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Sushkin's Bean Goose *Anser neglectus* has Not Been a Phenotype or a Color Variation of the Western Taiga Bean Goose *Anser fabalis fabalis* and Probably Obtains a Full Species Status, Following the 'Tobias Criteria'

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Review Article

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Abstract

This study was the result of a comprehensive literature review. The well-known Russian ornithologist Prof. Dr. Peter Sushkin described *Anser neglectus* as a distinct species from Bashkiria (Bashkortostan, East European Russia) in 1897. Since that time, there has been a long-standing debate over the taxonomic position of *A. neglectus*. Many taxonomists have argued that *A. neglectus* has been a synonym or a color variation of the Western Taiga Bean Goose *Anser fabalis fabalis*. Some contemporary taxonomists maintain this view, but the author of this study follows the thesis of the discoverer and the earliest authors who studied this new species.

Anser neglectus, though a typical Western Taiga Bean Goose, distinguished itself from *A. f. fabalis* and from other taxa of the Bean Goose by its plumage, its field identification, by its specific "Gé-gé" call, the size of its bill, and by its preference for dry and warm winter haunts. As I concluded in former papers, this taxon should therefore be considered as a separate, distinct species, if we follow the many papers written in the past and the new quantitative criteria for species delimitation in bird systematics.

Keywords: *Anser neglectus; Anser fabalis fabalis*; Taxonomic position; Species; Tunguska catastrophe

Introduction

The breeding ground of *A. neglectus* (hereafter SBG, Sushkin's Bean Goose), a new species described by Sushkin [1,2] in Bashkiria (Bashkortostan, East European Russia) has never been discovered. Previous studies [3,4] have shown that the ornithological characteristics of extensive parts of the Central Siberian taiga were unknown at the beginning of the 20th century [5]. The earliest ornithological investigations in this area only date from the 1950s [6-10] a time when the existence of Sushkin's Bean Goose had not been confirmed for several years. In the early 20th century, high numbers of SBG visited two lakes in the Republic of Bashkiria and the surroundings of the town of Tashkent (Republic of Uzbekistan) during their migration, and spent the winter in Hortobágy Puszta, among other places. During the winter periods between 1908 and 1911, an estimation of up to 150,000 individuals of SBG passed the winter here. After 1911, a not explainable decrease in its numbers was observed [11-15]. The last living birds were seen in the zoological garden in Budapest in 1934 or some years later [16]. Since then, *A. f. fabalis* and the western Tundra Bean Goose *A. serrirostris rossicus* of the 'Type *neglectus*' (i.e. *A. f. fabalis* and *A. s. rossicus* with a color of the bill band and the legs, similar to the former *A. neglectus*), have been observed sporadically as a color variation of *fabalis* and *rossicus* on the breeding grounds and in the winter quarters of both taxa (pp: 45-46) [3]. However, the true *A. neglectus* seems to be extinct. Its sudden disappearance may be related to the Tunguska event, the catastrophe in 1908 that may have

caused genetic mutations in men, animals and plants (pp: 36-37 and 43-45) [3].

Stresemann, Buturlin and Stegmann [17-19] were the last taxonomists who considered SBG as a separate species. Afterwards, GP Dement'ev played a major role in researching the taxonomic position of SBG. He united *A. neglectus*, along with the Western subspecies of the Taiga Bean Goose and the Western Tundra Bean Goose, *A. f. fabalis* and *A.* s. rossicus, in a single species, *A. fabalis* Latham [20-22]. His opinion was decisive and followed for many years by all taxonomists except for one author, Arrigoni degli Oddi [23]. This opinion persisted until the 1950s, when Dutch and Belgian field ornithologists found that A. f. *fabalis* and *A. s. rossicus* were clearly separate entities [24-27]. After all, many field ornithololegists were lucky enough to be able to study tens of thousands *A. s. rossicus* in the field in the Dutch province of Zeeland and thousands of *A. f. fabalis* in the border area of the Dutch provinces of North Brabant and Limburg during 39 winter seasons (winters 1960/61 – 1998/99).

