The hoo's hoo of gibbon communication

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Pair of Gibbons at Salzburg zoo. Credit: MatthiasKabel /Wikipedia

The secret communication of gibbons has been interpreted for the first time in a study published in the open access journal *BMC Evolutionary Biology*. The research reveals the likely meaning of a number of distinct gibbon whispers, or 'hoo' calls, responding to particular events and types of predator, and could provide clues on the evolution of human speech.

While lar gibbons (*Hylobates lar*) are mainly known for their loud and conspicuous songs, they can also produce a number of soft call types known as 'hoo's. These subtle calls have been alluded to in studies dating back to 1940, but due to their volume, they are virtually indistinguishable to the human ear and have been difficult to record and analyse.

Researchers using modern recording technology and computer analysis have revealed that distinct hoo calls are made in response to specific events, such as foraging and encountering neighbours, and that subtle differences even distinguish between different predators when used as a warning.

Lead author Esther Clarke said: "These animals are extraordinarily vocal creatures and give us the rare opportunity to study the evolution of complex vocal communication in a non-human primate. In the future, gibbon vocalisations may reveal much about the processes that shape vocal communication, and because they are an ape species, they may be one of our best hopes at tracing the evolution of human communication."

The researchers spent almost four months following lar gibbon groups around the forests of North-eastern Thailand. The gibbons were usually followed from the first encounter in the morning until they had located their evening sleeping tree, while researchers recorded their hoos and noted the event that elicited the response. From the recordings they extracted over 450 hoo sounds and used computer analysis to find links between audio patterns and the context in which they were recorded.

The gibbons reliably produced individual hoo calls for different contexts, including foraging, predator detection, encountering neighbours, and as part of duet songs by mated pairs. In addition to differences between contexts, the team also discovered subtle hoo variations within contexts, for example to distinguish between different

types of predator.

The team investigated the responses to a range of predators including clouded leopards, tigers, pythons, and raptors including eagle owls and crested serpent eagles. In addition to real predator observations, they presented fake model predators in realistic poses for the rarer animals.

Raptor hoos were acoustically distinct - less intense, shorter and with a smaller frequency span than the other hoos, making them the least audible. Raptors hear best in the range of 1-4kHz, while gibbon hoos are consistently below the 1kHz threshold. The raptor hoos were the lowest frequency of all and could help gibbons avoid attracting the attention of the predator.

Tiger and leopard hoos were similar, suggesting that callers perceived these two predators as belonging to the same 'big cat' class.

While both gibbon sexes displayed similar hoo calls, female calls were lower in frequency than male ones. The researchers say this is surprising, as among mammals, males tend to have lower frequency voices than females.

Females also typically did not produce hoo vocalisations when encountering neighbours and often remained passive and removed, while males engaged and interacted with neighbouring individuals.

The researchers say the study is of direct relevance for the on-going debate about the evolution of human speech. The ability to produce calls that are context-specific is necessary for communication where an actor refers a recipient's attention to an external event.

This behaviour appears to be widespread and was likely present in the ancestor of modern primates and humans. The acoustic variation seen in

gibbon hoos in particular may be similar to human speech, in which subtle acoustic parameters, like pitch, can be important carriers of meaning.

More information: Esther Clarke, Ulrich H Reichard and Klaus Zuberbuhler , Context-specific close-range "hoo" calls in wild gibbons (Hylobates lar) , *BMC Evolutionary Biology* 2015 . DOI: 10.1186/s12862-015-0332-2