



The first satellite tracking data on the migration of the common cuckoo *Cuculus canorus* (Cuculiformes, Cuculidae) from Southern Siberia (Khakassia, Russia)

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ABSTRACT

In early June and July 2018 and 2019, during the reproduction period, we captured and equipped with satellite transmitters (5.3 g PinPoint GPS ARGOS 120) four males of the common cuckoo *Cuculus canorus canorus* (Linnaeus, 1758) in the vicinity of the city of Abakan in Khakassia, Southern Siberia. In one male, it was possible to track the route of autumn migration up to the border of the Democratic Republic of the Congo with Zambia (10819 km), in another male to Western Iran. The routes of the other two birds were interrupted for unknown reasons in the Pavlodar region of Kazakhstan and in the Novosibirsk region. Satellite data confirmed our assumption that the cuckoos breeding in the territory of Southern Siberia migrate in autumn to the southwest via Kazakhstan, Central Asian countries (Uzbekistan, Turkmenistan), Iran, and Saudi Arabia to the southern part of Africa.

Key words: common cuckoo, *Cuculus canorus*, Khakassia, migration, satellite telemetry

Первые спутниковые данные о миграции обыкновенной кукушки *Cuculus canorus* (Cuculiformes, Cuculidae) из Южной Сибири (Хакасия, Россия)

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РЕЗЮМЕ

В начале июня и июля 2018 и 2019 гг. в период размножения нами были пойманы и снабжены спутниковыми передатчиками (5.3 g PinPoint GPS ARGOS 120) четыре самца обыкновенной кукушки *Cuculus canorus canorus* (Linnaeus, 1758) в окрестностях г. Абакан в Хакасии, Южная Сибирь. У одного самца удалось проследить путь осенней миграции до границы Демократической Республики Конго с Замбией (10 819 км), у другого – до Западного Ирана. У двух остальных птиц маршрут был прерван по неизвестным причинам в Павлодарской обл. Казахстана и в Новосибирской обл. Спутниковые данные подтвердили наше предположение о том, что кукушки, размножающиеся в Южной Сибири, мигрируют осенью на юго-запад через Казахстан, страны Средней Азии (Узбекистан, Туркменистан), Иран и Саудовскую Аравию в южную часть Африки.

Ключевые слова: обыкновенная кукушка, *Cuculus canorus*, Хакасия, миграция, спутниковая телеметрия

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INTRODUCTION

To date, using satellite telemetry, migration routes have been elucidated in many European populations of the common cuckoo, *Cuculus canorus canorus* (Linnaeus, 1758) (Sokolov et al. 2022) and in some Asian populations – of the Kamchatka (Sokolov et al. 2020), South Korea (Lee et al. 2023) and Mongolia (The Beijing Cuckoo Project 2016; The Mongolian Cuckoo Project 2019). Where and by what routes common cuckoos from Western, Eastern, and Southern Siberia fly to winter was unknown. We hypothesized that populations of this species from Eastern Siberia circle the Tibetan Plateau from the east and then fly through China, Myanmar, Bangladesh, and India to the African continent, while birds from Western Siberia fly north of Tibet through Kazakhstan and Central Asia also to Africa (Bulyuk et al. 2018). Testing this hypothesis was the main goal of this work.

MATERIAL AND METHODS

At the beginning of the reproduction season of common cuckoos in 2018 and 2019, an expedition was organized to Khakassia with the aim of catching mating birds using mist-nets and tagging them with satellite transmitters. In the first year, we managed to catch, ring, and tag only one adult male (PB 142592) on 10 July. The next year, on 8–11 June, three adult males were caught and tagged (PB 142594, PB 142595, PB 142596).

To track the cuckoos, we used 5.3 g PinPoint GPS ARGOS 120 tags (LOTEK, Newmarket, Canada, <https://www.lotek.com/>). ARGOS uses the Doppler effect to estimate the position of each transmitter as the message is transmitted. The accuracy of this technique ranges from 350 m to 1 km, depending on how many copies of the message were received by the satellite as it passes overhead. The transmitters were attached to the backs of the birds with nylon threads looped around the neck and wings (Fig. 1). PinPoint transmitters collected and archived GPS locations, and then, during a certain period, transmitted the collected data through the ARGOS satellite system. Obtaining information about the location of a bird using this type of transmitter is limited by the capacity of the batteries built into the transmitter. The dates, times of positioning, and frequency of transmission of the data were programmed in such a way



Fig. 1. Common cuckoo *Cuculus canorus* (Linnaeus, 1758) with transmitter released.

as to obtain information about the movement of the bird along a large section of the migratory route during the autumn migration. The output position data contained the latitude, longitude and GMT time of the fix. Our program settings of the GPS Schedule provided collecting GPS coordinates every 7 days at midnight. The data processor application was used to convert the GPS data downloaded from the ARGOS web site into a format that could be used by the researcher. The use of such transmitters for tracking cuckoos in the United Kingdom, Denmark, and Sweden has shown their high efficiency and reliability (Willemoes et al. 2014; Vega et al. 2016).