In contrast, *A. neglectus* continued to be widely regarded as an invalid taxon at the time. However, there were dissenting opinions regarding this decision. Hartert [28] wrote that the final word has not been spoken about SBG. Schenk [29] wrote: "How is it possible that the population of a species had decreased so catastrophically within only two decades, that only a few birds remained of the thousands of birds that used to occur in the puszta Hortobágy?". Also Voous (in litt. dd. 12.03.1974) refers to the occurrence of large numbers in Hungary. The fact that these birds were recognizable by their call is a fascinating story, he wrote. The Bean Goose specialists Georges Huyskens, Paul Maes and others, who were aware of the former Hungarian ornithological literature, were convinced that SBG has been an independent taxonomic unit. Huyskens [25] refers to the fact that thousands of birds suddenly disappeared, as one of the most outstanding ornithological phenomena that occurred in 20th century Europe. Or in words of Bauer and Glutz van Blotzheim [30] in their Handbuch: "The marked instability in the occurrence of *A. neglectus* remains an unsolved problem. From about 1899 to 1911, this goose wintered in Hungary in very large numbers but from the 1920s, it only appeared in small numbers". When SBG as a separate species was first negated [20], it was probably already extinct.

No study has ever shown that this goose has been the subject of excessive hunting in the winter quarters or was more susceptible to hunting pressure than other species of wild geese. No study has ever indicated that SBG would have fallen victim to infectious diseases. Hybridization with other Bean Geese taxa cannot be accepted as an explanation for a mass disappearance. Not a single study of the many papers I reviewed contains a single suspicion of hybridization [16]. A hybrid pair *A. neglectus* x *A. f. fabalis* was described in Moscow Zoo. The pair gave birth to six young, two of which reached maturity. The bill band and the legs were orange in one bird and pink in the other [20,21].

In his works the Hungarian ornithologist Schenk and others, who observed hundreds of SBG in the field and collected them, were very worried about the absence of *A. neglectus* and in one of his studies Schenk [29] deeply deplored this situation.

Various forms of disbelief have arisen about the content of my literature review on the existence of SBG as a separate species. This critique includes reservations about nearly all of the chapters discussed in detail: the reliability of the literature reviewed; the field characteristics and call of *A neglectus*; the measurements of museum birds; the molecular research, and the validity of the species criteria according to Tobias et al. [31] when applied to *A. neglectus*. Since 1936 and repeating current criticism, it has been indicated as an invalid taxon, as a phenotype or color variant of the Western Taiga Bean Goose [3].

More specifically, the Criticism is worded as Follows:

Concerning the reliability of the consulted literature: "The large number of sources consulted has introduced considerable uncertainty into the study. It must be assumed that these sources are reliable".

Regarding the field characters: "A description of the individual color of the plumage of *A. neglectus* and of *A. f. fabalis* is not given".

Regarding the call: "The differences between the voices of *A. neglectus* and of *A. f. fabalis* are not verifiable nor quantifiable. A spectrographic analysis of the voice is lacking".

Regarding the measurements of collected birds: "These are incomplete. Only the ranges of measurements are given. There is no information about the sample size, the mean and the standard deviations. Statistical analyses are lacking".

Regarding molecular research: "A DNA study based on the mitochondrial material showed that *neglectus* was spread between Taiga Bean Geese, Tundra Bean Geese and the taxon *middendorffii* [32]. Unfortunately, the descriptions of *neglectus* have been based on birds collected in the autumn. The breeding area, if any, has remained unknown".

Regarding the validity of the criteria of Tobias, et al. [31] for determining a species: "This new direction in systematic research, i.e. the use of a points system, is a dubious direction to take in determining a species".

The accompanying study is based on a review of the considerable data in literature, on a reworking of the statistical results, and on a reworking of the various chapters from the two previous studies.

Material and Methods

This study is based on a critical examination of the writings left to us by the many original authors and their followers who worked on SBG. Their works were assessed against the criteria of Tobias, et al. [31], which may provide an answer to the question of whether a taxon under investigation should be accepted as an independent species. In this regard, the method of awarding points to different characteristics was based on the works of del Hoyo & Collar [33,34]. According to these authors, a minimum of seven points of differentiation must be collected for the taxon under study in order to conclude that the taxon in question can continue to be considered as a separate species.

