

Even light oiling is like flying with a ball and chain for birds

5 July 2017

It's a depressingly familiar sight when an oil well blows or a tanker runs aground: thousands of stranded, helpless animals wallowing in cloying crude oil. 'Birds are often used as the poster children for the deadly effects of oil', says Ivan Maggini from Western University, Canada, recalling the shocking images of struggling animals that accompanied the catastrophic Deepwater Horizon oil spill in the Gulf of Mexico in 2010. 'However, the effects of oiling go far beyond the unfortunate individuals that become heavily oiled', says Maggini, highlighting the risks of hypothermia and toxin ingestion for lightly oiled birds when they preen. Western University physiological ecologist Chris Guglielmo has been assessing the toxicity of crude oil since 2011. However, no previous study had looked at the effect of oiling on flight, so Maggini, Guglielmo and Karen Dean wondered how even a small amount of contamination might affect the flight of migratory birds that cover great distances. They publish their discovery that light oiling can dramatically increase the flight costs of migrating birds in *Journal of Experimental Biology*.

Selecting western sandpipers as a representative of the migrating species that got caught up in the Deepwater Horizon incident, Guglielmo and Maggini received 80 birds that had been collected in British Columbia just before the animals embarked on their migration flights, 'when they should be highly motivated to fly', explains Maggini. And when Maggini, Guglielmo, Lisa Kennedy, Alex Macmillan and Kyle Elliott tested the birds' stamina in a flight tunnel, all the birds flew comfortably for 2 hours.

Having set the baseline for unhindered bird flight, the team gently applied oil - collected from the Deepwater Horizon oil well - to the wing and tail feathers of some of the birds (which they considered lightly oiled) before testing their flight in the wind tunnel. They then added oil to the backs and bellies of the birds 1 week later (moderately oiled), to mimic the natural contamination pattern,

before giving them a second run in the [wind tunnel](#): the birds struggled on both occasions. 'They found it hard to keep up with the wind speed,' says Maggini, adding that the scientists had to stop half of the flight trials early because the birds kept attempting to land.

Wondering how much of a difference the oil made to the birds as they beat their wings, the team filmed the birds while they flew briefly at wind speeds ranging from 5 to 15 m/s. The moderately oiled birds beat their wings faster across the entire speed range and when the team calculated the impact of the contamination on the amount of energy that the birds consumed, it rocketed by 45% in the moderately oil migrants. 'Even when oiled only on wingtips and tail, the cost of flight was increased by 20%', observes Maggini, adding, 'It's like trying to fly with clipped wings or carrying a ball and chain'.

Maggini suspects that oil reduces the amount of lift that the [birds](#) can generate while also increasing the drag that they experience, which could have significant repercussions for the amount of time that the animals take to recover after a high endurance flight. 'We think that our results set a precedent for future oil spill damage assessments by showing how significant small amounts of oil can be for bird [flight](#). Every movement they make in the air becomes more costly and this can have cumulative effects on migration, survival and reproduction', warns Maggini.

More information: Maggini, I., Kennedy, L. V., Macmillan, A., Elliott, K. H., Dean, K. and Guglielmo, C. G. (2017). Light oiling of feathers increases flight energy expenditure in a migratory shorebird. *J. Exp. Biol.* 220, 2372-2379. [DOI: 10.1242/jeb.158220](https://doi.org/10.1242/jeb.158220)

Provided by The Company of Biologists

APA citation: Even light oiling is like flying with a ball and chain for birds (2017, July 5) retrieved 15 November 2019 from <https://phys.org/news/2017-07-oiling-ball-chain-birds.html>

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