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First record of *Carcharhinus leucas* from Tonga, South Pacific

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Based on direct observation of a free-ranging specimen and access to a jaw from a caught animal, the bull shark, *Carcharhinus leucas*, is reported from Tonga, South Pacific, for the first time. This finding extends the known geographical distribution of this species in the South Pacific.

The bull shark (*Carcharhinus leucas* Valenciennes in Müller & Henle, 1839) is a common species that occurs in marine, estuarine and fresh water and is wide-spread along the continental coast of all tropical and subtropical seas as well as numerous rivers and lakes (Garrick, 1982; Compagno, 1984; Compagno & Cook, 1995). In the South Pacific, the bull shark is reported from the east coast of Australia, Philippines (Compagno et al., 2005), New Guinea (Boeseman, 1964), Borneo (Compagno & Niem, 1998), New Caledonia (Last & Stevens, 1994), Fiji (Brunnschweiler & Earle, 2006), French Polynesia (including Rangiroa Atoll; Johnson, 1978) and the Solomon Islands (John Randall, personal communication).

The specimens reported here (Figure 1) were observed in the morning of 22 June 2006 approximately one mile north-east of the town of Toulou on Vava'u, Tonga. Three SCUBA divers were approached by two female bull sharks in water 29 m deep. Water temperature was 27°C and visibility was estimated to be 20 m owing to siltation. The sharks were observed at the bottom of a small shipping channel, at the bottom of a steep incline of stunted coral on sandy substrate. Although the channel leads to a small harbour, Vava'u features no rivers and only one brackish water lake and it must be assumed that the water was pure seawater. The lengths of the sharks were visually estimated to be 100 cm and 120 cm. Both sharks were observed at close range for 8 min by the divers kneeling on the sandy bottom, with the smaller individual always swimming just behind the larger.

In addition to the directly observed specimens, in September 2006, a local fisherman from the island of Ofu, Vava'u, Tonga, accidentally caught a bull shark in a net. Ofu Island is directly adjacent to the spot where the two perceived bull sharks have been observed. No pictures of the dead shark are available but the jaw of the animal could be purchased from the fisherman (Mike Neumann, personal communication). Figure 2A and B show teeth from the upper and lower jaws, respectively.

Sharks of the genus *Carcharhinus* are rather uniform, become increasingly stocky and develop a straighter, more erect first dorsal fin with growth, and can be difficult to distinguish from one another in the field. The Tongan sharks are most similar in external morphology and dentition (from the jaw specimen), to the bull shark, *C. leucas* and the Java or pigeye shark, *Carcharhinus amboinensis*. These are similar, large, heavy-bodied, short-nosed, small-eyed species that have often been confused in the past but are readily separable (Bass et al., 1973; Garrick, 1982; Compagno, 1984, Last & Stevens, 1994). From *C. amboinensis*, the bull shark differs in its lower, less erect first dorsal fin and higher, more erect second dorsal fin. The ratio of first:second dorsal height is 3:1 or less in *C. leucas*, but over 3:1 in *C. amboinensis*. Furthermore, the bull shark has narrower lower tooth cusps, and slightly greater lower anteroposterior tooth counts (usually 12 to 13, versus usually 11). Figure 1 shows the ratio of first:second dorsal height to be approximately 2:1 and tooth count on each side of the lower jaw is 13. We are confident from their body and fin morphology, coloration,



Figure 1. A bull shark (*Carcharhinus leucas*) about 120 cm total length (TL) swimming at a depth of 29 m, north-east of Toulou on Vava'u, Tonga. From a video frame by Karen Varndell.

and characteristic teeth that the Tonga sharks are bull sharks and not Java sharks or any other species of *Carcharhinus* or of Carcharhinidae.

This represents the first documented record of the bull shark in Tonga. The exact geographical distribution of this species in the South Pacific remains largely unknown. The only island group in which *C. leucas* can be encountered reliably and in large numbers for most of the year is Fiji (Brunnschweiler & Earle, 2006). Preliminary findings suggest that bull sharks are capable of moving great distances and crossing deep waters (Brunnschweiler & Van Buskirk, 2006) but it is not known whether bull sharks from Fiji swim to neighbouring island states such as Tonga. The small size of the two specimens reported here suggests that they were juveniles. Males and females mature at 157 to 226 cm and 180 to 230 cm, respectively (Compagno, 1984). Confirmed bull shark nursery grounds are unknown from the South Pacific except for the east coast of Australia (Pillans & Franklin, 2004) but subadult *C. leucas* can also be seen in Fiji (personal observation). The present report of two juvenile bull sharks is the first indication that Tongan waters might also provide suitable habitat for reproduction.

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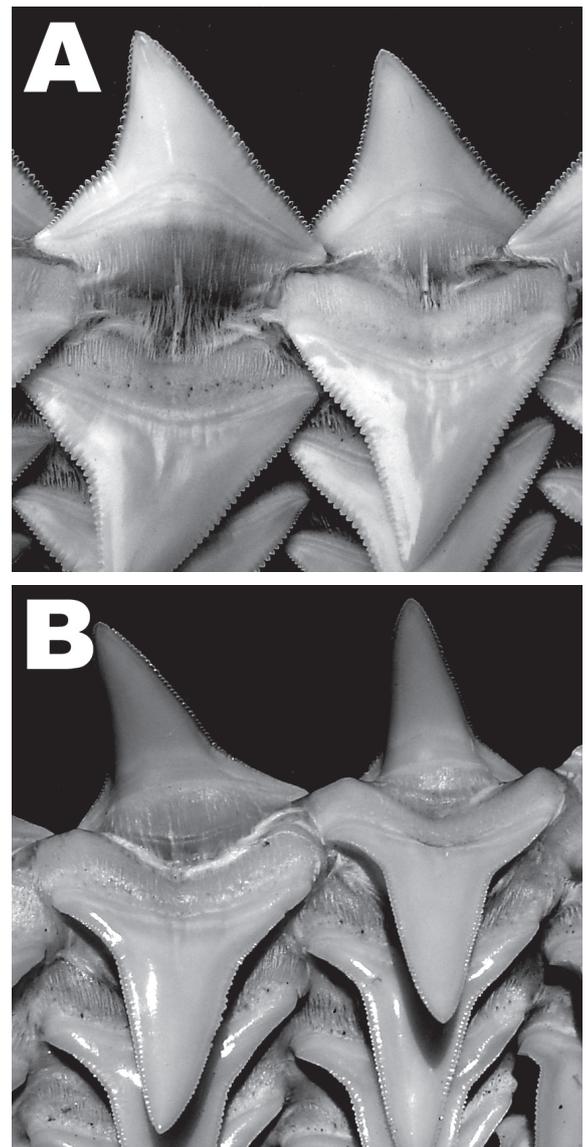


Figure 2. Teeth of a bull shark accidentally caught in September 2006 in Vava'u, Tonga. (A) upper jaw; (B) lower jaw. Photographs by Mike Neumann.

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