Identification of the *Larus canus* complex

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Recent decades have seen a wealth of new information published on the identification and taxonomy of the so-called 'large white-headed gulls'. In contrast, the smaller taxa have been rather neglected. This is certainly the case with Mew Gull *Larus canus*, a familiar species that occurs throughout the Northern Hemisphere but whose geographical variation and field identification remain poorly understood. Despite its wide distribution, Mew Gull has been treated as a single species, consisting of four subspecies: nominate *L c canus* (Common Gull; hereafter *canus*) in Europe (including parts of European Russia), *L c heinei* (Russian Common Gull; hereafter *heinei*) throughout Russia, including large parts of Siberia, *L c kamtschatschensis* (Kamchatka Gull; hereafter *kamtschatschensis*) in eastern Siberia, and *L c brachyrhynchus* (Short-billed Gull; hereafter *brachyrhynchus*) in western North America (formerly, the name Mew Gull was often reserved for the Nearctic taxon only). Treatment of these four taxa in recent literature is often minimal, and some information is even misleading; for instance, in the two most recent gull monographs *heinei* is pictured as a bird that is more or less inseparable from *canus* (Olsen & Larsson 2003, Howell & Dunn 2007). This hinders identification in various places around the world; eg, how should we approach the identification of a vagrant *kamtschatschensis* when we do not know what *heinei* looks like? In some ways, *heinei* is a key taxon but one that has remained something of a mystery. Another problem is that variation in nominate *canus* is still not widely understood and is sometimes underestimated.

This paper aims to provide more clarity on the

1 Common Gulls / Stormmeeuwen *Larus canus canus*, displaying adults, Koksijde, West-Vlaanderen, Belgium, 5 March 2014 (*Peter Adriaens*)

Larus canus complex. We present new identification features for all age classes of all taxa and use these to comment on the taxonomic treatment of the complex. In particular, we build a case for considering *brachyrhynchus* as a valid species, distinct from the Old World (Eurasian) taxa. Also, it came as a surprise to us that many *heinei* can be identified in the field, some birds being so distinctive that they have been tentatively put forward as *brachyrhynchus* in the past (eg, Shepherd & Votier 1993, Lowe 2000). We present new features to enable field identification of *heinei*, which will hopefully help to avoid such problems in the future.

We dedicate this paper to the memory of Visa Rauste, a Finnish gull enthusiast who sadly passed away in November 2015. He was a modest man but to us and many others he was a monument of gull wisdom. He was a friend of ours, and will be missed.

Material and methods

Terminology and ageing

We use the term 'cycle' to describe plumage and age classes. This term helps avoid many of the problems of using 'calendar years' or terms such as 'first-winter', 'second-winter' etc. A plumage cycle runs from a given plumage or complete moult to the next occurrence of a complete moult. The first cycle starts with juvenile plumage, the second with the onset of the first complete moult in the bird's second calendar-year, and so on. The start of a complete moult is indicated by the replacement of the innermost primary. However, since we mainly describe plumages rather than moult in this paper, and since we focus on the winter period, our use of the term 'cycle' is usually restricted to birds with a full set of primaries, rather than those actively moulting.

While categorizing Mew Gulls into three age classes (first cycle, second cycle and adult) is generally straightforward (see, eg, Svensson et al 2009), there are some important caveats that need to be borne in mind. Some second-cycle birds can show very retarded plumage, with all-brown wing-coverts and complete black tail-band (eg, plate 49). Such birds can be similar to first-cycle ones although they usually show a number of advanced, rather adult-like secondaries (bluish-grey, with broad white tip) and often the innermost primaries have a bluish tinge. The presence of two white mirrors on the wing (on p9-10) should readily exclude first-cycle birds but note that some of the latter can show one white mirror (on p10), just like many second-cycle birds, and that, very exceptionally, two white mirrors may be present (we have documented one such first-cycle bird, a *canus*). Conversely, we have noted two second-cycle *kamtschatschensis* with just a tiny mirror on one wing only (plate 49), and one second-cycle *brachyrhynchus* without mirrors. If any juvenile scapulars are retained, this should safely exclude a second-cycle bird. A few first-cycle birds may already show an advanced, adult-like pattern on some of their secondaries and inner primaries and such birds, when they have already replaced all of their juvenile scapulars, can be near impossible to age correctly. If they retain a brown rump they can be more easily told from retarded second-cycle but otherwise ageing comes down to correct assessment of the median and lesser coverts, if they are not too worn: juvenile feathers have a warm

TABLE 1 Areas visited by authors to study Mew Gulls *Larus canus* in the field and collect main photographic material used in this paper

Taxon	Country	Year(s)	Details
brachyrhynchus	USA	2009, 2011 & 2012	California, locations extending from Bodega Bay (38°20'20.22''N, 123°03'35.91''W) to Monterey (36°36'00.04''N, 121°53'07.05''W)
canus	Scotland	2012-2015	Aberdeen (57°08'28.23'' N, 20°5'43.35''W). Studies specifically undertaken for this paper were made in 2012- although more general observations of *canus* have been made over much longer period
heinei	Georgia	2014	Black Sea coast between Batumi (40°38'50.00''N, 41°38'04.93''E) and Anaklia (42°23'30.23''N, 41°33'39.35''E)
heinei	Turkey	2013 & 2014	Istanbul (41°00'34.85''N, 29°00'01.02''E)
kamtschatschensis	Japan	2003, 2011 & 2012	Primarily Choshi, Honshu (35°44'16.44''N, 140°51'06.21''E)
kamtschatschensis	South Korea	2015	East coast, close to border with North Korea (centred on 37°48'18.86''N, 128°55'17.26''E)

brown centre with a neatly defined pale fringe, while in retarded second-cycle birds the coverts are paler, more washed out and lacking the solid brown centre (except for the smallest feathers along the leading edge of the arm). In addition, many second-cycle birds already show a number of plain grey, adult-like lesser coverts.

Third-cycle birds usually resemble adults but tend to retain a little black on the alula or in the primary coverts. A few fully adult birds (even when more than 20 years old) may retain such immature traits too, however, and some advanced second-cycle birds can look very similar to third-cycle, so it is better to talk about 'third-cycle types' (Bengtsson & Blomquist 2003, Rattiste 2006). For field identification, the exact age in these birds is not crucial, as the criteria for adults are also valid for third-cycle types.

Throughout this paper, primaries are abbreviated to 'p' and numbered inside out, so that for example the innermost primary is referred to as p1 and the outermost as p10.

Overview

The paper is based on our field observations of all four taxa, study of photographs, examination of museum specimens and analysis of sound recordings. For adult and second-cycle birds, initial field observations and a review of existing literature were used to develop a list of potentially useful identification features. A scoring system was developed for these features, with birds then scored either from photographs or direct examination of skins. In total, 1451 adult and second-cycle birds were scored according to 22 features. This total included 31 birds suspected to be in their third cycle (ie, subadults) but these were left out of the statistical analyses so they could not bias our samples of the main two age categories. The resulting database was used to identify combinations of features that permit field identification and to calculate the proportion of adult and second-cycle birds of each taxon considered safely identifiable. First-cycle birds were tackled in a rather more descriptive way, though some features were scored (tail and uppertail-covert patterns were scored on 402 birds and scapular moult on another 497).

Many birders will be interested in identification of taxa outside of their normal range, or identification in areas where two or more taxa (may) occur. In both of these cases, identification during the winter months is most relevant. Vagrants are perhaps most likely to occur in winter, while identification issues in East Asia, for example, are most acute once wintering birds arrive, belonging potentially to two or more taxa. We therefore concentrated on assessing features that are relevant at all times of the year (eg, adult primary pattern, iris colour) or, if varying seasonally, were characterised during the winter months (eg, bill pattern, head streaking). The following sections provide full details of our methods.

Field and museum work: adult and second-cycle birds

We visited the accepted ranges of all four taxa to study and photograph birds in the field (table 1, figure 1). The main sample material for adult *canus* was collected during the breeding season in north-eastern Scotland, with photographs taken in five different colony areas in June-July 2014. The main data for second-cycle *canus* were also collected in Scotland; some birds were photographed during summer (those present in colonies) but most material was collected during winter. We assumed that birds in winter in north-eastern Scotland were all *canus*, or that the number of individuals of other taxa was so low that it would not affect the outcome of our statistical analysis. For practical and logistical reasons it was not possible to study the other taxa on their breeding grounds; for instance, *heinei* breeds over a vast area, much of which is extremely difficult to access, while visiting the Kamchatka peninsula, Russia, to study *kamtschatschensis* was beyond our means. Thus, *brachyrhynchus*, *heinei* and *kamtschatschensis* were studied on their respective wintering grounds and in museums.

We spent five days in October 2014 examining the skin collection of the Zoological Museum of Moscow, Russia. This visit had the specific purpose of enabling us to include *heinei* and *kamtschatschensis* collected from the breeding grounds in our sample. The museum houses a large collection of birds from breeding colonies in western Russia and Siberia, extending from Pskov in the west (close to the Estonian border) to the Kamchatka peninsula, Chukotka and the Commander Islands in the east, and includes birds breeding around Lake Baikal (see inset in figure 1). Thus, it enabled us to characterise birds from the core ranges of both *heinei* and *kamtschatschensis* as well as populations in potential areas of intergradation (*canus* with *heinei* in the west and *heinei* with *kamtschatschensis* in the east; see inset in figure 1). We confined our museum studies to birds collected from breeding areas during the summer months; the sample included all ages. Birds from the (supposed) intergradation zones (n=18) were not included in the analysis initially but were used as an independent

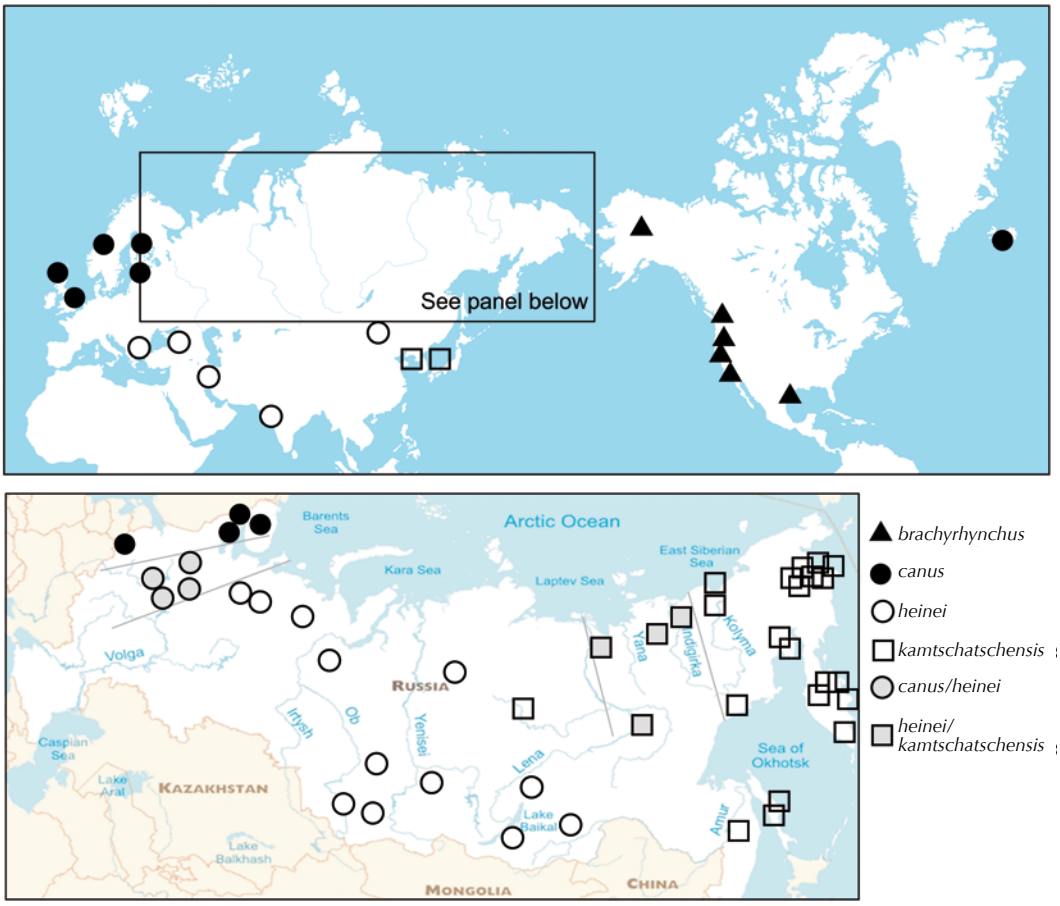


FIGURE 1 Location of sampling areas of adult and second-cycle Mew Gulls *Larus canus* of which wing-tip patterns were scored. To avoid clutter, locations from which several birds were examined or photographed shown as single point only. Inset shows in more detail collection locations of all skins from breeding grounds examined by authors at Zoological Museum of Moscow. For skins of which labels gave only administrative region rather than precise grid co-ordinates, symbols are positioned in centre of respective regions. Two sets of lines indicate areas of intergradation mentioned by Olsen & Larsson (2003); birds examined from within these areas indicated by grey shading, as specified in key.

'test' data set; ie, we used features generated from the analysis of birds of clear identity to provide some insights into the traits shown by birds from intergradation zones. Similarly, *heinei* from Romania (n=42), where *canus* may also occur regularly, and *kamtschatschensis* from South Korea, where *heinei* can also be found, were not used to develop the identification keys (table 3-4) but were used afterwards to check that the keys allowed birds from independent locations to be identified. Such an independent 'test' was not needed for *brachyrhynchus* since that taxon's range is isolated from that of the Old World taxa, though we did test the identification key on a few vagrant *brachyrhynchus* from eastern USA.

