Caluta

No. 15 September 2023

Editor-in-chief Annika Forsten
annika.forsten@gmail.com
Editor Antero Lindholm
antero.lindholm@caluta.fi

For more information:
http://www.caluta.fi/

Contents

Identification of Eastern Common Tern outside its core breeding range – mission impossible?

HANNU HUHTINEN & WILLIAM VELMALA

Background

In recent decades, there has been a lively discussion surrounding the identification and potential occurrence of Eastern Common Tern in Western Europe. Occasional sightings of individuals with dark bills have been reported (Nixon 2011, Darby 2011, Hatton 2012), leading to debates on their classification as belonging to the eastern subspecies *longipennis*. However, due to the taxonomical inconsistencies described in the literature, the situation is not as straightforward as it may seem. Unfortunately, most discussions tend to overlook the widely recognised subspecies *minussensis*. Moreover, the biometric and plumage variations within the Eurasian subspecies are poorly understood, which poses a challenge for European rarities committees when evaluating these records. In this study, we have examined museum collections to identify the most crucial features that can aid in distinguishing between different subspecies of the Common Tern in the context of vagrancy.

Taxonomy and geographical distribution

According to recent taxonomic literature, which includes the IOC World Bird List, the Common Tern is classified into four subspecies: *Sterna hirundo hirundo* (referred to as *hirundo*), S. h. *minussensis* (referred to as *minussensis*), S. h. *longipennis* (referred to as *longipennis*), and S. h. *tibetana* (referred to as *tibetana*) (Cabot & Nisbet 2013, Golovatin et al. 2013, del Hoyo 2017, Gill & Donsker 2017). The *hirundo* subspecies breeds in North America, northern South America, and extensively in Eurasia, spanning from the Atlantic Islands to Europe, North and West Africa, the Middle East, and Central Asia, reaching as far east as western China. During winters, *hirundo* can be found in the southern Oceans, south of the Tropic of Cancer. *Minussensis* is known to breed in central Asia, ranging from the upper Yenisey Valley to Lake Baikal and northern Mongolia, while its wintering grounds primarily lie in the northern part of the Indian Ocean (Mlikovsky 2009, del Hoyo 2017). *Longipennis* breeds in northeastern Siberia and extends south to northeastern China, wintering in the eastern Indian Ocean, Southeast Asia, Australia, and occasionally New Zealand. The subspecies *tibetana* represents a high-altitude population that breeds from the western Himalayas and Tibet to western Mongolia, with its main wintering area situated in the eastern Indian Ocean. However, certain references (Cramp et al. 1977, Olsen & Larsson 1995, Becker & Ludwigs 2004) only introduce three subspecies, considering *minussensis* as a transitional form between *hirundo* and *longipennis* in the intergradation zone. Based on the prevailing taxonomy adopted in most European countries, *minussensis* is recognised here as a valid subspecies, although it is often overlooked in common discussions.

In general, the literature provides only superficial and often conflicting descriptions of the intergradation zones between Common Tern subspecies. This creates difficulties in understanding the distribution of the subspecies and their plumage characteristics within these zones. For instance, Cabot & Nisbet (2013) suggest that the *hirundo* subspecies extends further east, reaching the northeastern region of Lake Baikal. On the other hand, *minussensis* is depicted as having a narrow range between *hirundo* and *longipennis*, with its distribution supposedly extending south-west to the Caspian Sea. However, according to Russian studies (Golovatin et al. 2013), *minussensis* is predominantly concentrated around Lake Baikal and up to 1000 km east of it. Conversely, *longipennis* is shown to continue westward as a narrow belt, bordering the northern range of *minussensis*. Additionally, these studies have identified new breeding areas of *minussensis* westward from the Ob River in western Siberia, near the northern part of the Ural Mountains, adjacent to Europe. These findings suggest that particularly the northern populations of *minussensis*, may exhibit plumage characteristics more closely resembling those of *longipennis*.

The genetic distinctions between *hirundo* and *longipennis* have been explored in a few studies.

Table 1: Structural and plumage differences of Common Tern subspecies *minussensis* and *longipennis* in full breeding plumage in comparison with nominate *hirundo* (Cramp et al. 1977, Olsen & Larsson 1995, Becker & Ludwigs 2004, Hatton 2012, Cabot & Nisbet 2013, del Hoyo 2017).

S. h. longipennis (in comparison with nominate *hirundo*)	
Structure	Slimmer body, slenderly built
	Slightly smaller and rounded head
	On average, slightly longer wings
	Shorter, thinner, and sharper bill
Bare parts	Legs blackish or dark reddish brown
	Black bill, only the hint of purple at base of the lower mandible possible
Plumage	More sharply defined edges on the black crown
	Upperparts darker, ash-grey
	Underparts clearly dark grey
	Narrow white cheeks stripe, contrasts to underparts
	On underwing, dark trailing edge to the secondaries
	Outer webs of the central tail feathers paler grey
S. h. minussensis	
General	Variation extensive. Plumage features between *hirundo* and *longipennis*
Structure	Bill shorter than in *hirundo* , approaches *longipennis*
Bare parts	Bill largely reddish or full black. Red colour at base often darker than in *hirundo* . Dark-billed proportion increases eastwards
Plumage	Underparts dark grey, closer to *longipennis* than *hirundo*

Samples of *hirundo* from the US and *longipennis* from the Russian Far East showed minimal differentiation despite the significant geographical gap between their breeding ranges (Zink 1995). Although there has been some discussion on whether the differences in mtDNA among Common Tern subspecies indicate distinct phylogenetic species, Sibley & Monroe (1990) concluded that there is no evidence of difference at the species level.

Limited information exists regarding the hybridization of Common Tern with other tern species. However, based on the available literature, it has been observed that Common Tern can hybridise with Little Tern, Forster's Tern, Roseate Tern, and Arctic Tern (McCarthy 2006). In the United States, it has been discovered that Common Tern and Arctic Tern have mated and produced at least nine genetically verified hybrids over several years. These hybrids exhibited certain characteristics that were somewhat intermediate between the parent species, but they were primarily more like Common Tern (Mostello et al. 2016). Furthermore, an unverified yet presumed hybrid nest in Finland successfully yielded two chicks in both 2020 and 2022 (Salonen 2022). Additionally, hybrids between Common Tern and Roseate Tern have been documented in both the United States and Europe, with their plumage characteristics found to be intermediate between those of the parent species (Olsen & Larsson 1995). Hence, when evaluating the plumage characteristics and occurrence patterns of Common Tern subspecies, the hybrids with other species do not create a high possibility of confusion.

