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Nesting of Tundra Wader Species in the Orenburg Steppe Area in the 19th Century

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Abstract—Several tundra wader species occasionally nesting in the former Orenburg Province in the second half of the 19th century were reported by the prominent researchers of the avifauna of that region E.A. Eversmann, N.A. Zarudnyi, and P.P. Sushkin among others. In most cases, the scientists based their assumptions on circumstantial evidence alone, for instance, summer records of adult birds and migrating broods. Taking into account the specific biology of the species in question, such data could not be regarded as sufficient proof for the species' nesting. In the middle of the 20th century, these data were revised and quite justly criticized: this led to varying conclusions regarding the nesting of tundra wader species in the region as having been wrong. The matter seemed to be settled. Yet it should be noted that, along with circumstantial data on the nesting of northern waders, the early researchers had also reported very solid facts like finding nests with clutches of eggs and nonflying chicks (including the Red-necked Phalarope and the Little Stint). For certain reasons, those facts were not considered during the revision that followed. Firstly, it was difficult to find an explanation for such outstanding evidence in the middle of the 20th century. Secondly, no new nests of those species were found that could confirm the 19th century researchers as having been right. Furthermore, the idea that long-term cycles of climate changes influence the dynamics of bird nesting areas became widely accepted only by the end of the 20th century. Nowadays when this idea has been thoroughly developed, the possibility of the former nesting of some tundra wader species in arid regions does not seem so incredible. It seems likely that Zarudnyi and Sushkin were the last scientists to witness the nesting of tundra wader populations in the Orenburg region as over time due to climate warming the waders might have left the region for good.

Keywords: fauna, birds, distribution, nesting area dynamics, climatic cycles

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INTRODUCTION

The study of bird distribution has long been one of the main areas in ornithology, its foundation. Avifaunistics has undergone complex stages of formation over its history. Even 100–150 years ago, naturalists cared little about the actual evidence of the reproduction of one species or another in each particular locality, and the expression "the species nests there" often meant nothing more than "the species occurs there in the nesting time." At that time, a special search for nests was not a top priority for ornithologists. By the mid-19th century, the description of many bird species had been just completed. At the first stages of making the inventory of the fauna of the Russian Empire, it was necessary to study the distribution of bird species on certain territories. Therefore, the main subject of research was to form collections of bird bodies. The specimens collected were examined for the degree of development of the genital organs and the presence of breeding patches, and this made it possible to judge their breeding indirectly. Later, the collection of bird bodies gradually lost its significance for faunistics and shifted into the field of systematics. Instead, the need to obtain rigorous evidence describing the status of a species on a particular territory came to the fore. Only finds of nests with clutches of eggs or nonflying chicks began to be recognized as irrefutable evidence of nesting in a particular area.

It is not surprising that the previous ideas about the boundaries of the nesting ranges of various bird species were revised at the new stage of development of avifaunistics. Thus, the conclusions on breeding that were made in the 19th century on the basis of summer records of adult individuals and wandering broods were rejected, including for birds with more northern ranges in the Orenburg steppe. In particular, this was relevant for waders. However, the study of the papers of the first researchers of bird fauna in Orenburg Territory and critical articles of their followers show that this criticism was often excessive. Some facts were either distorted or completely discarded and forgotten. In the opinion of Davygora (2000), the truth always seems to be in the middle, since critics noted serious

factual data when a researcher described in detail the nesting sites, finds of nests, and nonflying chicks. Apparently, it was premature to believe this matter settled.

In this paper, we decided to study the arguments of past researchers who had reached conclusions about the nesting of tundra waders in the Orenburg steppe and the followers who had rejected these conclusions, and to discuss these arguments. The Orenburg steppe we study is the territory occupied by Orenburg Province in the 18th–19th centuries and its surroundings. This province was more extensive than the current Orenburg region of Russia and included part of the western regions of Kazakhstan.

ANALYSIS OF THE PRIMARY SOURCES

In the second half of the 19th century, the most significant contributors to the study of birds in Orenburg Territory were E.A. Eversmann, N.A. Severtsov, P.S. Nazarov, N.A. Zarudnyi, and P.P. Sushkin. These researchers attributed several wader species to the category of nesting birds, the main ranges of which are located far to the north, in the tundra zone. The reasons that allowed them to draw such conclusions are very curious. Below we provide an annotated list of these species along with the authors' arguments in favor of the nesting of each species, dividing them into two groups. The first group includes the species for which the arguments about their nesting in the region considered are regarded by us as unconvincing. The second group deserves more attention; for these species, there are quite specific facts on nesting in the Orenburg steppe. We emphasize the most important of these facts. When primary sources are cited, the author's text is highlighted in italics. Dates are left in the old style as they are given by the cited authors. The numbers in square brackets in the text correspond to the numbers of localities indicated on the schematic map.

The First Group of Species

Common Ringed Plover (*Charadrius hiaticula* (Linnaeus 1758)). Eversmann (1866) writes that this species "*... builds its nests, at least in Kazan and Simbirsk provinces*" and gives a description. "*It lays eggs in a hole, on sand; there are four of them in one nest; the birds are quite large in size and have a lot of gray and brown–black dots and small spots on the matte whitish, slightly reddish background*" (p. 381); this description differs from his own descriptions of the Small Plover nests. However, it is unclear whether he found the Common Ringed Plover in the Orenburg Territory itself. Zarudnyi (1888, p. 277) found the Common Ringed Plover "*as a bird nesting along the Ilek near the Burannaya stanitsa* [1] *and near the city of Aktobe* [2]." The author does not give any factors that confirm nesting.