To supplement our own field and museum studies, photographs provided to us or published on the internet were incorporated into the database (table 2). In particular, we were provided with large samples from birds breeding in Estonia and Finland. These locations are especially interesting because of their geographic positions; along with those from other locations, and those examined in Moscow, the photographs enabled us to include birds breeding at points across an east-west transect covering the full range of *canus*.

TABLE 2 Summary of all locations and sample sizes for adult and second-cycle birds included in the analysis. Third-cycle types, birds from the presumed intergradation zones and wintering birds from Romania were excluded from the analysis and therefore not listed in this table.

Taxon	**Age**	**Location**	**Season**	**Number of birds**
brachyrhynchus	adult	Alaska	summer	15
		British Columbia	winter	6
		California	winter	84
		Oregon	winter	1
		Washington	winter	20
				total = 126
	second-cycle	Alaska	summer	13
		British Columbia	winter	5
		California	winter	35
		Texas	winter	2
		Washington	winter	7
				total = 62
canus	adult	Estonia	summer	94
		Finland	summer	47
		Iceland	summer	6
		Netherlands	summer	1
		Norway	summer	1
		Russia	summer	3
		Scotland	summer	250
				total = 402
	second-cycle	Estonia	breeding	6
		Finland	summer	5
		Iceland	summer	2
		Netherlands	summer	2
		Russia	summer	5
		Scotland	winter	101
				total = 121
heinei	adult	Georgia	winter	163
		Istanbul	winter	97
		Kazakhstan	summer	10
		Russia	summer	20
		Siberia	summer	40
				total = 330
	second-cycle	Georgia	winter	79
		Istanbul	winter	37
		Kazakhstan	summer	1
		north-western China	winter	1
		Russia	summer	1
		Siberia	summer	12
				total = 131
kamtschatschensis	adult	Japan	winter	93
		Siberia	summer	32
				total = 125
	second-cycle	Japan	winter	56
		Siberia	summer	7
				total = 63

Field and museum work: first-cycle birds
Details of the plumage of first-cycle birds are less easy to categorise than the black-and-white wing-tip patterns of adult and second-cycle ones. We therefore adopted a descriptive approach for this age group, based on field studies, assessment of photographic material and examination of skins. Nonetheless, we developed a classification system for aspects of the uppertail-covert and tail patterns, to allow the frequency of different patterns to be quantified. The sample of birds used for analysis of uppertail-covert and tail patterns were photographed mainly in winter: *canus* in north-eastern Scotland, *brachyrhynchus* in California, *heinei* in Georgia and Turkey (but the sample also included skins from Siberia and other parts of Russia, collected in summer), and *kamtschatschensis* in Japan. We also received photographs of skins of eight first-cycle *heinei* (from western Siberia, India and Iran) and six first-cycle *kamtschatschensis* (from Commander Islands and Japan) housed at the Natural History Museum at Tring, England. The sample sizes differed slightly for each uppertail-covert and tail feature and are given in figure 5-7. We also assessed the extent of post-juvenile scapular moult in each taxon. This was based on a separate sample of 497 birds photographed in November-March (locations as per figure 1). We assumed that the post-juvenile moult ceased before November, such that our data captured the final extent of this moult.

Scoring system for adult and second-cycle birds
We developed a categorical scoring system to describe details of the wing-tip pattern and bare parts of adult and second-cycle gulls. Birds were scored according to 22 individual features, with scores for each of the 1451 sample birds entered into an Access database. The elements of the scoring system are illustrated in diagram 1-15. For each feature, categories were kept as simple as possible, so that precise measurement was not required: relative lengths and sizes were used, mostly expressed as proportions. Details of bill markings and eye colour were also recorded; these were based on field studies only, since they are not reliable in museum skins (bill markings fade, eyes are no longer present). For analysis of bill patterns, only birds photographed in winter were used. As the main sample material for adult *canus* was collected in summer (Estonia, Finland, Scotland), another sample of birds was taken in winter, solely for the purpose of assessing bill markings. These birds (n=109) were observed in north-eastern Scotland in October 2014.

Method for statistics
Simple summary statistics describing the frequency of scores for each feature in each taxon were drawn up (see diagram 1-15). These statistics were then used to develop an identification key, based on wing-tip features. Non-metric Multi-Dimensional Scaling (NMDS) was used to assess the similarity of the wing-tip patterns of the four taxa, dealing simultaneously with all the individual features. NMDS was applied separately to adult and second-cycle birds. Detailed methods and output from the NMDS analyses are given in the appendix.

Due to variable and often small sample sizes, we did not apply any formal statistical tests to determine whether the wing-tip patterns of adult *heinei* from the breeding areas differed from the wintering grounds. However, simple visual inspection of the frequency plots for the individual wing-tip features indicated that there were no major differences between the breeding and wintering samples: birds from Georgia and Istanbul, Turkey, in winter showed basically the same wing-tip patterns as the *heinei* we examined from the breeding grounds in European Russia, Siberia and Kazakhstan. We noted only three minor differences: ***1*** Shape of the black wedge on p8. This is not a reliable character in adults, so we did not use it for the identification key. It is, however, valid and relevant for second-cycle birds, so we used it for this age group. ***2*** Shape of the black wedge on p7. Again, this is not a reliable character in adults, and so we did not use it in the identification key (but it is valid and so was used for second-cycle birds). ***3*** Length of the tongue on p8 (cf diagram 8). It was rather surprising that almost half of the adult *heinei* from the breeding grounds showed a fairly long tongue on p8 (slightly longer than 50% of feather length). A long tongue is more typical of *canus*, so it is reassuring that a short tongue (<50% of feather) predominates in the larger sample of birds from wintering grounds in Georgia and Istanbul believed to be *heinei*. This feature is described in the text and used in the NMDS but is not used in the key.

Analysis of calls
We examined 20 recordings of the display call of *brachyrhynchus*, 15 of *canus*, six of *heinei* and nine of *kamtschatschensis*. Each recording was analysed visually by creating a sonagram using Audacity.

Identification

Size and shape

There are average differences in size and shape between the four taxa that may be helpful in the field at times, although there is a lot of variation and overlap. Interpreting what are often subtle differences in the field may require extensive experience with all four taxa.

In general, the taxa increase in size from west to east. *Brachyrhynchus* is the smallest, followed by *canus*, *heinei* and then *kamtschatschensis*. However, there is extensive overlap in size between *canus* and *heinei*, especially where their breeding ranges meet (Olsen & Larsson 2003), and there are a few *kamtschatschensis* that look surprisingly small, even inviting confusion with *brachyrhynchus* (plate 28). It should also be kept in mind that there is a notable size difference between males and females, sometimes even more so than between the taxa.

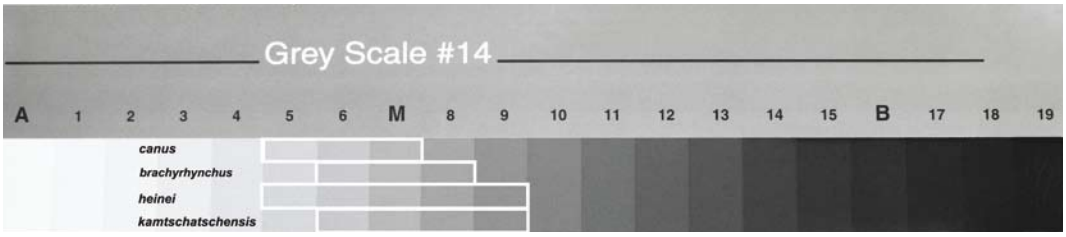
Brachyrhynchus is about as small as a Black-legged Kittiwake *Rissa tridactyla* and always has a small bill. The head is often very rounded and dove like, with a markedly steep forehead, and the neck can look quite long. The head may look obviously small compared with the body. Quite a few birds show a slim body with flat back, no tertial step, and curiously upturned wing-tips at rest, creating a slight 'banana shape' that is quite unique among gulls (plate 29-30). *Canus* has a more angular head shape with less steep forehead, a slightly stronger bill, fatter body with rounded back, bulging breast, and often a visible tertial step. Many *heinei* (though far from all) stand out due to their noticeably long wings, at rest but also in flight, when the wings may look slender with a very pointed hand. The crown may look very flat, and the forehead rather more sloping than in *canus*. Most *kamtschatschensis* are big, being similar in size to Ring-billed Gull *L delawarensis*. The body may look oval shaped and inflated, almost recalling a rugby ball. Many birds have an obviously long, sloping forehead and a long, strong bill, which combined may give a rather 'snouty' impression. Their distinctive jizz can even be evident in flight, when they show much length in front of the wings as a result of a long bill and long, snouty head shape.

Measurements of the *Larus canus* taxa have been widely published (eg, in Olsen & Larsson 2003). They are not very useful for field identification, of course, but we feel the need to say something about them because the identification of extralimital *heinei* has generally been deemed impossible in the field and has therefore relied heavily on biometrics, at least in western Europe (eg, Schmitz & Degros 1988, Kompanje & Post 1990, 1993, Bengtsson & Pedersen 1998, Hein & Martens 2002). For instance, a wing length of more than 390 mm is generally believed to exclude *canus* but as more studies are being carried out several breeding *canus* have been recorded with wing lengths slightly over this limit (from Estonia, Norway and Poland), with a maximum of 395 mm (Bukaciński & Bukacińska 2003). It should also be kept in mind that there is some geographical variation in size between populations of *canus*, eastern birds being generally larger than those breeding in western Europe. As an example, the mean head and bill length for Scottish *canus* males is 90 mm (maximum 96 mm; Craik 1997), while in Estonia it is 94 mm (maximum 103 mm; Larsson et al 1997; Kalev Rattiste in litt). Only a few Russian *canus* from further east (including potential intergrades with *heinei*) have been measured, so the total range of overlap with *heinei* is probably still unknown. Thus, relying solely on biometrics to identify *heinei* may be problematic.

Grey tones

After the post-juvenile moult, all birds have some grey in their upperparts. There is a lot of overlap between the taxa in the tone of this grey (figure 2), so it is not a very useful character, except in ex-

FIGURE 2 Kodak grey scale values of the upperparts of adult Mew Gull *Larus canus* taxa; (A = white, M = medium grey, B = blackish)



treme cases. There is some conflicting information on exact grey tones in the literature, so we have compared museum skins of *canus*, *heinei* and *kamtschatschensis* with a Kodak grey scale ourselves. Figure 2 integrates our results with the Kodak grey scale values that have been published. While the published values for *heinei* are 6-8, we found nine adult birds in the Moscow museum collection that we assessed as Kodak 5 (ie, as pale as the palest *canus*) and six adults with Kodak 9 (ie, as dark as the darkest *kamtschatschensis*). The grey tone of these birds was not linked to location. Some of the literature suggests a cline in *heinei* from paler to darker upperparts eastwards but we cannot confirm this; in fact, most of our palest birds were from further east in Siberia than the darkest ones. Our results for *canus* and *kamtschatschensis* matched those already published.

Assessment of Kodak grey scale values is something of a theoretical exercise; for field identification it is more useful to know that the upperparts of adult *canus* are about as dark as nominate Yellow-legged Gull *L michahellis michahellis* and slightly paler than Black-legged Kittiwake, and that some *heinei* and *kamtschatschensis* can be as dark as Lesser Black-backed Gull *L fuscus* of the subspecies *graellsii* (plate 21). The grey tone of adult *brachyrhynchus* overlaps widely with that of *kamtschatschensis*, although the darkest extremes of the latter are not matched.

Description of adults

In addition to size, structure and grey tone of the upperparts, adults (plate 2-34) can be identified by primary pattern and, in winter, head pattern and bare part colours. The details of the primary pattern are quite complex, and will require good photographs for careful evaluation. Various characters have to be used in combination before the identification of a vagrant bird can be clinched. Rather than describing all the possible combinations of features, we have opted for presenting them in the form of an identification key (table 3) that, when followed step by step from the top down, provides a path towards the correct taxon. A number of birds will not fit into this key, which simply means that they do not show any diagnostic combinations of features in their primary pattern and, unless they show other key traits, may have to be left unidentified. Still, we estimate that by using primary pattern alone (as per the key) it will be possible to identify over 80% of adult *brachyrhynchus*, over 30% of adult *canus*, 40% of adult *heinei*, and over 30% of adult *kamtschatschensis*.

Results of the NMDS, which allow us to compare all individual sample birds and look for overall differences between the four taxa, are presented in the appendix. The NMDS supports the conclusion that adults of the four taxa differ consistently in their primary pattern. Overall, the sample birds cluster very well according to taxonomy. The clusters of *heinei*, *canus* and *brachyrhynchus* separate clearly across the two-dimensional NMDS plot, with very little overlap (just a few individuals of each taxon sit within the constellation of the others). Thus, although there are a few intermediate and hence problematic individuals, these three taxa appear rather distinct when characterised using their wing-tip features. *Canus* and *heinei* sit closest together on the plot and hence are most similar. *Brachyrhynchus* separates from these two; thus the new world taxon is rather distinct. *Kamtschatschensis* occupies an intermediate position on the plot but overlaps extensively with *brachyrhynchus* and to a lesser degree *canus* and *heinei*. Thus, while *kamtschatschensis* has its own characteristic wing-tip pattern, many individuals share some features with one or more of the other taxa.

Head pattern

If we rank the taxa by their head/neck pattern from palest to darkest, the result is *heinei – canus – kamtschatschensis – brachyrhynchus*.

By early winter, adult *heinei* regularly show a clean, unmarked white head sharply set off from a 'boa' of dark, pencil-like streaks or neat, rounded spots on lower hindneck. This gives them a white-headed look somewhat reminiscent of adult Caspian Gull *L cachinnans*.

In winter, the head of adult *canus* looks variably streaked, especially on the crown, nape and ear-coverts, with any pattern on the neck often rather smudgy brown. The pattern may extend onto the breast.

