Learning Performance Is Influenced by the Social Environment in Cichlid Fishes

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It has been hypothesised that some specialised cognitive abilities may have evolved because of the challenges of living in complex social environments. Therefore, more-social species might be able to learn faster than less-social species. The aim of this study was to develop a learning framework to test how more- and less-social Lamprologine cichlid fishes perform across associative learning tasks. These cichlids are a group of closely related species with similar ecologies and life histories but varying degrees of sociality, making them an ideal group for comparative learning studies. We found that three nongrouping cichlids (*Telmatochromis temporalis, Lamprologus meleagris*, and *Neolamprologus tretocephalus*) outperformed three closely related highly social, cooperatively breeding cichlids (*N. pulcher, N. multifasciatus*, and *Julidochromis dickfeldi*) on an associative learning task based on food rewards. However, we hypothesised that these differences may be caused by the social environment during testing and might not reflect true cognitive differences. Indeed, when we drilled down and compared just two species across four different social conditions, we found that the social environment during learning trials affected the performance of the highly social *N. pulcher* and the less-social *T. temporalis* differently. We then performed further experiments with both *N. pulcher* and *T. temporalis* under more natural social settings. Under these more natural social conditions, we found that *N. pulcher* learned to differentiate accessible and inaccessible shelters faster than *T. temporalis*. These findings highlight the potential for expanding comparative experiments investigating the relationship between sociality and cognition and emphasise the crucial role social environment plays in learning outcomes.