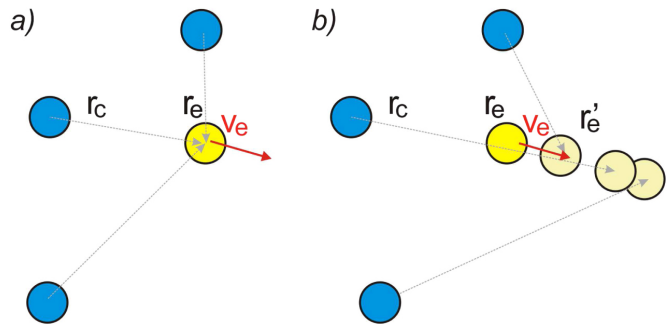
Modelling explains how hunters team up to catch faster prey

19 May 2017



The chasers (blue) are chasing (a) the current position of the escaper (yellow) and (b) its position predicted. Credit: *New Journal of Physics* (2017). DOI: 10.1088/1367-2630/aa69e7

Seeing a chase play out between predator and prey on a wildlife documentary is a familiar sight for many. But in situations where the prey is faster than the hunters, how do the hunters get the upper hand?

To answer this question, scientists from Eötvös Loránd University, Hungary, applied physics modelling to demonstrate how groups of predators can gain an advantage over a faster prey, which none of them would be able to catch individually. They published their results in the journal *NJP*.

Lead author Milán Janosov said: "Group hunting is one of the most important forms of collective behaviour, and stems from the fact that co-operation among predators can dramatically enhance their chances of catching difficult prey.

"It is even beneficial when not all members of the group take part. Indeed, evolution appears to have optimised the size of hunting packs to somewhere between three and 10."

The researchers used bio-realistic computer modelling of the actions and interactions of both prey and the chasing predators, incorporating the variables of time delay, external noise and limited acceleration, as well as collective chasing tactics, the chasers' prediction of their target's future position, and the escaper's tactics.

Mr Janosov said: "Many early models of prey/predator chase interaction lacked real life, biologically-relevant aspects, such as inertia and time delay. Our aim was to have a model that was as close to reality as possible.

"Our model showed that when the prey is faster, multiple hunters can only bring it down when there is strong tactical interaction between them. We found that an optimal group of chasers, which can catch a faster prey, exists in both two and three dimensions when there is a soft, repulsive interaction force between them. This would be impossible without the interaction between the chasers. The optimal group size found here is also comparable to the ones observed in nature when using realistic model parameters.

"With certain parameters the chasers can encircle their prey. These patterns emerge right from the implemented chasing rules, and reflect what happens in the real world."

The researchers also found that chasers' effectiveness increased if they were using prediction to forecast their prey's position; that large delays can completely stop the chasers' success, but could be overcome with a long enough prediction time; faster prey using a zigzag pattern stood a better chance of escape, especially when there was delay.

More information: Milán Janosov et al. Group chasing tactics: how to catch a faster prey, *New Journal of Physics* (2017). DOI: 10.1088/1367-2630/aa69e7

Provided by Institute of Physics