Typical adult *kamtschatschensis* in winter are characterized by an extensive, heavily blotched, brown 'shawl' or 'tide-mark' across the neck, which may continue far down onto breast and even onto flank in some (which is rare in *canus*). Head streaking can be stronger and more extensive than in *canus*, and heavy streaking may be present on the chin and throat (again, only rarely so in *canus*). While the head pattern is certainly variable, the forehead tends to be more extensively streaked or spotted than in *canus*, and there may also be a more distinct pattern on the lore and below the eye.

Brachyrhynchus are the most distinctive. Adults have an extensive brown wash across the neck in

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2 Common Gull / Stormmeeuw *Larus canus canus*, adult, Peterhead, north-eastern Scotland, 18 December 2011 *(Chris Gibbins)*. Typical bird with brown spots on forehead, crown and nape, lightly streaked ear-coverts, and extensive brown spotting on hindneck. Bill is dull greenish and has complete black band. Iris is dark and upperparts are medium grey. Grey base of wing-tip does not extend beyond tertial-tips.
3 Common Gull / Stormmeeuw *Larus canus canus*, adult or third-cycle, Visé, Liège, Belgium, 17 February 2013 *(Peter Adriaens)*. Lack of prominent white tip to p9 might indicate that this bird is not quite fully adult. Neck quite heavily blotched with brown, perhaps suggesting *kamtschatschensis* but note dull greenish bill with complete blackish band, dark iris, medium-grey upperparts and mainly white throat and lore in this bird.
4 Common Gull / Stormmeeuw *Larus canus canus*, adult or third-cycle, Lombardsijde, West-Vlaanderen, Belgium, 15 February 2013 *(Peter Adriaens)*. Bird with only light head markings but brown spotting still present in usual places (crown, nape, hindneck). Note also dark iris, contrasting blackish bill-band and medium-grey upperparts.
5 Common Gull / Stormmeeuw *Larus canus canus*, adult, Peterhead, north-eastern Scotland, 9 November 2013 *(Chris Gibbins)*. Complete absence of black on p5 strongly points to nominate *canus*, especially in combination with large amount of black on outer primaries. Note also extensive brown spotting on head (in this bird also including lower throat), dull greenish bill with distinct blackish band, and medium-grey upperparts. White tips to inner primaries clearly narrower than those on secondaries.

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6 Common Gull / Stormmeeuw *Larus canus canus*, adult, Lombardsijde, West-Vlaanderen, Belgium, 15 February 2013 *(Peter Adriaens)*. Absence of black on inner web of p5 is indicative of *canus*, as this is rare in the other Mew Gull taxa, especially *heinei*. Note also head streaking above and behind eye, as well as dull greenish bill with distinct black band. Using identification key, this bird is easily clinched as *canus*: p9 without distinct tongue-tip (visible in other photographs of this bird) → p5 with black spot on just one web → p8 without white mirror → p8 without white tongue-tip (visible in other photographs) → p7 with long black wedge on outer web (more than 50% of length of feather) = *canus*.

7 Common Gull / Stormmeeuw *Larus canus canus*, adult, Koksijde, West-Vlaanderen, Belgium, 5 March 2014 *(Peter Adriaens)*. This bird has complete but thin black band on p5. There is nothing particularly diagnostic of nominate *canus* in this bird's primary pattern but well demarcated hood of brown spots clearly set off against white neck is almost unique to this taxon. Note also dark iris and dull greenish bill.

8 Common Gull / Stormmeeuw *Larus canus canus*, adult or third-cycle, Lombardsijde, West-Vlaanderen, Belgium, 15 February 2013 *(Peter Adriaens)*. Same bird as in plate 4. Example of a *canus* with thick, complete black band on p5. Nothing particularly diagnostic in this bird's primaries but black pattern on outer primaries is not extensive enough for *heinei*, while pale head and neck markings, dark iris, dull bill colour, blackish bill-band, small white tip to inner primaries, relatively short grey tongue on p8 and lack of white tongue-tip on p8 are certainly not suggestive of *kamtschatschensis* or *brachyrhynchus*.

9 Common Gull / Stormmeeuw *Larus canus canus*, adult, Peterhead, north-eastern Scotland, 5 March 2011 *(Chris Gibbins)*. Example of *canus* with little black and much white in wing-tip. Easily told from *brachyrhynchus* by white mirror on p8 (white spot completely surrounded by black) and lack of black on inner web of p5 – a diagnostic combination. Note also black bill-band and thin white tip on inner primaries (clearly narrower than white tip to secondaries).

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10 Russian Common Gulls / Russische Stormmeeuwen *Larus canus heinei*, with Caspian Gulls / Pontische Meeuwen *L cachinnans*, Besh Barmag, Azerbeijan, January 2015 *(Steve Klasan)*. White-headed appearance of these birds in midwinter is eye catching. Note also very white body of several first-cycle birds.
11 Russian Common Gulls / Russische Stormmeeuwen *Larus canus heinei*, adults, with Caspian Gulls / Pontische Meeuwen *L cachinnans*, and Black-headed Gulls / Kokmeeuwen *Chroicocephalus ridibundus*, Poti, Georgia, 29 January 2014 *(Peter Adriaens)*. In these birds, predominantly white head contrasts with sharp spots or streaks on hindneck. Yellow bills are also striking, and white primary tips are relatively small. In left bird, base of wing-tip is visible just below tertials and looks entirely black.
12 Russian Common Gull / Russische Stormmeeuw *Larus canus heinei*, adult, Poti, Georgia, 30 January 2014 *(Peter Adriaens)*. Note clean white head in midwinter (with just a few indistinct brownish streaks on hindneck), yellowish bill and legs and very small white primary tips (matching those of second-cycle nominate *canus*). Note rather pale upperparts, not different from adult nominate *canus*.
13 Russian Common Gull / Russische Stormmeeuw *Larus canus heinei*, adult, Istanbul, Turkey, 28 December 2013 *(Chris Gibbins)*. Nearly 20% of adult *heinei* have obviously pale iris and this, together with strong, yellow bill may be among first things drawing attention in a European context. There is nothing really diagnostic in wing-tip of this bird but black spots on both webs of p4 are rare in adult nominate *canus* (shown by only 1%) and rather small white mirror on p9 of this bird (about same size as black tip) is also more indicative of *heinei*.

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14 Russian Common Gull / Russische Stormmeeuw *Larus canus heinei*, adult, Bucharest, Romania, 25 February 2011 *(Chris Gibbins)*. Note 'Asian look' caused by white head set off against thin necklace of brown spots. Bill yellow and although primary pattern of this bird not diagnostic, two black spots on p4 and very indistinct tongue-tip on p7 certainly more indicative of *heinei* than of nominate *canus*.
15 Russian Common Gull / Russische Stormmeeuw *Larus canus heinei*, adult or third-cycle, Istanbul, Turkey, 2 January 2014 *(Chris Gibbins)*. Typical bird with predominantly white head contrasting with sharply defined brown necklace, yellow bill and lots of black on primaries. Primary pattern not diagnostic but two black spots on p4, full black outer web of p8 (right up to primary coverts) and rather small white mirror on p9 strongly indicative of *heinei*. On underside of wing, pale tongue on outermost three primaries clearly very short.
16 Russian Common Gull / Russische Stormmeeuw *Larus canus heinei*, adult, Poti, Georgia, 27 January 2014 *(Peter Adriaens)*. Very typical individual with clean white head, subtle brown spots on hindneck, yellow bill and diagnostic primary pattern: p9 without white tongue-tip → p5 with complete black band → p8 without white mirror → p8 with entirely black outer web (just tiny grey spot just along primary shaft) → p6 with long black wedge (> 2/3 of feather length) = *heinei*. Tiny grey spot at base of p8 could be matter of discussion but broken black band on p4, black spot on p3 and small white mirror on p9 further confirm identification as *heinei*.
17 Russian Common Gull / Russische Stormmeeuw *Larus canus heinei*, adult, Koksijde, West-Vlaanderen, Belgium, 8 January 2014 *(Peter Adriaens)*. Example of out-of-range *heinei*. Bird stood out by slim, elongated shape with long wings, rather dark grey upperparts and predominantly white head contrasting with strong brown 'boa' on hindneck. Note also largely black base of wing-tip (visible below tertials) and small white primary tips.

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18 Russian Common Gull / Russische Stormmeeuw *Larus canus heinei*, adult, Koksijde, West-Vlaanderen, Belgium, 8 January 2014 *(Peter Adriaens)*. Same bird as in plate 17. Bare parts of this bird rather dull coloured but primary pattern diagnostic: no white tongue-tip on p9 → broken black band on p5 → p7 with thin white tongue-tip → p8 with entirely black outer web (no grey at base) = *heinei*. Furthermore, white mirror on p9 slightly smaller than in most nominate *canus* (white on outer web not much larger than black tip) and black wedge on outer web of p6 slightly longer (almost covering 50% of feather length).
19 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, adult, Hywajin-po, South Korea, 6 January 2015 *(Chris Gibbins)*. Note head and neck heavily spotted, bill virtually unmarked, iris slightly paler than pupil and upperparts very dark grey. Sloping forehead and strong bill also typical for this taxon.
20 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, adult, Choshi, Japan, 6 March 2012 *(Peter Adriaens)*. Typical individual with bulky, almost 'inflated' body, extensive brown on head and neck creating impression of 'hood', dark slaty-grey upperparts, rather pale iris, sloping forehead and 'banana yellow' bill with just small dark spot on gonys. Grey base of wing-tip does not extend beyond tertial-tips.
21 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, adult, Choshi, Japan, 6 March 2012 *(Peter Adriaens)*. Smaller individual, with duller bare parts and rather strong bill markings. Upperparts, however, distinctly dark slaty-grey, nearly matching those of some Lesser Black-backed Gulls *L fuscus*, and neck heavily blotched with brown.

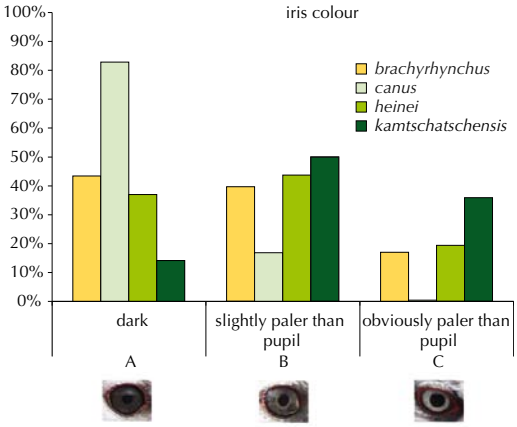

DIAGRAM 1 Iris colour of adult Mew Gulls *Larus canus*

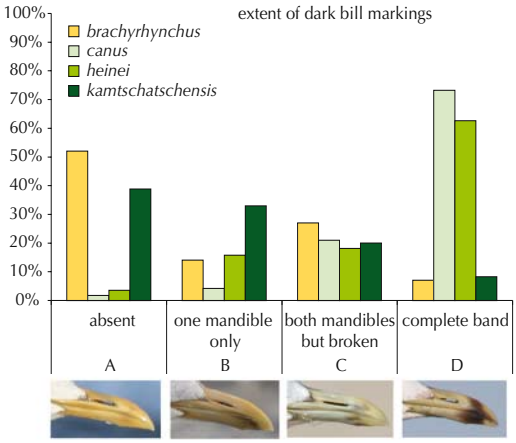

DIAGRAM 2 Bill pattern of adult winter Mew Gulls *Larus canus*

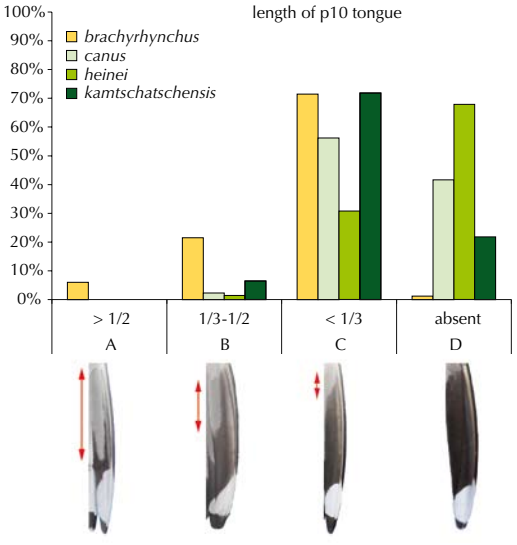

DIAGRAM 3 Length of tongue on p10 of adult Mew Gulls *Larus canus*

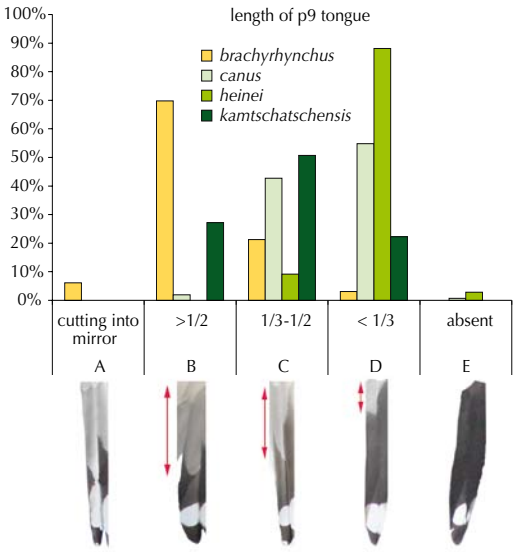

DIAGRAM 4 Length of tongue on p9 of adult Mew Gulls *Larus canus*

winter, which unlike *kamtschatschensis* tends to be smoothly textured rather than heavily blotched. The brown wash often extends onto the flanks. Head markings are often rather smudgy and brown. The chin and throat are usually rather clean white, as in *canus*.

Bare parts

There are average differences in iris colour, bill colour and bill pattern between the four taxa (diagram 1-2).

