

## Supplementary Information for “Occurrence of white sharks (*Carcharodon carcharias*) in Hawaiian waters”

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### Detailed descriptions for white sharks listed in Table 1 of doi: 10.1155/2013/598745

**19260603:** On 3 June 1926 a 3.8 m white shark was caught just offshore of Kahuku, O‘ahu. The shark had been hooked by its tail to a long line set for ulua (*Caranx ignobilis*) the night before, and was so exhausted that it was easily landed. Upon being cut open, the stomach was observed to contain “the skull and bones of both arms, one hand and one leg besides a quantity of black hair about three inches in length...together with a pair of bathing trunks.” [1]. The trunks appeared to be Army issue, and the remains were identified the following day as belonging to an Army private who had drowned at Haleiwa on May 18. The shortest distance from Haleiwa to Kahuku along the coast is approximately 25 km. Newspaper accounts did not indicate the sex of the shark, and only one account [2] identified the shark as a white shark.

**19591207:** In response to a December 13, 1958 fatal attack on Billy Weaver off Lanikai, O‘ahu the State of Hawaii conducted the Billy Weaver Shark Research and Control Program, which operated from 1959-1960 [3, 4]. Two white sharks were caught off Windward O‘ahu during the program. The first was a 3.5 m male caught 7 December 1959 on a line set at depth 44-47 m off Kahuku to Waiale‘e.

**19600306:** The second white shark caught during the Billy Weaver program was a 10 ft 10 in (3.3 m) female. It was caught 6 March 1960 on a line set at depth 23-30 f (42-55 m) off Mokoli‘i (Chinaman’s Hat) to Pyramid Rock [3].

**19610308:** A 4.1 m white shark was captured by a commercial fisherman off Honolulu and brought back to the Honolulu Marineland at Kewalo basin, where it lived for two days [5, 6]. Unfortunately, records do not include the sex of the shark, nor what happened to the carcass following the its death.

**19660120a, 19660120b and 19690503:** In the late 1960s the Oceanic Institute (Waimanalo, O‘ahu, Hawaii) operated a shark culling program at Kawaihai Bay on the Big Island of Hawaii [4, 7]. The program reported the capture of three white sharks, but did not record size, sex or other details [5, 7].

**19690308:** On 8 March 1969 a shark damaged a surfboard and inflicted a 5-inch laceration to the right leg of a 16-yr-old male surfer at Makaha, O‘ahu (Anonymous 1969)[8]. The incident occurred about 100 yards (m) from shore, and water temperature was 23.8°C. A dead whale had recently been removed from the beach. In a report to the International Shark Attack File (George Burgess, personal communication), then housed at Mote Marine Laboratory in Sarasota, FL, University of Hawaii graduate student Richard Wass identified the species as *Carcharodon carcharias*, based on the victim’s description of a uniform black dorsal coloration and tooth impressions left in the surfboard. The impressions were described as symmetrically triangular in shape, about 2 cm deep, with both jaws similar to each other. Based on a bite width of 24 cm, Wass estimated the length of the shark at 9 ft (2.7 m). In a letter accompanying the report, Albert Tester, then Senior Professor of Zoology at the University of Hawaii, concurred with Wass’ identification, but did not comment on the length estimate.

**20021028:** On 28 October 2002 researchers Walter Ikehara and Chuck Holloway, in the Hawaii Undersea Research Lab submersible Pisces IV, observed a shark at Penguin Bank, Molokai, at a depth of 350 m (**Figure S1**). They observed a shark with a conical snout, a dark grey upper surface with a sharp, blotchy line demarcating the transition to a white ventral surface and identified the individual as a white shark [9].



Figure S1. White shark observed by the Pisces IV submersible at Penguin Bank, Molokai in 2002. Photo courtesy of the Hawaii Undersea Research Lab.

**20041004:** On 4 October 2004 Amy Baco-Taylor, Terry Kirby and Tom Fritz saw a female white shark at Makapu‘u, O‘ahu, at a depth of 446 m, estimated at 3.9 m total length (**Figure S2**). The observers noted that the shark appeared to have a very large girth for its length [9].



