

A Study of Group Dynamics and Individual Identifications for a group of Atlantic spotted dolphins (*Stenella frontalis*) observed around North Bimini Island, Bahamas

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ABSTRACT

This pilot study began an examination of the group dynamics of Atlantic spotted dolphins (*Stenella frontalis*) found on the Great Bahamas Bank, north of Bimini Island, Bahamas. A total of 126.5 hours was spent on-effort searching for dolphins inside the main survey area on trips. On 58 surveys, 70 sightings of spotted dolphins, 17 sightings of bottlenose dolphins and 6 sightings of mixed groups were recorded. Approximately 15 hours of dolphins underwater were recorded on videotape during encounters. Spotted dolphins and bottlenose dolphins were recorded on 57 encounters, 18 short encounters and 30 attempts (Table 3). Currently, 61 individual spotted dolphins have been identified. The gender of 25 spotted dolphins was documented: 17 are female and 8 are male. The age classes for these 61 identified spotted dolphins is as follows: 38 are age class 5 (adults), 5 are age class 4 (sub-adults), 17 are age class 3 (juveniles) and 2 are age class 2 (calves). Baseline data for a first season of observations on this group of Atlantic spotted dolphins will yield information for continuing to observe how dolphins respond to swimmers and boats in the waters of the Bahamas, and around Bimini Islands for this particular group of dolphins.

INTRODUCTION

Atlantic spotted dolphins (*Stenella frontalis*) frequent the waters of the Bahamas; the newest group identified around Bimini near the Great Bahamas Bank. Members of this species and possibly this population have been observed for more than 25 years north of Grand Bahamas Island, on the White Sand Ridge (Dudzinski, 1996; Herzing 1991, 1997; Brunnick 2000). Swim with dolphin programs abound in the Bahamas, yet little is known about this group of spotted dolphins around Bimini. Our study began an examination of the group dynamics of the spotted dolphins found around Bimini and the Great Bahamas Bank to better understand parameters of this population. Are the groups observed both north and south of Grand Bahamas Island distinct or members of a larger population resident to Bahamian waters? Identification of individuals facilitates calculations of the following parameters: population size, distribution, and site fidelity, COA, age/gender composition, and more. An examination of these parameters provides baseline data necessary to understand shifts in population size, behavior or association patterns, which could be the result of any type of change in their environment. This baseline data also provides information on the dolphins as the swim programs in the area increase in scope and popularity. Longitudinal data will permit analyses of how swimmer presence might affect the dolphins and their behavior and distribution. This report summarizes our methodology and preliminary results for the 2001 summer field season.

METHODS

Study Site

The shallow sandbanks north of the Bimini Islands were our primary study area. Depths ranged from six to 20 m within five to 10 km north of the island of North Bimini, Bahamas. The main survey area was approximately established by the following boundaries: 25° 54' N to 25° 48' N; 79° 18' W to 79° 11' W (Figure 1). Also searched on several survey days was the area from shore up to 3 km west along the length of North Bimini Island.

Study Animals

Atlantic spotted dolphins were the main species under consideration; however, bottlenose dolphins (*Tursiops truncatus*) were also observed on several occasions and were included on an *ad libitum* basis. Records of the bottlenose dolphins were kept but not included in the photo-identification study of the spotted dolphins.

Data Collection Protocol

Data were collected between May-August 2001 from two dive/snorkel vessels operated by Bimini Undersea. Vessels were an 11.6 m Delta boat and a 12.8 m custom Stappleton boat. Bimini Undersea operates ecotour swim-with-dolphin trips from these vessels and data were collected during these commercial swims. Few surveys (commercial trips) were conducted during morning hours (0830h-1230h), therefore, the majority of trips were in the late afternoon (1530h - 2000h). Trip duration was routinely four hours: two hours in the defined survey area and two hours enroute to and from the survey area. No systematic transects were conducted during this study, therefore, effort time represents search effort and includes the times we were engaged with dolphins.

Initial sighting information on direction of travel of dolphins, angle at which dolphins were sighted, group size, depth and GPS location were recorded. All photo-identification of individual dolphins was conducted underwater with a video camera (Stingray II underwater housing and digital 8mm video camera, Sony CCD DCR-TRV 110). Underwater observations by the researcher (XB) were conducted whenever possible. Surface observations of behavior were collected *ad-libitum* (Altmann, 1974) and sighting data was recorded for all trips.

An encounter by definition is an in-water observation of dolphins lasting more than three minutes. Encounter lengths were coded following categories used by Dudzinski (1995) and include: 1) Encounter- 3 minutes or more underwater with dolphins in visual range; 2) Short encounter- 30 seconds to 179 seconds underwater with dolphins in visual range. A third category coded as "Attempts" was added to quantify those encounters that lasted less than 30 seconds. Sightings and encounters that occurred outside the designated survey area were also noted and used for photo-identification.

During the initial minutes of a new sighting, whether dolphins approached the boat or the boat approached dolphins was documented. An approach to the boat was defined as dolphins approaching the vessel to bow-ride or wake-ride without the vessel changing its original course.

RESULTS

A total of 126.5 hours was spent on-effort searching for dolphins inside the main survey area on trips where photo-identification was possible (Table 1). On these trips only 2.5 hours were spent surveying outside the main survey area. During non-photo-identification trips, a total of 79.7 hours was spent searching within the main survey area, with 29.1 hours spent outside this same area. The total number of survey trips conducted was 103, with 58 surveys available for underwater photo-identification (Table 2). During the latter, 70 sightings of spotted dolphins, 17 sightings of bottlenose dolphins and 6 sightings of mixed groups were made. Of these sightings, 84 were made within the survey area (Table 2). Of the 58 photo-identification trips, 17 were conducted during morning hours and 41 during afternoon hours.