Adult *canus* usually have a dark iris throughout the year but the iris can appear slightly paler than the pupil in a minority (17% in our sample), especially in bright sunlight. An obviously pale iris (score C in diagram 1) is very rare in *canus*; we have seen only a few such birds. In winter, the bill is usually quite dull (greenish), unlike most *heinei* and *kamtschatschensis*, and most birds (73%) show a complete dark bill-band. *Canus* that completely lack dark markings on the bill are rare in winter (only 2% of our sample).

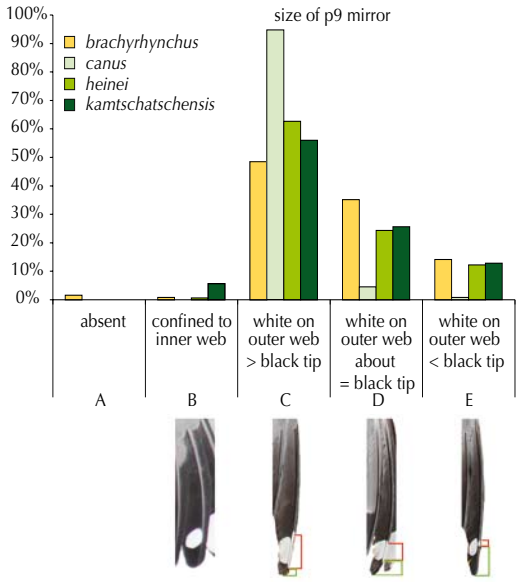

DIAGRAM 5 Size of white mirror on p9 of adult Mew Gulls *Larus canus*

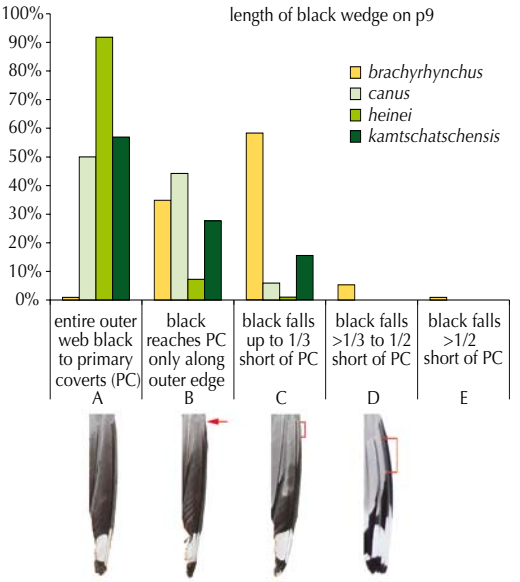

DIAGRAM 6 Length of black pattern on outer web of p9 of adult Mew Gulls *Larus canus*

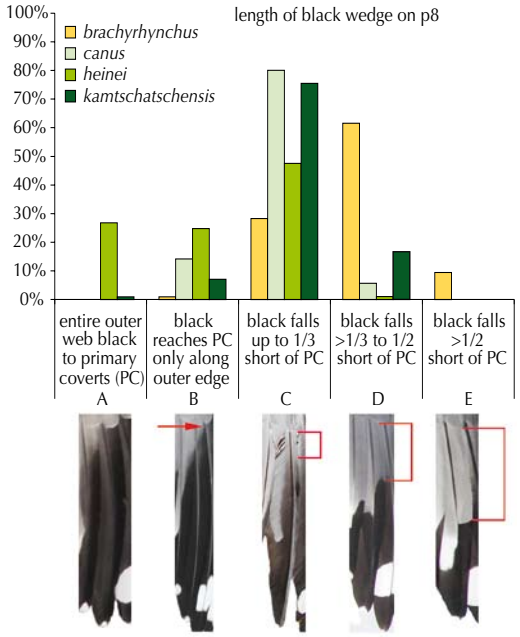

DIAGRAM 7 Length of black pattern on outer web of p8 of adult Mew Gulls *Larus canus*

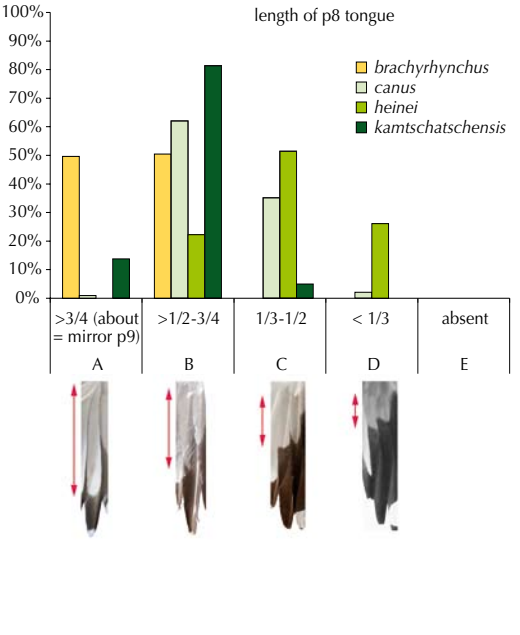

DIAGRAM 8 Length of tongue on p8 of adult Mew Gulls *Larus canus*

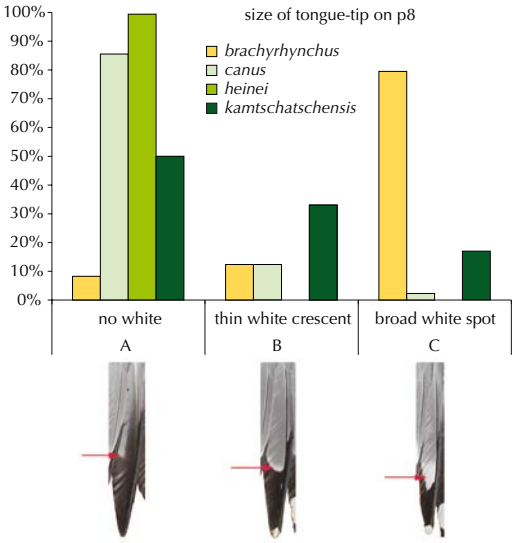

DIAGRAM 9 Size of white tongue-tip on p8 of adult Mew Gulls *Larus canus*

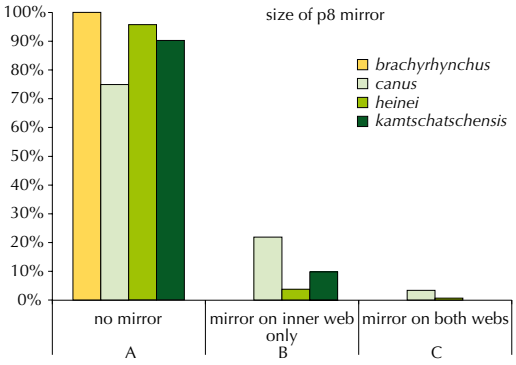

DIAGRAM 10 Size of white mirror on p8 of adult Mew Gulls *Larus canus*

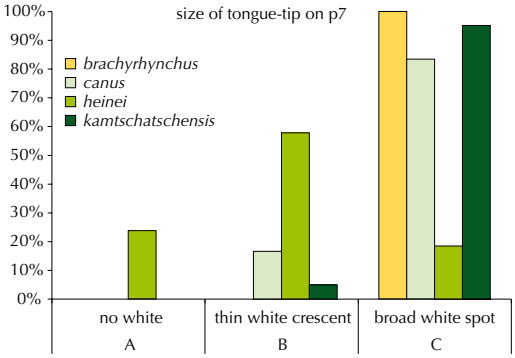

DIAGRAM 11 Size of white tongue-tip on p7 of adult Mew Gulls *Larus canus*

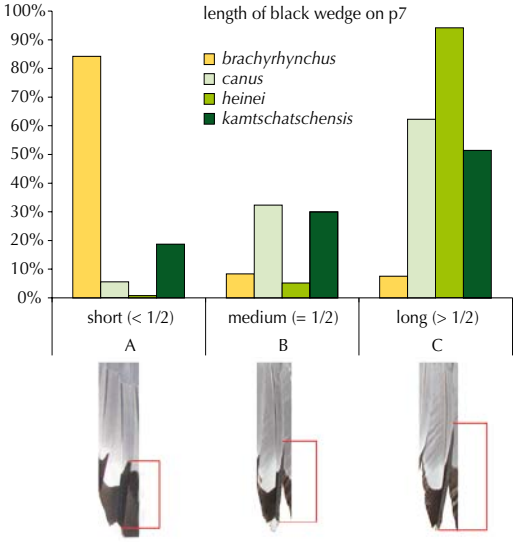

DIAGRAM 12 Length of black pattern on outer web of p7 of adult Mew Gulls *Larus canus*

Perhaps surprisingly (as it is not hinted at in current literature), the majority of adult *heinei* show a fairly pale (44%) or obviously pale (19%) iris. The palest-eyed birds can actually have yellow tones to the iris and so give the feel of a Ring-billed Gull. Note however that a substantial proportion of birds (47%) still have a dark iris. All through the winter the whole bill is often brightly coloured: strong mustard-yellow to orange, quite different from most *canus*. We have found no clear differences in bill pattern between adult *heinei* and *canus*; ie, *heinei* typically show a complete band.

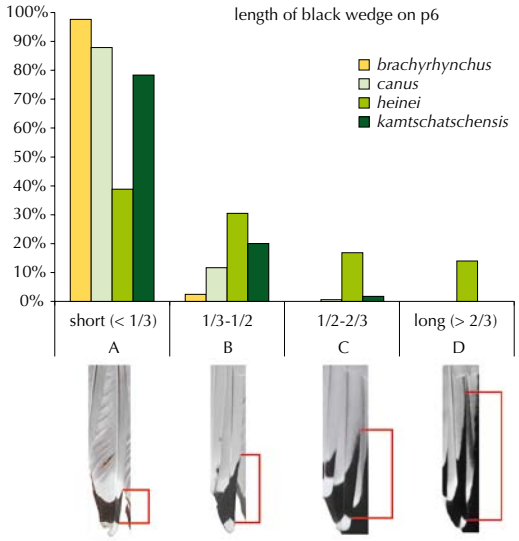

DIAGRAM 13 Length of black pattern on outer web of p6 of adult Mew Gulls *Larus canus*

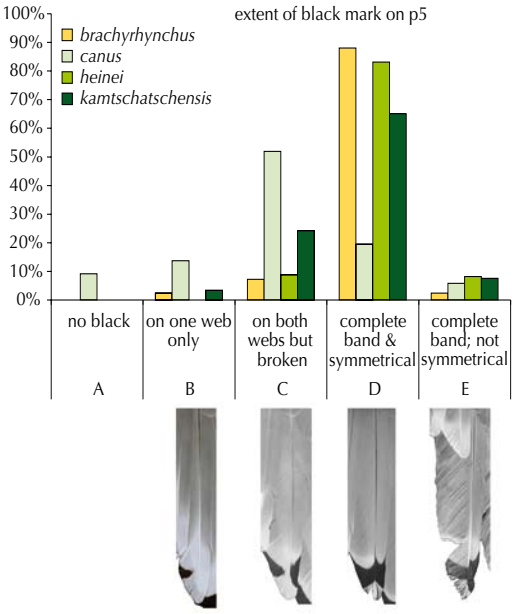

DIAGRAM 14 Extent of black pattern on p5 of adult Mew Gulls *Larus canus*

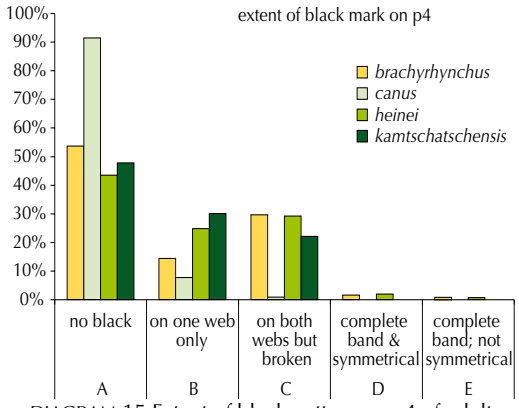

DIAGRAM 15 Extent of black pattern on p4 of adult Mew Gulls *Larus canus*

Adult *kamtschatschensis* are usually pale eyed (86% in total, with the iris being very pale in 36%). Most (though not all) have a yellowish or even orange bill all winter, and adults with a complete dark bill-band are rare (only 8%). Any blackish colour is typically confined to the gonys area. Also, the gonys can look slightly more orange than the rest of the bill, as if the bird has ambitions to be a large gull.

The iris colour of adult *brachyrhynchus* is rather variable but there are certainly more birds with relatively pale irides (57%) than in *canus*. In winter, the bill colour is usually dull as in *canus* but a dark bill-band is normally absent. Some birds (7%) show a complete band but it is rather greyish and does not contrast much with the rest of the bill.

Primary pattern

For the diagnostic combinations of features we refer to table 3, which provides a path to clinch the identification of a vagrant adult bird. In this section, we describe general aspects of the primary pattern of each taxon. The percentages of birds showing a certain feature in the primaries are shown in diagram 3-15.

Adult *brachyrhynchus* has the most distinctive pattern. Compared with the other taxa, it tends to have longer pale tongues on the outermost three primaries (p8-10), a larger, more rounded white tongue-tip on p7-8, and a shorter black wedge on the outer web of p6-9. On a standing bird, these short black wedges often leave a very extensive grey basal area of the wing-tip visible just below the tertials, which may extend clearly beyond the tertial-tips; this impression is unlike in the other

TABLE 3 Identification key for primary pattern in adult Mew Gull *Larus canus* taxa. Key should be followed from top down, step by step. Birds that do not fit the criteria may not be identifiable, at least not on primary pattern alone.