In the chapter 'Measurements' we used only data acquired from initial Russian researchers, [18,20,22,35-37] partly repeated in the Hungarian-German literature, to exclude data who may relate to *A. f. fabalis* and *A. s. rossicus* 'Type *neglectus*'. In order to successfully complete an investigation of the past appearance of SBG, it is necessary to consider all the Russian and Hungarian-German literature on the subject, and compare the two multi-sided sources in detail. In the past, this guideline was either applied to a limited extent or not at all.

Results and Discussion

The Reliability of Earlier Sources

All the researchers who worked on the existence of *A. neglectus* in the late 19th and early 20th centuries were eminent ornithologists and taxonomists of world renown. Those worthy of mention include: *Sergei Alphéraky, Valentin L. Bianki, Sergei A. Buturlin, Istvan Chernel, Titus Csörgey, Ernst Hartert, Hermann Grote, Kurt Lambrecht, Gyula Madarász, Eugen Nagy, Lord Lionel Walter Rotschild, Jakob Schenk, Boris Stegmann, Istvan Sterbetz, Erwin Stresemann, Peter P. Sushkin, Elemér L. von Szalay, Arkady Ya. Tugarinov* and Nikolay *A. Zarudniy*.

Repeated and detailed reports of the scientific work of all these researchers have been published in ornithological journals in Russia and Hungary, as well as in other countries. It is therefore reasonable to assume that these eminent ornithologist-taxonomists were not mistaken either individually or in groups, and that their many parallel studies on SBG are completely reliable from a scientific point of view.

According to Sangster & Oreel [38] the SBG was formerly wrongly classified as a species at the time, because at the beginning of the 20th century the discoverers of this goose and other researchers had applied 'typological thinking'. Mayr's book [39] contrasted 'typological thinking' with 'population thinking'. Ruokonen & Aarvak [32] also adhered to the view of 'population thinking' in the past and believed that SBG, with the former *A. oatesi* and *A. mentalis*, have been wrongly named historically. However, the literature tells us [40], that typological thinking has already been abandoned by the end of the 19th century. Haffer [41] is rigid about this question. Population thinking started already in the years 1850-1880 and the author gives the names of the first taxonomists who started with population thinking.

All the eminent taxonomists, such as Buturlin, Madarász, Nagy, Schenk, Sushkin and Zarudniy, the original observers of *A. neglectus,* and the immediate followers of the papers of the original observers, especially Alphéraky and Grote, were very aware of the variations that may occur within the measurements of a taxon. Sushkin [35], in his original description of SBG wrote that: "the attached table shows there are connections between the measurements of individual birds". And furthermore: "knowledge of a higher number of measurements, would undoubtedly give a greater fluctuation than the one we have now observed. Therefore, we are currently unable to pass a judgement on the extreme measurements of *A. neglectus*". Zarudniy also described new subspecies, for which he used 50 to 150 specimens in his series of prepared bird skins [42,43].

Morphology and Field Characters of *Anser neglectus*

According to all the original authors SBG was a typical Bean Goose which could easily be distinguished from other Bean Geese, in hand as well as in the field [1,2,16,22,29,35,37,44,45]. She belonged to the Taiga group of Bean Geese [20,22,25,26,28,45-47] (Figures 1,2).

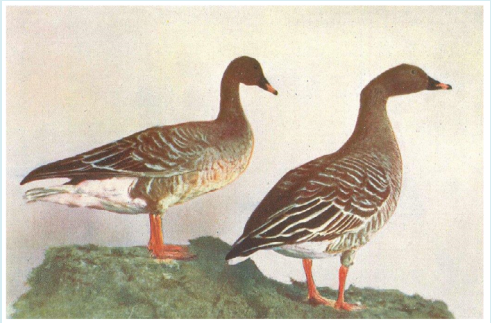

Figure 1: *Anser neglectus*. Adult (right) and juvenile bird (left). Shot on 4. March 1923 and 23. December 1928, Puszta Hortobágy (Photo L. Szomjas in J. Schenk) [29].