Common Dotterel (*Eudromias morinellus* (Linnaeus 1758)). Nazarov (Nazarov, 1886) assumed the nesting of common dotterels at the "wormwood strip," but did not indicate what this assumption was based on and what area it related to. Zarudnyi (1888, p. 277) writes: "*In 1883 I encountered a small number of these birds nesting in the desert clay places of the Bish-Tomak tract* [3] *between the Isenbai and Iset-Batyr rivers. In addition, I found a few birds in a clayey upland steppe near Ashche-Kul Lake, not far from the confluence of the Sau-Kain River in the Ulu-Hobda* [4]*, where they also nested, since they led me away like pratincoles do this around a nest or near chicks*." In the remaining space of the Orenburg steppe, Eversmann, Severtsov, Zarudnyi, and Sushkin observed common dotterels only during flight. However, there is information about finds of clutches and nonflying chicks in the Volga-Ural interfluve (Volchanetskii, 1937). It is noteworthy that in the first half of the 19th century the Common Dotterel was found in the region under consideration in large numbers during the spring and autumn migration (Eversmann, 1866), and after 1933, researchers did not record this species at all for a long time even during migrations. There are only a few records of small flocks and single individuals during the autumn migration period that were made in recent years (Gordienko, 1982; Korovin, 1997; Davygora, 1998; Nazin, 2014).

Ruddy Turnstone (*Arenaria interpres* (Linnaeus 1758)). Eversmann (1866) and Nazarov (Nazarov, 1886) call the Ruddy Turnstone in a generalized form a nesting bird of the semi-desert and desert zone. According to Zarudnyi (1888, p. 284), "*Ruddy turnstones normally nest annually only at large salt lakes, such as, for example, the Sor-Kul* [5]. *... The Sor-Kul near the Ku-Agach River in our region is the favorite place of stay of ruddy turnstones. Here they are found in flocks with up to 25 birds in each flock and very often*." It must be admitted that this statement really appears unfounded and, apparently, was justly criticized, because the matter concerns the flock placement of the species. This is the more so the case since he had been at Sor-Kul only from July 24 (on August 6 in the new style), as follows from his routes and from copies of his collection. On May 26, 1894, Sushkin (1908) found a female from a pair at Kairshakty-Kul [6], which had a strongly swollen ovary and follicles of about 3 mm in diameter. In the Irgiz area [7], he encountered a flying brood on July 20 at Bupay-Sor, saw single young birds on July 21 at Klim-Jaigan, and the next day he captured a single bird and then two males and two females from a flock at Kunspay-Sor; the captured specimens were adult and, "*judging by the state of the genitals, they had nested in that year*" (p. 156). At this point, it should be noted that they were captured on August 4 in the new style and, therefore, they could have already covered a sufficiently large distance from the nesting site.

Curlew Sandpiper (*Calidris ferruginea* (Pontoppidan 1763)). According to Eversmann (1866), this species is found throughout the summer in Orenburg Province everywhere in both northern and southern places that are convenient for it. Nazarov (1886),

referring to E.A. Eversmann, assigns the Curlew Sandpiper to species nesting in all the natural areas identified by him. Zarudnyi (1888, p. 298) found the Curlew Sandpiper "*nesting at Bish-Kop Sors and Sor-Kul* [8]*; in the latter, curlew sandpipers were very common*." The author does not give any confirmation of nesting. Most likely, his grounds for talking about the nesting of the species were the capturing of a very young bird on July 25, 1883, which had just replaced its downy attire with complete plumage (Buturlin, 1905). In other places (along the Ural, Ilek, and Khobda rivers and Ashche-Kul and Ak-Kul lakes), he found curlew sandpipers during the transit migration and summer wanderings. The specimens from his collection were obtained at Sor-Kul on July 24–25, 1883 (August 5–6 in the new style).

Red-backed Sandpiper (*C. alpina* (Linnaeus 1758)). According to Zarudnyi (1888, p. 297), "*this species is encountered in our region in summer quite rarely and nests even less often. I found it nesting in the valley of the Ilek near the settlement of Novoiletskii in 1881*" [9]. The author does not provide any evidence of the nesting of the species. Meanwhile, it is obvious that this single find has nothing common with the observations of numerous non-nesting (migrating or wandering) red-backed sandpipers in summer on the steppe. For example, one of the three specimens from his collection was captured on June 25, 1881, near Burannaya Stanitsa (the other two specimens were captured as early as August), whereas he does not name Burannaya Stanitsa as a nesting site of the Red-backed Sandpiper.

Sanderling (*C. alba* (Pallas 1764)). Zarudnyi (1888, p. 300) writes: "*Sanderlings normally nest in our country although they are rare. In the first days of July 1883, I found several broods at Bish-Kop Sors* [8]*, and in the second and last third of this month, I found them at Sulyuk-Kul* [10] *and Chushkaly* [11]". Note that in the new style these records fall in the second half of July and the beginning of August. Apparently, the matter concerns flying broods, which cannot serve as evidence of the species nesting in the region. Sushkin (1908) lists the Sanderling as a bird nesting at the upper reaches of the Irgiz [7]. In this connection, he relies on the observation of birds with distracting behavior at the beginning of the third ten-day period of June and emphasizes that such birds were found only in one place (pp. 145–146): "*The birds kept alone occasionally, more often they were in pairs or small flocks of 5–6 individuals. These species were especially numerous at Bupai-Sor; apparently, broods were also present there, but it was very difficult to get them... . It is interesting that sanderling flocks flew away when a man appeared, and then one or two sanderlings appeared and started, without coming up to a close shot, rotating around the hunter, as if trying to led him away—they would fly around, sit down, run away constantly looking back, and then fly up again*".

The Second Group of Species

Gray Phalarope (*Phalaropus fulicarius* Linnaeus 1758) was found nesting at Bish-Kop Sors [8] by Zarudnyi (1888, p. 292) who encountered a brood of three young birds that "still could not fly" on June 24, 1883 (on June, 5 in the new style). This species was included by him among occasionally nesting species.