A) p9 with distinct white tongue-tip (easily visible from above)..... *brachyrhynchus*
B) p9 without obvious white tongue-tip
B1) ➔ p5 without black ..... *canus*
B2) ➔ p5 with black spot on just one web
B2a)☐ p8 with white mirror ..... *canus*
B2b)☐ p8 without white mirror
B2b1)➔ p8 without white tongue-tip
B2b1a)• p7 with long black wedge on outer web
(1/2 or more of length of feather) ..... *canus*
B2b1b)• p7 with short black wedge on outer web
(< or = 1/2 of length of feather)
+ p9 with entirely black base of outer web ..... *canus*
B2b2)➔ P8 with white tongue-tip
B2b2a)• p9 with very long tongue (cutting into mirror) ..... *brachyrhynchus*
B2b2b)• p9 with entirely black base of outer web..... *kamtschatschensis*
B2b2c)• p7 with long black wedge on outer web
(1/2 or more of length of feather) ..... *canus*
B3) ➔ p5 with broken black band
B3a)☐ p7 without white tongue-tip ..... *heinei*
B3b)☐ p7 with white tongue-tip
B3b1)➔ p8 with entirely black outer web (no grey at base)..... *heinei*
B3b2)➔ p8 with some grey at base of outer web
B3b2a)• p9 with large mirror (> black tip)
+ [p7 with broad white tongue-tip & tongue on p8 short
(< or = 1/2 of length of feather) & black wedge on
outer web of P6 short (< 1/3 of length of feather)] ..... *canus*
B3b2b)• p9 with small mirror (= or < than black tip)
+ [p8 without white mirror & p8 with white tongue-tip
& P9 with entirely black base of outer web]..... *kamtschatschensis*
B4) ➔ p5 with complete black band
B4a)☐ p8 with white mirror
B4a1)➔ p6 with long black wedge on outer web
(> 2/3 of length of feather)..... *heinei*
B4a2)➔ p6 with complete, symmetrical black band
B4a2a)• p7 with short black wedge on outer web
(< or = 1/2 of length of feather);
+ p9 with large mirror (> black tip) ..... *canus*
B4a2b)• p7 with long black wedge on outer web
(> 1/2 of length of feather)
+ p8 with white tongue-tip..... *kamtschatschensis*
B4b)☐ p8 without white mirror
B4b1)➔ p8 with entirely black outer web (no grey at base)
B4b1a)• p6 with long black wedge on outer web
(> 2/3 of length of feather) ..... *heinei*
B4b1b)• p7 with little or no white on tongue-tip..... *heinei*
B4b2)➔ p8 with some grey at base of outer web
B4b2a)• p7 without white tongue-tip ..... *heinei*
B4b2b)• p7 with white tongue-tip
B4b2b1) p9 with entirely black base of outer web
B4b2b1a)» p8 with white tongue-tip
B4b2b1a1)* p9 with fairly small mirror
(= or < than black tip) ..... *kamtschatschensis*
B4b2b1a1)* p9 with large mirror
(> black tip)
+ p8 with extensive grey
base on outer web
(> 1/3 of length of feather)..... *kamtschatschensis*
B4b2b1b)» p8 without white tongue-tip

B4b2b1b1)* p7 with broad white tongue-tip & P4 with some black
B4b2b1b1a)* tongue on p9 short (= or < 1/2 of length of feather)
[black on p5 is symmetrical in shape &
tongue on p8 is long (> 1/2 of length of
feather) & p9 with fairly small mirror
(= or < than black tip)] ..... *kamtschatschensis*
B4b2b1b1b)* tongue on p9 long (> 1/2 of length of feather)
[black wedge on outer web of p6 is short
(< 1/3 of length of feather)]..... *kamtschatschensis*
B4b2b2) p9 with obvious grey at base of outer web & P5 with very symmetrical pattern
B4b2b2a)» p8 with broad white tongue-tip
B4b2b2a1)* black wedge on outer web of p7 short
(< 1/2 of length of feather) ..... *brachyrhynchus*
B4b2b2a2)* black wedge on outer web of p7 long
(= or > 1/2 of length of feather)
+ p9 with long tongue (> 1/2 of length of feather) .. *brachyrhynchus*
B4b2b2b)» p8 with no or little white on tongue-tip
+ [black wedge on outer web of p7 short (< 1/2 of length of feather)
& some black on p4] ..... *brachyrhynchus*

three taxa, although a few *kamtschatschensis* may be similar. Most birds (90%) show a complete black band across both webs of p5, and nearly half show some black on p4. The black pattern on p5 is usually very symmetrical (often shaped as a thick black 'W'). Historically, the pattern of p8, with a very long tongue (as long as the one on p7) and a large, pearl-shaped white tongue-tip (viewed from above), has been considered as a strong indication of *brachyrhynchus* but the same pattern is also found in 10% of our sample of adult *kamtschatschensis* as well as a few *canus* and even one *heinei* (from Krasnojarsk, central Siberia). This shows how important it is to use many features in combination when trying to make sense of the primary pattern of a suspected vagrant. Moreover, some adult *brachyrhynchus* (11%) can still be identified even if they have only little or no white on the tongue-tip of p8 (ie, they can still be keyed-out using table 3). Probably the easiest ones are those with a distinct white tongue-tip on p9 (18% of *brachyrhynchus* in our sample had this feature). In the other taxa, p9 never has a clear white tongue-tip; besides, on these taxa the pale tongue of this feather is difficult to see from above because it is narrower and shorter. In a few *brachyrhynchus* (6%), the pale tongue of p10 is so long (ie, covering more than half the length of the feather) that this alone more or less rules out the other taxa, especially in combination with a complete, symmetrical black band on p5 (none of the individuals of the other taxa in our sample had a p10 tongue exceeding half of the feather, and in fact only few had a tongue exceeding even one-third of the feather). Sometimes (6% of our sample) it is the tongue on p9 that is virtually diagnostic, when it is so long that it cuts into the white mirror (creating the so-called '*thayeri* pattern'). In 6% of our sample of *brachyrhynchus* the black on the outer web of p9 fell well short of the primary coverts, producing a long grey base that covered more than one-third of the length of the feather. None of the other taxa showed such extensive grey here. Similarly, in some adult *brachyrhynchus* (9%) the black wedge on the outer web of p8 is clearly shorter than in the other taxa, covering less than half the length of the feather. Unlike the other taxa, *brachyrhynchus* only exceptionally shows an isolated white mirror on p8 (one bird in our sample had a small white mirror on p8, and this was on one wing only). What also makes the primary pattern of *brachyrhynchus* distinct from the others is that the inner primaries usually have broad white tips (nearly as deep as the white tips to the secondaries) which may continue across the black outer primaries as a 'string of pearls'. In the other taxa, the inner primaries generally have only narrow white tips, clearly much narrower than the white trailing edge to the secondaries. There are, however, occasional exceptions to this: a few adult *kamtschatschensis* and *canus* have broad white tips, and, conversely, a few adult *brachyrhynchus* show only narrow ones.

Of all the taxa, adult *canus* tends to have the most limited amount of black on p4-5. Some birds (9%) show no black markings on p5, which was not the case in any of the *heinei*, *kamtschatschensis* or *brachyrhynchus* in our scored sample. We have seen one photograph of a *brachyrhynchus* with an exceptional amount of white in the outer

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22 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, adult, Jumunjin, South Korea, 1 January 2015 *(Chris Gibbins)*. Example of rather small, nominate *canus*-like individual with petite head, small bill and dull bare parts. *Kamtschatschensis* is variable in these respects, and not all birds will attract attention outside of their usual range. Still, compared with most adult nominate *canus*, dark streaking below eye and on forehead slightly more distinct, bill pattern more washed out, and slight uniform grey-brown hue on lower hindneck. Relative to *brachyrhynchus*, note more extensive black base of wing-tip and more distinct head streaking. Identification of bird like this can only be solved if primary pattern is photographed well.
23 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, adult or third-cycle, Choshi, Japan, 13 March 2012 *(Peter Adriaens)*. Very slim individual with small head and thin bill. Shape and bill pattern might suggest *heinei* but note extensive brown spotting on head. In flight, several features in primary pattern excluded *heinei*.
24 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, adult, Jumunjin, South Korea, 1 January 2015 *(Chris Gibbins)*. Identification of this taxon is not easy on wing pattern. In this bird, (long) process is as follows: p9 without white tongue-tip → p5 with complete black band → p8 without white mirror → p8 with grey base → p7 with white tongue-tip → p9 with black base of outer web → p8 without white tongue-tip → p7 with broad white tongue-tip → black on p4 → tongue on p9 shorter than 1/2 of feather length → black on p5 symmetrical and tongue on p8 longer than 1/2 of feather length and p9 mirror not much larger than the black tip = *kamtschatschensis*. Also typical of this taxon are flat forehead and extensive V-shaped brown spots on breast.
25 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, adult, Jumunjin, South Korea, 2 January 2015 *(Chris Gibbins)*. Individual with very nominate *canus*-like primary pattern. However, thick, complete black band on p5 in combination with rather small mirror on p9 (white on outer web about equal in length to black tip) more typical of *kamtschatschensis* and shown by only 2% of adult nominate *canus*. Note also pale iris, sloping forehead and strong bill, all combined giving impression of larger gull. Neck heavily blotched with brown.

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26 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, adult, Choshi, Japan, 30 December 2009 *(Chris Gibbins)*. Primary pattern somewhat intermediate between *canus* and *brachyrhynchus*, and most similar to latter. Differs from nominate *canus* in larger white tongue-tips (including prominent one on p8) combined with thicker, complete black band on p5 and rather small mirror on p9. A few *brachyrhynchus* have wing-tip pattern like this but most show larger extent of grey at base of outer web of p9, as well as shorter black wedge on outer web of p7. Strong bill, flat forehead and spotted neck pattern also differ from *brachyrhynchus*.
27 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, adult, Choshi, Japan, 12 March 2012 *(Peter Adriaens)*. Wing pattern strongly resembles *brachyrhynchus*, including relatively broad white tip to inner primaries. Neck poorly marked so pattern is of no real help. Note, however, only minimal amount of grey on base of outer web of p9 and that the black pattern on p5 is not symmetrical. Birds like this are serious pitfall for anyone looking for vagrant *brachyrhynchus* in East Asia.
28 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, adult, Choshi, Japan, 21 March 2012 *(Peter Adriaens)*. Small bill, rounded head shape and broad white trailing edge to wing continuing across outer primaries make this bird similar to *brachyrhynchus*. However, neck pattern is spotted and primary pattern is diagnostic for *kamtschatschensis*: p9 without obvious white tongue-tip (verified on other photographs of this bird) → p5 with broken black band → p7 with white tongue-tip → p8 with some grey at base of outer web → p9 mirror rather small (white on outer web about equal in length to black tip) → p8 without white mirror but with white tongue-tip and p9 with entirely black base of outer web = *kamtschatschensis*.
29 Short-billed Gull / Amerikaanse Stormmeeuw *Larus (canus) brachyrhynchus*, adult, Pillar Point harbour, California, USA, 29 December 2008 *(Chris Gibbins)*. Note very uniform dark brown neck-band, virtually unmarked yellow bill and peculiar 'banana-shaped' body. Grey tongue visible on underside of wing-tip, which is more often the case than in other taxa.

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30 Short-billed Gull / Amerikaanse Stormmeeuw *Larus (canus) brachyrhynchus*, adult, Half Moon Bay, California, USA, 19 January 2011 *(Peter Adriaens)*. Distinctive due to uniform brown wash and horizontal brown barring on neck, small head and bill, long neck, slim, 'banana-shaped' body, relatively pale iris, and grey base of wing-tip extending slightly beyond tertial-tips.
31 Short-billed Gulls / Amerikaanse Stormmeeuwen *Larus (canus) brachyrhynchus*, adults, Half Moon Bay, California, USA, 20 January 2011 *(Peter Adriaens)*. Two birds illustrating variation in mantle colour and neck pattern. Right bird has dark slaty-grey upperparts similar to many *kamtschatschensis*, while left one has rather spotted neck markings. Note long necks and also, on right bird, that grey base of wing-tip extends beyond tertial-tips.
32 Short-billed Gull / Amerikaanse Stormmeeuw *Larus (canus) brachyrhynchus*, adult, Bodega Bay, California, USA, 9 December 2012 *(Chris Gibbins)*. Uniform brown neck-band, small bill and large amount of white on wing-tip immediately suggestive of *brachyrhynchus*. Primary pattern confirms this impression: p9 without white tongue-tip → p5 with complete black band → p8 without white mirror → p8 with grey base of outer web → p7 with white tongue-tip → p9 with extensive grey base of outer web and p5 with very symmetrical pattern → p8 with broad white tongue-tip → black wedge on outer web of p7 covers c 50% of length of feather → p9 shows long grey tongue (slightly longer than 50% of feather) = *brachyrhynchus*.
33 Short-billed Gull / Amerikaanse Stormmeeuw *Larus (canus) brachyrhynchus*, adult, Bodega Bay, California, USA, 9 December 2012 *(Chris Gibbins)*. Note same features as in plate 32 but black wedge on outer web of p7 shorter (less than 50% of feather length) making primary pattern even more characteristic. White tips to inner primaries unusually narrow in this bird. Black wedge on outer web of p7-9 often very pointed in this species.

34 Short-billed Gull / Amerikaanse Stormmeeuw *Larus (canus) brachyrhynchus*, adult or third-cycle, Pacifica, California, USA, 14 December 2012 *(Chris Gibbins)*. Example of bird with relatively short tongue on p8 and extensive black on outer web of p9. Still, small bill and solid, uniform neck pattern clearly point to *brachyrhynchus*, and primary pattern is virtually diagnostic with broad white tongue-tip on p8, very short black wedge on outer web of p6 (shorter than one-third of feather length), complete, thick black band on p5 and black markings on p4 (and even p3). Combined wing-tip features are only shown by *brachyrhynchus* and very few *kamtschatschensis*.

