

Crafty crows know what it takes to make a good tool

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Credit: James St Clair

Biologists at the University of St Andrews have discovered how New

Caledonian crows make one of their most sophisticated tool designs - sticks with a neatly-shaped hooked tip.

New Caledonian crows are the only species besides humans known to manufacture hooked tools in the wild. Birds produce these remarkable tools from the side branches of certain plants, carefully 'crafting' a crochet-like hook that can be used for snagging insect prey.

The study, published in *Current Biology* today (7 December), reveals how crows manage to fashion particularly efficient tools, with well-defined 'deep' hooks.

The hook is widely regarded as one of humankind's most important innovations, with skilful reshaping, a useless piece of raw material is transformed into a powerful tool. While our ancestors started making stone tools over 3 million years ago, hooks are a surprisingly recent advance - the oldest known fish hooks are just 23,000 years old.

Project leader Professor Christian Rutz, from the School of Biology, has conducted field research on New Caledonian crows for over a decade. His team recently noticed that crows' hooked tools vary considerably in size and shape. While some tools only exhibit a small extension at the tip, others have immaculate hooks.

Professor Rutz explains: "We suspected that tools with pronounced hooks are more efficient, and were able to confirm this in controlled experiments with wild-caught crows. The deeper the hook, the faster birds winkled bait from holes in wooden logs."



Credit: Pedro Barros da Costa and Rutz Group

This finding raised the intriguing question of what it takes to make such well-formed hooks. The researchers started planning their study by imagining how humans would approach a comparable task. "When a craftsperson carves a tool from a piece of wood, two things ensure a quality product: good raw materials and skill," Professor Rutz said.

Researchers found that the same, apparently, applies to New Caledonian crows. The researchers discovered that the depth of the hook was influenced by both the properties of the plant material, and the technique crows used for detaching branches. When birds made controlled cuts with their sharp bills, the resulting hooks were significantly deeper than when they used a 'sloppier' alternative method of simply pulling off branches. Careful cutting may leave more wooden material at the tip of the stick from which the hook can subsequently be 'sculpted'.

Surprisingly, adult crows, which are expected to have considerable tool-making experience, did not produce the deepest hooks and regularly employed the 'quick-and-dirty' manufacture technique. Professor Rutz notes that making very deep hooks may not be the best strategy in the wild: "It probably takes more time and effort to make such tools, and experienced birds may try to avoid these costs. It is also possible that deep hooks break more easily when inserted into narrow holes and crevices."

Professor Christophe Boesch, a world-leading chimpanzee expert and Director of the Max Planck Institute of Evolutionary Anthropology in Leipzig, Germany, comments: "We have recently discovered that chimpanzees routinely use naturally-hooked stems to fish for algae, but they don't actively craft these hooks. The crows can reshape plant material with their pointed bills, which act like 'precision pliers', but this would be very difficult for chimpanzees with their large fingers."

The present study is the first to examine in a non-human animal what factors determine the morphology of crafted tools, and as a consequence, their foraging efficiency. Palaeo-anthropologists try to understand how our ancestors produced relatively complex [tool](#) shapes from basic raw materials, such as wood, bone or seashell, but they face the challenge that the manufacture process cannot be directly observed.

The New Caledonian [crow](#), with its remarkable ability to fashion hooked tools from plant stems, provides a fascinating window into humans' evolutionary past.

More information: 'Causes and consequences of tool shape variation in New Caledonian crows' *Current Biology* (2017). [DOI: 10.1016/j.cub.2017.11.028](#)

Provided by University of St Andrews

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