It's lonely at the top: Stickleback leaders are stickleback loners

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Research reveals that sticklebacks with bolder personalities are not only better leaders but also less sociable than more timid fish. The behaviour of these bolder fish shapes the dynamics of the group.

Throughout the animal kingdom, individuals often live and move together in groups, from swarms of insects to troops of primates. Individual animals may benefit from being part of groups, which provide protection from predators and help in finding food. To ensure that

individuals reap the benefits of togetherness, group members coordinate their behaviour. As a result, leaders and followers emerge.

Within groups, animals differ from each other in how they cope with their environment and often exhibit distinctive traits, such as boldness or sociability. Even three-spined sticklebacks, the 'tiddlers' collected from streams and ponds by generations of schoolchildren, can be described in terms of their personalities: some are bolder and take more risks, while others are more timid and spend more of their time hiding in the weeds.

Research carried out in the Zoology Department at the University of Cambridge suggests that observations of these tiny fish, and how they interact with one another, could provide important insights into the dynamics of social groups, including humans. The findings are published today (2 December 2014) in *Animal Behaviour*.

Jolle Jolles, lead author of the study, said: "Although we now know that the spectacular collective behaviours we find throughout the animal kingdom can often be explained by individuals following simple rules, little is known about how this may be affected by the personality types that exist within the group.

"Our research shows that personality plays an important role in collective behaviour and that boldness and sociability may have significant, and complementary, effects on the functioning of the group."

In the study, the researchers studied the behaviours of sticklebacks in tanks containing gravel and weed to imitate patches of a riverbed. The tanks were divided into two lanes by transparent partitions and randomly-selected pairs of fish were placed one in each lane. Separated by the see-through division, the fish were able to see and interact with one another.

The positions and movements of the individual sticklebacks were

recorded using sophisticated tracking technology, enabling accurate comparisons to be made of each fish's role in the collective movement of the pair.

"We found that individuals differed considerably and consistently in their tendency to approach their partner," said Jolles. The study showed that more sociable individuals tended to be coordinated in their behaviour while less sociable individuals were more inclined to lead.

Dr Andrea Manica, reader at the Department of Zoology and co-author of the paper, added: "Our research revealed that the tendency of fish to approach their partner was strongly linked to their boldness: bolder fish were less sociable than their more timid group mates."

Jolles explains that sociability may form part of a broader behavioural syndrome. "Our results suggest that bolder, less sociable individuals may often lead simply because they are less reluctant to move away from their partners, whereas shyer, more sociable, individuals become followers because they prioritise staying close to others," he said.

"Differences in boldness and sociability may be expressions of underlying risk-prone or risk-averse behavioural types, as risk-averse individuals may be more motivated to group together and to respond to other individuals in order to avoid predation."

The findings of this study suggest that leadership and group coordination can be strongly affected by personality differences in the group and that boldness and sociability may play important but complementary roles in collective behaviour.

"Now we know these personality traits affect the collective movements of pairs of fish, the next step is to understand their role in the functioning and success of larger, more dynamic groups," said Jolles.

"Although our study was conducted with fish and its results are therefore not directly applicable to humans, it provides new insights into the mechanisms that underlie group behaviour and may therefore even tell us something about ourselves."

The study, 'The role of social attraction and its link with boldness in the collective movements of three-spined sticklebacks, is published today (2 December 2014) in *Animal Behaviour*.

More information: Jolle W. Jolles, Adeline Fleetwood-Wilson, Shinnosuke Nakayama, Martin C. Stumpe, Rufus A. Johnstone, Andrea Manica, "The role of social attraction and its link with boldness in the collective movements of three-spined sticklebacks," *Animal Behaviour*, Available online 2 December 2014, ISSN 0003-3472, dx.doi.org/10.1016/j.anbehav.2014.11.004.

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