35 Short-billed Gull / Amerikaanse Stormmeeuw *Larus (canus) brachyrhynchus*, adult or third-cycle, Pacifica, California, USA, 14 December 2012 *(Chris Gibbins)*. Subadult age indicated by black spot on alula, very small white primary tips and bluish-green bill base. As in plate 34, primary pattern virtually diagnostic (shared only with few *kamtschatschensis*), even though white tips to inner primaries are unusually narrow. Regardless of wing pattern, extensive, solid, uniform brown neck-band and smudgy brown head streaking leave no doubt about identification.

primaries though, and this bird lacked any black on p5. However, in a vagrant context it is probably best to consider the lack of black on p5 as strongly indicative of *canus*; head pattern and other characters should further confirm the identification. The white mirror on p9 of *canus* is often larger than in the other taxa, and while a white mirror on p8 can be seen in all three Old World taxa, it is most common in *canus*.

Heinei is the taxon with the most black in its wing-tip. It shows a tendency towards a complete black band on p5 that is also deeper than in adult *canus*. In our sample, 91% of adult *heinei* showed a complete and deep black band on this primary (rather like that on adult Yellow-legged Gull) compared to 25% of adult *canus*. The majority (61%) of *heinei* show a long black wedge on the outer web of p6 (covering more than one-third of the length of the feather) and black on p4 is more frequent and extensive than in adult *canus*. Almost 30% of the adult *heinei* in our sample lacked any grey on the base of the outer web of p8. This lack of grey may create a largely black area on the folded primaries of standing birds, visible just below the tertials. We did not find such extensive black on p8 in any adult *canus* or *brachyrhynchus*. However, one adult *kamtschatschensis* and a few subadult ('third-cycle type') *canus* lacked grey on the outer web of p8, so this feature should be used in combination with others (as per table 3). Adult *heinei* usually show no white tongue-tip on p8, and little or no white on the tongue-tip of p7. In our sample, 24% showed no white at all on the tongue of p7, while white was always present in the other three taxa (though not always easy to see). The p8 tongue of adult *heinei* averages shorter than in *canus* (it typically covers less than half of the feather length), and is certainly shorter than in the other two taxa. The tongues on the outer primaries may also be slightly darker grey and slightly narrower than in *canus*, and therefore less obvious. On the folded wing, white primary tips tend to be slightly smaller than in adult *canus* but the difference is subtle and not easy to use, especially not from late winter onwards when worn *canus* make things more difficult. Still, large white primary tips (almost as large as the black spaces between the tips) should indicate *canus* rather than *heinei*.

Adult *kamtschatschensis* has the most variable primary pattern, which overlaps with that of *canus* as well as *brachyrhynchus*. The tongue on p10 averages a little shorter than in *brachyrhynchus*,

and the black on p4-5 is often more extensive than in *canus*. In our sample, 73% of adult *kamtschatschensis* showed a complete black band on p5, and 52% showed some black on p4 (compared with only 9% of adult *canus* with black on p4). The white mirror on p9 tends to be slightly smaller than in adult *canus*. The vast majority of *kamtschatschensis* (95%) showed a big white tongue-tip (pearl-shaped) on p7 and half of the birds in our sample showed at least some white on the tongue-tip of p8, so the pattern is more striking than in *heinei*. The tongue on the outermost three primaries also averages longer and wider than in that taxon. Thus, rather than *heinei*, the main confusion taxon for *kamtschatschensis* is really *brachyrhynchus*. We have seen a few adult *kamtschatschensis* with a very *brachyrhynchus*-like primary pattern (plate 27-28), including broad white tips to the inner primaries. Still, careful use of the identification key (table 3) combined with observable differences in size and structure should distinguish such birds.

Description of subadult birds ('third-cycle type')
Exact ageing of third-cycle birds (plate 35) is generally not possible, nor is it really necessary for field identification. The observer should, however, take into account that subadult birds may show a little more black in the primaries than full adults. This is particularly relevant when trying to identify a possible *heinei* candidate in the *canus* range. In practice, it will usually be possible – with care – to apply the identification key for adult birds to third-cycle types, since the primaries of the latter are already adult-like. Head pattern and the colour of the bare parts are useful characters too, mirroring those of adults of respective taxa.

Description of second-cycle birds
The black and white primary pattern of second-cycle birds (plate 36-60) is less well developed than it is in adults, and is therefore somewhat less useful. Nonetheless, we estimate that nearly 70% of second-cycle *brachyrhynchus* can be identified in a vagrant context on the basis of primary pattern alone, as well as 30% of *heinei*, 30% of *kamtschatschensis* and 20% of *canus* of this age group. Moreover, there are useful features in other parts of the plumage, such as the patterns of the primary coverts, secondaries and greater coverts. As with adults, the head pattern and colour of the bare parts are also helpful.

As in the section on adult birds, we have opted to present the diagnostic combinations of features in the primaries of second-cycle birds in the form of an identification key (table 4). We also compared overall patterns in the wing-tip of second-cycle birds using NMDS, the results of which are discussed in the appendix. In short, the NMDS indicated that the differences between some taxa are somewhat less clear cut than they are for adult birds, which is not so surprising given the less well developed primary pattern of second-cycle birds. Although the centroids of the *canus* and *heinei* constellations differ slightly, there is a lot of overlap; hence the wing-tip pattern of many second-cycle *canus* is similar to that of some *heinei*, and vice versa. The NMDS plot indicates that the wing-tip pattern of second-cycle *kamtschatschensis* overlaps with both of these taxa. As with adults, second-cycle *brachyrhynchus* have the most distinctive wing-tip pattern, with the constellation for this taxon sitting apart from the others. There is, however, a small degree of overlap in the wing-tip pattern of *kamtschatschensis* and *brachyrhynchus*. Overall, the NMDS indicates that some (ie, the very typical) individuals of each taxon have a wing-tip pattern that sets them apart from the others, but also that many individuals are not safely identifiable using wing-tip features alone. Thus, other aspects of plumage are needed to confirm identification. The most useful wing-tip and other plumage features are detailed below.

Primary pattern
Of the four taxa, *brachyrhynchus* has the most distinctive primary pattern at this age. It is characterized by less black on the outermost primaries on average than the other taxa: nearly 40% of all birds in our sample showed some distinct grey colour at the base of the outer web of p9 (which is not the case in the other taxa), with the black wedge on the outer web of p7-8 often not reaching the primary coverts. The pale tongues on the outermost primaries are long: in c 20% of sample birds the tongue of p9 ran for more than half the length of the feather, and in almost 20% the tongue of p8 reached so far down that it ended level with the white mirror on p9. These tongues are always shorter in the other taxa at this age. Over 40% of the second-cycle *brachyrhynchus* sampled showed a white tongue-tip on p8, which is not normally the case in the other taxa (present in just one *kamtschatschensis* in our sample). The tongue-tip can even be extensive and pearl shaped already. Almost 20% of birds showed a short, very symmetrical black pattern on both p5 and p6, while in the other taxa (except for the odd *kamtschatschensis*) the pattern is normally asymmetrical, with black running up the outer web, at least

TABLE 4 Identification key for primary pattern of second-cycle Mew Gull *Larus canus* taxa. Key should be followed from top down, step by step. Birds that do not fit the criteria may not be identifiable, at least not on primary pattern alone. Identification should always be based on as many features as possible, including head pattern and bill colour

A) p9 with distinct grey at base of outer web ..... *brachyrhynchus*
B) p9 with entirely black base of outer web
B1) ➔ both p5 and p6 show a complete, symmetrical black band ..... *brachyrhynchus*
B2) ➔ no black on p4
+ [p6 with distinct black(ish) wedge on outer web (= or > 1/3 of length of feather) & black(ish) wedge on outer web of p7 is pointed & p7 with white tongue-tip] ..... *canus*
B3) ➔ p4 with black spot on one web only
+ [black(ish) wedge on outer web of p8 is distinctly pointed & p7 with white tongue-tip] ..... *canus*
B4) ➔ p4 with broken black band
B4a)☐ p8 with white tongue-tip ..... *brachyrhynchus*
B4b)☐ p8 without white tongue-tip
B4b1)➔ p7 with white tongue-tip
+ [black(ish) wedge on outer web of p8 is distinctly pointed & p3 without black] ..... *canus*
B4b2)➔ p7 without white tongue-tip
+ [black(ish) wedge on outer web of p7 is blunt & p3 without black] ..... *heinei*
B5) ➔ p4 with complete black band
B5a)☐ p8 with white tongue-tip
B5a1)➔ black(ish) wedge on outer web of p7 is pointed ..... *brachyrhynchus*
B5a2)➔ black(ish) wedge on outer web of p7 is rectangular ..... *kamtschatschensis*
B5b)☐ p8 without white tongue-tip
B5b1)➔ p7 with white tongue-tip
B5b1a)• black(ish) wedge on outer web of p7 is pointed
+ [black band on p4 symmetrical & p8 with some grey at base of outer web] ..... *brachyrhynchus*
B5b1b)• black(ish) wedge on outer web of p7 is rectangular
+ [p8 with full black base of outer web & distinct tongue on p8 (= or > 1/3 of length of feather)] ..... *kamtschatschensis*
B5b2)➔ p7 without white tongue-tip
B5b2a)• white mirror of p9 reaches onto outer web ..... *heinei*
B5b2b)• white mirror of p9 absent or confined to inner web
B5b2b1)☐ p3 without black
+ p5 with symmetrical black band ..... *heinei*
B5b2b2)☐ p3 with black
+ [p8 with distinct tongue (= or > 1/3 of length of feather) & p8 with full black base of outer web] ..... *kamtschatschensis*

on p6. As in adults, the white tips to the inner primaries can be nearly as wide as those of the secondaries, creating a long and broad white trailing edge to the wing.

The wing-tip patterns of the other taxa show a lot of overlap and so it is unnecessary to describe them in great detail. A few things are, however, worth noting as they may be helpful for identification. First, unlike the other taxa, second-cycle *canus* only rarely lacks a white mirror on p9 (only 3% in our sample) whereas it is frequently absent in the other taxa (eg, absent in nearly 50% of all *brachyrhynchus*). Second, *canus* rarely (4% of our sample) shows a complete black band on p4, whereas the others frequently do: 75% of the *brachyrhynchus* in our sample have a complete band across p4 as do 70% of the second-cycle *kamtschatschensis*. In the latter taxon, black is always present on p4, at least as a spot on one web, whereas this feather is unmarked in over 30% of our second-cycle *canus* (as was also the case in a few *heinei* and one *brachyrhynchus*). These statistics reflect the general point that black averages less extensive on the inner primaries of *canus* than in the other taxa. By p3, the black has typically disappeared in second-cycle *canus*, whereas in the other taxa it is often present not just near the feather-tip but as patch or line running up the feather, parallel with the shaft in p3-4, sometimes p2 and even occasionally p1. A final point is that only a few *heinei* show a broad, pearl-shaped white tongue-tip on p7 (3%), whereas this feature is relatively frequent in the other taxa, especially in *brachyrhynchus* (76%).

Pattern of primary coverts
In their second cycle, the Old World taxa have either long, extensive blackish markings on the greater primary coverts or, in advanced birds, show very little black here (eg, just thin dark streaks near the tip of the feather). Many *brachyrhynchus*, however, show a quite unique pattern of thick, drop-shaped black tips contrasting with an extensive, unmarked grey base (plate 58-59). In the Old World taxa, any thick blackish markings are normally connected to the median primary coverts through a blackish outer edge on some of the feathers, even though this can be very thin. However, *brachyrhynchus* can also show a pattern very similar to that of the Old World taxa, so this feature works in one direction only.

Pattern of secondaries
All second-cycle *canus* in our sample showed unmarked, adult-like secondaries, so in Europe this may be a helpful feature for identifying the other taxa. We are not suggesting that dark markings are never present in *canus*; our sample consists mainly of birds photographed in Scotland, so we cannot exclude the possibility that a few birds from, for instance, Iceland or Scandinavia could show them. However, it is clear from many years of studying birds in Europe that patterned secondaries are rare, at best, in second-cycle *canus* types.

Blackish markings were present on the secondaries of c 50% of our sample of second-cycle *kamtschatschensis*. In better marked birds, the pattern may consist of rectangular, solid black patches ('piano keys') contrasting with a pale ground colour, thus giving a distinct piebald impression (plate 49-50). Solid dark markings are also present on the secondaries in a minority of *heinei* (12% of our sample) and in a few *brachyrhynchus*, although in the latter they are rare; it is more common to see second-cycle *brachyrhynchus* with unmarked secondaries or with just a few thin dark shaft streaks. Those few *brachyrhynchus* with extensive dark markings in the secondaries invariably show extensive black on the tail as well (ie, they are heavily marked overall).

Pattern of wing-coverts and tertials
While most second-cycle *canus* show very adult-like upperwing-coverts, there are a few birds with a browner, more immature look. In *heinei*, the latter type is slightly more regular but not to the extent that much weight can be put on this as an identification criterion. Many *heinei* show distinct blackish streaks along the outer edges of the outermost greater coverts (mainly visible in flight, on the spread wing); these streaks tend to be a bit more obvious and more extensive than in *canus*. Second-cycle *kamtschatschensis* typically have a very immature look, with an extensive brown wash on the wing-coverts, which also often have prominent white fringes. This may create a variegated appearance, as the dark grey 'saddle' then contrasts with a whitish looking wing (plate 47). The number of outer greater coverts with a black outer edge tends to be greater in *kamtschatschensis* than the other taxa. Second-cycle *brachyrhynchus* often show a brown wash on the wing-coverts but the wing does not usually look whitish (unless strongly bleached) and the outer greater coverts generally lack black outer edges. A few birds show just one, often incomplete, dark streak on the outermost greater covert.

The underwing-coverts are generally pale and unmarked in second-cycle *canus* and *heinei*, although thin brown fringes can be present in some birds of either taxon. These fringes are not very prominent, and the general impression from a distance is that of a mainly pale underwing. The underwing-coverts are often more strongly marked in *kamtschatschensis* and *brachyrhynchus*, with extensive dark brown fringes on most feathers, including some of the axillaries.