Table 1. Total effort spent searching for dolphins within and outside the main survey area

	Inside survey area (hours)	Outside survey area (hours)	Total time
Photo-id trips*	126.5	2.5	128.5
Non-Photo-id trips	79.7	29.1	108.8

* photo-id trips were those upon which the researcher was able to gather underwater observations. Non-photo-id trips were those upon which the researcher participated but could not enter the water. Only surface observations were made from the non-photo-id trips.

Table 2. Total number of surveys and sightings of spotted, bottlenose and mixed dolphin groups made within and outside the survey area

	Surveys	Spotted dolphins	Bottlenose dolphins	Mixed groups	Total sightings of dolphins
Photo-id trips	58	70	17	6	94 *
Non-Photo-id trips	45	65	14	2	81
Total	103	135	31	8	175

* During one sighting of one dolphin, a positive species identification was not possible.

Approximately 15 hours of dolphins underwater were recorded on videotape during encounters. Spotted dolphins and bottlenose dolphins were recorded on 57 encounters, 18 short encounters and 30 attempts (Table 3). Currently, 61 individual spotted dolphins have been identified. The gender of 25 spotted dolphins was documented: 17 are female and 8 are male. The age classes for these 61 identified spotted dolphins is as follows: 38 are age class 5 (adults), 5 are age class 4 (sub-adults), 17 are age class 3 (juveniles) and 2 are age class 2 (calves).

Table 3. Total number of encounters, short encounters and attempts for all species of dolphins found within and outside the survey area during photo-identification survey trips.

	# of Encounters	# of Short encounters	# of Attempts
Photo-id trips	57	18	30

The rate of sightings, encounters, short encounters and attempts per total effort time, which includes time spent searching within and outside the main survey area, were calculated and are shown in Table 4.

Table 4. The rate of sightings, encounters, short encounters and attempts per total effort time

	Sighting rate	Encounter rate	Short encounter rate	Attempt rate
Photo-id trips	0.73	0.44	0.14	0.23
Non-Photo-id trips	0.74	*	*	*

* Since in-water observation of dolphins was not possible during non-photo-identification trips, establishment of the lengths of encounters could not be accurately assessed.

The average group size of dolphins (for both species combined) in sightings (for photo-identification trips) was 2.7 (SD= 6.5); for non-photo-identification trips the average group size was 7.8 (SD=6.1). Group sizes ranged from 1-30 dolphins (Table 5).

Table 5. Average group sizes, standard deviations for group size and range sizes for all dolphins sighted within and outside the survey area.

	Average group size	Standard deviations	Ranges
Photo-id trips	2.7	6.5	1-30
Non-Photo-id trips	7.8	6.1	1-30

The number of occurrences and percentage of time spotted dolphins, bottlenose dolphins and mixed groups approached the vessel versus the number of times and percentage of time the vessel approached these dolphins are presented on Tables 6, 7 and 8.

Table 6. Comparison of number of occurrences spotted dolphin groups approached the vessel versus the number of times the vessel approached spotted dolphin groups.

	Approached vessel	Vessel approached	Sample size
Photo-id trips	34 (48.54%)	36 (51.4%)	70
Non-Photo-id trips	39 (60%)	26 (40%)	65
Total	73	62	135

Table 7. Comparison of number of occurrences bottlenose dolphin groups approached the vessel versus the number of times the vessel approached bottlenose dolphin groups.

	Approached vessel	Vessel approached	Sample size
Photo-id trips	4 (25%)	13 (76%)	17
Non-Photo-id trips	3 (21%)	11 (78.5%)	14
Total	7	24	31

Table 8. Comparison of number of occurrences mixed dolphin groups approached the vessel versus the number of times the vessel approached mixed dolphin groups.

	Approached vessel	Vessel approached	Sample size
Photo-id trips	4 (66%)	2 (33%)	6
Non Photo-id trips	2 (100%)	N/A	2
Total	6	2	8

DISCUSSION

A preliminary assessment of the spotted dolphin group observed around Bimini, The Bahamas, was conducted: 61 individual dolphins were reliably re-identified and observed during the field season. As yet, not matches in identification have been confirmed between this dolphin group and the spotted dolphins observed north of Grand Bahamas Island (Dudzinski 1996). As the remaining video footage is analyzed and photographs from both study locations are compared, matches may be found. The number of females to males was 2:1 for identified dolphins, however, it is not yet possible to determine if this is the sex ratio for this group. Similarly, significantly more adults and juveniles were identified compared with calves and sub-adults. Could these numbers represent a specific age-delineation for the study area? Could this area represent a resting or travel area for the dolphins? More information is required on dolphin group activity and behavior before conclusions may be drawn as to how the dolphins use this area.

Human presence in the area has increased during the last five years, due to an increase in the popularity of swim-with-dolphin programs in the region, and worldwide (Hoyt, 2001). The increase in swimmers and boats (potentially) should be considered an environmental change. Gathering longitudinal data in this area over time will facilitate an assessment of how swimmer presence affects the behavior and distribution of these dolphins.

ACKNOWLEDGMENTS

Through the International Human-Dolphin Eco-research Fund, the Dolphin Communication Project (DCP) received a grant from Casio, Japan and I.C.E.R.C. Japan to financially assist with this study. Bimini Undersea provided vessel platforms and logistical support during the summer field season for data collection. Data were gathered under a permit granted to DCP from the Bahamas National Government (2001). Mr. R. Aubrey assisted with permit procedures. C. Baker assisted with photo-identification data analyses and preparation of the photo-identification digital and print catalog.

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