Research Update

Whale Trust has several ongoing research projects that focus on behavior, social organization, and communication of humpback whales, which we detailed in our last newsletter. The primary objective of these projects is to contribute to the understanding of natural behavior patterns in whales and provide critical insights into how living in a marine environment may impact mammalian biology. Here, we provide an update on the most recent studies, as well as provide more information as to what is done with all the data that is collected.

The Function of the Song

One of our on-going studies, led by Jim Darling, currently is testing the hypothesis that the song may function as an index of association between individual males. That is, the song may be a means for individual males to recognize how closely associated they are with other males, and may determine if specific males cooperate or compete for females in the presence of estrus females. Studies to examine the validity of this hypothesis are the core of current work, and involve song playback experiments, investigation of the relationship of song similarity and geographic separation of singers, and analysis of male-male relationships on the breeding ground.

Much of the song research effort in 2009 was directed towards the second of the three aspects of this study – investigating if there is a relationship between the geographic distance separating singers and the similarity of the song. The expectation would be that the closer two whales are together the more similar the song. This is not nearly as simple as it may sound, as at this stage we have no idea of the scale that this might work on, or of the specific metric or level of detail that should be the basis of the song comparison.

For the first step in this study we choose a large geographic distance between comparison points. Songs recorded in the Babuyan Islands in Northern Philippines, Ogasawara in Japan and in Hawaii at the same time were compared. The recordings were collected with the collaboration of researchers, Jo Marie Acabes in Philippines and Manami Yamaguchi in Japan. The Philippine and Japanese locations are about 1500 miles apart, with relatively common interchange of whales and each is about 5000 miles from Hawaii (with less interchange of whales). The hypothesis would predict that the songs of the closer locations would be more similar than the further location.

The recorded humpback whale songs are analyzed using bioacoustic software programs that create spectographs (visual representations of the sounds), which allows the composition and patterns of individual songs to be described in themes, phrases and units. (Songs are composed of several single units of sound that are arranged in phrases that are repeated over and over as a theme, with each full song containing 4-6 different themes – *see WT website.*) So far, we have determined that songs from *all* three locations are all very, very similar at any large-scale comparison. That is the all three locations had all themes in common, although there may be some different in composition of phrases that make up some of the themes, or proportion of time spent in any one theme.

Jim Darling, examining sound spectrographs to compare the songs of different male singers.

What does this mean? With this type and scale of comparison, it would seem the songs between all the locations are more similar than what might be expected at first glance. Many questions arise, not the least being how do the whales maintain this degree of similarity of the ever-changing song over thousands of miles? Probably more important to our specific study, it may point us in the direction of focusing more effort on song comparisons between two individual males interacting on one breeding ground, rather than a population level where there are few differences.

Female Mating Strategies

The mating strategies of female humpback whales are currently under investigation, led by Meagan Jones. It is this type of study that will ultimately move us forward in better understanding the mating system of humpbacks in Hawaii by delving into the social dynamics of males and females during the breeding season. The research is important because despite females being described as the lynchpin of reproduction, virtually nothing is known about female reproductive behavior.

Fieldwork consisted of 'focal follows' where individual females in different reproductive phases (female without calf versus female with calf) and with different companions (female with male, female with calf and male, female with calf only) were followed for defined periods. Their course, speed, behavior and all interactions with other whales were documented. Playback experiments were also conducted where the sounds of mating males were broadcast to females in different reproductive phases. The reactions of the females indicated their willingness to interact with males.

Identifying individuals is one fundamental component of this research, and is done by photographing the flukes, organizing them into a photo-catalogue and entering into a computer database. From this data, we can learn vital information about populations and individuals, ranging from age, lifespan, reproductive histories, migration patterns, and population estimates to association patterns between individuals.

Meagan Jones, matching fluke photos to assess sighting and life history information of individual humpbacks photographed by Whale Trust.

The most striking findings of the study to date are evidence of females exercising choice in selection of male partners, and how the presence (or absence) of a calf is important in determining how males and females interact during the breeding season.

In relation to "choice", it has been shown in other mammals that females choose the male partner, but only speculated on for humpbacks. This new research demonstrates that here is great range in how an individual female behaves when accompanied by a male during the breeding season. She may accept the male, or be completely intolerant of his presence. This suggests that females are not just passive as to their partners, exercising some level of choice of males.

Results also suggest that the presence (or absence) of a calf is important in determining how males and females interact during the breeding season. Females with newborn calves utilize more strategies to avoid (sometimes overly attentive) males and are less likely to tolerate a male companion than females without calves. In addition, when sounds produced by male humpbacks were played back to females, 90% of females with calves moved away from the sounds, while 62% of females

without a calf remained neutral. And those that did move away did not move as far as those females with calves.

Thus, this research is beginning to shed light on how females behave specifically during the mating season.

Data Analysis and Publication

In prior years, we have collected large amounts of raw data – at sea, under water, or in the air. It is perceived to be the "exciting" part, close to the whales, and usually with the highest profile. However, most of the scientific insight comes during analysis of the data in a laboratory or office. This is where we organize and archive our thousands of photographs of individual whales, assess behavior that is captured on video, analyze the song acoustics, and assess geographic motion. It can be as exciting as the fieldwork at times, for it is during this part of the study when the breakthroughs (small and large) occur. Fieldwork is always the easiest stage of a study to fund. Whale Trust is determined to give all three parts of any project equal weight, and we sincerely appreciate your support in this work.