The presence of dark spots on the tertials is of no real use for identification of second-cycle birds, as individuals of each taxon can be found with or without it. The only helpful thing that can be said is that nearly all second-cycle *kamtschatschensis* show blackish tertial markings, while in the other three taxa the pattern is more variable and spots are often absent, especially in *canus*. However, such pigmentation is still regular enough in *canus* to render it of no use for separating this taxon from the others. For instance, dark is present in quite a few second-cycle birds in north-eastern Scotland in summer, which presumably are locally reared *canus*; also, we checked a separate sample of 116 second-cycle birds in north-eastern Scotland in winter and found dark markings in the tertials of 18 (16%) of these.

Tail pattern
Second-cycle birds of all four taxa can show black markings on their tail-feathers, so the mere presence of black here is of little importance. However, the extent of black may differ between the taxa. Black markings are rather rare in *canus*: only 3% of the birds in our (mainly Scottish) sample showed some pattern, consisting of small, isolated spots. None showed a complete black tail-band. Tail markings are clearly more common in *heinei*,

36 Common Gull / Stormmeeuw *Larus canus canus*, second-cycle, Koksijde, West-Vlaanderen, Belgium, 25 March 2012 *(Peter Adriaens)*. Aged by lack of white primary tips. Typical bird with advanced plumage (all wing-coverts adult type), evenly spotted head/neck and medium-grey upperparts.

37 Common Gull / Stormmeeuw *Larus canus canus*, second-cycle, Peterhead, north-eastern Scotland, 22 January 2011 *(Chris Gibbins)*. Note long blackish streaks on primary coverts and spotted neck pattern. While this bird's primary pattern is not diagnostic, lack of black on inner web of p4 combined with white mirror on p9 bleeding onto outer web more common in nominate *canus* of this age than in other taxa.

with almost 30% of our sample showing a variable amount of black, in a few birds even creating a full tail-band. Most second-cycle *kamtschatschensis* and *brachyrhynchus* show some patterning (in 76% and 92% of our sample birds, respectively), and they regularly show a complete black tail-band (plate 49 and 53).

Some second-cycle *kamtschatschensis* and *brachyrhynchus* still show a limited amount of brown barring on the upper- and/or undertail-coverts, which is normally absent in the other two taxa (plate 50, 54 and 60).

Head pattern

In winter, the same general differences in head pattern described for adult birds apply, but with any brown pattern usually being more extensive in second-cycle birds. Thus, *heinei* has the palest head of the four taxa: nearly half of all birds show a strikingly white head sharply set off against a necklace of well-defined brown spots or streaks. The necklace may form a complete boa that continues across the breast but the underparts are often rather clean white. There may also be a limited amount of thin streaking on the nape, in which case the pattern becomes more similar to some *canus*, although most second-cycle birds of that taxon also show brown streaking on crown and around the eye in winter. Head streaking is generally more extensive in *kamtschatschensis*, and many birds show a typical dark shawl on the hindneck consisting of heavy brown blotches. Some birds have such extensive, well-demarcated brown pattern that the impression of an 'executioner's hood' is formed (plate 48). Second-cycle *brachyrhynchus* also have an extensive brown shawl but it typically looks smooth and uniform. Some *brachyrhynchus* also have a smooth brown patch behind the eye, and others show extensive brown flanks or even a brown belly (plate 54).

It should be emphasized that the head and neck pattern is variable at this age, more so than in adult birds, with lots of overlap, especially between the browner patterned individuals. For instance, there are quite a few second-cycle *canus* with extensive, dense brown blotches on neck and breast, a pattern that may be suggestive of *kamtschatschensis* or even *brachyrhynchus* in extreme cases.

Bare parts

Although the colour of the bare parts in second-cycle birds is not as developed as in adults, some of the same general differences hold true. Thus, *heinei* and *kamtschatschensis* tend to show brighter bill colours than the other two taxa, with some already having vivid yellow or even pale orange bills. Unlike adults, however, there is no clear difference in bill pattern between the taxa: most birds show a complete dark bill-band at this age. The iris colour, on the other hand, is dark in all

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38 Common Gull / Stormmeeuw *Larus canus canus*, second-cycle, Koksijde, West-Vlaanderen, Belgium, 5 March 2014 *(Peter Adriaens)*. Although this bird has slightly more extensive brown on neck, note same features as in plate 37. Wing-coverts (on arm) already adult like.
39 Common Gull / Stormmeeuw *Larus canus canus*, second-cycle, Liège, Visé, Belgium, 17 February 2013 *(Peter Adriaens)*. Note same features as in plate 37-38.
40 Russian Common Gull / Russische Stormmeeuw *Larus canus heinei*, second-cycle, with Sandwich Tern / Grote Stern *Sterna sandvicensis*, Anaklia, Georgia, 25 January 2014 *(Peter Adriaens)*. Note clean white head, subtle brown spots on lower hindneck, strong, yellowish bill and brown wash on greater coverts.
41 Russian Common Gull / Russische Stormmeeuw *Larus canus heinei*, second-cycle, with first-cycle Yellow-legged Gull / Geelpootmeeuw *L michahellis*, Batumi, Georgia, 2 February 2014 *(Peter Adriaens)*. Bird with clean white head and limited brown spots on hindneck.

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42 Russian Common Gull / Russische Stormmeeuw *Larus canus heinei*, second-cycle, Poti, Georgia, 26 January 2014 *(Peter Adriaens)*. Primary pattern of this bird not diagnostic but showing slightly more extensive black on p6 than in most nominate *canus*. However, clean white head and neck pattern very typical for *heinei*.
43 Russian Common Gull / Russische Stormmeeuw *Larus canus heinei*, second-cycle, Anaklia, Georgia, 25 January 2014 *(Peter Adriaens)*. Although this bird has some dark streaking on rear ear-coverts, head still mainly whitish and sharply set off from spotted necklace. Dark streaks on tail and outer greater coverts more frequent in *heinei* than in nominate *canus*. Iris already becoming paler. Note also long wings and one thin dark streak on secondaries. Primary pattern not diagnostic but lack of white mirror on p9 and completely black outer web of p6 form combination only rarely shown by nominate *canus*.
44 Russian Common Gull / Russische Stormmeeuw *Larus canus heinei*, second-cycle, Istanbul, Turkey, 2 January 2014 *(Chris Gibbins)*. Bird with rather immature looking plumage due to extensive brown on wing-coverts and mainly blackish outer primaries but still with very whitish head and limited brown spotting on hindneck. Primary pattern not diagnostic but very small mirror on p10, lack of mirror on p9 and complete black band on p4 readily exclude nominate *canus*.
45 Russian Common Gull / Russische Stormmeeuw *Larus canus heinei*, second-cycle, Bucharest, Romania, 27 February 2011 *(Chris Gibbins)*. Example of bird with very retarded plumage. Note distinct black 'piano keys' on secondaries (not shown to this extent by nominate *canus*), clean white head contrasting with spotted necklace and prominent dark streaks on outer greater coverts. Primary pattern not really helpful but rather small white mirror on p9 and extensive black on p6 more common in *heinei* than in nominate *canus*.

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46 Presumed Russian Common Gull / vermoedelijke Russische Stormmeeuw *Larus canus heinei*, second-cycle, Gangneung, South Korea, 31 December 2014 *(Chris Gibbins)*. While vast majority of Mew Gulls seen in South Korea in winter appear to be *kamtschatschensis*, this bird differs in its rather whitish head with restricted brown pattern, long wings, more advanced look to wing-coverts without whitish fringes, and less distinct dark streaks on outer greater coverts. Primary pattern with combination of completely grey inner web of p4 and rather extensive white mirror on p9 (present on both webs) very rare in second-cycle *kamtschatschensis*.
47 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, second-cycle, Jumunjin, South Korea, 8 January 2015 *(Chris Gibbins)*. Note (fresh) brown wing-coverts with extensive whitish fringes contrasting with dark grey 'saddle' characteristic for this age. Nearly all second-cycle *kamtschatschensis* show dark tertial spots. Note also extensive blackish inner primaries, strong brown 'shawl' on hindneck, strong head streaking and rather long bill.
48 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, second-cycle, with Black-tailed Gulls / Japanse Meeuwen *L crassirostris*, Choshi, Japan, 7 March 2012 *(Peter Adriaens)*. Extensive brown 'shawl' is well demarcated from white underparts and, together with strong head streaking, may form dark 'hood'. Note also distinct white fringing on greater coverts, yet these feathers are still fresh.
49 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, second-cycle, Choshi, Japan, 8 March 2012 *(Peter Adriaens)*. Piebald pattern on secondaries striking, as well as frosty whitish look to (fresh) wing-coverts. Full black tail-band, dark streaks on outer greater-coverts, almost complete lack of white mirrors on outer primaries and rather advanced bill colour also worth noting. Smooth brown neck pattern might suggest *brachyrhynchus* but note pattern of secondaries, primary coverts and outer greater coverts. Retarded birds like this could be tricky to age but always differ from first-cycle in non-juvenile pattern of median and lesser coverts, latter often with some adult grey admixed.

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50 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, second-cycle, Sacheon, South Korea, 2 January 2015 *(Chris Gibbins)*. Extensive brown barring on rump and uppertail-coverts characteristic for *kamtschatschensis* and *brachyrhynchus* at this age, while strong black 'piano keys' on secondaries typical of former (but also seen in some *heinei*). Note also thin dark streaks on outer greater coverts, pale fringes on wing-coverts, extensive blackish on primary coverts, black tail spots and strong head and neck markings.
51 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, second-cycle, Sacheon, South Korea, 2 January 2015 *(Chris Gibbins)*. Note extensive brown fringes on underwing-coverts. Aged by broken black tail pattern and broad white tips to secondaries.
52 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, second-cycle, Jumunjin, South Korea, 3 January 2015 *(Chris Gibbins)*. Note extensive black tail-band, whitish fringes on median and lesser coverts, thick V-shaped marks on breast and flank, dark streaks on outer greater coverts, brown lesser underwing-coverts, flat forehead and strong bill. Primary pattern of this bird is quite helpful: p9 with entirely black base of outer web → p4 with complete black band → p8 without white tongue-tip → p7 with white tongue-tip (here mainly visible on underwing) → black wedge on outer web of p7 (more or less) rectangular → p8 has full black base of outer web and long tongue (covering more than 1/3 of feather length) = *kamtschatschensis*.
53 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, second-cycle, Choshi, Japan, 8 March 2012 *(Peter Adriaens)*. Example of bird with full black tail-band. Whitish fringing on fresh wing-coverts typical and also note dark streaks on outer greater coverts. Primary pattern not diagnostic but at least complete lack of mirror on p9 and complete black band on p4 when combined should exclude nominate *canus*.

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54 Short-billed Gull / Amerikaanse Stormmeeuw *Larus (canus) brachyrhynchus*, second-cycle, Bodega Bay, California, USA, 21 December 2008 *(Chris Gibbins)*. Distinctive bird with extensive brown on belly, probably not matched by any second-cycle Eurasian Mew Gull *L canus*. Note also thick brown bars on undertail-coverts, very uniform brown hindneck, dusky brown head markings, steep forehead and small bill.
55 Short-billed Gull / Amerikaanse Stormmeeuw *Larus (canus) brachyrhynchus*, second-cycle, Pillar Point, California, USA, 29 December 2008 *(Chris Gibbins)*. Distinctive bird with its very brown head and neck markings, including uniform brown mask through eye. Note also very rounded head shape and thin bill. Some grey already present at base of wing-tip.
56 Short-billed Gull / Amerikaanse Stormmeeuw *Larus (canus) brachyrhynchus*, second-cycle, Bodega Bay, California, USA, 29 December 2008 *(Chris Gibbins)*. Rather whitish greater coverts may recall *kamtschatschensis* but note browner, smudgier head and neck markings, steep forehead, thin bill, and some grey already present at base of wing-tip.
57 Short-billed Gull / Amerikaanse Stormmeeuw *Larus (canus) brachyrhynchus*, second-cycle, Bodega Bay, California, USA, 8 December 2012 *(Chris Gibbins)*. Though this bird has less extensive brown on neck than average, very rounded head shape, smudgy brown head markings and immature look of plumage still distinctive.

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58 Short-billed Gull / Amerikaanse Stormmeeuw *Larus (canus) brachyrhynchu*s, second-cycle, Bodega Bay, California, USA, 8 December 2012 *(Chris Gibbins*). Primary coverts with clean grey base and thick black subterminal spot characteristic of this taxon. Outer greater coverts lack strong dark streaks. Primary pattern further confirms identification: p9 with distinct grey at base of outer web (here seen as grey sliver just right of shaft) = *brachyrhynchu*s. Broad white tongue-tip on p8, very pointed black wedge on outer web of p7 and extensive black on p3-4 also typical.
59 Short-billed Gull / Amerikaanse Stormmeeuw *Larus (canus) brachyrhynchu*s, second-cycle, Monterey, California, USA, 1 February 2011 *(Peter Adriaens)*. Another bird with typical pattern of primary coverts (clean grey base, drop-shaped black subterminal spot). Secondaries only lightly marked with few thin dark streaks. Only outermost greater covert shows thin dark streak. Although primary pattern lacks strong white tongue-tips usually seen in this taxon and therefore maybe not fully diagnostic, combination of no white mirror on p9, some grey at base of the outer web of p8, very pointed black wedge on outer web of p7, complete black band on p4, and some black on p3 readily rules out Eurasian taxa.
60 Short-billed Gull / Amerikaanse Stormmeeuw *Larus (canus) brachyrhynchu*s, second-cycle, Pillar Point, California, USA, 22 January 2011 *(Peter Adriaens)*. Primary coverts identical to those of Eurasian Mew Gull taxa but note uniform brown pattern on neck, ear-coverts and crown. Underwing-coverts extensively fringed with brown, few brown spots present on uppertail-coverts, secondaries virtually unmarked and only outermost greater covert shows complete, thin dark streak. Wing pattern not easy to interpret but there appear to be grey slivers at base of outermost primaries which, in combination with rather extensive black on p3-4 and lack of white mirror on p9, indicate *brachyrhynchu*s.
61 Common Gull / Stormmeeuw *Larus canus canus*, first-cycle, Peterhead, north-eastern Scotland, 18 January 2015 *(Chris Gibbins)*. Bird with typical neat saddle formed by grey second-generation mantle and scapular feathers. Wing-coverts have extensive chocolate-brown centre, so general impression of folded wing is rather dark, and contrasting in colour with mantle. Ear-coverts and crown extensively marked with sharp greyish-brown streaks, with markings extending along flank and lightly onto belly; fundamentally, however, ground colour to head and body is whitish. Bird shows strong black marks on undertail-coverts, as some nominate *canus* do. Note, however, clean white vent.

second-cycle *canus*, while it can already be slightly paler than the pupil in many individuals of the other taxa (13% of *brachyrhynchus*, 13% of *heinei* and 17% of *kamtschatschensis* in our sample) or even obviously paler (2% of *brachyrhynchus* and *heinei*).

