Tursiops truncatus Signature Whistles in Baja California, Mexico

by

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INTRODUCTION

The bottlenose dolphin, Tursiops truncatus, lives in a unique society. A population of dolphins will reside in a certain home range. Individuals will come and go within a large group of dolphins. These large fluid groups have more stable smaller subgroups. Subgroups include adult females, adult males, and the adolescents. The stability of these subgroups promotes social bonds between the dolphins. Individuals within theses groups are often out of sight of one another. Therefore, they need a way of maintaining communication. The bottlenose dolphin produces several types of acoustical signals. Short pulsed clicks lasting less than a millisecond, used for echolocation, make up one type. Another very different type of signal is narrow-band frequency modulated whistle, which lasts on the order of a second. The term signature whistle describes these narrow-band frequency signals. Whistles are individually distinctive and used by dolphins to transmit their identity (Buck 1993). Overall shape of the whistle contour generally remains consistent for each dolphin. Bottlenose dolphin signature whistles are thought to be used as a nametag for each individual dolphin (Caldwell et al 1990).

METHODS

During the month of February, 2000 from the 16th to the 21st, sixteen recordings were made in various locations in lagoons of Baja California, Mexico. Marine bioacoustics were recorded with a hydrophone at ten meters depth for several minuets each time. In the outer lagoon of Laguna San Ignacio recordings were made on February 16th three times from 15:58 to 17:15. On February 17th there were four recordings made in the same lagoon from 9:24 to 11:21 then in the afternoon two recordings from 15:30 to 16:05. Five recordings were made in Laguna Ojo de Liebre on February 19th from 16:31 to 17:32. Recordings at Bahia de Los Angeles in the Gulf of California were made on February 21st but no dolphin whistles were recorded. The whistles were recorded on digital audiotape then burned onto compact disks. The sounds were then analyzed on a sound spectrogram using the software Canary 1.2.4 program.

RESULTS

In all twenty-two *Tursiops truncatus* whistles were recorded. Four distinct signature whistles were identified. Three whistles came from Laguna San Ignacio including a down type whistle a single-loop whistle, and a multi-loop whistle. A rise type whistle was recorded at Ojo de Liebre. The results of the sound spectrograms show different

whistles of *Tursiops truncatus* populations were recorded from different lagoons. In figure 1 a down type signature whistle from a *Tursiops truncatus* was recorded in Laguna San Ignacio. Figure 2 displays a multi-loop signature whistle recorded in Laguna San Ignacio. Figure 3 is of a rise type signature whistle from Laguna Ojo de Liebre. The rise whistle is repeated and displays how slight variations at the beginning and end of the whistle can occur. Figure 4 is of a single-loop signature whistle from Laguna San Ignacio. The whistle in figure 4 displays how harmonics can occur from these whistles.

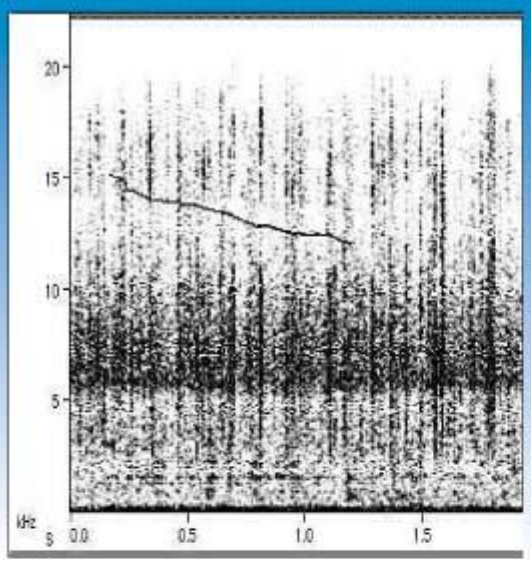

Figure 1. Spectrogram of a signature whistle of a bottlenose dolphin in Laguna San Ignacio.

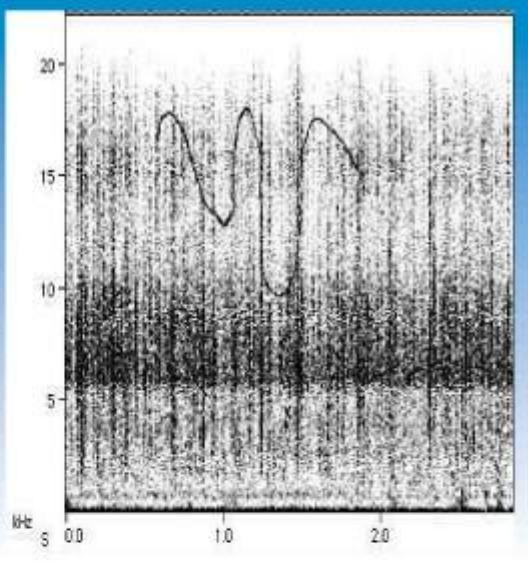

Figure 2. Spectrogram of a bottlenose dolphin signature whistle in Scammon's lagoon.

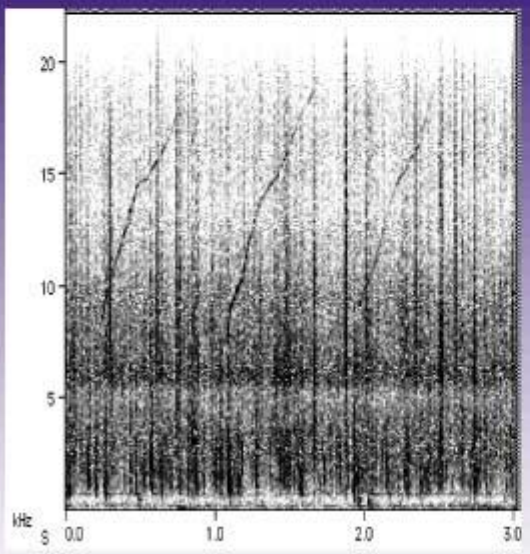

Figure 3. Spectrograph of a multi-loop signature whistle from Laguna San Ignacio.

