

Public Abstract

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Title:Noise and signal transmission properties as agents of selection in the vibrational communication environment

The ability of organisms to communicate successfully is strongly affected by the ecological conditions that are present during communication. Consider plant-feeding insects, many of which communicate using micro-scale vibrations they transmit through their plants. For these insects, major factors affecting communication are the structural plant components that transmit the vibrational signals (e.g., plant stems and leaves), and incidental vibrations from wind, which create noise when stems and leaves collide. Many aspects of this "communication environment" for vibrationally-communicating insects are poorly understood. In my dissertation I address how variation in plant transmission properties and noise can affect communication behavior and the evolution of signals and sensory structures. Using *Enchenopa binotata* (Hemiptera: Membracidae), plant-feeding insects found throughout the eastern United States, I show that background noise decreases the likelihood of a female's response and also affects male signal timing. However, individuals adjust their behavior such that communication continues during low levels of noise. Individuals also use signals that match the unique transmission properties of the local environment. The importance of this research is three-fold: I provide the first evidence in vibrational communication that wind-related noise affects signaling behavior; I use novel methods to measure plant stem vibrations more accurately—methods that will be useful in addressing many other questions in vibrational communication; and my results are the first to show that plant transmission properties can affect signal evolution. Given that plant-feeding insects make up a large proportion of animal diversity, these results may help us understand the communication systems of many animals.