Introduction

picture by Lily Swift

In order to discover what level of communication occurs between humpback whales, it is necessary to define what communication is. Communication is the transfer of information between members of a species or between mutualistic symbionts usually to the advantage of both. In my experiment, I hope to distinguish upon whether or not humpback whale communication is philosophical or essential. For clarity, I classify philosophical as a communications in which sounds are formed into words when the meaning be varied by phonemic or word order (like humans). Essential communication would be when a sound signifies a behavior or reaction.

Although my experiment will only use humpback whale songs, for my conclusion, it will be important that I draw upon the other types of communication used by whales, which I will present to you here. There are three recognized forms of communication between whales: non-vocal auditory communication, calls, and songs.

Since non-vocal auditory communication requires no "voice" (which is a controversial term, as to whether the oceanic environment and water pressure allows for an individual sound), it would seem to support the essential communication theory, it is important to remember that humans use a form of philosophical communication in which visual signs (stance, expression, motions, etc.) play a very important role. One of the more unordinary (and most spectacular) actions of the humpback whale is the breach. In this awesome display of pure power, the whale hurls it's body out of the water head first, before rotating and landing in the water in what can be described as a sort of "backflop." The force of the descending whale hitting the water creates a tremendous sound both out of and under water. Hypothesis' for the reason for this activity include for use as a spacing mechanism, to maintain contact with one another in conditions in which its hard to visualize, to shed skin and/or parasites, and to show excitement in response to sexual stimulation, location of food, or an irritation or injury. Calves frequently spend much of the time attempting to breach, which is not thought to have any real communicative meaning, rather an action of playfulness or mimicry of its elders. Tail slapping, when the whale sticks it's tail out and beats it against the surface of the water in succession, is another non-verbal form of whale communication. It is thought to be a sign of aggression, as whales have been seen rapidly swimming away from the slapping individual. Whales often engage in pectoral fin slapping, which may have the same meaning. The other form of non-vocal communication is bubbles. Bubbles are often seen occurring during social situations. They are thought of as perhaps a type of communication for recognizing others or as threats.

Humpback calls are separated into three categories: simple calls, complex calls, or social sounds, and clicks, pulses, knocks, and grunts. Simple calls are of very low frequency and are assumed to be used for some form of long range transmission. Possibly these sounds can be used to synchronize biological or behavioral activities in listeners to promote subsequent feeding of breeding success. Clicks, pulses, knocks and grunts contain no frequency modulation and have not been widely studied. Complex or social calls are pulsive and occur in a broad area of frequency. To the human ear, they are frequently described as screams, roars, and growls. Complex sounds have only been heard in social situations, such as large surface-active pods containing multiple escorts (contrasting the singer whales who sing while alone). In groups like these, antagonistic behavior is a common place, suggesting these sounds may include some sort of acoustic threat. Feeding sounds that have been recorded in Alaska have proven to attract other whales. For example, Humphrey was lead out of the Sacramento River and into the open ocean by following recordings of Alaskan feeding sounds. In a play back experiment in Hawaii, the feeding sound attracted a high percentage of whales (believed to be males). Hypothesis as to why this sound was attractive was that if functioned as a dinner bell (although whales don't normally feed during breeding season) or, since it was feeding sounds from a female, perhaps the males were attracted to a lone female.

Songs are the most complex and fascinating sounds in the humpback's repertoire. A song is defined as sequences of notes occurring in a regular sequence and patterned in time. Humpback songs have a very distinct hierarchical organization. The lowest level of organization is the shortest sounds which seem continuous to the human ear, called units. Repeated units form subphrases, which combine to form phrases. Identical phrases form themes, and a series of different themes combine into a song. Songs are only sung by male humpback whales. When they sing, humpbacks go into a head down posture in the water, which is thought to allow better blood flow into their brains. This would go with the fact that humpback songs are so amazingly complex, perhaps the extra blood helps them to remember their songs. One of the reasons humpback whale songs are probably difficult to remember is because they are constantly evolving.

Humpback populations constantly compose their own songs by making minor modification of their old songs. To do this they can add to, delete from, or modify their current themes. Amazingly, whole populations of whales sing a similar song and change it in the same way throughout the breeding season. These non-reversing changes occur so quickly that in eight years there is not resemblance to the original song. The new variations the whales place into their songs requires them to be constantly learning the trend of their population, so that they may keep up with the song, and seems to support that humpbacks have a very high mental capability. One hypothesis as to why the songs evolve at such a rapid rate is that each individual hears a song and tries to sing it himself, but his singing has slight difference. Then the next song from this slightly different version is sung by a different whale in a slightly different way and the song evolves.

This rapid change also can support another theory. Darwin noted that evolution is driven by sexual selection. Noting this, biologists have hypothesized one of the most logical reasons for the male humpback to sing. It has been hypothesized that the song serves as an indicator for sexual selection. Females may choose males due to the strength or pleasantness of their song or the length of time that they can hold their breath underwater. If females do chose their mates in this way, then it is quite possible that the song is some sort of fitness indicator, showing that the male may have good genes, and enhancing the chance of the next generations' survival.

Other logical hypothesis of the function of humpback songs is for them to be an attracter of females, maintainer of spacing between competing males, to synchronize and/or induce ovulation in females, to establish male dominance, relay information about the environment, or relay information about who they are, their species, sex, age, location, readiness to mate, and readiness to engage with aggressive behavior.

Another intriguing possibility is that humpbacks use a lek mating system. In lek mating systems males conjugate and display themselves with visual and vocal behaviors at breeding grounds away from the feeding grounds. There they present themselves in hopes that the females who come will want to breed with them and not any of the other whales. However, in a lek mating system the males are supposed to control the females, and evidence of that in humpback populations has not yet been found.

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