Identification in breeding plumage

Based on the available literature (Cramp et al. 1977, Olsen & Larsson 1995, Becker & Ludwigs 2004, Cabot & Nisbet 2013, del Hoyo 2017), it is not possible to reliably identify immature Common Terns or birds in winter plumage to the subspecies level, neither in the field nor in the hand. Consequently, the assessment of plumage differences between subspecies is only possible in late spring or early summer. It has been observed that there can be significant variation in the individual plumage development. For instance, during spring, older subadult birds (3rd calendar year) may exhibit certain signs of immaturity in their plumage features (Cramp et al. 1977, Olsen & Larsson 1995, White & Kehoe 2001). The identification criteria discussed in the literature are specifically for birds in full adult breeding plumage. Table 1 provides a compilation of the most significant structural and plumage characteristics of the *longipennis* and *minussensis* subspecies in comparison to *hirundo*. Additionally, Table 2 offers a summary of the distinctive biometric data available for both *hirundo* and *longipennis*. In conclusion, it is evident that there is considerable overlap in biometrics among the subspecies, making it impossible to rely solely on biometrical characteristics for their differentiation. Detailed discussions on the characters of various Common Tern subspecies, along with their geographic variations, can be found in the figure captions accompanying Photos 1-10.

Table 2: The bill and wing lengths as well as the tail fork (mean values together with ranges in parentheses) of adult *hirundo* and *longipennis* based on Olsen & Larsson (1995). The number of studied individuals is given with the values.

	S. h. hirundo		***S. h. longipennis***	
Bill length (mm)	Male (n=201)	Female (n=103)	Male (n=55)	Female (n=37)
Olsen & Larsson (1995)	36.8 (32.2-40.3)	35.7 (32.1-39.6)	35.2 (31.8-39.9)	33.5 (31.9-37.4)
Wing length (mm)	Male (n=201)	Female (n=111)	Male (n=55)	Female (n=32)
Olsen & Larsson (1995)	271.9 (256-289)	270.1 (248-292)	276.7 (263-299)	274.8 (262-287)
Tail fork (mm)	Male (n=198)	Female (n=102)	Male + female (n unknown)	
Olsen & Larsson (1995)	73.2 (58-92)	74.9 (64-93)	51-114	

Photo 1: The nominate *hirundo* has angular features, giving it a large-headed and robust appearance when compared to the more elegant *longipennis* or Arctic Tern, for example. In its breeding plumage, the bill of a typical *hirundo* is relatively long and has a thick base. It exhibits a distinct two-tone colouration, with a wide orange-red base and a narrow black tip. The grey wings and back create a noticeable contrast to only slightly greyish underparts, which gradually transition to pure white cheeks and throat. Note the long wings that extend to the tail-tip and the recent post-nuptial moult, indicated by a few moulted feathers on the forehead. Helsinki, Finland, 11th July 2008. © Risto Lammin-Soila.

Variation based on the museum specimens

Using museum specimens, we conducted a systematic examination of the structural and plumage characteristics at the Natural History Museum, Tring (NHMUK), Zoological Museum, St. Petersburg (ZMR), Finnish Museum of Natural History, Helsinki (FNHM), and Zoological Museum, Turku (ZMT). Our focus was solely on individuals in full breeding plumage, excluding those showing signs of immaturity or winter plumage. The specimens were classified into three subspecies groups. Skins of *longipennis* (n=48) had been exclusively collected from the easternmost regions in Russia, such as Kamchatka, Anadyr, Sakhalin, Primorye, Kolyma and Amur rivers, as well as eastern China and Japan. Specimens of the nominate *hirundo* (n=40) were from various locations, including the European Continent (n=8), the British Isles (n=13), Finland (n=10), and the Arabian Peninsula (n=9). *Minussensis* (n=33) specimens were primarily from Siberia, Krasnoyarsk, Buryatia, Altai and the Ural region in Russia, as well as from Mongolia. Specimens from the Caspian Sea and Turkmenistan, for example, were excluded from this study due to their taxonomic uncertainty.

We conducted a systematic analysis of various characteristics from the specimens, including bill length and colour, belly colour, outer primary feather pattern, and the colour of the outer web of the central tail feathers. To study chromatic variations, we employed the 20-stepped Kodak grey scale. The biometric data

Photo 2: Subadults and adults in winter plumage of the *hirundo* subspecies Common Terns exhibit a fully black bill, while their legs are typically a darkish red or even blackish in colour. Therefore, it is important to ascertain whether a dark-billed Common Tern is in full breeding plumage, devoid of any characteristics associated with immaturity or winter plumage. Failing to do so may result in misinterpretation regarding its subspecies. New Jersey, USA, 10th September 2016. © Jyrki Normaja.

Photo 3: Adult *longipennis* photographed on its breeding grounds. *Longipennis* exhibits a long and narrow-winged structure, with a relatively small head. Its bill, fully black in colour, appears remarkably short. The underparts of *longipennis* are characterised by a smoky grey shade throughout, with the distinct narrow pure white cheek and throat contrast that is typical of this subspecies. Chukotka, Russia, 6th July 2010. © David Erterius.

Photo 4: In its finest form, *longipennis* exhibits a small and slender structure, with a round head and an extremely short and thin bill. Note the dark grey underparts of this individual, which contrasts with the paler cheek, although the latter is not as pure white and sharply defined as is typically for *longipennis*. Yakutsk, Russia, 29th June 2018. © Hannu Huhtinen.

Photo 5: While some Common Terns from the central breeding range of *longipennis* may have legs that are misleadingly red, albeit slightly darker than those of *hirundo*, it is important to observe the distinct features such as the fully black bill and the relatively dark grey underparts. Note the striking contrast between the narrow, pure white cheek stripe and the surrounding plumage. Yakutsk, Russia, 29th June 2018. © Hannu Huhtinen.

and their relevance in distinguishing the subspecies are in Table 3 and discussed in detail in the main text. Additionally, we measured wing length, bill depths at the gonys and at the rear edge of the nostrils, depth of the tail fork, and estimated the darkness of the trailing edge to the secondaries on the underwing. However, based on our study, we did not find any significant differences between the subspecies in these measurements. Summaries of raw data for various biometric measures and bill colouration are presented in the appendix images.

