

ENEMY

at
the gates

When Vladimir Dinets went back to his home country, the landscape had changed dramatically. It was the spread of a pair of cuckoo species that had him the most worried.

I was born in Moscow, Russia. It's Europe's second largest city, and I lived in its busy urban centre. A terrible predicament for a young naturalist, so I spent the first twenty-something years of my life trying to get as far from my birthplace as possible. My efforts were limited to the fenced-in territory of the Soviet Union – the empire's entire land border was a double wall of barbed wire. And in that huge prison of a country you couldn't get any further from Moscow than Chukotka, a peninsula stretching towards Alaska in the far northeast of Siberia. It was vast, gorgeous, and unforgiving, a sparsely populated world of open tundra, endless mountains and rugged shorelines teeming with birdlife. There were still some native peoples; the most numerous of them were Chukchi – a nation of noble warriors who have managed to resist Russian occupation for almost two centuries, much longer than anybody else in Siberia. There were also Russians; some of them loved that land and tried to protect it, but many behaved as if they were still invaders looking for quick loot – it was a Soviet version of the Wild West.

The Soviet Union eventually fell apart, and most of it is now Russia. When I moved to the US in the 90s, the only part of Russia I really missed was that crazy,





beautiful, cold frontier. It wasn't until 16 years later that I finally got a chance to get back to Chukotka, and I didn't recognise my beloved wilderness.

Everything had changed. What used to be open tundra was now covered by dense thickets of willow, alder, and dwarf birch. The timberline had moved more than a hundred miles north. The catastrophic warming of the climate was pushing native wildlife towards the Arctic coast. A whole menagerie of southern plants and animals - from larch trees to barn swallows - was spreading across the land. I even heard cuckoos near the Arctic Circle - the common cuckoo, the one that gave an entire bird family its name because that's what its call sounds like: sad, monotonous, repetitive "coo-coo... coo-coo... coo-coo". An old Russian belief is that you can ask the bird "How many years do I have left?" and then count the coo-coos to get the prophetic answer.

The cuckoos' new distribution had me worried. The place where I heard cuckoos in Chukotka was less than two hundred miles from the Bering Strait, a rather narrow passage of water between Russia and the United States - you can see the other side on a clear day. Like many other birds that are using the changing climate to expand northward, the cuckoos (originally widely distributed in Eurasian forests and shrublands) were clearly poised to cross over and start colonising a new continent. When



I got back to the States I learned that two Siberian species – common and Oriental cuckoos – were indeed increasingly turning up in Alaska. There was one record of a pair in courtship, and also a fall record from California. It seemed possible that they were already breeding somewhere in Alaska and trying to establish a new migratory route. Now I was really worried. These cuckoos are not like other birds. Both common and Oriental cuckoos are highly advanced brood parasites.

Cuckoos evolved to lay their eggs in other birds' nests at least three times over evolutionary history. The reasons for this are unclear. One theory says that they've learned to delay the laying of eggs until the embryo is partially developed, and that shortened the incubation time, allowing the cuckoo chick to get a head start and outgrow the host's brood. Another explanation is that they had no choice: their preferred food, hairy caterpillars, are unsuitable for small chicks. Native North American cuckoos are not brood parasites, but Siberian ones are really good at this. They have preferred host species, and lay eggs that match the colour of their host's eggs. In Siberia, the Oriental cuckoo is a parasite of a small bird called the Arctic warbler. The common cuckoo has many hosts; its females belong to a number of so-called gentes, maternal lines that search for nests of a particular species and lay appropriately coloured eggs. Male

common cuckoos mate with females of all gentes. In northeastern Siberia there are two known gentes: one lays spotted eggs into the nests of pipits and sometimes wagtails, the other lays blue eggs into the nests of bluethroats. Cuckoo chicks hatch blind, naked, but very muscular, and immediately throw all other eggs and chicks out of the nest. That way they monopolise the food supply – an important consideration, since some of their adoptive parents weigh 12-15 times less than cuckoo fledglings.

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The relationship that cuckoos have with their native hosts is a delicate one, with cuckoos and hosts being part of an ever-changing evolutionary arms race where cuckoos evolve adaptations to outsmart their hosts, and hosts evolve to catch them out. In places where cuckoos and host birds have always coexisted, you find a balance that allows all species to survive. Sometimes cuckoos are successful and their chicks fledge another's nest, sometimes the host is successful and evicts the stranger's egg, raising its own successful brood. But what will happen if the cuckoos invade Alaska, where the would-be host birds have not had time to evolve defences?