Red-necked Phalarope (*Ph. lobatus* (Linnaeus 1758)). Zarudnyi (1888, pp. 290–291) found this species nesting in many points of Orenburg Territory to the south of the Bish-Kop tract [8] "*... the birds are in sufficient quantity everywhere, where there are more or less vast wet solonetz areas with salt lakes and swamps. ... As far as I managed to notice, red-necked phalaropes mostly nest along the damp shores of sors covered with low grass. Nests are built a few steps apart from one another approximately in the following pattern: each bird pair constructs a kind of hillock under the shelter of a particularly dense bush, using last-year's stalks and leaves, which are often taken from heaps of water sediments; they trample the top of this hillock with their legs to form a flat hole that must play the role of a nest. The female lays three to four eggs there, which it incubates together with the male. In early June, I found eggs that had already been strongly incubated*." In another of his works (Zarudnyi, 1889, p. 661), he writes that "*most of the specimens captured near nests turned out to be males*" and recognizes that he had been wrong in concluding previously that females took part in incubation and also indicates that only a tenth part of all red-necked phalaropes nested in the region.

Sushkin (1908, pp. 180–182) says about the Red-necked Phalarope that this species, like some other tundra inhabitants, "*... is predominantly represented by migrating and wandering summer individuals, but a part of them undoubtedly breed. ... On July 18, 1898, I encountered a brood of five young birds at the lake between Kara-Zhilandy and Sary-Turgai* [12]*; two old birds kept near this brood and one was swimming at a distance. The birds kept a close group and were flying noticeably worse than the old ones; several times I came very close to the brood, and then the old birds began anxiously flying around and led the brood to the other side of the lake. ... At the Masak tract, in the solonetzic aryk floodplains, I encountered a solitary red-necked phalarope that flew up to the dog with a cry and very successfully confused both it and us. From May 6 until the end of this month, pairs of red-necked phalaropes that kept completely apart from both their relatives and other phalaropes were found by me in other mentioned points along with migratory flocks. The terrain in all these points completely satisfied the conditions for the breeding of the Red-nested Phalarope, as Zarudnyi describes them.*"

Little Stint (*Calidris minuta* (Leisler 1812)). According to Eversmann (1866, p. 436), the Little Stint is not a rare bird in Orenburg Territory; young birds with absolutely incomplete plumage are found there in late June and early July. According to Zarud-

nyi (1888, p. 297), the Little Stint "*... is rarely found in summer, but it nests quite constantly near Sor-Kul* [5]." Just like for the Common Ringed Plover, the Red-Backed Sandpiper, and a number of other waders, he does not indicate any facts to confirm breeding, but he probably simply did not consider it necessary to give any obvious evidence, which he would certainly have done if he had found the only nest of some particularly rare species. It follows from this that he found nests of little stints many times.

Sushkin (1908) writes that the Little Stint "*is ordinary in the Orenburg steppe and sometimes even numerous during migrations and in the summer, and a few individuals also breed there*" (p. 138). At the upper reaches of the Ilek River [2], he caught a female with a breeding patch on June 28, 1893 (Sushkin, 1908, p. 139), on May 24 and 27, 1894, at Ak-Kul Lake [6] between the Emba and Mugodzhar Mountains, he found "*females with swollen ovaries and oviducts that led him from nests; one of them* (captured on May 24) *already had a large breeding patch. Males did not keep near the breeding females*" (Sushkin, 1908, p. 141). Sushkin gives another argument for the breeding of little stints, referring to encountering individual anxious birds at grassy marshes around lakes, while nomadic and migratory birds were seen only in muddy shallow-water areas (Sushkin, 1908, pp. 140–141): "*In summer, little stints are found alone, in pairs, and in flocks of approximately 20 birds; such a flock life is led by the vast majority of individuals ... Along with such wandering individuals, there are also individuals that undoubtedly breed, as I have already said. Flocks like to keep along completely naked shores of saline lakes or along river banks; breeding little stints, and single birds and pairs in general keep in swampy places of a marsh or lake that are covered with sparse grass or where areas of dense grass alternate with bald areas; flocks are found in such places only upon arrival. ... I am sure that all little stints that occur outside the migration period at the grassy marshes of the region breed there.*" This statement speaks in favor of the fact that Sushkin distinguished between breeding and nonbreeding individuals.

Broad-billed Sandpiper (*Limicola falcinellus* (Pontoppidan 1763)) was found at the nesting site by Zarudnyi (1897, p. 299) at reed sors near Ak-Kol and Tuz-Kol Lakes [13], where he "*caught several chicks that had already formed plumage, but could not yet fly*" at the end of June 1888. Sushkin (1908) encountered broad-billed sandpipers two times at the upper reaches of the Irgiz River in the summer of 1894. In one of these cases "*on July 7, a male broad-billed sandpiper with breeding plumage and an incubation patch was captured at the Kamysty-Kul reed marsh with solonetzic shores, which was near the Bill-Kop reed lake* [14]*; it led me from the nest and, after a shot at other sandpipers, it flew up to me and circled around for a long time*" (p. 137). Meanwhile, the autumn migration of broad-billed sandpipers usually takes place in August; their migration is observed most early and only in some years from July 10, moreover, in flocks.

DISCUSSION

As can be seen, the data on the breeding of northern warders in the 19th century in Orenburg Territory are very contradictory. In some cases, the same authors seem to bring convincing facts, and in other cases they draw manifestly erroneous conclusions. In general, tundra warders misled many researchers of the past, and not only in Orenburg Territory. These species, especially sanderlings, are in no hurry to fly to nesting sites in spring. They keep on the shores of steppe reservoirs for a long time, until the beginning of summer (Belik, 1996; our data) and, after reaching the tundra, they immediately start breeding. But in the case of failure, some of them (the Red-backed Phalarope, Little Stint, etc.) immediately leave the nesting area almost without repeated attempts (Ryabitsev, 1993; Ryabitsev et al., 2005) and after a few days find themselves again in the southern regions. This summer break in the stay of these species in the steppe zone, during which the birds have time to visit tundra for a short while and come back, is so short that it can sometimes be overlooked. However, most importantly, the birds that have recently had clutches may keep breeding patches and elements of breeding behavior, although they have already passed thousands of kilometers to the south (for example, Gavrilov, 1985).

