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Brown Dippers (*Cinclus pallasi*) Overwintering At –65°C in Northeastern Siberia

Vladimir Dinets[1,3] and Michael Sanchez[2]

ABSTRACT.—The Brown Dipper (*Cinclus pallasi*) was discovered to be a regular winter resident in the mountains of Verkhoyansk Range in Northeastern Siberia. This area is one of the coldest in the Northern Hemisphere, with winter temperatures normally staying around –50 °C and occasionally dropping below –65 °C. Despite the extreme cold, the birds exhibited normal foraging behavior. Precise breeding locations of these dippers, wintering almost 200 km NW from the species' known range, remain unknown. *Received 10 May 2016. Accepted 2 November 2016.*

Key words: *Cinclus pallasii*, cold tolerance, Sakha, winter range, Yakutia.

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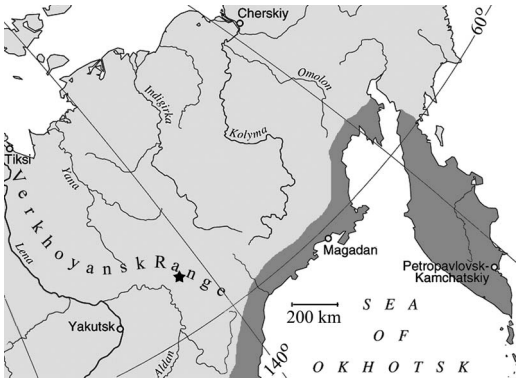

FIG. 1. Known breeding range (dark-shaded) and the new wintering location (black star) of the Brown Dipper (*Cinclus pallasii*) in northeastern Siberia.

FIG. 2. Wintering habitat of the Brown Dipper (*C. pallasii*) at Shaman-Ruchey (Shaman's Creek), Verkhoyansk Range, Sakha (Yakutia) Republic.

The remote, sparsely inhabited mountains and plateaus of northeastern Sakha (Yakutia) Republic in Siberia have a remarkably extreme climate. This is the only place in the world with a temperature range of more than 100 °C, summer temperatures may exceed 35 °C, while in winter the temperature may drop to almost −70 °C (Roshydromet 2016). The extreme cold may persist for most of the year, and it is not unusual for the average daily temperature to stay below −50 °C for 3–5 months and below 0 °C for 7–8 months (Newell 2004). In addition, the climate is very arid, with annual precipitation <220 mm, more than half of it falling in June–September (Roshydromet 2016). Despite the extreme climate and relatively poor floral diversity (all non-riparian forests are formed by just one tree species; see Andreev [1995] and Newell [2004] for overviews of habitats), this region has a surprising diversity of avifauna: 130 species have been recorded breeding, and even more surprisingly, 20 are known to remain in winter, including Northern Goshawk (*Accipiter gentilis*), four grouse (Tetraodontinae), five owls (Strygidae), three woodpeckers (Picidae), three corvids (Corvidae), Gray-headed Chickadee (*Poecile cinctus*), and three finches (Carduelinae); all of them winter predominantly or exclusively in forests (Vorobyev 1963, Boehme et al. 1998). The actual numbers might be higher since the area has been very poorly surveyed, particularly in winter (Andreev 1995, Newell 2004).

Brown Dippers (*Cinclus pallasii*) are common and widespread across many parts of northeastern Asia. They occur in all coastal mountains of the Russian Far East almost up to the northern tip of the Sea of Okhotsk, but they are not known to breed in the more inland areas in the northern part of their range and have never been recorded in northeastern Sakha; the nearest known breeding and wintering area is in the mountains along the coast of the Sea of Okhotsk ~200 km away (Fig. 1), where the climate is much milder (Boehme et al. 1998, Ormerod and Tyler 2005). In fact, the only record from the region was by VD, who observed a single bird on 10 March 1992 at a location described below (Dinets 2001). It was, however, unknown if this winter record represented a vagrant, a very early spring migrant, or a regular occurrence.

More recently, MS visited the same location. His observations are described below, followed by a discussion of zoogeographical, ecological, and conservational implications of the discovery.

OBSERVATIONS

On 19–25 December 2015, as many as five Brown Dippers were observed in Verkhoyansk Range at 63° 01′ 20.48″ N, 137° 32′ 29.3″ E, at 430 m a.s.l. At that location, the Kolyma Highway (km 145 from Khandyga) crosses a small river (Fig. 2) known as Shaman-Ruchey (Shaman's Creek). Because of the presence of warm springs at the bottom, this river remains partially ice-free year-round despite the extreme cold (Dinets 2001). The temperature of the springs is unknown, but the water of the unfrozen portion of the river is very cold to touch in winter, likely <10 °C. The gravel shores of the river are lined with small clumps of

chosenia (*Chosenia arbutifolia*) and willows (*Salix* spp.), while the rest of the valley floor is covered with Dahurian larch (*Larix gmelinii*). Air temperatures during the observational period ranged from 55 °C during the day to –65 °C at night, with only ~3 hrs of daylight per day. Less than 10 cm of snow was on the ground, which is the normal snow cover in the region (Dinets 2002).