Figure S2. White shark observed by the Pisces V submersible at Makapuu, Oahu in 2004. Photo courtesy of the Hawaii Undersea Research Lab.

**20050104:** On 4 January 2005 divers at Molokini Crater off Maui photographed a large shark at 12 m depth (Figure S3). It had a distinctly lamnid body shape and was identified as a white shark from the photographs, based on the short conical snout and broad dorsal fin [9]. The photographs did not include the ventral surface for determination of sex. Photographs and morphological descriptions were provided by John Chakerain to K. Weng on 27 June 2012.



Figure S3. White shark observed at Molokini Crater, Maui in 2005. Photo courtesy of Jon Chakerain.

**20051228:** The shark cage diving tours north of O`ahu regularly view sharks at a consistent location. A large shark photographed on 28 December 2005 was identified as a white shark (Figure S4). Ventral views of the shark clearly identify it as a female. Based on 2 m cage, shark is estimated to be 4.5 m total length. Photographs were provided by Jimmy Hall to K. Weng on 3 January 2006.



Figure S4. Female white shark observed at Haleiwa, Oahu on 28 December 2005. Photos courtesy of Jimmy Hall.

**20060129:** On 29 January 2006 a whale monitoring boat was operating west of Mahukona, Hawaii (Figure S5). A large shark approached the boat and underwater photographs were taken that identified it as a female white shark of approximately 4.2 m total length. Photographs were provided by Todd Buczyna to K. Weng on 21 June 2012.



Figure S5. Female white shark sighted off Mahukona, Hawaii, on 29 January 2006. Photos courtesy of Todd Buczyna.

**20110501:** As part of a project monitoring bottomfish populations, a remotely operated stereo video camera system was deployed on the bottom of the Pailolo Channel between Molokai and Maui at 233 m depth [10]. The system recorded a white shark, which was estimated to be 3.3 m long by Virginia Moriwake using stereo video calculations (Figure S6). The images are not clear enough for a positive identification of sex, but lack of claspers suggests it was female.

