Two closely related cichlids with divergent social systems differ in socially relevant behaviours and molecular pathways

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Publication Details
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Abstract
Abstract of a presentation that was presented at the Society for Integrative and Comparative Biology 2014 Annual Meeting, 3-7 January, Austin, TX, USA.

Disciplines
Medicine and Health Sciences | Social and Behavioral Sciences

Publication Details

Authors

This journal article is available at Research Online: http://ro.uow.edu.au/smhpapers/1930
Meeting Abstract

28.1  Saturday, Jan. 4 13:30  Two closely related cichlids with divergent social systems differ in socially relevant behaviours and molecular pathways
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It is widely assumed that complex social behaviours arise from modifications to simpler behaviours and via small changes to the underlying molecular pathways. However, few empirical studies have explored variation between species in simple dimensions of social behaviour in conjunction with proximate mechanisms. Here, we make use of the diversity of social systems that have arisen through the radiation of African cichlid fishes to compare socially relevant behaviours and related molecular pathways between closely related cichlids with similar mating behaviour and ecological niches but divergent social systems. We found individuals of the group-living species displayed higher social motivation and more sophisticated conflict resolution strategies than individuals of the non-grouping species. Furthermore, individuals of the group-living species had higher brain gene expression of the neuropeptides isotocin and vasotocin (the teleost fish homologues of oxytocin and vasopressin, respectively) and their receptors than did the non-grouping species. These results suggest that simple behaviours related to social motivation and conflict resolution are an important component of an overall group-living social system. Furthermore, we provide support for the notion that isotocin and vasotocin play a role in modulating social behaviour in cichlid fishes. Together, the combination of laboratory and field-based, behavioural and molecular results contribute to our understanding of how social systems evolve at the level of both simple behaviours and the underlying molecular mechanisms.