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### The Relationship between Electroreceptor Anatomy and Signal Localization in Weakly Electric Fish

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# THE RELATIONSHIP BETWEEN ELECTRORECEPTOR ANATOMY AND SIGNAL LOCALIZATION IN WEAKLY ELECTRIC FISH

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African weakly electric fishes of the family Mormyridae communicate using discrete electric pulses. These signals are produced by an electric organ and received by electroreceptors on the skin surface. Differences in signal amplitude and phase detected across electroreceptors on the fish can be used to localize a signal source. Interestingly, different patterns of electroreceptor distribution are found within the family Mormyridae. Some species have electroreceptors distributed broadly throughout their body, while other species have clusters of receptors located on both sides of their head. The purpose of this study was to determine how the receptor distribution affects electric signal localization. I predicted that species with distributed electroreceptors will better track the electric field lines to the signal source, due to the ability to better detect differences in signal amplitudes and phases across broadly distributed electroreceptors. I conducted playback experiments in a circular tank to track the approach patterns, in response to synthetic electric signals, of species with distributed and clustered electroreceptors. I measured the length, velocity, duration, turn angles, and shelter exit angles of the approach responses. Species with distributed electroreceptors had signal localization patterns that were longer in duration, longer in length, and slower in velocity than species with clustered electroreceptors. Additionally, the approach patterns of species with distributed electroreceptors better tracked the electric field lines produced by the signal source than species with clustered electroreceptors. I hypothesize that these differences in signal tracking pattern reflect adaptations for different social environments. Species with distributed electroreceptors are often territorial and highly aggressive while species with clustered electroreceptors are often social and form shoals. Because the electric pulses provide information about sender identity, approaching a signal source by tracking the electric field lines may allow receivers of species with distributed electroreceptors to obtain more information about the sender.