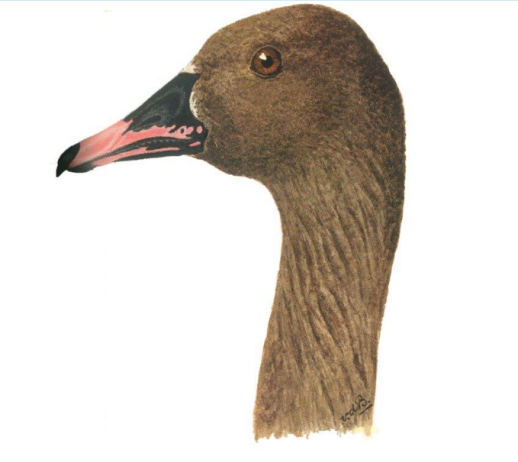

Figure 2: Head of *Anse. neglectus* (Source: F.H. van den Brink) [48].

It was a large goose, significantly larger in the field than *A. s. rossicus*, with the approximate size and structure of *A. f. fabalis*, and had a long neck, a narrow unusually slender bill [35,36,49,50] than in other taxa of the Bean Goose (Figure 3,4). The nail of the bill was more oval shaped, smaller and narrower than in other taxa of the Bean Goose (i. e. Salvadori) [50]. It had a straight lower mandible, without a sign of a 'bump' [1,2,20,35,45,50,51] (Figures 1-4). Some birds showed a white ring of feathering round the base of the upper mandible, which width was variable [35].

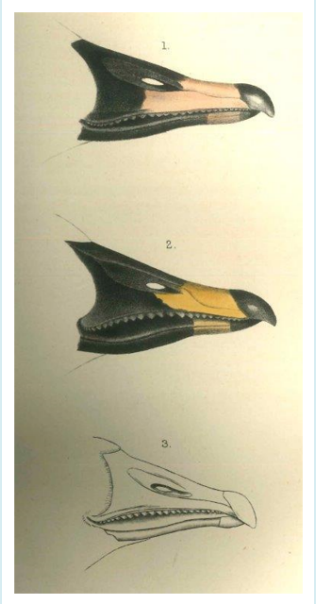

Figure 3: Bill of *Anser neglectus* (above), Anser serrirostris rossicus (middle) and Anser brachyrhynchu(below) (After original drawings of P.P. Sushkin, 1897b) [2] .

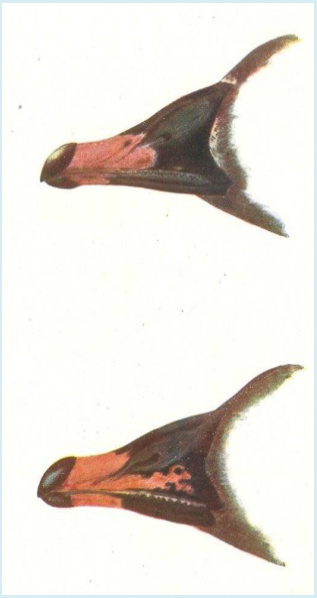

Figure 4: Two bills of *A. neglectus*. Slender (above) and more curved (below). Picture of T. Csörgey in J. Schenk, 1929 [29].

The head, neck and sides of the neck, as well as back and belly had a warmer brown tone than in the other Bean Geese (Figure 1). The head could have a reddish or a soot-colored tone. The feather edges of the upperparts and the flanks had also a browner color [1,22,29,35,45,49,52-54]. According to Tarján [55] the dark colors made the SBG easily recognizable, even when the bird was in flight.

An important characteristic, which distinguished this goose from all other 'large' Bean Geese, was the pink color of the bare parts, which ranged from yellow pink to dark pink. This applied to the bill band, located between the nail of the bill and the nostril, as well as the legs. In the other large Bean Geese, they are yellowish to a deep orange yellow. The width of the bill band was quite variable. It was usually limited to the area between the nostril and the nail of the bill, whereas in other cases the entire or almost the entire upper bill was pink colored (Figures 1, 2 & 4). These pink colors were a consistent feature. In Budapest Zoo in the early 1930s, there were up till three *A. neglectus* and about ten *A. fabalis*. They were checked regularly by reliable ornithologists, including M. Vasvári and J. Schenk himself. They never noticed any change of the pink color of the bare parts of SBG, nor in the orange-yellow color of the bare parts in *A. fabalis* into the pink color of *A. neglectus*. At first sight both taxa were distinctly different [16]. Also Buturlin [37] writes about the unchanging pink color of the bare parts in SBG.