Such features of the biology of tundra waders can cause erroneous ideas about the nature of their stay in a certain area, which makes it necessary to look for other, weightier evidence of nesting than summer records of adult birds and wandering broods. This behavior drew the attention of Mikheyev (1938), Buturlin (1905, 1934), and other researchers. In particular, Buturlin (1934, p. 95) questions the nesting of little stints in the lower reaches of the Ilek (Sara-Kul) and near Aktyubinsk on the grounds that "*female little stints often wander and fly away, leaving down chicks in the care of males*" (although he agrees with the arguments in favor of the Red-backed Phalarope nesting in the basin of the Ural River). After the appearance of the article by Cheltsov-Bebutov (1950), all the earlier conclusions about northern waders nesting in the Orenburg steppe were completely rejected. The regional report *Ptitsy Kazakhstana* (Dolgushin, 1962) no longer mentions any fact of the nesting of the species under consideration; all of them are characterized only as transit species.

The Article by A.M. Cheltsov-Bebutov

The first question that arises after studying the original sources is the following: why were these seemingly irrefutable facts of the nesting of the species considered ignored? Why were the finds of clutches and

downy chicks regarded as errors in the identification of the species? To answer this question, one should first turn to the study by Cheltsov-Bebutov "On the Nature of the Stay of Northern Wader Species in Kazakhstan" (1950). It was this article that played a key role in studying the nesting of tundra wader species in Kazakhstan, having actually settled this problem. The significance of this small article was so great that professor I.A. Dolgushin who wrote a five-volume monograph on the birds of Kazakhstan removed from the group of nesting species not only all tundra waders, but also some species that are more widely distributed: Green Sandpiper (*Tringa ochropus*), Wood Sandpiper (*T. glareola*), Common Greenshank (*T. nebularia*), Common Sandpiper (*Actitis hypoleucos*), Common Snipe (*Gallinago gallinago*), and Great Snipe (*G. media*).

Within three months, from June 8 to September 8, 1946, Cheltsov-Bebutov studied the seasonal dynamics of the species composition and numbers of waders in the territory of Naurzum Reserve and also conducted observations on the course of their nesting, wandering, and migration, which he described in detail in his article. Regarding the northern wader species, no signs of their nesting were discovered by him (as they had not been discovered by De Livron (1938) and Mikheyev (1938) who had worked on this territory earlier, also observing these species in the summer). Based on this, Cheltsov-Bebutov (1950, p. 89) came to the conclusion that "*neither summer finds of bird pairs or flocks, nor records of young birds, nor breeding songs, courting, or fights, nor adherence of individual birds to certain places can serve as evidence of nesting.*" This principle became fundamental for subsequent generations of faunists and remains such today. Of course, the article by Cheltsov-Bebutov was extremely important for faunistics. This study for the first time clearly indicated that if a particular bird species is encountered somewhere in the breeding period, this does not yet prove that this species breeds there. On the other hand, it was necessary to explain somehow the finds of eggs and downy chicks of tundra waders that had been described by the early researchers. These factors were interpreted by Cheltsov-Bebutov very simply. He "explained" them by an incorrect identification of the species. It appears not quite ethical. Why did he do that? Let us try to find out.

Cheltsov-Bebutov (1922–1978) was an outstanding Soviet ornithologist, ecologist, biogeographer, systematist, and faunist. He made a great contribution to the development of domestic science, primarily zoogeography (for example, Flint et al., 1999). But at the time of writing the article (1946), he was still a university student, and that article was his first scientific publication. It should be noted at this point that in those years Soviet science had a strong political component. The fact that the young Soviet researcher "once again unmasked venerable tsarist scientists" is fully consistent with the spirit of that time. This is felt in some obviously disparaging phrases: "*Relying upon the summer finds of bird pairs and flocks and catches of females with breeding-patches, Sushkin populated various zoological sites of the region he described with nesting (however, sometimes sporadically) ruddy turnstones, phalaropes, three sanderling species, ruffs, and some other northern wader species*" (p. 81) (we did not include the Ruff (*Philomachus pugnax*) mentioned by Cheltsov-Bebutov among the species discussed, because there is sufficiently convincing evidence of this species breeding in the Orenburg steppe, including collections of egg clutches; see below).

Arguing about the preservation of breeding patches in parents before young birds begin flying, which fully explains the presence of such patches in birds flying from northern nesting sites, Cheltsov-Bebutov for some reason does not say that these patches were also found at the very beginning of the breeding season in birds that obviously had not yet been in the tundra zone. It is hardly possible to find breeding patches in those individuals that have yet to arrive at nesting sites. By the way, later Cheltsov-Bebutov (1958) changed his mind about the nature of the Caspian Dotterel (*Charadrius asiaticus*) staying in the Naurzum region just due to the presence of black patches in the specimens collected by A.R. De Livron.

As for the facts of finds of clutches and downy chicks of the tundra wader species, they clearly did not fit into the general picture created by Cheltsov-Bebutov, because if they had been recognized, the article would be deprived of any meaning. So, he decided simply to ignore these facts, explaining them by wrong species identification. This was particularly the case since, as we have shown above, there were really few facts that deserved attention and most of the conclusions of the first researchers on the nesting of tundra waders were unfounded. The finds of clutches and downy chicks were not supported by collection materials. The information about such finds was given only for four species; moreover, it was obviously accidental for two of them. There were no new nesting finds of tundra waders that could confirm the correctness of the pre-revolution researchers. Therefore, contemporaries were forced to agree with the "visitant" metropolitan student, who wrote a small critical article based on the results of observations of the summer season alone and partly made null and void the works of the eminent scientists who had devoted many years to researching the Orenburg steppe and had written many-volume books.

However, is it possible that wrong species identification actually took place? Let us try to find out.