While assessing the colour of bare parts in museum specimens can pose challenges, the distinction in our study is clear. The bill of *longipennis* is predominantly very dark, often entirely black, with a few individuals showing a hint of purple red at the base of the lower mandible. In contrast, the bill of *hirundo* exhibits a broad orange-red colour at the base, narrowing to a black tip. However, the darkest-billed *minussensis* specimens do not differ from *longipennis*, whereas the lightest-billed individuals from the western part of the intergradation zone are indistinguishable from the darkest-billed *hirundo* specimens. A summary of the

Photo 6: Common Terns of the *minussensis* subspecies, exhibiting intermediate characteristics between *hirundo* and *longipennis*, have been discovered breeding further west than previously known, in proximity to the northern Ural Mountains. These birds typically possess slender, blackish bills, with a slight hint of reddish colouration at the base of the lower mandible. Notably, a narrow, rectangular-shaped, pure white cheek stripe is present, situated between the black crown and grey underparts. Although their legs display a distinct red colour, it is exceedingly challenging to differentiate these individuals from those of the *longipennis* subspecies. Labytnangi, Yamalo-Nenets, Russia, 26th June 2006. © Antero Lindholm.

variation in bill colour between taxa is provided in Photo 11 (Refer to the raw data depicted in the appendix Photos S1-S3). Additionally, our study reveals that the bill length in eastern *minussensis*/*longipennis* is, on average, shorter than in *hirundo*. In our data, *minussensis* samples exhibited on average even shorter bill length than longipennis samples (appendix Figure S4).

One of the most distinguishing features among the subspecies is the colour of the underparts. Eastern *longipennis* exhibits a noticeably darker belly compared to *hirundo*, while *minussensis* falls somewhere in between. The darkest nominate specimens in Finland display a belly colour similar to that of *minussensis*, resulting in the underparts of Finnish birds being, on average, darker than those of their counterparts in Western Europe. This led us to selectively choose the darkest individuals from the collection (approximately 15% of the entire sample) to explore the transitional zone between the darkest

hirundo and the eastern *minussensis*/*longipennis*. The average difference in underpart colour between Western and Eastern Common Terns is much more pronounced (appendix Figure S1).

Based on the skin data, the outer webs of the central tail feathers (T1) are generally lighter in colour in *longipennis* compared to *hirundo*. The colour of the outer web of T1 exhibits significant variation in *minussensis*, typically falling somewhere between the other two taxa (appendix Figure S2). As the width of the dark grey wedge on the inner web of the outermost primary (measured at the level of the tip of the fifth outermost primary in a closed wing) has been used as a distinguishing criterion between nominate *hirundo* and Arctic Tern, we decided to assess this characteristic for Common Tern subspecies as well. Our data suggests that the wedge appears relatively narrow in eastern *longipennis*, approaching that of Arctic Tern, although in some specimens it resembles *hirundo*. Furthermore, the width of the wedge in *minussensis* is somewhat narrower than in *hirundo*, though broader than in *longipennis* (appendix Figure S3).

Photo 7: During migration in Hong Kong, Common Terns have been observed exhibiting plumage characteristics resembling both *minussensis* and *longipennis*. This bird displays typical *longipennis* features, such as fully black legs and bill. However, under the bright lighting conditions, the back appears surprisingly pale grey, deviating from the expected colouration. Additionally, the cheek lacks the distinctive narrow white squarish area that typically contrasts against the dark grey belly in *longipennis*. Hong Kong, China, 18th May 2006. © Martin Hale.

Photo 8: Alongside the local subspecies *tibetana*, both *minussensis* and *longipennis* can be observed during migration in Mongolia. This individual demonstrates distinct features of subspecies *longipennis*, including a relatively dark ash-grey upperwing, deeply dark grey underparts that transition to a pure white cheek, and a fully black bill. Böön Tsagaan Nuur, Mongolia, 30th May 2010. © Tom Lindroos.

Photo 9: While the underparts colour and its contrast with the cheek patch align with that of *longipennis*, it is worth noting that certain migrating Common Terns in Mongolia may exhibit a prominently red bill base, suggesting a potential origin from the intergradation zone. Mongolia, 30th May 2016. © Martin Hale.

Photo 10: In certain literature (such as Shirihai 1996), it has been suggested that the wintering Common Terns in Eilat include subspecies *longipennis*. However, upon closer examination of plumage details, these individuals appear to be more likely from the intergradation zone. While the bill colour of this bird is darker than that of nominate *hirundo*, it appears relatively long with a reddish base. Additionally, the belly lacks the typical darkness, and the cheek does not exhibit the narrow and pure white contrast commonly seen in *longipennis*. Eilat, Israel, 29th March 2016. © Jyrki Normaja.

Table 3: The colour of the underparts and the outer web of the central tail feathers (T1) were measured using the 20-stepped Kodak grey scale, where a lower value indicates a paler colour and a higher value represents a darker colour. Additionally, we examined the length of the bill, measured to the base of the feathering, and the width of the dark grey wedge on the inner web of the outermost primary at the level of the tip of the fifth outermost primary, on closed wing. The latter measurement is commonly used to differentiate between juvenile Common and Arctic Terns in their breeding grounds (Hario 1986). The values presented are the mean values, and the values in parentheses indicate the observed ranges of variation. It is important to note that for the samples of nominate *hirundo*, only individuals with the darkest bellies were selected, so the actual minima in the ranges are smaller than shown here, making the difference compared to *minussensis* and *longipennis* even more significant.

Subspecies (n)	**Colour of the belly** (grey scale)	**Outer web of T1** (grey scale)	**Primary wedge** (mm)	**Bill length** (mm)
S.h.hirundo				
Arabia (9)	3.9 (1.9-5.0)	2.9 (2.1-4.5)	5.4 (4.6-6.1)	35.6 (32.9-37.1)
Britain (13)	3.9 (2.5-5.1)	2.9 (1.4-5.2)	5.2 (4.4-6.0)	35.3 (33.2-40.4)
Europe (8)	4.2 (3.3-5.2)	2.6 (1.9-3.9)	5.2 (4.6-5.9)	35.9 (32.4-39.0)
Finland (10)	5.5 (4.9-6.6)	2.7 (1.5-4.6)	5.2 (4.4-6.0)	36.0 (33.5-39.8)
S.h.minussensis (33)	5.6 (4.0-7.1)	2.3 (0.7-4.6)	5.0 (3.4-5.9)	32.9 (30.5-36.0)
S.h.longipennis (48)	6.6 (4.4-8.3)	1.8 (0.4-4.3)	4.6 (3.6-6.1)	34.5 (31.1-37.6)

Photo 11: Typically, specimens of nominate *hirundo* collected during the breeding season in Britain (a) and Europe (b) exhibit bills that are predominantly orange, with narrow black tips. However, in some individuals collected in Finland, the bill appears slightly darker red, with a broader and darker bill tip (c). The bill colour in *minussensis* from the intergradation zone shows significant variation without clear geographic patterns. For instance, we saw specimens from Krasnoyarsk with entirely black bills (d), while samples from western Sakha exhibited bills with intermediate colours (e), and individuals from the western Ural displayed bills that resembled the *hirundo* type (f). The bills of *longipennis* from the Kolyma River (g) and Sakhalin (h) are typically fully black. However, some individuals collected from Sakhalin may have remarkably reddish tones at the base of the bill, extending even to the upper mandible (i). © Hannu Huhtinen, Tring (NHMUK), St. Petersburg (ZMR) and Helsinki (FNHM).