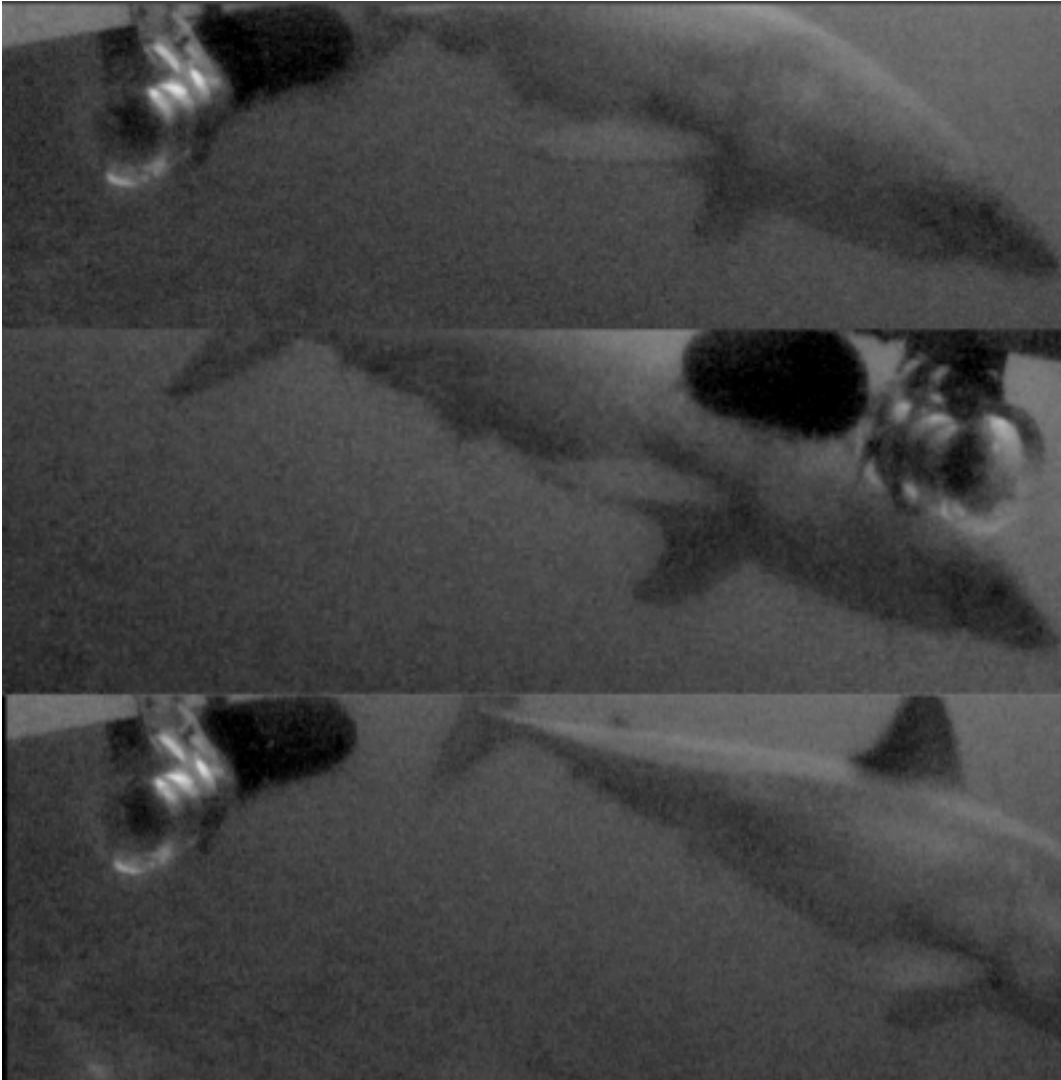


Figure S6. White shark observed by a deep water baited camera (BOTCAM) between Molokai and Maui. Photos courtesy of Jeff Drazen and Virginia Moriwake.



### **Unverifiable reports of white sharks in Hawaii**

Three incidents reported to the ISAF involved large sharks, which may have been white sharks, but evidence was inadequate to positively identify them (George Burgess, personal communication). They are therefore not included in Table 1, but are worth mentioning as they have all been reported in the media. In each case, there was some discrepancy between descriptions provided by witnesses, and speculation as to the species by media sources. The ISAF classifies them as “data insufficient for judgment” or “unresolvable conflict of reports.”

On March 5, 1999 a female swimmer approximately 300 m off the coast of Ka‘anapali, Maui was severely bitten in the right leg, suffering significant tissue loss.

On June 24, 2003 a male snorkeler watching a pod dolphins was about 75 m offshore of Makua, O‘ahu when the dolphins suddenly swam away at a high speed. The victim felt a tug on his foot, and looked down to see a large shark. The injury was relatively minor.

On February 1, 2006, two kayakers were observing a pod of humpback whales about a mile (1.6 km) off Makena, Maui, when one of the kayaks was bumped by a large shark, length estimated at 4.6-5.5 m.

On 10 October 2008 people aboard an ecotourism vessel saw a shark of approximately 4.5 m TL capture a dolphin. Interviews were conducted within 1 week of the incident by Dr. Michael Domeier (personal communication), who reported that “claspers could be seen dangling from the pelvic fins and the entire underside was bright white. The snout was rounded and the eye completely black. The shark’s mouth was closed and no teeth could be seen. The shark’s dorsal surface was grey and the caudal fin was homocercal and lunate. The line of demarcation between the dark dorsal pigmentation and white ventral pigmentation was pronounced.” Based on these characteristics, it is likely that the animal was a white shark.

In addition to the above, on March 17 2012 a free diver reported seeing a white shark off Kona, Hawaii. Photographs were not available to determine morphology.

TenBruggencate [11] also mentioned three reported sightings of white sharks off Niihau during the summers of 1995, 1997, and 1999, one off Ma‘ili, O‘ahu in August 1999, and one off Makua and Keawa‘ula, O‘ahu in July and August 2001. Because it is not possible to confirm these sightings as white sharks, they are also not included in Table 1. Some may have been mako sharks, which have a similar body form to white sharks.

### References

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11. TenBruggencate J: Great white a regular visitor. Honolulu Advertiser, B1, January 3, 2002.