On the Scientific Qualifications of the 19th Century Researchers of the Orenburg Steppe

The greatest contribution to the study of the bird fauna of Orenburg Territory was made in the 19th century by the naturalist and traveler N.A. Zarudnyi (1859–1919). As a teacher of the Cadet Corps in Orenburg in 1879–1892, he devoted all those years to the study of the regional fauna, mainly birds in the vicinity of Orenburg, in the middle reaches of the Ural, and in the Ilek basin. He is considered to be the greatest Russian bird systematist, who distinguished more than 250 bird species (Chibilev, 2012). His qualification as an ornithologist of the highest class was repeatedly confirmed by his contemporaries, and his authority was considered significant for ornithology in the late 19th and early 20th centuries not only in Russia, but also far beyond its borders. Zarudnyi is still an unsurpassed faunist and collector (Davygora, 2000, 2010; Kovshar and Mitropol'skii, 2009; etc.). Even Academician F.D. Pleske who edited his manuscript and studied his collections was in some cases mistaken in believing that he had found some inaccuracies in the species identification. Modern revision of these collections has shown that it was Zarudnyi who was right, and not Pleske (Koblik et al., 2006, p. 206). Moreover, such facts are not unique.

Despite this, Zarudnyi did not have a fundamental biological education and, moreover, he made his most significant finds of northern waders at the age of 25 years. At that time his lack of scientific experience was noted by Buturlin (1905, pp. 226–227): "*...Zarudnyi's trip in summer 1883 (to which the analyzed finds belong) was rather hasty; he visited Bish-Kop Sors (where the Curlew Sandpiper was not numerous) at the end of June, and at the end of July, he arrived at Sor-Kul, and there he eventually found the Curlew Sandpiper common. The end of July, even far to the north beyond the Arctic Circle, is in most cases a period too late for observing the breeding habits and nesting of waders, not to mention such relatively southern localities as the Kyrgyz steppe in the Ural region. Thus, Zarudnyi could not report the observations of nesting, which he had not made... . In 1882–1884, Zarudnyi seriously studied ornithology only in the first years, and there is every reason to assume that now, twenty years later, having acquired extensive experience in the same Kyrgyz steppe and in the vast zoologically unknown spaces of the Turan Lowland and the Iranian Plateau, he would not have taken a find of a flying, although a very young bird for undoubted proof of nesting, as, of course, he would not take molting, exhausted, and dingy old birds for the full brilliance of their breeding attire.*"

Indeed, it can be assumed that Zarudnyi could have been mistaken in interpreting the status of some species or another in the region due to his young age. But it is nevertheless ridiculous to accuse him of incorrectly determining the species identity of clutches and wader chicks. Let us add to this that chicks that have formed plumage, but are still nonflying or poorly flying are two times smaller in the species such as Phalaropes, Little Stint, and Broad-billed Sandpiper than in the species the nesting finds of which in the Orenburg region have not been doubted by anyone. That is, it is impossible to identify them incorrectly confusing them with chicks of other species, not least because of their size. Even having an initial level of qualification, one cannot confuse them with chicks of a similar size range, for example, with those of the Little Ringed Plover (*Charadrius dubius*).

It is necessary to add that Academician Sushkin also criticized Zarudnyi. In his review of the bird fauna of the Middle Kyrgyz steppe (Sushkin, 1908), he said that this researcher had a weakness of "*attributing birds to the nesting category too easily*" (pp. 14–15). To vindicate Zarudnyi, we can quote his own statement (Zarudnyi, 1897, p. 302): "*When solving the question about the nesting of one or another of them, I had to pay attention to the behavior of females and nonflying chicks if I had not found nests, etc., but I was in no way guided by the early finds of old birds.*" However, at this point, it is much more important that Sushkin himself appears before us as a strict and responsible researcher in characterizing Zarudnyi in this way. If he relates some species to the category of nesting (even following one of his predecessors), he is fully responsible for his words.

The need to obtain strict evidence of bird nesting was expressed by Sushkin in relation to another predecessor (p. 180): "*... In many places Eversmann's book pays attention to whether a given bird is found in a certain area as a transit or wandering bird, in other words, a nonbreeding bird, or if this bird actually breeds there; the conditions of being in some territory are indicated by the indefinite word "it occurs." However, it should be noted that only after Eversmann's death, in the sixties and even in the seventies, it became more fully understood that it is necessary to distinguish strictly between breeding and nonbreeding birds for each given area.*" After reading these words, we have to admit that if the studies by Zarudnyi and Sushkin state about one species or another that "it was found breeding," then the authors had good reasons for this formulation, even if they do not present them. So, we hardly have the right to discard this information as completely unsubstantiated and unfounded.

Occasional Nesting along the Migration Pathways

A number of northern bird species are notable for occasional breeding in various places along their migration pathways. One of such wader species in Western Siberia is the Ruff. Its main breeding area is located in southern tundra and forest tundra, but it can also be found at breeding sites further to the south: in

the greater part of the forest zone and even in steppe (Ryabitsev, 2014). It seems that some individuals stay to breed along the migration path, not reaching the main breeding sites, and the number of such individuals gradually decreases in the direction from north to south. Figuratively speaking, in spring the flow of migrating ruffs leaves behind itself a kind of "plume" or "comet's tail" of females that stay to breed, which gradually thins out towards the south and disappears at the border of the steppe and semi-desert zones. The southernmost breeding sites of ruffs are those at the Ilek River in the Orenburg region (collections of E.P. Spangenberg, which are kept at the museums of the Institute of General and Experimental Biology, Siberian Branch, Russian Academy of Sciences, and the Institute of Zoology, Academy of Sciences of the Kazakh Soviet Socialist Republic) and in the lower reaches of the Turgai River (Khrokov, 1988).