The differences in field characteristics between the SBG and other representatives of the Bean Geese were also

confirmed by anatomical studies. Szalay [56] conducted a comparative anatomical study of the glenohumeral joint in *A. neglectus* and in *A. f. fabalis/A.s. rossicus* in a series of 34 osteological measurements . Out of these, five were more distinct than in a comparative osteological study between the glenohumeral joint in the Black-headed Gull *Larus ridibundus* and the Common Gull *L. canus.* The paleontologist K. Lambrecht (in litt. in Schenk) [16] also conducted research on the degree of pneumatization of the glenohumeral joint of SBG and found there was a higher degree of occurrence of pneumatization in *A. f. fabalis/ A. s. rossicus* than in the SBG (see also Schenk, Sterbetz) [29,45].

The author considers the criticism of the lack of an individual variation in this description to be unnecessary. Let us look to the example of the Pink-footed Goose (*A. brachyrhynchus*). The wing coverts of this species are ash-grey, and much lighter than in all the representatives of *A. fabalis* s.l. This is an ideal feature to distinguish them in the field and in the hand of all representatives of the Bean Goose s.l.. Could a variation in the color of the plumage of *A. brachyrhynchus* and of the taxa of *A. fabalis/serrirostris* s.l. play any role in differentiating them? We thought not.

The Voice of *Anser neglectus*

SBG had an unusual call which could easily be distinguished from the call of the other representatives of the genus *Anser*.

Nagy [44] visited the Hortobágy puszta in April 1907 and came across not only *A. albifrons*, but also *A. f. fabalis* , *A. s. rossicus* ad *A. neglectus*. At that time the Hungarian ornithologists had been able to distinguish both subspecies of the Bean Goose in the field [57]. Nagy described the call of *A. albifrons* as "Gli gli gli" and that of both Bean Geese as "Taddadat". The call of *A. neglectus* consisted of a very typical "Gé-Gé [16,29,37,53,55,58-60]. Hence the Hungarian vernacular name of the SBG: Gé-gé lud (=Gé-gé Goose). The vernacular name of this goose had already been in use before 1904 [29,53,58-60]. In the Hungarian vernacular this call also sounds like"Gé-gé" (L. Megyery, oral comm.). Sushkin [1] and Alphéraky [35] also drew our attention to a melodious call with a double note which was heard in Bashkiria. This unusual voice described in the International Phonetic Alphabet as: "ɣe-ɣe" was immediately recognized by hunters and non-ornithologists in Hungary, which, made the "Gé-gé" goose so well-known [29,55,58-60]. The story of Chernel [59], who on 13.01.1913, was made aware of the presence of *neglectus* by their call while out in the field and could discover SBG later from his hiding place, is typical. L. Szomjas, who observed one of the latest SBG in the puszta Hortobgy on 30.11. 1932, immediately recognized this goose on his unique call [16,61]. Schenk [45] observed that among the wild geese which foraged in the puszta in the company of SBG, only this goose responded to the SBG's alarm call.

In the previous century hundreds of Western Taiga Bean Geese wintered in the southern Netherlands. Dutch and Belgian expert field observers of wild geese (G. Huyskens, P. Maes, G. Bulteel, J. De Ridder, W. Suetens, L. van den Bergh, H. van Deursen, H. Voet, J. Van Impe) had never heard such a "Gé-gé" call made by *A. f. fabalis* during a long-time observation period, 39 winter seasons (see above). Also this call does not agree with the call made by *A. f. middendorffii*, which is described as deeper than that of both western subspecies, but the syllables are identical [62]. The heavy call of *middendorffii*, which sounds very deep and nasal to the human ear, was also confirmed in the manuals consulted [63-65]. This unique call can also be heard on the Xeno-canto site where Anon Torini [66] reproduces several sound recordings which were sourced in the Kohoku Wild-Bird Center, Shiga prefecture (Japan).

