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Clasper Flaring: Maintenance Behavior, or a Normally Hidden Feature of Male Whitetip Reef Sharks, *Triaenodon Obesus?*

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Abstract: Male whitetip reef sharks, *Triaenodon obsesus*, are able to pivot their claspers beyond regular flexing, including spreading their distal tips in a funnel like fashion. The feature of this extended clasper flexing, labelled *clasper flaring*, is described here. It is speculated to possibly reflect a pre- or post-copulation-related behavior.

Keywords: Clasper, copulation, flexing, shark, *Triaendodon obesus.*

INTRODUCTION

The copulation of whitetip reef sharks, *Triaenodon obesus* (Rüppell, 1837), is well documented, and several accompanying behaviors are identified [1-3]. 'Clasper flexion,' one of the more obvious male behaviors prior to copulation, refers to a lateral abduction of one or both myxopterygia, the external sexual appendices, for later insertion. In this novel description, the claspers are not just 'flexed' in the initial meaning, with a rotation at their proximal ends [1-3], but also bent forward with a simultaneous spreading of their distal ends. Spreading the clasper tip reflects a mechanism generally occurring within a female during copulation. Combined with the hooks and spurs at the clasper tip [e.g., 4, 5]—not yet been examined in detail for whitetip reef sharks—spreading locks the male's appendage within the female's urogenital system to enhance successful sperm transport [3]. To distinguish this external form of spreading from the internal mechanism used while copulating, this behavior is referred to as *flaring*.

MATERIAL AND METHODS

Flaring was recorded in June 2011 at 'Roca Partida' within the Revillagigedo Archipelago, Mexico, in 15 m depth of water. No other whitetip reef shark of either sex was noticed within visual range. Flaring was videotaped in high definition, 30 fps, with a Sony HC-9 in a SeaTool housing, then desaturated and contrast enhanced in Final Cut Pro 6.x (Apple®) and saved in a ProRes format. Single frames were modified with Photoshop CS5 (Adobe®).

Over the duration of 45 seconds, the male performed seven flexions and four flarings with both of his claspers. Fig. (**1**) shows a 4-second segment, which includes three flexions and two flarings with both claspers. The antero-lateral rotation of the left clasper (Figs. **1a**, **b**) required approximately 0.7 seconds until flaring began (Fig. **1c**, **d**). Although the right clasper commenced flexion after the rotation of the left one, flaring began at about the same time (Fig. **1d**). In addition to the general antero-lateral motion of the right clasper, a longitudinal rotation of about 90º along the main axis of the clasper occurred, reflected by visualization of the clasper's dorsal grove (Fig. **1d-f**). Both claspers remained in a fully flared position (Fig. **1g**) prior to deflating (Fig. **1h**, **i**). Before the left clasper reached its regular position along the ventral surface behind the pelvic fins (Fig. **1j**), it flexed again but without flaring (Fig. **1k-n**). Both flaring motions lasted between 1.5 and 2 seconds. The remaining flexions and flarings performed by this male were of shorter duration but still involved both claspers. Although the video could not be enhanced to allow for detailed measurements, it nonetheless showed that the right clasper widened to about twice the regular diameter at the tip when fully flared.

Because of this single observation, the purpose of clasper flaring can only be speculated about at this point. That irritation may have caused this behavior is rather unlikely because no sharksuckers were attached nor was it likely that parasites would trigger the same motions on both claspers simultaneously, especially considering that, after the claspers finished flaring, no additional flexing or flaring occurred while the animal was in visual range. Because this motion occurred during the assumed mating season—surmised to take place between February and June for the Northeastern Pacific whitetip reef sharks [1, 6]—clasper flaring could reflect a pre- or post-copulation-related behavior. Before male sharks can copulate, their siphon sacs need to be filled with seawater to assist in later transport of sperm into the female by squirting the seawater mixed with the sperm through the claspers' grooves [reviewed in 2]. The forward positioned and flared openings of the claspers' tips (Figs. **1h-k**) could facilitate filling the siphon sacs, acting like funnels for seawater intake. If this is indeed the case, a suction mechanism would likely be needed. On the other hand, the flared claspers' tips could also catalyze flushing the remaining sperm