It should be noted that the Ruff is one of the most numerous wader species that migrate through the Orenburg steppe. According to our observations, in some years in the Trans-Ural region, it can even exceed the abundance of all the other migrant waders taken together. However, only single individuals of such a numerous species breed along the migratory pathways (more precisely, only single finds are known). Perhaps, individual cases of breeding at southern latitudes also occur in other migratory wader species, but they are much less likely to be detected because of their small numbers. The facts of successful (!) breeding along the migratory pathways are known for species such as the Red-breasted Goose (*Branta ruficollis*) in the Kurgan region (Naumov, 2001; Tarasov et al., 2010), the Magpie Diver (*Mergellus albellus*) in Naurzum Nature Reserve (Bragin, E.A. and Bragin, A.E., 2009), the Long-tailed Duck (*Clangula hyemalis*) near Tyumen (Sharonov, 1954, cited according to Blinova and Blinov, 1997), etc. Each such case has quite objective reasons that prevent the further migration of birds to the north. Perhaps, some bird from a breeding pair was wounded and the birds were forced to stay along the pathway. There could be other reasons. We do not know what forces individual female ruffs not to fly further to the north, but to stay for breeding in the steppe zone. Most likely, these single facts of breeding are explained by the different quality of individuals, which is present in any population and has an adaptive value (for example, Shilov, 1985). (In this regard, the larger the sample size, the easier it is to find all sorts of deviations from the statistical norm in this sample, as regards physiological, behavioral, and any other signs.)

It is known that red-necked phalaropes occasionally breed in the Novgorod region (Mishchenko and Sukhanova, 2009) and on the shores and islands of the White and Baltic seas (Lappo et al., 2012), i.e., in regions that are also far from the main nesting area. Apparently, Zarudnyi's finding of a nonflying brood of gray phalaropes near the lower reaches of the Ilek was the same kind of "*exceptionally rare eventuality*" (Buturlin, 1934, p. 191). The migration pathways of this species go along sea coasts, whereas in inland areas it is a rare migratory species. At present, it is difficult to imagine that in such conditions birds could find a pair and breed somewhere in steppe far from the migration pathways. However, in the earlier period, they were encountered in the Orenburg steppe in flocks (for example, in July 1883 a flock of 13 individuals was recorded at Sor-Kul, cited according to Sushkin, 1908), which suggests the existence of a former transit pathway that passed through the Caspian Sea and Turgai Lowland.

It should be noted that the Ruff and a number of other wader species (Gray Phalarope, Little Stint, Curlew Sandpiper, etc.) are geographically labile species, individuals of which do not seek to return in spring to their previous year's nesting sites (Shamel and Tracy, 1977; Ryabitsev, 1993; Soloviev et al., 1996; Ryabitsev et al., 2005; Tomkovich and Soloviev, 2006; etc.). If certain conditions that prevent migration arise, they may prefer to breed somewhere along the migration pathways, rather than continue to fly farther at any cost, particularly since they no longer need to have a partner after egg laying. However, it is known that even geographically conservative species such as the Black-bellied Plover (*Pluvialis squatarola*) have a property that some individuals of these species change their breeding places from year to year (Ryabitsev, 1998). Apparently, this is also typical for brant geese that also prefer to build nests outside the main range than to miss the breeding season completely, if they stayed for some reason along the migration pathways, since they are notable for having constant pairs and pair-mates flying together. (By the way, red-breasted geese quite successfully nest in many zoos.) From these considerations, making allowance for the fact that a number of waders (Ruddy Turnstone, Gray Phalarope, Red-necked Phalarope, Little Stint, Curlew Sandpiper, Sanderling) can form pairs during the last stages of spring migration (Kondratiev, 1982; Cramp and Simmons, 1983; Ryabitsev, 1993; Lappo et al., 2012; etc.), their episodic breeding far from the tundra nesting areas cannot be regarded as unlikely.

Shifts in Breeding Ranges

In the recent years, substantial information has been accumulated on significant changes in the breeding ranges of birds, which have taken place over a relatively short period of time. In many cases, these dynamics of ranges are determined by centuries-old climate cycles. Thus, for example, in half of the wader species that breed in the southern Trans-Ural region, the distribution boundaries passing there (the southern boundaries in some species and the northern ones in others) moved northward in the 20th century by an average of three parallels and in individual species by seven parallels (Polyakov and Tarasov, 2011), which is

consistent with climate warming processes. However, this warming began not in the 20th century, but much earlier. On the scale of centuries-old climatic cycles (according to Krivenko, 1991), noticeable warming can be seen as early as from the 18th and early 19th centuries when the so-called "Little Ice Age" ended, and since then the air temperature on the Earth has been increasing steadily.

Thus, the Ruff was an ordinary breeding species in the Orenburg steppe as early as 50–100 years ago (Raiskii, 1913; Stepanyan, 1971). Zarudnyi (1888) found this species "very common" at breeding sites along the Khobda and at swampy estuaries in southern steppe. The label to one of the clutches collected by E.P. Spangenberg, which was dated May 25, 1931, indicates that breeding ruffs (near the village of Sargachin in the Akbulak district of the Orenburg region) were numerous; another label is dated May 28, 1948. Since then, the Ruff has been discovered at the breeding site in the region under consideration only once, in 1986 in the Irgiz district of the Aktobe region (Khrokov, 1988).

The above-mentioned "plume" of episodic breeding of this species along the migration pathways from southern steppe to northern taiga may indicate the existence of a once single breeding range along the banks of the Turgai Strait, which connected the West Siberian Lowland with the Aral-Caspian Sea (Suess, 1901; Naidin, 2003). Most likely, such a distribution was characteristic not only for ruffs, but also for a number of other bird species. The modern breeding ranges of many northern waders in Eurasia (Black-bellied Plover, Golden Plover (*Pluvialis apricaria*)), Common Ringed Plover, Spotted Redshank (*Tringa erythropus*), Red-necked Phalarope, Ruff, Little Stint, White-tailed Sandpiper (*Calidris temminckii*), Red-backed Sandpiper, Broad-billed Sandpiper, Stone Plover (*Limosa lapponica*)) are most strongly wedged southward into the continent precisely in Western Siberia (Lappo et al., 2012) (which is obviously due to its lowland nature), and some of these species have isolated centers of their range there, but do not have (except the Stone Plover) an "optimum" or "core" of the range (Lappo et al., 2012), which suggests a decrease in the significance of these centers.