All males weighed in the range of 118–139 grams, so the transmitter weight did not exceed the recommended 5% of the bird's body weight. We calculated the distance of autumn migration, taking into account the bird's movement strategy at particular sections of the route, the duration of migration in days, the conditional speed of daily migration, and the duration of stopovers at individual sections of the route. The distance was calculated using the haversine formula (Gade 2010). Movements of less than 10 km during migration were not taken into account.

RESULTS

The male PB 142592, caught on July 10, 2018, left the reproduction area (vicinity of Abakan, Khakassia) on July 28 and moved to Altai Territory in the vicinity of Barnaul (576 km to the west). After that, it flew south and changed direction to the west near



Fig. 2. The routes of autumn migration of four males of the common cuckoo *Cuculus canorus canorus* (Linnaeus, 1758) from Khakassia.

the village of Chemal. Near the town of Semey (Eastern Kazakhstan), it turned to the southeast and, on August 21, appeared in the territory of western Mongolia near the town of Ulgiy (318 km). Finally, it flew southwest through southern Kazakhstan, Kyrgyzstan, Uzbekistan, and Turkmenistan to Iran, cover-

ing 2283 km in a few days (Fig. 2). In the vicinity of Mashhad, the bird changed its direction to the west and, on September 4, arrived in the province of Western Azerbaijan in Iran (in the vicinity of Mekhabad), after which it moved to the northeast to the border of Eastern Turkey, and stopped south of Iğdır. The next

signal was recorded already in Uganda to the west of Lake Victoria on November 20, and on the same day in the south of the Democratic Republic of the Congo. Whether this male flew all the way from Iran to Uganda (5793 km) in a single hop is difficult to say, but quite possible, as we have previously shown that cuckoos are capable of travelling long distances of 3000–4000 km without stopping (Bulyuk et al. 2018; Sokolov et al. 2022). The last signal from the transmitter was received on November 20, 2018, so we do not know where this male would have wintered if communication with it had continued. The entire journey from Khakassia to the Democratic Republic of the Congo was 10 819 km and took 116 days, i.e. 93 km/day.

Male PB 142596, captured on June 8, 2019, started its migration on July 20, having moved about 277 km to the northwest to the vicinity of Novokuznetsk. After that, it flew to the northwest and reached the vicinity of Aleisk, Altai Territory, on July 27 (314 km) before heading southwest towards Kazakhstan. It crossed the border into Kazakhstan and continued moving south of Pavlodar and Karaganda towards Uzbekistan, which it reached on September 7 (Fig. 2). On September 14, this male reached the city of Bafq in central Iran. The last signal from its transmitter was received from the area of the city of Saveh in Merkezi Province in western Iran on October 5. The entire path of this bird totaled 4497 km and took 77 days, i.e. 58 km/day.

Male PB 142595, caught on June 8, 2019, moved southwest to the border of Russia with Kazakhstan on July 20 and reached the vicinity of Pavlodar, Eastern Kazakhstan, on August 10 (1577 km, i.e. 75 km/day). After that, unfortunately, the signal from the transmitter stopped coming in a few days.

Male PB 142594, caught on June 11, 2019, left the vicinity of Abakan on July 21, and on July 31 was recorded not far from Novosibirsk, 534 km northwest of the site of capture. After that, the signal from the transmitter was lost.

DISCUSSION

Satellite tracking of the autumn movements of some Asian populations of the common cuckoo breeding in northern Mongolia and in the area around Lake Baikal showed that birds in the first stage of migration fly south through the Gobi Desert, skirting the Tibetan Plateau from the east (The Beijing

Cuckoo Project 2016; The Mongolian Cuckoo Project 2019). Then, in China, they change the direction of migration to the west and fly through Myanmar and Bangladesh to India, where, after a long stop (about a month), they cross the Arabian Sea (about 3000 km) and reach the African continent in the Somali region. Next, they fly through Kenya and Tanzania to Mozambique, where they stop for wintering. Populations from South Korea (Lee et al. 2023) and Kamchatka (Bulyuk et al. 2018) migrate in the fall through China, Myanmar, and Bangladesh also to India, where they make a long stop, and fly through the Arabian Sea to Africa, where the Korean cuckoos winter in Mozambique and Kamchatka birds in Botswana and Namibia. It remains unclear which way and where cuckoos from Western and Southern Siberia migrate in autumn.

For the first time, we obtained satellite data on the autumn migration route of the population of the common cuckoo breeding in South Siberia (Khakassia). Our assumption that cuckoos from this region migrate in autumn to the southwest through Kazakhstan, Central Asia (Uzbekistan, Turkmenistan), Iran, and Saudi Arabia to Africa has been confirmed. Unexpectedly, it turned out that birds can fly westward to the border with Turkey and then fly through Iraq and Saudi Arabia to the African continent. It remains unclear whether the wintering grounds of the common cuckoos from Khakassia are located in the south of the Democratic Republic of the Congo, in Zambia or further south. The last signal from the transmitter on the male that flew through most of Africa was recorded on November 20, 2018, when the autumn migration was still ongoing. Therefore, it is necessary to continue studying migration routes and wintering areas of other populations of common cuckoo from Western and Eastern Siberia.

Satellite telemetry data confirmed our assumption that common cuckoos from Khakassia fly in autumn through Kazakhstan, Central Asia and Iran to South Africa, where they stay for wintering.

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