Table 4: The combination of critical characteristics on which the identification of the individuals of subspecies pair *minussensis/longipennis* in full breeding plumage should be based in a rarity context. To evaluate the reliability of these traits, a direct comparison with individuals of the nominate subspecies can be useful.

Critical characteristics
(1) Black bill, just a subtle reddish hue at the base of the lower mandible acceptable
(2) Moderately dark grey underparts, creating a sharp contrast with the narrowly pure white cheek
Supporting features
(1) Relatively small and short-looking bill
(2) Inner web of the outermost primary only narrowly dark grey
(3) Overall, a small and slender-looking bird
(4) Blackish or reddish-brown legs, clearly darker than in a nominate *hirundo*

Identification Eastern Common Tern in Europe

The Far Eastern *longipennis* exhibits noticeable differences from nominate *hirundo*, especially in terms of bill and underpart colour. These distinctions are so significant that they are apparent even in field conditions. However, from any report committee's point of view, it is crucial to have high-quality photographic evidence for a reliable verification of the important characters. The starting point to subspecific identification of Common Tern is to make sure that there are no signs of immaturity or winter plumage on the individual, and these signs can be extremely hard to detect in live conditions, without high-quality photos. Other features examined in this study, such as primary pattern, bill length, and colour of the central tail feathers, demonstrate clear overlap, rendering them irrelevant for assessing random records, including from photographs.

The subspecies *minussensis* poses a significant challenge, as we interpret it to be an intergradation taxon with an extremely wide distribution range between *hirundo* and *longipennis*, where all critical characteristics vary greatly. Our data, based on museum specimens, support the findings of Russian ornithologists that the distribution range of Common Tern exhibiting *longipennis*-type characters extends further west in northern populations than previously realised, while in southern populations, birds with intermediate characters are located more to the east. Furthermore, based on our data, none of the *hirundo* specimens had as dark a bill as any *longipennis*. It is worth noting that *hirundo* specimens from Finland have, on average, darker bills compared to birds elsewhere in Europe or the Arabian Peninsula. The darker bill colour, along with the darker bellies in Finnish birds, may suggest that the intergradation zone between *hirundo* and *longipennis* even could begin in Finland. Considering this, it may not be justified that this heterogeneous group of birds within the intergradation zone, partly resembling *hirundo* but also showing many *longipennis*-like characteristics, is classified as a distinct subspecies *minussensis*.

In summary, our conclusion is that identifying a single individual as *longipennis* outside its usual distribution area appears to be impossible due to the extensive intergradation zone between western *hirundo* and eastern *longipennis*, which likely extends as far as Finland. Considering the prevailing taxonomy, we propose that the well-documented individual in full breeding plumage, displaying all the characteristic features supporting its eastern origin (Table 4), could be considered as belonging to the subspecies pair *minussensis*/*longipennis*, or *longipennis*/*longipennis-hirundo* intergrade, if *minussensis* is not accepted as a valid subspecies.

Acknowledgements

We would like to thank Mr. Mark Adams and Mr. Hein van Grouw at the NHMUK, Tring, Prof. Vladimir Loskot and Dr. Alexander Vesyolkin at ZMR, St Petersburg, Dr. Aleksi Lehikoinen at the FNHM, Helsinki, and Dr. Kari Kaunisto at ZMT, Turku, for permission to study the specimen collections.

References

Becker P H & Ludwigs J-D 2004: Sterna *hirundo* Common Tern. BWP Update 6: 91-137.
Cabot D & Nisbet I 2013: Terns of the World. HarperCollins, London.
Cramp S, Simmons K E L (eds) 1977: The Birds of the Western Palearctic. Vol. I. Oxford University Press, Oxford.
Darby C 2011: Eastern Common Terns in Suffolk and Belgium. Birding World 24(12): 511-512.
Gill F & Donsker D (eds.) 2017: IOC World Bird List (v 7.3). doi: 10.14344/IOC.ML.7.3.
Hario M 1986: Itämeren lokkilinnut, määritys ja esiintyminen. Lintutieto, Helsinki.
Hatton D H 2012: Birding Frontiers: Eastern Common Tern - did one frequent Minsmere in 2011. (retrieved from http://birdingfrontiers.com/2012/04/24/eastern-common-tern-did-one-frequent-minsmere-in-2011/ on 20 April 2012).
del Hoyo J, Elliott A, Sargatal J, Christie D A & de Juana E (eds.) 2017: Handbook of the Birds of the World Alive. Lynx Edicions, Barcelona. (retrieved from http://www.hbw.com/ on 25 February 2017).
Golovatin M G & Paskhalny S P 2013: Where are Western Bounds of Area S. h. *minussensis*? The Open Ornithology Journal 6: 52-54.
McCarthy E M 2006: Handbook of Avian Hybrids of the World, Oxford University Press. Oxford.
Mlikovsky J 2009: Waterbirds of Lake Baikal, eastern Siberia, Russia. Forktail 25: 13-70.
Mostello C S, LaFlamme D & Szczys P 2016: Common Tern *Sterna hirundo* and Arctic Tern *S. paradisaea* hybridization produces fertile offspring. Seabird 29: 39-65.
Nixon S 2011: The Eastern Common Tern in Suffolk. Birding World 24(5): 211-215.
Olsen K M & Larsson H 1995: Terns of Europe and North America. Christopher Helm, London.
Salonen V 2022: Kala- ja lapintiiran sekapesintä Lempäälässä. Lintuviesti 47(3): 26-27.
Shirihai H 1996: The Birds of Israel. Academic Press, London.
Sibley C G & Monrow B L 1990: Distribution and taxonomy of birds of the world. Yale Univ. Press, New Haven, CT.
White S J & Kehoe C V 2001: Difficulties in determining the age of Common Terns in the field. British Birds 94(1): 268-277.
Zink R M, Rohwer S, Andreev A V & Dittmann D L 1995: Trans-Beringia comparisons of mitochondrial DNA differentiation in birds. The Condor 97: 639-649.