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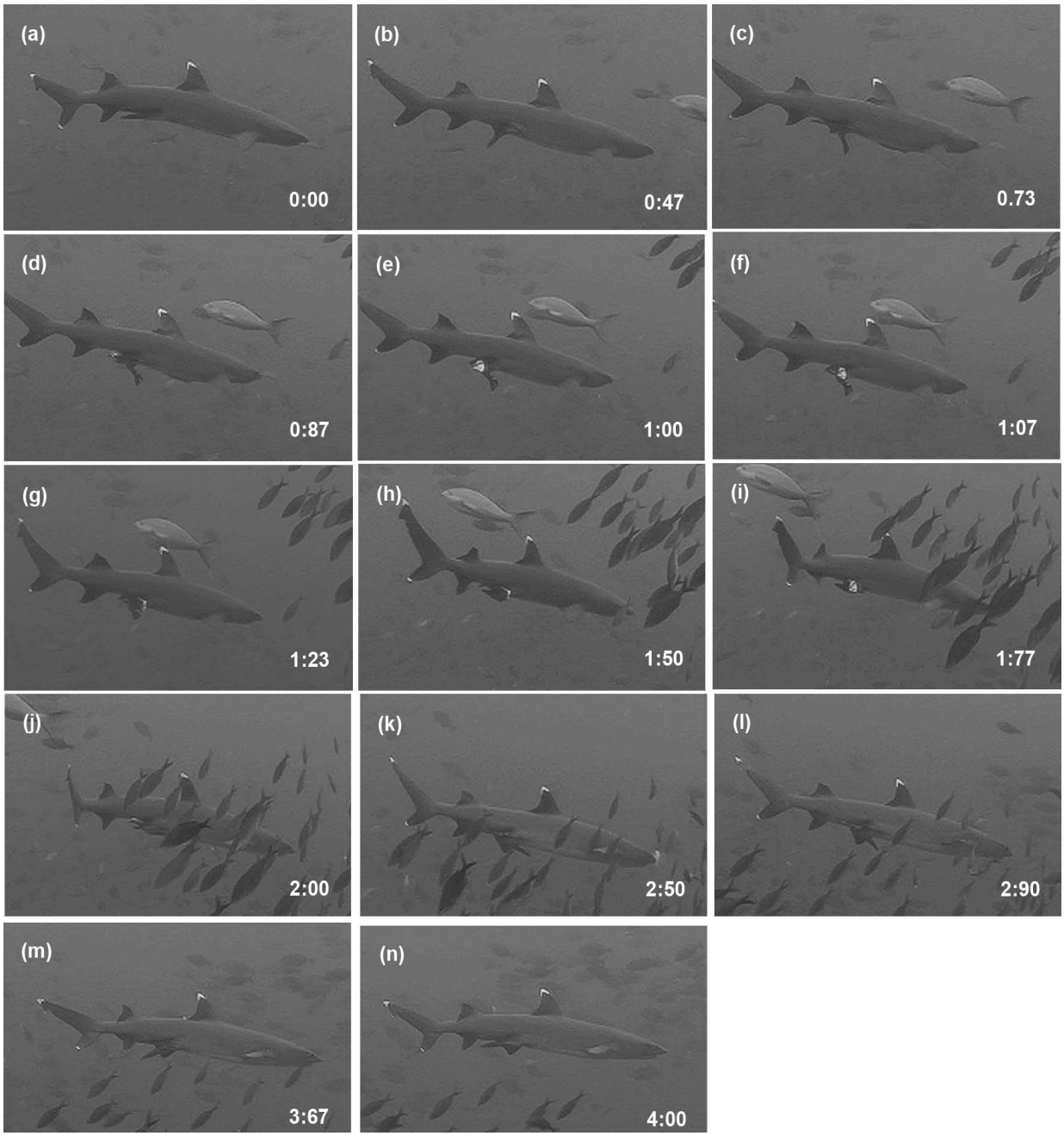

Fig. (1). Sequence of clasper flexing and flaring. Bottom right: Running time in seconds.

from the individual dorsal grooves, thus being a post-copulation maintenance behavior.

Some shark species are thought to use one clasper only while mating, but by keeping both ready, a male could have more positional freedom when grabbing a female for copulation. Among the possible reasons for clasper flaring, that this behavior may not have any true function beyond a simple stretching mechanism should also not be excluded.

Despite the speculative explanation about the function of flaring, this observation offers some insight into the aligning of a clasper with a female's urogenital tract during copulation. The videotaped male was capable of a longitudinal rotation of the right clasper, suggesting that the movement likely facilitates the task of aligning his hypopyle with her urogenital papilla for sperm transport [e.g., 3]. Furthermore, this video sequence also shows that claspers are not just passively bent during copulation by a female's body weight and position but are, indeed, capable of flexing and bending in a coordinated manner.

CONFLICT OF INTEREST

The authors confirm that this article content has no conflicts of interest.

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Declared none.

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