It was reported as early as by Zarudnyi (1888, p. 22) that the occasional breeding of the Skua (*Stercorarius* sp.), White Owl (*Nyctea scandiaca*), Gray Phalarope, and a number of other species in Orenburg Territory probably showed "*the dying remains of the formerly widespread distribution range that related to the time of existence of the Aral-Caspian Sea*." Sushkin (1908) cited the surveyed information on the breeding of the Siberian Crane (*Grus leucogeranus*) in the Turgai Lowland. Nazarov (Nazarov, 1886) described swamped birch forests along the shores of Ayke Lake on the territory of the modern Orenburg region (now they are absent), where siberian cranes also bred. More detailed information on the influence of climate rhythms on the dynamics of the ranges of aquatic and semi-aquatic bird species in Northern Eurasia is presented in the review by Krivenko and Vinogradov (2008).

However, doubts about the possibility of tundra waders breeding in the steppe zone may be caused by a lack of habitats necessary for them. In particular, the Little Stint builds nests in moss turf, and phalaropes build them on wet grassy and mossy marshes or lakeshores among low grass, and the Broad-billed Sandpiper builds them on swampy mossy or grassy marshes with hummocks and bush clumps (Lappo et al., 2012; Ryabitsev, 2014). Such plant associations are characteristic of the tundra zone, whereas in the steppe zone physiologically similar habitats can be found only somewhere along lakeshores, in river floodplains, and on grassy and mossy marshes, raised bogs, and floating bogs. Now their area is negligible in comparison with open dry steppe, but 150 years ago, judging from the descriptions of the nature of the localities by Zarudnyi (1888) and Sushkin (1908), it was larger.

Some Final Considerations

When discussing the problem indicated in the title of the article, we deliberately limited ourselves to the tundra wader species, although there is also reason to talk about the past breeding of a number of forest species in the Orenburg steppe. So, for example, at the end of May 1882, Zarudnyi (1888, p. 308) found in the Governor's meadows (near Orenburg) a breeding pair of Terek Sandpipers (*Xenus cinereus*) that "*led him from a clutch*"—it follows from this that a clutch was found. Sushkin (1908) found clutches of the Wood Sandpiper at the Emba in May 1898. We should also note in favor of the arguments of Zarudnyi and Sushkin that by no means all the species of tundra waders flying in steppe were attributed by them to the rank of breeding species. Thus, Zarudnyi (1888, p. 274) writes that he found young golden plovers, which "*had been obviously raised somewhere nearby*," but that he had "*never encountered breeding golden plovers anywhere*." Neither he nor Sushkin managed to find any evidence of the breeding of Temminck's Stint. They mention the Black-bellied Plover, Grass Snipe, and Stone Plover (*Lymnocryptes minimus*) as species that definitely do not breed in steppe, although all of them were also recorded by them in summer.

Unfortunately, Zarudnyi did not collect clutches and in most cases did not provide detailed descriptions of his finds, but limited himself to a short phrase "the species was found breeding." He set himself the task of enumerating first of all those places where he found a certain species at a nesting site, during migration, etc., without being distracted by the details of the reproductive biology of the species. He refers to these details only in a few specific essays, in particular giving a description of clutches of red-necked phalaropes,