Just as I began thinking about this, I met Mark Hauber. Mark has spent decades studying brood parasites, from cowbirds to weird-looking whydas of Africa. He was also worried. We feared that the cuckoos would 'jump species', laying their eggs in these naive birds' nests. They might



Left: cowbird nestling parasitising a woodthrush nest in America.
 Above: fieldwork in Chukotka
 Below: brown-headed cowbird.

even abandon their methods of fine-tuning their behaviour and egg colour to particular species and start behaving more like cowbirds - a brood parasite found throughout the continental United States and southern Canada that lays its spotted eggs into the nests of numerous species of small birds; the cowbird chick usually outgrows the host's chicks and often causes them to starve. So Mark and I decided to find out how American birds would react to cuckoo eggs. We used a 3-D printer to make model cuckoo eggs, and painted them like the eggs of the two Siberian cuckoo species. We made spotted models (like the eggs of the Oriental cuckoo and the "pipit" gens of the common cuckoo) and blue ones (like the eggs of the "bluethroat" gens of the common cuckoo). And we put them into bird nests.

At first we did a pilot study in California. We tested many American robins; they were apparently familiar with cowbirds because they mostly threw out spotted eggs but accepted blue ones (their own eggs are greenish-blue). Then we tried American pipits, a species that occurs also in Siberia and is sometimes parasitised by common cuckoos there. Pipits are rare in California, and they nest very high in the Sierra Nevada, in an area way too high for cowbirds, so they were unlikely to have been exposed to a brood parasite before. It took me two days to hike to their habitat. The pipits accepted all model eggs, but their nests, hidden among barren rocks near the shores of small glacial lakes, were so difficult to find that our sample size was too small.

At the same time our European colleagues did a mirror study, putting model cowbird eggs into the nests of European birds. In the last 300 years,



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deforestation has allowed the cowbird to spread from its native prairies to both coasts, and many native bird populations plummeted. It is now spreading north in Canada and the Alaska Panhandle, and some are turning up as vagrants along the Atlantic coast of Europe; there was even a small flock in England a few years ago. The results were mixed; some birds recognised the alien eggs and removed them, but many didn't.

It was clear that we had to test the behaviour of Alaskan birds, particularly of the species that also occur in Siberia and are cuckoo hosts there. That's not an easy task, because many of those species have small ranges in the remote northwestern corner of Alaska. But Mark managed to obtain some funding, and I found volunteers who donated a lot of their time and money to slog through miles and miles of wilderness in search of birds. Simon Makaroff spent more than a month in the field, flying our team in his small plane to places where most pilots don't go in single-engine aircraft, such as the uninhabited, incredibly scenic island called Saint Matthew in the Bering Sea. Timothy Yancey mobilised his entire Wilderness Naturalist Club - twelve charming schoolkids - to help us find nests. Meanwhile, Kristaps Sokolovskis did the same thing in Chukotka, in a place on the Arctic Coast that the cuckoos haven't reached yet, and Daniel Hanley made beautiful egg models. It was a very intense field season; we found hundreds of nests, including all our 'target species'. The results were striking.

In Siberia, all species Kristaps and his friends tested clearly had behavioral defenses against brood parasites. Most of our models got kicked out or pecked on; some birds destroyed the entire clutch and built a new nest. These birds lived in a place with no cuckoos, but they probably had some gene flow from the south, or had maintained that behaviour since the end of the last ice age when they moved north into cuckoo-free tundra.

But Alaskan birds were totally clueless. We tested sparrows, warblers, wagtails, pipits, bluethroats and wrens, and the result was always the same: all our model eggs were accepted. Only one pair of red-throated pipits threw out a non-matching model egg; this species occurs in North America in a tiny strip of land on the coast of the Bering Strait, so it's probably a very recent coloniser from Siberia and still has genetic 'memory' of cuckoos.

We also found that the two species of cuckoos, which look very similar, will face different choices if they get a foothold in Alaska. The Arctic warbler is relatively common in willow thickets in the north of the state, so the Oriental cuckoo can keep parasitising it, as it does in its native range. But host species of the common cuckoo that inhabit various habitats in Siberia behave differently in Alaska; they mostly nest in very open tundra or small clumps of willows, where cuckoos can't survive. In addition, many of them have tiny populations here (I think we sampled about half of all white wagtail nests in North

Below: Red throated pipit (*Anthus cervinus*) and bluethroat (*Luscinia svecica*), two of the species tested in Alaska. Right: Common cuckoo egg in a white's thrush nest.



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America). This means there will be a lot of pressure to switch to other hosts, and that's what the cuckoos will probably do.

How will they impact the native species? We don't know. It could be negligible or completely disastrous. The cuckoos might rapidly spread all over the continent or remain confined to Alaska for a long time. But the latter possibility is unlikely: just this June there was the first summer record from British Columbia. So it would be wise to prepare for the worst. Alaskan outdoorsmen, and professional and amateur naturalists should know what the cuckoos look and sound like, and report sightings. Biologists should monitor the populations of native birds to make sure sudden declines don't go unnoticed. But, of course, if we don't slow down the global warming that has caused this problem, songbirds will be just some of many species that may be unable to cope with their environment changing so quickly and drastically around them.

Dinets, V., Sokolovskis, K., Hanley, D., & Hauber, M. E. (2018). Striking difference in response to expanding brood parasites by birds in western and eastern Beringia. *Journal of Field Ornithology*, 89(2), 117-125.