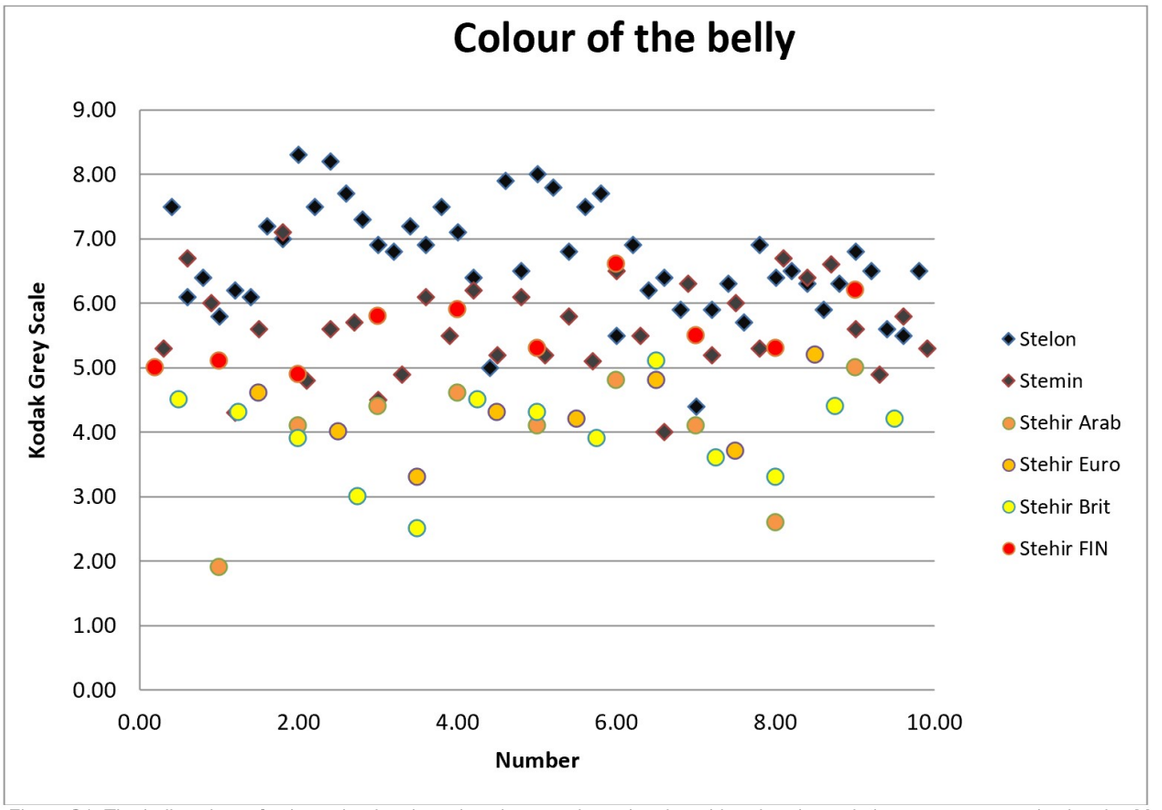

Figure S1: The belly colour of subspecies *longipennis, minussensis*, and various *hirundo* subpopulations was measured using the 20-stepped Kodak grey scale. A smaller value on the scale indicates a paler colour, while a greater value represents a darker colour. It is important to note that for the nominate *hirundo*, only the darkest individuals from the collection were selected (approximately 15% of the entire sample) to explore the transitional zone between the darkest *hirundo* and the eastern *minussensis/longipennis*. The actual difference in underpart colour between Western and Eastern Common Terns is much more pronounced.

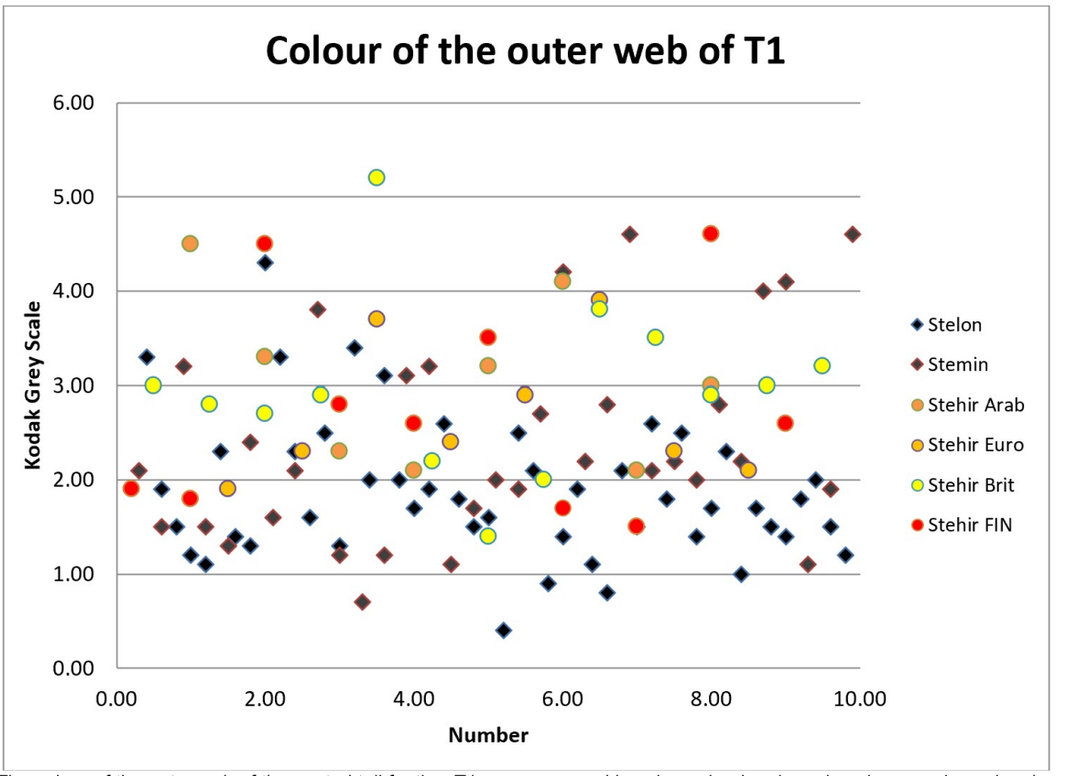

Figure S2: The colour of the outer web of the central tail feather T1 was measured in subspecies *longipennis, minussensis*, and various *hirundo* subpopulations using the 20-stepped Kodak grey scale. A smaller value on the scale indicates a paler colour, while a greater value represents a darker colour.

