, including an attack on a white shark (*Carcharodon carcharias*) (Pyle *et al.*, 1999) and a description of benthic foraging on rays (Visser, 1999). Here, we describe killer whale predation on a shortfin mako shark (*Isurus oxyrinchus*) in New Zealand waters, a species previously not reported as prey of killer whales.

Materials and Methods

At 0930 hr on 11 November 1998, a whale-watch vessel reported a group of killer whales in the 'Middle Ground', Bay of Islands (35°9.4S, 174°11E), New Zealand. One of the authors (JB) arrived at approximately 1130hr (aboard a 4.9 m aluminium boat), while the others (INV & RvM) followed several minutes later (aboard a 5.8 m rigid-hull inflatable). A group of seven killer whales were identified by saddle patches, eye patches, and natural markings on their dorsal fins following Bigg (1982) and Visser & Mäkeläinen (2000). From their size relative to the observation platform (5.8 m boat), previous identification of sex by viewing genital area and relative size of dorsal fins following Bigg (1982), the group was determined to consist of two adult females (NZ4, NZ63), one presumed adult female (NZ5), one adult male (NZ6), two subadult males (NZ101, NZ9), and one unidentified juvenile (Visser, unpublished data). JB observed two other killer whales (their identities were undetermined, but one was an adult male, and the other of an undetermined age/sex class), 15 min earlier on the seaward side of Moturua Island (35°12.8′S, 174°11′E). These two whales were 6.3 km from, and travelling towards, the focal group.

Results

While photographing the focal group of whales, JB observed the whales beginning to mill. Within one minute, NZ63 surfaced with a shark grasped by the tip of its tail, the first documentation of a killer whale holding a shark by the tip of the tail during prey capture. The shark attempted to escape by swimming vigorously at the surface. At approximately 1150 h, INV entered the water to make underwater observations. The closest whale—NZ63, was 9 m away and swimming towards INV, grasping the shark around its girth. NZ63 released the shark when she approached within 4.5 m of INV (Fig. 1). The shark swam underneath INV in an apparent attempt to escape NZ63 and lay parallel to, and approximately 0.15 m from, the swimmer. The 1.2–1.5 m shark was identified as a female mako, based on the homocercal caudal lobes of the tail, pointed snout, large first and small second dorsal fins, five gill slits, and lack

Figure 1. Killer whale (NZ63) with shortfin mako shark, previously held in her mouth, then later consumed.

of claspers (Fig. 2; Cox & Francis, 1997). A few, small puncture marks were seen behind the first dorsal fin on the shark's right side. NZ63 swam abruptly towards the swimmer and shark, 'spooking' the shark from underneath the swimmer. The shark rapidly swam towards the boat, approximately 4.5 m away, and 'hid' under it, in a second attempt to escape from NZ63. The killer whale swam quickly under the boat, bit the shark around the girth, and descended with the shark in its mouth, regrasping it near the tail. A second killer whale (size, age class, or individual identification could not be determined) approached underwater and bit the shark's head as it was held by NZ63. Both killer whales continued to descend whilst consuming the shark, until they could no longer be seen by the underwater observer. At least five whales were observed at the surface (including NZ4, NZ6, NZ9, NZ63 and the unidentified juvenile), milling over the same location where the whales descended with the shark. After five minutes of milling in the same location, the encounter ended when the animals (estimated to be nine individuals at this time, and perhaps including the two previously unidentified animals observed by JB) moved off in an easterly direction.

Discussion

New Zealand killer whales have been previously documented preying on seven elasmobranch species. They have been observed feeding most frequently on short-tailed (*Dasyatis brevicaudatus*), long-tailed (*Dasyatis thetidis*), and eagle rays (*Myliobatis tenuicaudatus*) (Visser, 1999), but also have been observed feeding on a basking shark (Fertl *et al.*, 1996), blue sharks (Fertl *et al.*, 1996, Visser, unpublished data), torpedo rays (*Torpedo fairchild*) (Visser, 2000), and school sharks (*Galeorhin usgaleus*) (Visser, 2000*b*).

The current observation of predation on a shortfin mako shark supports the suggestion by Visser (1999) that elasmobranchs are an important prey for New Zealand killer whales. New Zealand elasmobranchs are long-lived apex predators that may contain high levels of heavy metals and organochlorides (Cox & Francis, 1997; Fenaughtly *et al.*, 1988; Taylor & Taylor, 1986). The New Zealand population of killer whales (based on photographic identification methods) appears small (mean = 119 ± 24 SE, Visser, 2000*a*), and currently little is known about their ecology. If elasmobranchs are a primary prey of killer whales in New Zealand, then bioaccumulation of high levels of

Figure 2. Shortfin mako shark caught and consumed by a killer whale near New Zealand.

heavy metals and organochlorides may occur in these predators.

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