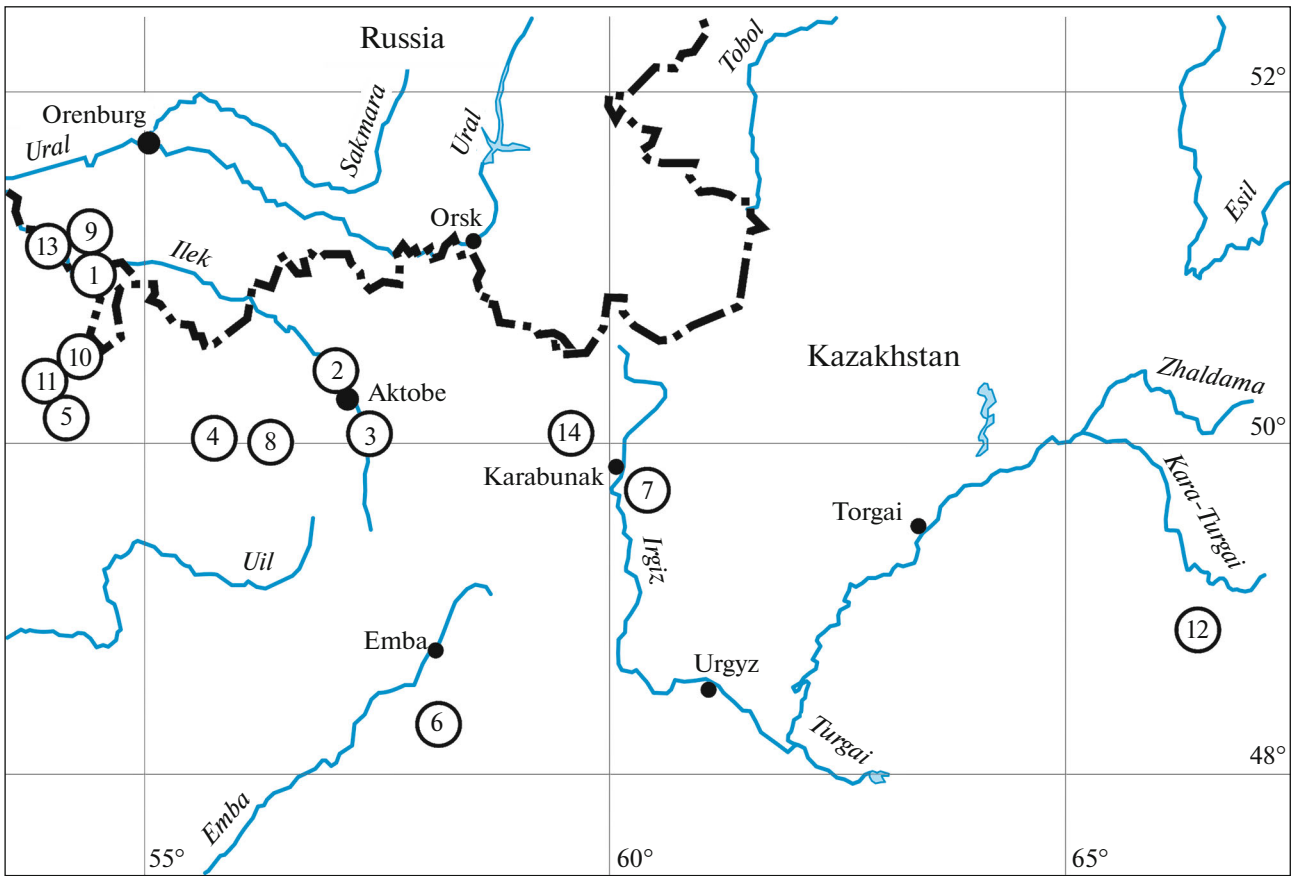

Fig. 1. Places of nesting (?) finds of the following species in the Orenburg steppe: Common Ringed Plover [1, 2], Common Dotterel [3, 4], Ruddy Turnstone [5, 6, 7], Gray Phalarope [8], Red-necked Phalarope [8, 12], Little Stint [2, 5, 6], Curlew Sandpiper [8], Red-backed Sandpiper [9], Sanderling [8, 10, 11], and Broad-billed Sandpiper [13, 14]. See the details in the text.

nonflying chicks of gray phalaropes and broad-billed sandpipers. By the way, writing an essay on the Ruff (Zarudnyi, 1888, pp. 298–300), after giving the standard phrase "the species was found breeding somewhere," he decided to describe the behavior of females scared from the nest because of the unusualness of this behavior, as well as to describe the structure of nests. Some details are given by Zarudnyi in the comments. Thus, he wrote the following about great snipes (Zarudnyi, 1888, p. 295): "*they were very common in the vicinity of the villages of Burannaya, Izobilnaya, and Novoiletskaya in July* (1880) *(almost all the birds were old), but I found only three of them breeding, despite the most thorough search.*" After such words, it is already difficult to doubt the fact of the breeding of the species, although the author never gives specific data. In this regard, we should note that if he does not point directly to finds of nests in other essays, this does not mean that he did not find them.

Unlike Zarudnyi, Sushkin does give detailed descriptions of his finds. However, among all his finds, there is, perhaps, only one that can serve as some evidence of the breeding of tundra waders: a female little stint with a breeding patch, which was captured on May 24, 1894 (admittedly, this is so only if this formation was not the result of some bird injury). Sushkin made two long expeditions (in 1894 and 1898) and explored the territory from the northeastern of the Kostanai region to the lower reaches of the Irgiz and Mugodzhar Mountains, but his stay there fell on a dry period when most of the lakes and some rivers had completely dried up.

Thus, we believe that a part of the finds that were made by the researchers of the 19th century was undeservedly rejected and forgotten. While many conclusions about tundra waders breeding in the Orenburg steppe were wrong, it was just as wrong to deny all these data without detailed analysis. The above evidence shows that there is sufficiently strong proof of the Red-necked Phalarope breeding in the Orenburg steppe and allows us to suppose that at least three more species (Gray Phalarope, Little Stint, and Broad-billed Sandpiper) sporadically bred there. Along with them, there were probably a number of other breeding species. Apparently, there was random breeding of migrating individuals. However, it is not unlikely that at the end of the "Little Ice Age," which lasted until the middle of the 19th century (Shnitnikov, 1950,

1957), there still existed isolated, biologically specific steppe populations of waders, the main nesting ranges of which were located in the tundra zone similarly to the modern isolated populations of the same species at tundralike swamps in the taiga zone of Western Siberia (Vinogradov et al., 1991, 1992) or the steppe subspecies of the Whimbrel (*Numenius phaeopus alboaxillaris*). In this case, Zarudnyi and Sushkin turned out to be the last researchers who managed to detect these subsequently disappearing populations breeding in Orenburg Territory. However, this hypothesis needs further confirmation by more facts.

As for the personality of Cheltsov-Bebutov, we by no means think that we have the right to blame him for nonobjectiveness, bias, or other violations of scientific ethics. On the contrary, even now, more than half a century after the publication of his first article (Cheltsov-Bebutov, 1950), we tend to agree that the harsh rhetoric that sounded in this article was fully justified at that time. Had his article written in such a style not appeared, new "information" about one northern bird species or another breeding in various southern regions of our country would have continued to appear. Even though this researcher did not manage to write without exaggeration, as is often the case, such criticism was nevertheless necessary in order to bring domestic avifaunistics to a new level of development. This is important since the next article by Cheltsov-Bebutov (1958) did not contain the slightest hint of disrespect for his predecessors, was written in a strict scientific style, and gave a careful and comprehensive analysis of the problem posed, fully meeting the requirements of high-quality scientific work.

The circumstances were such that interest in studying the bird fauna of the Orenburg region to the level when researchers began to distinguish between breeding waders and migrants objectively arose at the very end of the supposed existence of their southern populations. After the appearance of the article by Cheltsov-Bebutov (1950), in which the necessary requirements for recognizing one species or another as breeding in a specific locality were clearly marked for the first time, there was a great lack of new nesting finds of tundra waders that would meet these requirements. They could have confirmed the correctness of Sushkin and Zarudny. But, unfortunately, at that time, such finds were no longer possible due to the warming and aridization of the climate.

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COMPLIANCE WITH ETHICAL STANDARDS

The authors declare that they have no conflict of interest. This article does not contain any studies involving animals or human participants performed by any of the authors.

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