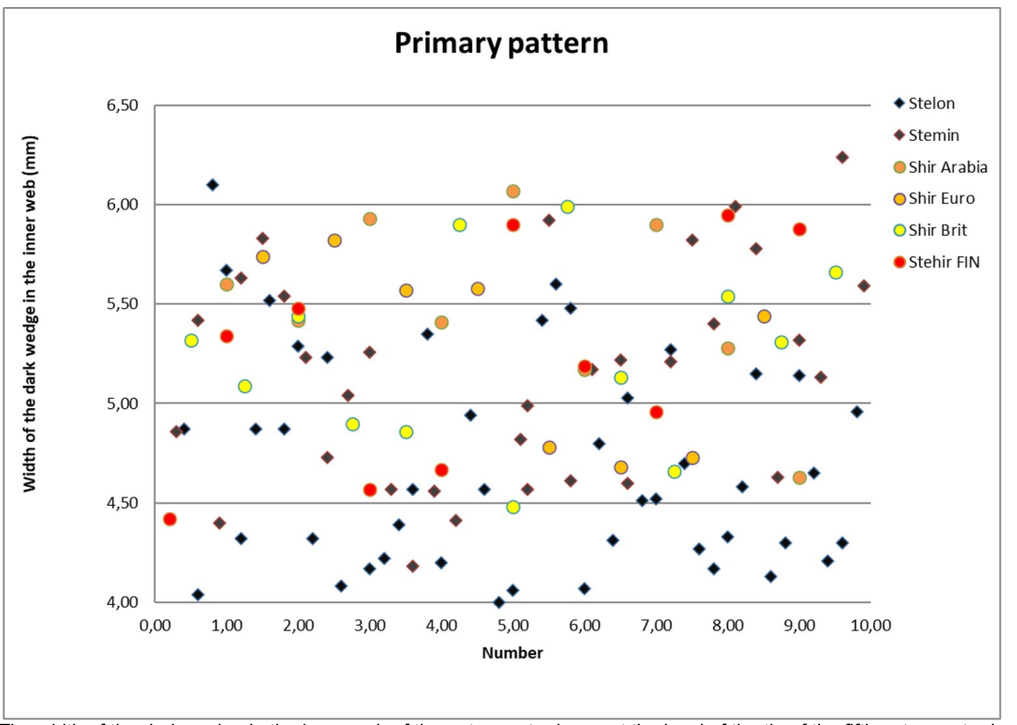

Figure S3: The width of the dark wedge in the inner web of the outermost primary at the level of the tip of the fifth outermost primary, measured in a closed wing, the method used for separating juvenile Common and Arctic Terns in their breeding grounds.

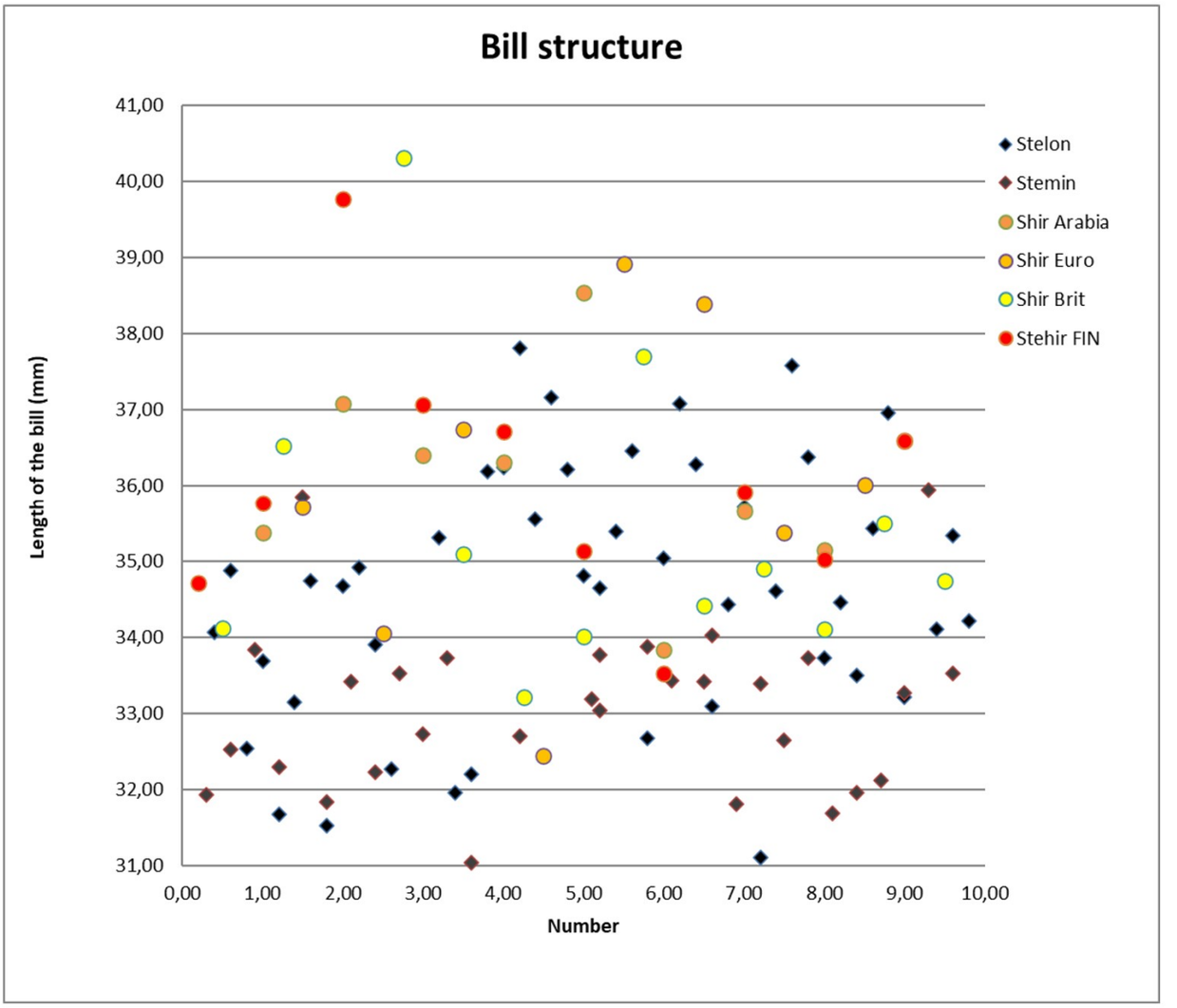

Figure S4: The length of the bill measured to the feathering at base in subspecies *longipennis, minussensis* and in different *hirundo* subpopulations.