Measurements of *Anser neglectus*

The criticisms mentioned above do not take into account that measurements in older studies were not presented by the same standards as papers from the last few decades. Studies from the 19th century and early 20th century did not always present averages, and obvious statistical research was missing entirely.

The length of bill, tarsus and wing give many overlapping values between *A. neglectus* and *A. f. fabalis* and are not appropriate for a differentiation between both taxa [3,4,18,35-37]. We re-edit our former (Tables 1 & 2) (Van Impe p. 30) in a renewed, more appropriate Table 1.

Concerning the sample size. Alphéraky [35] gave the measurements of several individual birds (n), which enables the calculations of mean and standard deviation (of each measurement. The average bill length of neglectus (n= 11) was shorter than that of A. f. fab. (n=37): 57.7 mm. to 64.1 mm (t_{46} = 1.127, N.S.). The picture in the book of Buturlin (fig XI, p. 259) [18] gives also this shorter bill. The values of n and σ could not be distilled from Buturlin's works [18,36,37].

Concerning the height of the under mandible. Buturlin [36] and Buturlin & Dement'ev [21] noted that the thinner bill of *neglectus* compared to that of the Western Taiga Bean Goose *A. f. fabalis* was due to a lower maximum height of the under mandible, if this measurement was taken when the bill is fully shut. This height must not exceed the value of 6.50 or 6.70 mm [18,35].

There is no overlap in the series of measurements comparing the height of the lower mandible in adult *A.*

neglectus and *A. f. fabalis* in the works of Alphéraky [35] and Buturlin [18,36,37]. There is only a slight overlap in the range of values in juveniles in the works of Buturlin [18,37], where 6.0 mm is the maximum height of the lower mandible for *A. neglectus* and also the minimum height for this characteristic in *A. f. fabalis*. Although averages with standard deviation are missing in these series of maximum and minimum values, we may cautiously conclude that the lower mandible height of *neglectus* was lower than that of *A. f. fabalis.*

	Length Bill		Height Under Mandible	
	Anser neglectus	***Anser f. fabalis***	***Anser neglectus***	***Anser f. fabalis***
Alphéraky (1905) [35] (Ad. + Juv.)	n=11 55 - 63	n=37 54 - 72	n= 3 5.5 – 6.5	n=27 7.0 – 8.5
Buturlin (1908) [36] Ad. + Juv.)	54.9 - 69.1	61.5 – 71.9	Adult: 5.8 – 6.3 Juv.: 5.6	Adult: 6.8 - 8.1 Juv.: often < 6.8
Buturlin (1934) [37] (Ad. +Juv.)	54.0 – 69.0	54.0 - 72.0 Usually 59.0 - 69.0	Adult: 6.0 – 6.7 Juv.: 5.5 - 6.0	Adult: 7.0 - 8.5 Juv.: 6.0 - 8.0
Buturlin (1935) [18] (Ad.+ Juv.)	51.0 – 69.0	54.0 – 72.0	Adult: 6.0 – 6.7 Juv.: 5.5 – 6.0	Adult: 7.0 - 8.2 Juv.: 6.0 – 6.8
Dementieff (1936 [20] (Ad.)	--	--	n = 10 5.5 – 7.0 Mean: 6.0 ± 0.5	--
Tugarinov (1941) [22] (Ad.)	n = 9 55.3 – 63.0	--	n = 9 5.0 – 6.7	--

Note: No distinction has been made between *A. f. fabalis* and *A. s. rossicus*.
Table 1: Length of bill and height of under mandible (in mm) under the condition of a completely closed bill in *A. neglectus* and *A. fabalis fabalis.*