The birds were observed with binoculars over a distance of ~500 m along the river. Individual Brown Dippers were separated by at least 50 m, and despite the extreme conditions, they exhibited typical feeding behavior, wading in the water and sometimes fully submerging. However, they were never observed >30 cm from the water's edge, and were never seen flying.

At dusk, two birds were seen roosting on small pebbles very close to the water's edge. On the night of December 25, one dipper was briefly seen wading in the water in the light of the full moon to suggest that the birds could sometimes be feeding at night.

The total length of partially ice-free stretch of the river was not determined. Therefore, the total number of dippers remains unknown.

DISCUSSION

All other bird species known to winter in northeastern Sakha are not aquatic and overwinter in forests, willow thickets, and sometimes human settlements (Vorobyev 1963, Boehme et al. 1998). Common Ravens (*Corvus corax*) are occasionally observed on riverbanks in winter but never enter the water (Vorobyev 1963; VD, pers. obs.). It is surprising that only the smallest aquatic bird of the region is capable of surviving the extremely cold winters. This may be because available winter habitat is either too limited for larger birds, or the small size of Brown Dippers allows them to remain in the thin layer of relatively warm air adjacent to the water surface while foraging, or because of both reasons.

To estimate the air temperatures that the birds are exposed to, VD measured air temperatures at a creek of a size similar to Shaman's Creek, located near Barrow, Alaska. The measurements were taken on a windless night at 10 cm above water or land surface with a mercury thermometer; there were <5 cm of snow on the ground. The creek was prevented from freezing for a few hundred meters by warm (+9 °C) water discharge from an artificial well. One hundred meters downstream from the spring, where the water temperature was +3 °C, the air temperature at the time of measurement was –22 °C away from the spring, –20 °C at the shore 5 cm from the water edge, and –5 °C above the water in the middle of the creek. Although the conditions differed between the two sites, these measurements suggest that the birds are protected from exposure to the extreme cold as long as they are in or directly above the water, but have almost no such protection when they move ashore, likely because the warm air rises vertically from the creek surface and the cold air flows horizontally from the shores to replace it. In windy weather, the protection is probably weaker, but strong winds are rare in the study area in winter (Newell 2004).

Our observations show the unexpected capacity of a small passerine to withstand extreme environmental conditions. Smaller birds and even smaller shrews (*Sorex* spp.) also overwinter in the area without hibernation, but they spend nights in hollow trees or under snow (Novikov 1981) and do not swim or dive. No other bird has ever been reported to enter the water at such low air temperature; even Antarctic species of penguins (Spheniscidae) are not subjected to such cold air, although they have to cope with the chilling effect of very strong winds (Bucher et al. 1990).

Shaman's Creek is located >200 km from the known range of the Brown Dipper (Fig. 1). This species is known to be sedentary or conduct short-range altitudinal migrations but not long-distance movements (Ormerod and Tyler 2005), so it follows that the birds wintering at Shaman's Creek breed somewhere in the area. However, VD did not find Brown Dippers at Shaman's Creek during a summer visit in 1991, and birders or ornithologists traveling in summer along the Kolyma Highway never reported them. The Brown Dippers may breed in isolated narrow, rocky canyons that are common in Verkhoyansk Range at higher elevations (VD, pers. obs.). Alternatively, although less likely, these birds may migrate from the known breeding range on the Sea of Okhotsk coast. The distance is comparable to those covered by migrating White-throated Dippers (*C. cinclus*), a close relative of Brown Dippers (Ormerod and Tyler 2005), but such a migration would require flying northwest in autumn and crossing two mountain ranges.

Rivers in northeastern Sakha sometimes have unfrozen stretches in winter because of water

breakouts following the formation of '*naled*,' large bodies of ice blocking the river channels all the way to the bottom, but these stretches are unlikely to be suitable for wintering dippers (or any other birds) because of violently unstable hydrology (Vorobyev 1963, Dinets 2002, Newell 2004). It is unknown if any streams in the area other than Shaman's Creek remain permanently ice-free. If Shaman's Creek is the only wintering habitat available for Brown Dippers in the region, it should be protected. For now the creek is somewhat protected by traditional beliefs (Dinets 2002), and there seems to be little disturbance away from the Highway. However, there may be considerable risk from gasoline spills and recreational development. Despite the overall decline in the human population of the region (Newell 2004), from 1992–2015 the number of visitors to Shaman's Creek has increased, and wooden railings were constructed along a short stretch of the creek adjacent to the road (MS, pers. obs.).

The physiology and provenance of Brown Dippers wintering at Shaman Creek are worth investigating, but we urge extreme caution in studying this tiny population. Subjecting the birds wintering in such adverse conditions to the additional stress of capture, handling, and fitting with transmitters may be too risky. If a remote tracking study is conducted, it would be advisable to capture the birds in spring, after the worst weather extremes but before the migration.

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