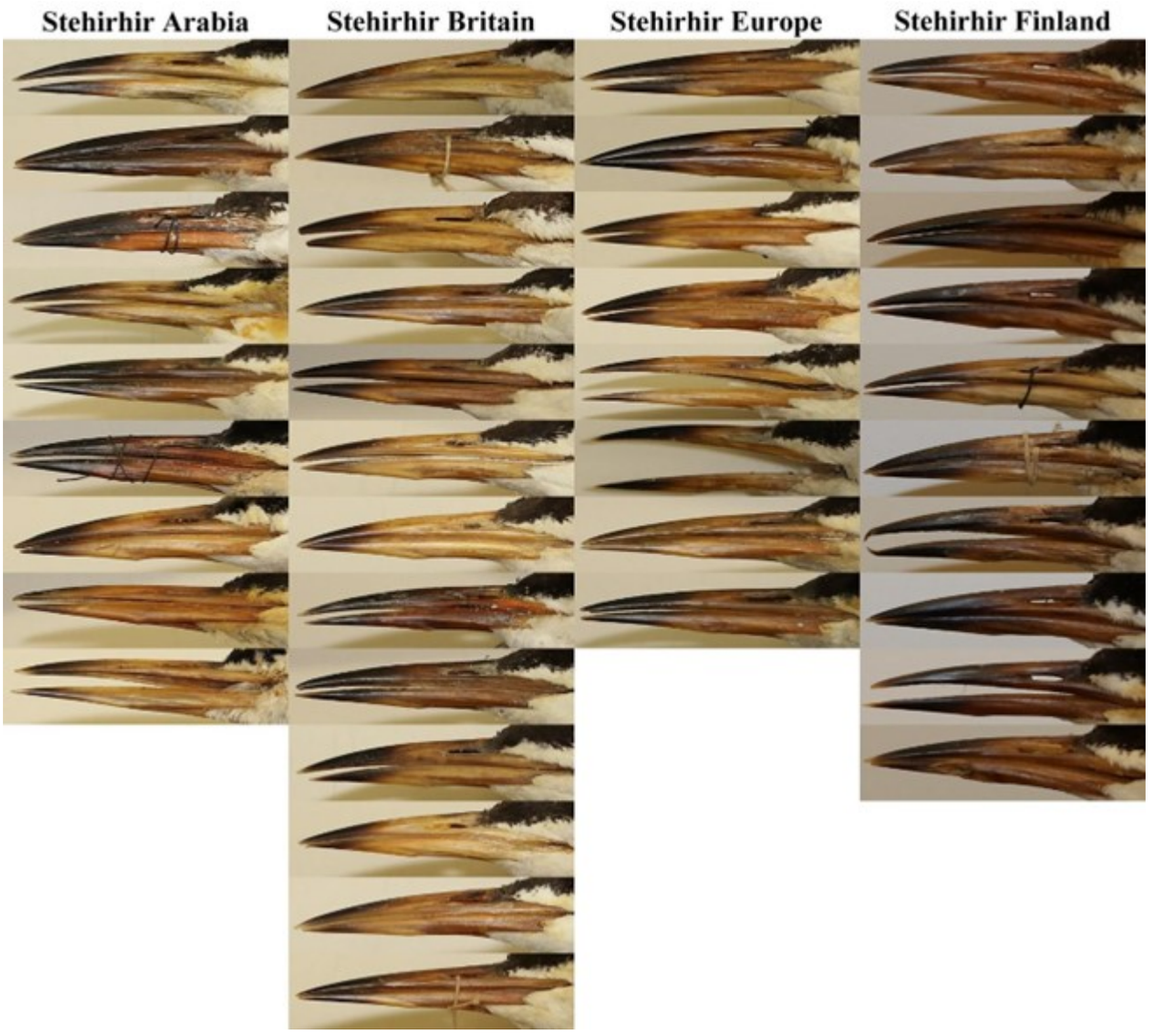

Photo S1: The bills of nominate *hirundo* collected in the Arabian Peninsula, British Isles, continental Europe and Finland. © Hannu Huhtinen, Tring (NHMUK), St. Petersburg (ZMR) and Helsinki (FNHM).

