

BRIEF COMMUNICATION

An encounter between a pelagic shark and giant cephalopod

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Abstract

An oceanic whitetip shark (*Carcharhinus longimanus*) was observed off the coast of Kona, Hawaii, with scars caused by the tentacles of a large cephalopod. While the exact species could not be confirmed, candidate species include the giant squid (*Architeuthis dux*) or species from the genera *Thysanoteuthis* (flying squids) and *Megalocranchia* (glass squids). Telemetry shows *C. longimanus* will dive within the mesopelagic zone and may interact with or even forage for large cephalopods.

KEYWORDS

giant squid, oceanic whitetip shark, open ocean

Large pelagic predators tend to spend the majority of their time in the shallow epipelagic zone (<200 m) but make occasional deep dives into the mesopelagic zone (200–1000 m) and beyond (e.g., Howey *et al.*, 2017). The oceanic whitetip shark (*Carcharhinus longimanus*) is a pelagic predator, maximum size 3–4 m, found throughout tropical pelagic ecosystems (Young & Carlson, 2020). Most of their time is spent within the mixed layer (0–200 m), but in the Atlantic they make occasional dives to depths >1000 m (Howey *et al.*, 2017). Their diet primarily consists of pelagic fishes and squid, although the relative contributions of each will vary seasonally and spatially (Madigan *et al.*, 2017). *C. longimanus* are often found associating with short-finned pilot whales (*Globicephala macrorhynchus*), although the function of these associations is unknown (Stacey & Baird, 1993). In November 2019, an estimated 1.8–2.2 m male *C. longimanus* was seen associated with a pod of foraging pilot whales off the coast of Kona, Hawaii. The shark had an unusual scarring pattern consisting of several bilayers of circles running across the lateral flank (Figure 1). At the anterior region of the shark, just behind the head, ran a bilayer of smaller single dots.

The scarring patterns suggested a potential encounter with a very large cephalopod. The larger sucker markings were arranged in a biserial set of circular marks, consistent with those on the underside of a large squid tentacle. The bilayer of smaller dots could be from very small suckers on the narrowing section of the end of the tentacle. Potential candidate species could be the giant squid (*Architeuthis dux*) or species from the genera *Thysanoteuthis* (flying squids) and

Megalocranchia (glass squids) (Jereb & Roper, 2005). All these species reach >2 m in length (and up to 18 m in *Architeuthis*), have tentacle morphologies consistent with scarring patterns and are found (or likely found) in Hawaiian waters (Coro *et al.*, 2015; Jereb & Roper, 2005). The vertical distribution patterns of these cephalopod species range from 200 to 800 m, but can be as deep as 1000 m (Jereb & Roper, 2005). The vertical distribution of cephalopods is well within the vertical dive range of oceanic whitetip sharks in the Atlantic (Howey *et al.*, 2017). Six oceanic whitetips were tagged with satellite transmitters (Wildlife Computers, Redmond, WA, USA) off the Kona coast, and had maximum dive depths ranging from 250 to 1177 m, with an average maximum depth of 589 ± 317 m (M. Hutchinson, unpublished data).

The deep dives of oceanic whitetips have been hypothesized to be related to foraging, especially when they associate with pilot whales, which regularly perform foraging dives >500 m and as deep as 1300 m in Hawaii (Abecassis *et al.*, 2015; Howey *et al.*, 2017). Sharks may use pilot whales to locate prey at depth or consume prey remains regurgitated at the surface. Regardless, the markings show a previously unknown interaction between a giant cephalopod and a pelagic shark. Whether the sucker marks were defensive or offensive is unclear, but the lack of any obvious wounding suggests they were more likely defensive (i.e., the shark attacked the cephalopod). Similar scarring patterns are seen on sperm whales, which are well-known predators of large cephalopods (e.g., Evans *et al.*, 2002). However,

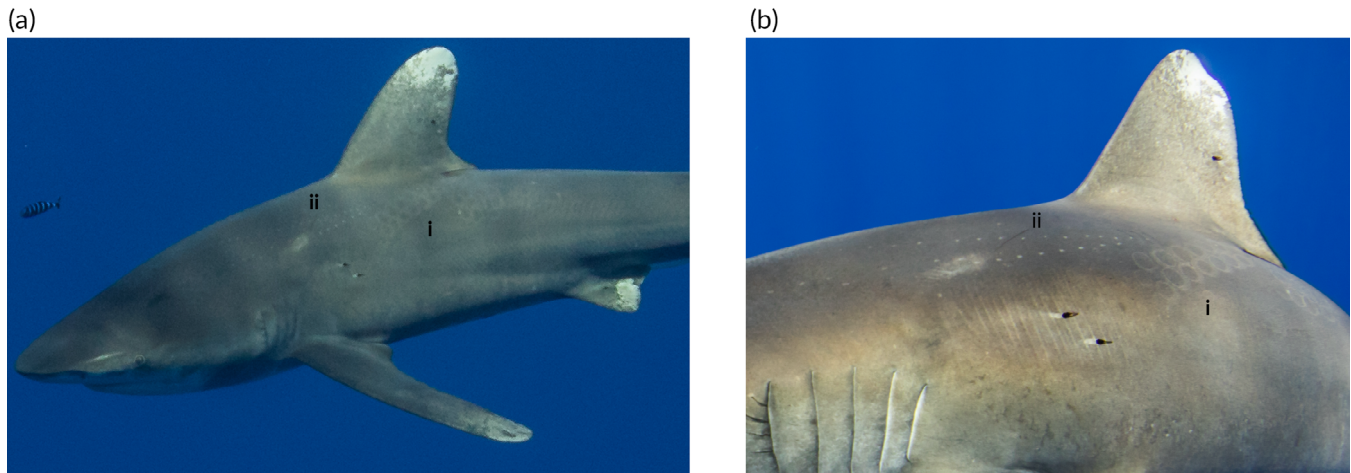


FIGURE 1 (a) *C. longimanus* and (b) a close-up of the squid sucker markings. A biserial set of circular marks is indicated by (i) while potential smaller cusp scars from trailing edge of tentacle are indicated by (ii). Picture: D. Verbeck

these interactions may represent an additional connection between surface, meso- and epipelagic communities.

ETHICAL STATEMENT

This study was based on opportunistic photographs taken of wild animals in the field, without interaction, therefore no animal care protocols were used.

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CONTRIBUTIONS

Y.P.P. wrote the manuscript with input from all authors. D.V. made the field observations. M.H. provided satellite telemetry data. H.B.G. provided cephalopod identification.

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