© Wissenschaftskolleg

Hanna Kokko, Ph.D.

Professor of Evolutionary Ecology

Australian National University, Canberra

Born in 1971 in Helsinki

Studied Systems Analysis at Helsinki University of Technology and Evolutionary Ecology at the University of Helsinki

SCHWERPUNKT

ARBEITSVORHABEN

Is Mother Nature Shortsighted? Conflict and the Failure to Maximize Group-Level Performance in Biological Evolution

It may come as quite a surprise that biological evolution can create organisms that do not appear to maximize fitness, that fail to solve problems set by the environment, or that act in ways that are detrimental to the performance of their populations. Yet all these characteristics are, in fact, predicted by evolutionary theory. Natural selection can definitely produce traits that appear to give organisms "foresight" - e.g., young migratory birds leaving their natal territories to fly south long before the first snow falls - but there are also mechanisms that guarantee that populations cannot be expected to always find solutions that appear "wise" from the outside.

One of the most fundamental reasons for such outcomes is conflict. Biological life is organized into several levels: one individual is the developmental result of many genes and their interactions; one population consists of numerous individuals; one species of several populations. It is a common mistake in fields - from economics to medicine - that remain relatively uninformed about evolutionary theory to assume that the "interests" of entities on different levels of organization are aligned (Trivers 2011). Naively, one might expect more efficient systems to win and prevail, but evolutionary biology (and game theory) can demonstrate that when the interests of two or more individuals do not coincide, the outcome can be suboptimal for the group (Rankin et al. 2007). A particularly common reason for conflict is that individuals come in two categories: male and female. I will study the mathematical conditions predicting exactly when such suboptimality is expected to be severe - or mild.

Recommended Reading

Kokko, H. and K. U. Heubel (2011). "Prudent males, group adaptation, and the tragedy of the commons." Oikos 120: 641-656.

- (2013). "Conflict and Restraint in Animal Species: Implications for War and Peace." In War, peace, and human nature: the convergence of evolutionary and cultural views, edited by Douglas P. Fry, 38-53. New York: Oxford University Press.

- (in press). "How wise is Mother Nature? Maximization, optimization and short-sighted resource use in biological evolution." In Human happiness and the pursuit of maximization: is more always better? Edited by Hilke Brockmann and Jan Delhey. Berlin: Springer. (Happiness Studies Book Series.)

PUBLIKATIONEN AUS DER FELLOWBIBLIOTHEK

Kokko, Hanna (Valencia,2019)

Diverse ways to think about cancer : what can we learn about cancer by studying it across the tree of life?
https://kxp.k10plus.de/DB=9.663/PPNSET?PPN=1748725475

Kokko, Hanna (London,2015)

Why inclusive fitness can make it adaptive to produce less fit extra-pair offspring
https://kxp.k10plus.de/DB=9.663/PPNSET?PPN=1670849155

Kokko, Hanna (2015)

The mothematics of female pheromone signaling : strategies for aging virgins
https://kxp.k10plus.de/DB=9.663/PPNSET?PPN=1048651185

Kokko, Hanna (2015)

Mate-sampling costs and sexy sons
https://kxp.k10plus.de/DB=9.663/PPNSET?PPN=1042051356

Kokko, Hanna (London,2015)

Towards cancer-aware life-history modelling
https://kxp.k10plus.de/DB=9.663/PPNSET?PPN=1041103840

Kokko, Hanna (London,2015)

Cancer susceptibility and reproductive trade-offs : a model of the evolution of cancer defences
https://kxp.k10plus.de/DB=9.663/PPNSET?PPN=1040705332

Kokko, Hanna (2015)

Direct reciprocity stabilises simultaneous hermaphroditism at high mating rates : a model of sex allocation with egg trading
https://kxp.k10plus.de/DB=9.663/PPNSET?PPN=85347219X

Kokko, Hanna (London,2014)

The hawk–dove game in a sexually reproducing species explains a colourful polymorphism of an endangered bird
https://kxp.k10plus.de/DB=9.663/PPNSET?PPN=168735782X

Kokko, Hanna ([London],2014)

Seasonal changes in predator community switch the direction of selection for prey defences
https://kxp.k10plus.de/DB=9.663/PPNSET?PPN=1668802619

Kokko, Hanna (2014)

Local gamete competition explains sex allocation and fertilization strategies in the sea
https://kxp.k10plus.de/DB=9.663/PPNSET?PPN=853478457