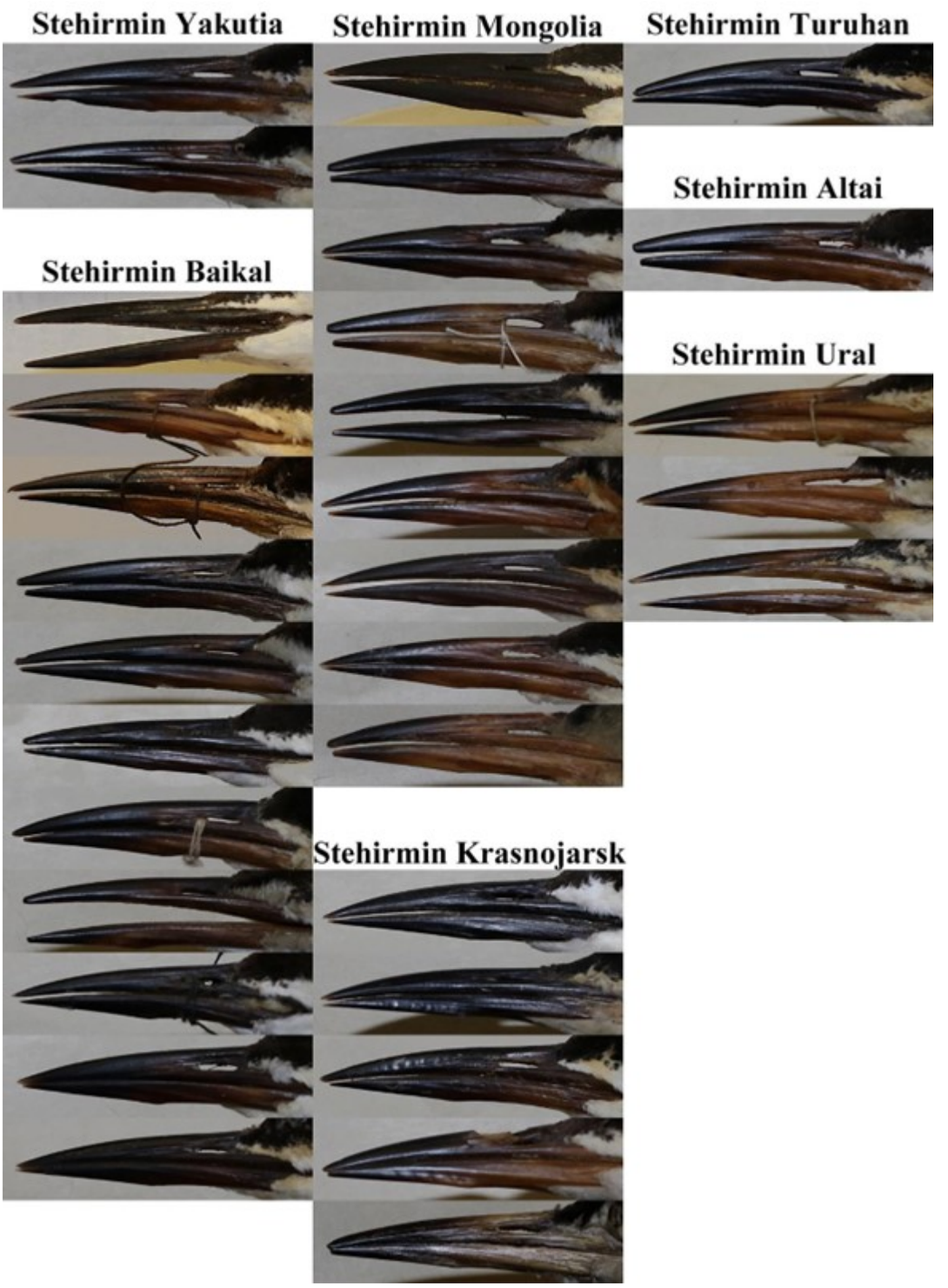

Photo S2: The bills of subspecies *minussensis* collected across its westernmost breeding grounds in the Ural Mountains to Lake Baikal, northern Mongolia and Yakutia in the east. © Hannu Huhtinen, Tring (NHMUK), St. Petersburg (ZMR) and Helsinki (FNHM).

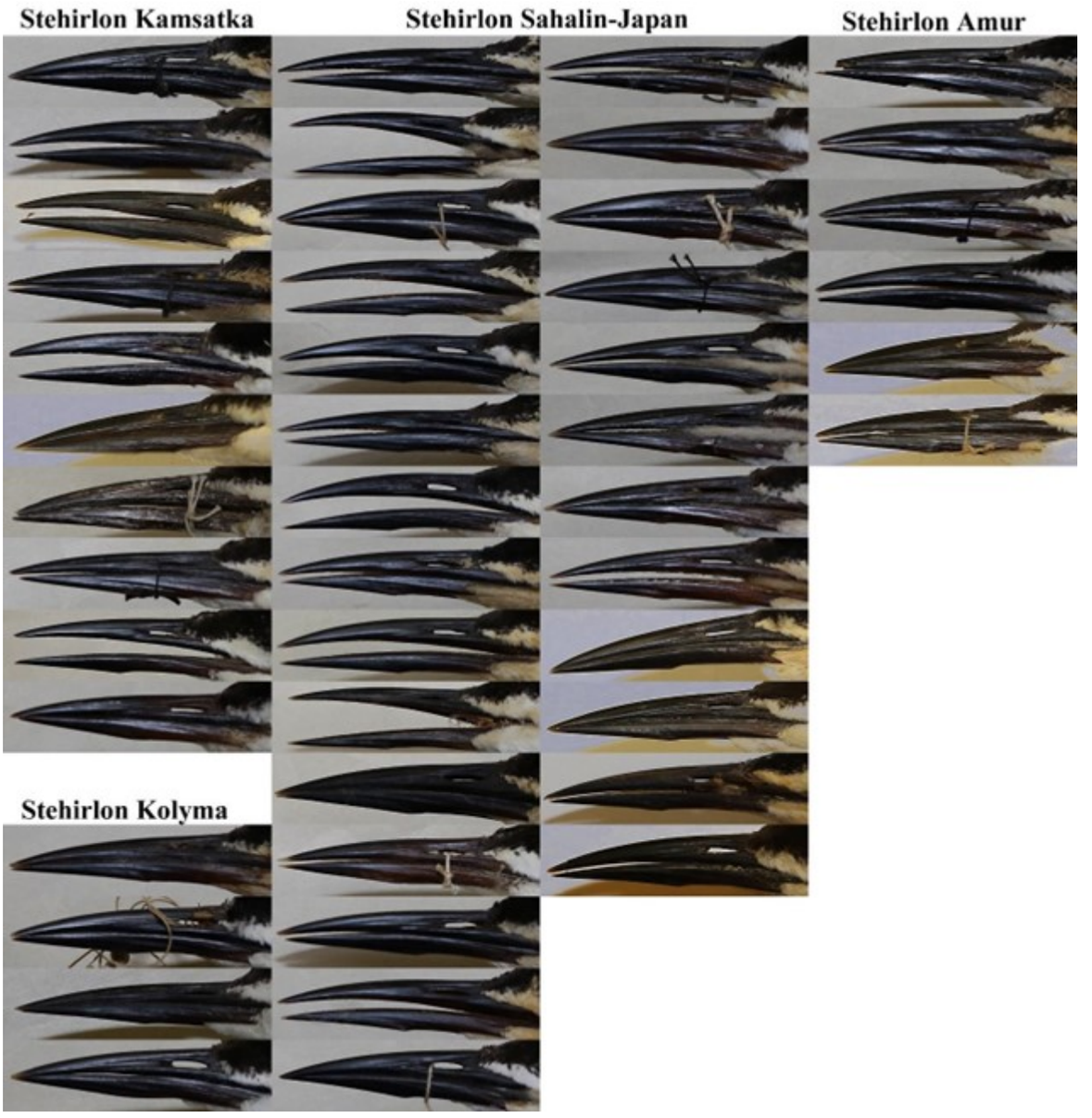

Photo S3: The bills of subspecies *longipennis* collected along the rivers Amur and Kolyma, as well as Kamchatka Peninsula, Sakhalin and Japan. © Hannu Huhtinen, Tring (NHMUK), St. Petersburg (ZMR) and Helsinki (FNHM).