

Flocks of starlings ride the wave to escape

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Why does it seem as if a dark band ripples through a flock of European starlings that are steering clear of a falcon or a hawk? It all lies in the birds' ability to quickly and repeatedly dip to one side to avoid being attacked. For a split second, these zigs change the view that observers on the ground have of the birds' wings to cause a so-called agitation wave. This evasive strategy is copied as quick as a flash from one neighboring bird to the next. The escape behavior underlying this was discovered in a study led by Charlotte Hemelrijk of the Centre for Ecology and Evolutionary Studies in the Netherlands and portrayed in a series of video clips. The findings are published in Springer's journal *Behavioral Ecology and Sociobiology*.

Agitation or shimmering waves form when individuals in a flock of birds, swarm of insects or school of fish quickly repeat the fear reaction or escape maneuver of a close neighbor. They can be seen as spirals, concentric rings or moving lines. In giant honeybees, this happens when each insect lifts its abdomen, while in anchovies, individuals temporarily move closer together or roll sideways.

In starling flocks, a dark band moves continuously in a line from one end of a flock to the other, away from the predator. It generally happens at a speed of 13.4 meters per second, and moves faster than the flock itself. What maneuvers underlie the moving band are unknown, because the wave happens high above the ground and cannot be observed in detail. Therefore Hemelrijk's team turned to a computational model called Star Display. It models flocks that resemble groups of starlings flying together.

It showed that agitation waves among starlings are caused by changes in the orientation of the birds and not due to variations in density in the flock.. The waves occur when individuals try to escape by moving sequentially closer together and further apart. A single band is obtained when the individual birds roll sideways and back again, thus performing half a zigzag or a zig. When repeated by others further down the [flock](#), this zig movement generates a moving single band known as an agitation wave. These agitation waves are shown in a series of [video clips](#) accompanying the study.

"On the ground, someone watching will, for a split second, see the largest wing area once a bird has rolled 90 degrees sideways," Hemelrijk explains. "This temporary increase of dark surface of the wing causes us to see a black band continuously moving away from the predator when the birds repeat each others' zig maneuver."

The researchers also found that repeating the escape behavior from only two to seven neighbors close by is enough to generate an agitation wave. The wave speed increases along with the number of neighbors from whom the movement is mimicked and the distance between them. It also depends on the reaction time of individual [birds](#).

More information: Hemelrijk, C.K. et al (2015). What underlies waves of agitation in starling flocks, *Behavioral Ecology and Sociobiology*. [DOI: 10.1007/s00265-015-1891-3](https://doi.org/10.1007/s00265-015-1891-3)

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