Cormorants cannot capture the benefits of global warming

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(Phys.org)—Even though cormorants seem ideally placed to benefit from global warming, by expanding their breeding range into the far north, the darkness of the polar night is likely to keep them firmly in their place, according to research published this week by scientists at the University of Birmingham in the *Journal of Zoology*.

As climate change warms the northern hemisphere, predictions that many bird species will shift their breeding ranges northwards have become common place. There is already evidence that the most northerly breeding populations of Great Cormorants have shifted northwards in Greenland, and this has been linked to the retreat of sea-ice in summer.

With sea-ice predicted to continue a rapid northward retreat, cormorants would seem poised to penetrate even further north. But it now seems that this range expansion will be quite limited. It may be a case of thus far and no further, due to two key aspects of these birds' biology; the costs of migration and the way they find their food.

The researchers had previously shown that Great Cormorants are visually guided foragers and they now show that the polar nights in the north are too prolonged and dark for the cormorants to see to forage successfully. No matter how far north the cormorants breed it seems that they must continue to migrate in winter to the same latitudes in the south of Greenland that they currently occupy, as it is only at these locations that there is enough light for them to forage successfully through the winter.

Furthermore, the migratory journeys that the birds currently perform each year are so energetically demanding that it is unlikely that they could extend their journey length. The result is that the birds may not be able to penetrate much further north to breed since the cost of getting there and coming south for the winter may be too high.

Graham Martin, Emeritus Professor at the University of Birmingham, said: 'We have shown that even if climate change does make conditions right for these birds to exploit the resources of the far north, they would still need to come south in the winter because the long polar night means that they cannot see well enough to forage successfully."

'So even though climate change may result in generally more amenable ecological conditions further north, birds will be constrained by the lack of light in the polar winter, so they will have to continue to move south so that they can find food,' he added.

"Furthermore these birds may be unable to breed further north because the increased migratory journey back south each winter will be at the limit of what they can achieve. It is as though the birds are on a piece of elastic anchored in the south of Greenland where they spend the winter. They can stretch the elastic and go north to breed but must bounce back south each winter. However, to stretch the elastic further north away from the winter base requires a lot more energy than the birds currently expend each year. They already seem to be at their migratory limit. The extra cost of a longer journey on top of their annual energy budget will be too much and this will stop them being able to follow the retreating edge of the sea-ice ever further north. The prospects for range expansion are thus quite restricted"

"The ecological effects of global warming are often portrayed through species changing their distributions as they follow the envelope of suitable climatic conditions which will shift as the result of a warming

world", Professor Martin explained. "We have shown that Great Cormorants are an example of a species which may not be able to do this. These birds are subject to the twin constraints of needing to see well enough to forage in winter and the cost of a lengthening migratory journey. Only time will tell if we are right, but other species may well be subject to similar constraints. We suggest that for some animals their sensory ecology may be as important as energetics in determining their response to climate change."

Provided by University of Birmingham