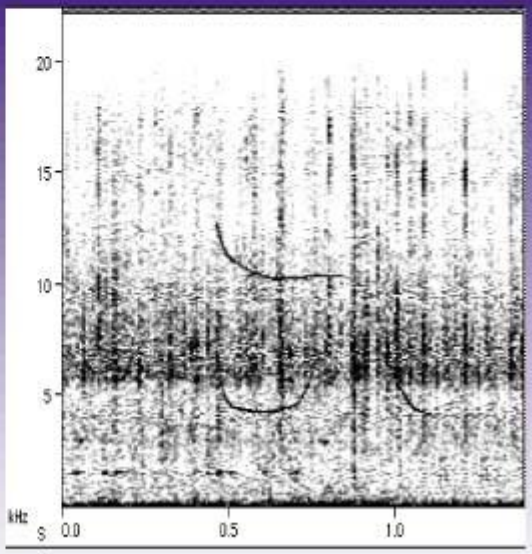

Figure 4. Harmonic of a single-loop signature whistle ofa bottlenose dolphin in Laguna San Ignacio.

DISCUSSION

As soon as a bottlenose dolphin, *Tursiops truncatus*, calf is born it starts to produce a whistle. The whistle of female calf is more distinct from its mother's than a male calf's whistle. When offspring become three to six years old, they leave their mother and join a subadult group. Separation of a calf may be induced earlier by another pregnancy. When young dolphins come of age, between 10 to 15 years, they then join up with either a female adult group or a male adult group. Therefore, females could have this greater difference in their whistle so other females in the band can differentiate mother from daughter. Males have their own group to go to so they do not need a distinct whistle from their mothers (Sayigh *et al*. 1995).

Male *Tursiops truncatus* begin to form alliances once in the subadult group. These alliances appear to last quite long, and are very stable. Male pairs depart from the subadult group and begin mating with individuals from female bands. Although the majority of male *Tursiops truncatus* have been known to from paired associations, solitary males have been observed. Solitary males tend to have a smaller home range compared to that of paired males. Alliances are thought to be important in herding females to mate. Dolphins have a blind spot just below their dorsal fin. This is the area where the paired male dolphin occupies to keep an eye out for predators. The use of signature whistles may enable males to stay in contact while out of sight.

Tursiops truncatus have the need to recognize individuals over a lifetime. Signature whistles allow dolphins to recognize each other and their community. *Tursiops truncatus* mothers respond more to their own offspring's whistle than another infant dolphin's whistle. The ability to discriminate among many different whistles is essential for individual recognition in fluid social groups. Dolphins can associate objects with sound, a skill necessary to associate specific whistles with individuals and groups. Variations in vocal tracts could lead to distinct voice cues and individual recognition (Sayigh *et al.* 1998).

Tursiops truncatus whistle types range from multipart loops to rising and falling lines. Whistles produce long duration potentials in the posterior lateral temporal cortex (Janik *et al.* 1994). *Tursiops truncatus* signature whistle has a very similar shape but not the exact identity temporally each time (Buck 1993). The type of whistle a dolphin uses does not change when it swims isolated from its group members (Janik 1999). The four types of bottlenose dolphin whistles I recorded in lagoons of Baja California, Mexico, were rise, down, single-loop, and multi-loop. The variation at the beginning and end of each signature whistle may change in relation to context caused from change in physiological parameters or to communicate information (Janik *et al.* 1994). The rise whistle from Laguna Ojo de Liebre had variations at the beginning and end of the repeated whistle. The whistles from each lagoon are most likely from different populations because *Tursiops truncatus* stay in certain community areas (Buck 1993). The repeated whistle from Laguna ojo de Liebre shows how a dolphin's signature whistle is basically the same each time and may represent a signature call.

The differences in these *Tursiops truncatus* whistles displays how different bottlenose dolphin populations have different whistle signatures. Coalitions of two to three unrelated males are together approximately 100% of the time. Mother and calves remain in association for three to six years. Dolphins interact with many other individuals over their fifty year life span. Further studies are needed to justify how these animals perceive and classify their whistles to determine the role of whistle variations in the community system of *Tursiops truncatus*.

REFERENCES

Buck JR. (1993). A quantitative measure of similarity for Tursiops truncatus signature whistles. Acoustical society of America 94(5): 2494-2506.

Janik VM. (1999). Pitfalls in the categorization of behavior: a comparison of dolphin whistle classification methods. Animal Behavior 57:133-143.

Janik VM, Dehnhardt G, Todt D. (1994). Signature whistle variations in a bottlenose dolphin, Tursiops truncatus. Behavioral Ecology & Sociobiology 35:243-248.

Sayigh LS, Tyack PL, Irvine AB. (1995). Sex difference in signature whistle production of free-ranging bottlenose dolphins, Tursiops truncatus. Behavioral Ecology & Sociobiology 36:171-177.

Sayigh LS, Tyack PL, Wells RS, Solows AR, Scott MD, Irvine AB. (1998). Individual recognition in wild bottlenose dolphins: a field test using playback experiments. Animal Behavior 57:47-50.