Molecular Research

Based on intensive morphological investigations and studies of mitochondrial DNA, Ruokonen & Aarvak [32] decided to deny the existence of *neglectus*, because these authors could not find any evidence for accepting taxa other than those already known: they must therefore be the subspecies *fabalis*, *middendoffi*i, *rossicus* and *serrirostris*. Ruokonen & Aarvak [32] investigated five specimens thought to be *A. neglectus* in their study. It is a pity that these researchers did not measure the height of the lower bill, an important characteristic for SBG. Among these five, four had origins which did not match the distribution of the 'real' *A. neglectus.* After all, two were from Novaya Zemlya, where the SBG as a typical Taiga Bean Goose , may well not have bred. One bird came from Denmark in 1920 and one from China in 1921. The former was again determined to be a *rossicus* by these authors and the latter a *fabalis*. As explained earlier, in both cases it was most likely an *A. f. fabalis/A. s. rossicus* of the '*neglectus* type', that does not show any affinity with the 'real' *A. neglectus*. The fifth specimen came from Samara (South-east European Russia) and was collected in the year 1906. This was again determined by Ruokonen & Aarvak [32] to be an *A. f. fabalis*. Only this goose could possibly match the 'real' *A. neglectus*, because the 'real' SBG was here a very frequent migrant in the early 20th century [1,15,35,67-69]. The museum of Samara contained two *neglectus* in its collection. These were identified by Karamzin, with the famous Russian ornithologist V. L . Bianki confirming the identification [67]. This bird carried a new haplotype, not found in the other examined birds. Only this bird could possibly match the 'real' *A. neglectus*.

This collected bird may have been a *neglectus* whose bill color changed after it died. In fact, many authors have noted a change in the bill color of SBG, which could occur as early as one hour after death. The bill could become orange, red or reddish brown [35-37,49,50,70-73]. According to Oates [70] and Buturlin [36], the characteristic color of the bill and legs should have been recorded immediately a bird was shot. The reverse is also true, however. Buturlin [36,71] described how the orange bill of *A .f .serrirostris* turned pink soon after death.

All of these observations may explain why the birds identified as *neglectus* were actually a different taxon. Ruokonen & Aarvak's research material [32] seemed to thin for us to conclude that *A. neglectus* did not exist.

Indications about the existence of SBG can still be found in my previous studies [3-4]:

- According to Alex and Shergalin [74] "the mass presence of the 'true' *A. neglectus* until the end of the 1920s goes against the status of individual variation".
- We quote Sushkin [1] and Alphéraky [35] in his meetings with the SBG in Bashkiria: " From my hide-out, armed with a pair of binoculars, I could probably examine hundreds of geese. Only once or twice did I see Bean Geese with orange bill bands and legs among them, all the others were *A. neglectus*, except for a few Graylag Geese (*A. anser*), which appeared as lost birds among the Bean Geese. These Bean Geese with flesh- coloured legs and bill bands were well known to the local population, the Bashkirs and the Tatars. I showed them a goose with an orange bill band and legs (*A. s. rossicus*), they claimed that it was a rare or unknown goose to them. Also, the local hunters, who were familiar with the wild geese, consistently spoke of a pink color".

Stegmann [19] and Stegmann in Schenk [16] wrote:" To me it sounds out of the question that *A. neglectus* would be a subspecies of *A. fabalis*. For me, *A. neglectus* is an independent species. This is a logical decision. If at first sight any animal species is immediately unequivocally recognized as belonging to a single form, there is no reason to doubt the independence of that species. Up to now no transitional forms between the SBG and the different races of the Bean Geese are known, which usually does not justify a degradation of this species to subspecies. The uncertainty, which still exists regarding the location of the breeding area, is no reason to doubt an independent species".

Here we also quote Sushkin [75]: "Until now, the Ufimsky Gummenik (= *A. neglectus*) has been a mystery in the fauna of the Palearctic area. Undoubtedly it belongs to the *fabalis* group. It distinguishes itself from the other Bean Geese with rather static, recurrent characteristics, although they are not important. At the Xth International Zoological Congress in Budapest (1927), I was privileged to show my colleagues round the garden of the Zoological Park, among them Lord Rothschild, Dr. Hartert and Dr. Stresemann, to observe the *Melanonyx (= Anser) neglectus* and *M. fabalis fabalis* living there. After a thorough inspection my colleagues recognized that without a doubt it was the species I had described".

The Use of a Points-Based Scoring System for Determining Species According to Tobias, et al. (2010) and Del Hoyo & Collar (2014) [33].

Tobias, et al. [31] proposed a new direction in the research of systematics , intending to judge whether an unknown taxon could be considered a species or not. Tobias's criteria has already been applied when preparing the work "HBW and BirdLife International, Illustrated Checklist of the Birds of the World, Vol1: Non-passerines and Vol. 2: Passerines [33,34]. This work explains why the characteristics of both the phenotype and the distribution of the taxon under investigation are considered. In this series, each characteristic examined was awarded points. Since the location of the breeding grounds of SBG was never determined with certainty, we cannot answer the question about distribution. Only the phenotypical characters remain open for our research.

The work of Tobias, et al. [31] was rated positively by many authors in the past [76-83]. Hurrell [84] described the Tobias method as follows: "The Tobias method is a fast, reliable points-based system that assesses differing characteristics of an animal. The method is central to the taxonomic classification that underlies BirdLife's work on the Red List and species are the most fundamental unit of biology, conservation and environmental legislation".

If points are awarded strictly, the taxon *A. neglectus* to be examined will be given:

- A completely different call. This gives a minimum of ten points according to del Hoyo & Collar [33], which attached great importance to the voice. In former papers [3,4] I randomly reduced these ten points to four, because the required spectrographic analysis of the voice of the taxon to be examined was missing. Even if only four points are awarded to this different call, the total in our count reaches more than seven points (p.35). However, when this call was recognized, known and used as a vernacular name by the people of Hungary and heard and described by at least six original ornithologists (Sushkin, Chernel, Csörgey, Schenk, Szomjas, Tarján), we find a strong indication to assign not four, but ten points to this special call, in line with that prescribed by del Hoyo & Collar [33].

The following characteristics further increase the value of these ten points: the browner color of the plumage, easily recognizable in the field, the lower height of the under mandible in *neglectus*, compared to *A. fabalis fabalis* [18,35,36,37] and the pink instead of the orange-yellow color of the bill band and the legs. Moreover, the migration and wintering areas of *A. neglectus* were dry steppe areas, namely Tashkent and surroundings, two lakes in Bashkiria, and the Hortobágy puszta (P. Maes in litt., Sterbetz 1980). This does not correspond with the well described wintering biotopes of *A. f. fabalis* [25,27,85-86].

Taking all these features into account, our total becomes more than ten points, so we may cautiously conclude that *A. neglectus* was a species according to the criteria of Tobias, et al. [31] and further elaborated by del Hoyo & Collar [33].

Conclusions

There can be little doubt that, between 1897 (Sushkin) [1,2] and 1934 (Szomjas) [61], a large number of internationally renowned ornithologists and taxonomists described a species of goose which no longer exists. This study has attempted to show that this goose newly described by Sushkin in 1897, was not a phenotype or an individual color variant of the western Taiga Bean Goose (*A. f. fabalis*).

An element in this argumentation is that many ornithologist colleagues identified and studied many *A. fabalis* in the field in the South-East of the Netherlands during 39 winter seasons. Their total number ran into thousands. None of these birds ever uttered a distinctive "Gé-Gé" call. None of these birds exhibited a narrow, thin bill, as shown in Fig 1, from two stuffed SBG taken by *neglectus* expert L. Szomjas in Schenk [29]. These arguments also contribute to establishing the former existence of a now extinct species of goose.

The mystery of SBG is not resolved and further research is needed. As stated formerly, a lot of questions still arise. Further genetic studies on existing museum specimens are highly recommended. In the past, a large number of skins or stuffed birds were considered to belong to *A. neglectus*, although in reality they belonged to other taxa of *A. fabalis,* and more specifically to *A. f. fabalis/A. s. rossicus* 'Type *neglectus*'. It is therefore recommended that in the future accurately identified birds are studied. This could be the original series of Sushkin - Alphéraky - Buturlin - Tugarinov, which can be regarded as safe.

Although the detrimental effects of the Tunguska event cannot be excluded for the disappearance of SBG, researchers for isotopes unique for the Tunguska event will be also welcome in the future.

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