Description of first-cycle birds

Overall patterns of similarity

In general, first-cycle birds of the four taxa (plate 61-101, figure 4) differ in the darkness of their head and body plumage, with corresponding differences in the darkness of the tail, uppertail-coverts and undertail-coverts. In very simplified terms, the rank order of taxa runs from *heinei* (palest) to *canus* to *kamtschatschensis* to *brachyrhynchus* (darkest).

Mantle and scapulars

The extent of the post-juvenile moult has been suggested to differ between some taxa, purportedly reflecting differences in the latitude of breeding grounds. For example, the retention of a full set of juvenile scapulars has been suggested as a way to detect *heinei* in Europe in winter. Figure 3 shows the results of an assessment of the extent of post-juvenile scapular moult in first-cycle birds. A number of points are evident from this figure. ***1*** Within each taxon there is considerable variation in the extent of the moult, with each one spanning four or five of the categories. ***2*** The most frequent pattern (the modal category) for *canus* differs from that of all other taxa. Most *canus* in our sample had moulted all of their scapulars, such that they had a full grey 'saddle', whereas the other taxa most frequently retained up to one-third of their juvenile feathers. ***3*** There is no indication from this sample that *heinei* often retain all of their first-generation scapulars; indeed, none fall within this category whereas a small number (1%) of *canus* do. By increasing sample size, it is possible that we would have found some *heinei* with all juvenile scapulars but it is nonetheless evident that the extent of the post-juvenile moult is not a sound basis for separating first-cycle *heinei* and *canus*. ***4*** The overall patterns are similar for *heinei* and *brachyrhynchus*, with c 80% of birds of these taxa retaining no or just a few (less than one-third) juvenile feathers. Finally, *kamtschatschensis* is the taxon which shows the greatest tendency to retain juvenile scapulars. Nonetheless, this tendency is not strong, with 65% of birds retaining no or just a few juvenile feathers. The data suggest a difference in overall moult

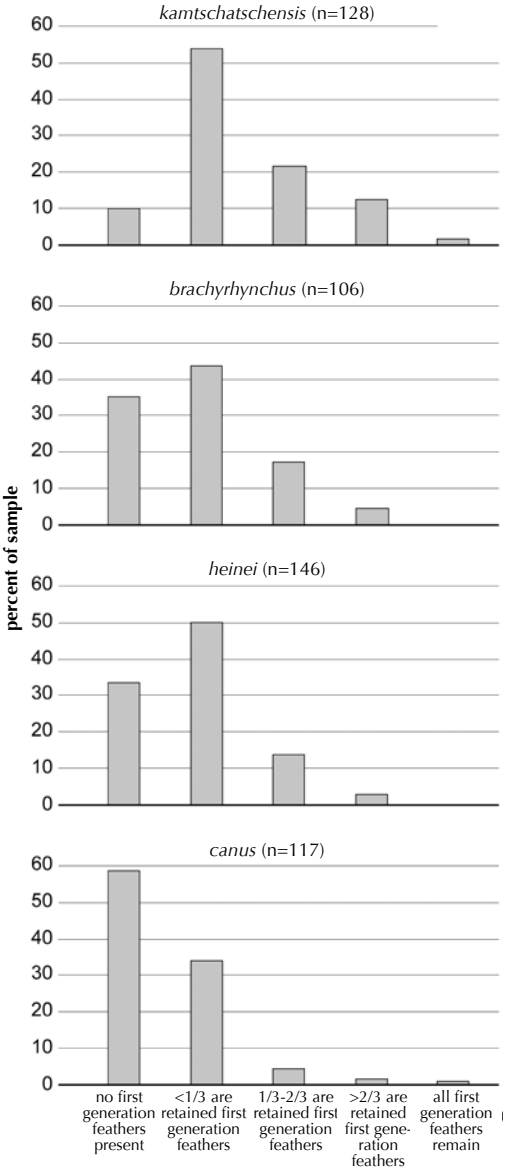

FIGURE 3 Extent of post-juvenile scapular moult in Mew Gull *Larus canus* taxa. Sample sizes are shown in parentheses. Statistics are produced from birds observed in Scotland (*canus*), Istanbul, Turkey, and Georgia (*heinei*), Japan (*kamtschatschensis*) and western USA (*brachyrhynchus*). Birds to the left are those with extensive moult (ie, no first-generation feathers remaining) and those to the right have limited or no moult.

strategies between *kamtschatschensis* and *canus* but variation means that anyone looking at a few 100 *canus* will easily find a few birds with the very limited moult more typical of *kamtschatschensis*, and vice versa.

Overall, the patterns depicted in figure 3 offer little hope that moult is of great use for definitive identification of out of range first-cycle birds. It may, however, be useful as a supporting feature, especially for *kamtschatschensis*. This conclusion is more or less what we have long suspected, although these are the first published data which can be used to support the conclusion quantitatively.

There are some subtle but useful differences in the overall appearance of the mantle and scapulars of first-cycle birds of each taxon. These differences result from a combination of the extent of the post-juvenile moult and the pattern of the second-generation feathers.

First-cycle *canus* typically looks the most uniform, with a clean, relatively homogeneous grey saddle created by the second-generation mantle and scapulars (plate 61 and 68). This saddled effect is especially obvious from a distance. Some birds have a subtle brown cast and/or a dark shaft on a few of the second-generation feathers but in most cases this does not detract too much from the overall impression of a grey saddle. *Brachyrhynchus* and *kamtschatschensis* typically look rather different in this respect. The majority of *kamtschatschensis* (eg, plate 82) have very clear, broad and diffuse pale fringes to many or most of their second-generation scapulars (115 birds from a sample of 119 in Japan showed such fringes). Some second-generation scapulars are pure grey, while some have a dark feather shaft and a distinct brownish cast to the grey. On some feathers the brown cast is strong, forming an ostensibly dark centre; it can differ little in tone from the juvenile feathers remaining alongside. As a result of the mixture of these different types of second-generation feathers, and the presence of at least some juvenile feathers, the overall impression of *kamtschatschensis* is very patchy, rather messy looking on many birds. Note also that the tone of the grey present in the second-generation feathers of *kamtschatschensis* varies considerably between individuals; on some the grey is rather dark and hence adult-like, whereas on others it is pale and silvery. Those with paler grey can look surprisingly pale on the mantle overall, because of the extensive pale fringes that differ little from the silvery grey.

Like *kamtschatschensis*, on *brachyrhynchus* the saddled effect is normally less obvious than *canus*. Most *brachyrhynchus* have pale fringes to many second-generation feathers along with subtle dark feather shafts; birds with a light, sandy brown cast to the feathers are also frequent. There seems to be less contrast between the various feather patterns present, so *brachyrhynchus* look a little neater on the mantle than *kamtschatschensis*.

Heinei is most similar to *canus*, although with a darker grey colour and greater tendency for the grey to be broken by some pale fringes and/or browner feathers. For example, of 105 *heinei* photographed in Georgia in winter, 87 (ie, 83%) had clear pale fringing and/or a subtle brown cast to some second-generation feathers.

Head and body

Some taxa differ considerably in the amount of head and body streaking shown by typical individuals. *Heinei* is typically the whitest and most clean looking, with many having only a 'boa' of sharp, fine streaks around the rear neck (plate 73-74). In this regard they can be reminiscent of first-cycle Caspian Gull or even Relict Gull *L relictus*. A frequent pattern is for a rather extensive ginger boa extending round as a half-collar, which contrasts with a striking white head. Many completely lack flank markings and we saw no birds in Georgia with extensive dark on their belly. The vast majority (more than 90%) of *heinei* in Georgia had a completely unmarked vent and undertail-coverts; the remainder had just a few isolated fine pencil streaks and only one had extensive dark feather centres. Many of the first-cycle birds examined in Moscow (collected in breeding areas in late summer) were also very white bodied. The whiteness of *heinei* (along with the tail and uppertail-covert patterns, for which see below) can be useful to help differentiate typical birds from the other taxa. However, some *heinei* are rather more marked, with streaks over the head and around the breast side and down the flank. Such birds (eg, plate 78) begin to match paler *canus*. Because there tends to be a correlation between body darkness and the tail and uppertail-covert patterns, these darker-bodied *heinei* tend also to match *canus* in other ways and so are inseparable.

Canus has a white ground colour to the head and body, with a rather variable amount of streaks and scales. The norm is for streaks around the ear-coverts, crown and neck, extending down onto the flank. The malar region and chin are normally unmarked. The nape streaking on *canus* does not form the boa in the way it does in many *heinei*, because the head is also streaked (plate 61 and

62 Common Gull / Stormmeeuw *Larus canus canus*, first-cycle, Visé, Liège, Belgium, 19 February 2012 (*Peter Adriaens*) **63** Russian Common Gull / Russische Stormmeeuw *Larus canus heinei*, first-cycle, Batumi, Georgia, 1 February 2014 (*Chris Gibbins*). Predominantly white head set off against thin, sharp brown streaks on hindneck. Note also rather white underwing with contrasting blackish trailing edge.

68). Paler *canus* lack or have extremely limited flank streaking and show an unmarked belly, or have just a few isolated streaks or scales. Conversely, some have streaks or scaling on the central part of the belly and so begin to overlap with paler *kamtschatschensis*. However, even on the darkest birds we have in our sample, streaks are absent from the lower belly and vent (between and immediately behind the legs) so the belly markings do not meet up with those on the undertail-coverts, even though these coverts can be quite strongly barred. We have no evidence that first-cycle *canus* can show the extensive soft brown wash on the breast and underparts that is typical of *brachyrhynchus*.

On average *kamtschatschensis* is the most coarsely marked taxon. The most distinctive individuals are covered extensively in dark markings, extending across the head, breast and belly, reaching between the legs and meeting the bars of the undertail-coverts. On the darkest individuals these markings coalesce so strongly that they appear almost uniformly dark on the body from a distance. In some dark birds the head streaking extends obviously around to the malar region and chin. Those birds that are not so extensively marked often retain a patch of streaking or barring on the belly – a 'Dunlin *Calidris alpina* patch'. This will help separate them from *canus*. Very occasionally, birds with more or less unmarked underparts occur (eg, just one in a sample of c 50 from Japan). *Kamtschatschensis* commonly has well marked undertail-coverts (crescents or spots), and this pattern usually continues on the vent well towards the legs. In this respect they differ from darker *canus*, which can be well marked on the undertail-coverts and belly but not normally so on the vent.

Brachyrhynchus (plate 94-97) is typically dark bodied but the general impression is of a softer, more velvety texture to the body than the other taxa. The head is somewhat more streaked than the body but the streaks tend to sit over buffy rather than white ground colour so contrast less than they do in *canus* and darker type *heinei*. Compared with *kamtschatschensis*, the head markings tend to look a bit duskier, less coarse, but there is overlap. The post-juvenile moult typically brings in paler feathers to the head and body, giving a distinctly blotchy look. The undertail-coverts of *brachyrhynchus* are typically the darkest of all the taxa, frequently with dark dominating over pale. This can be a useful distinction from *kamtschatschensis* (which despite being well marked have pale dominating over dark). The pattern on the undertail-coverts of *brachyrhynchus* is either that of banding or, in extreme cases, most of each undertail-covert is dark, with just a pale base and narrow pale fringe. Some *brachyrhynchus* with pale bodies retain dark undertail-coverts, and so are rather distinctive; others however have dark on their undertail-coverts reduced to a few narrow bands or arrowheads and so are a closer match for *kamtschatschensis*.

Tail pattern and uppertail-coverts pattern

Figure 4 shows examples of patterns on the upperside of the tail, the outer tail-feathers and the uppertail-coverts of the four taxa, while figure 5-7 plot the frequency of different pattern types. These patterns provide some critical clues for identification, although it is important to note that they tend to be correlated (eg, birds with dark tails also have well patterned uppertail-coverts) and so cannot be treated as three independent traits. Another caveat is that our categories cannot represent the more-or-less continuous nature of the variability seen in life, so it can occasionally be difficult to decide which category to assign a particular individual to.

The majority of *canus* and *heinei* in our sample have type 1 or type 2 tails. Type 1 includes birds which have black lines extending longitudinally from the tail-band towards the tail base. These lines vary in length; on some birds they are extremely short (and hence hardly visible at all) and on others very long, extending for a length equivalent to the depth of the tail-band. We found no consistent differences in the length of these lines between *canus* and *heinei*. The depth of the tail-band also varies within each of these two taxa. On some individuals it is very deep, appearing (especially on the closed tail) to occupy much of the visible part of the tail; on others, it is narrow, occupying only the distal third or so of the tail. As with the black lines, we found no consistent difference in the depth of the black band on type 1 tails between *canus* and *heinei*; narrow and deep bands can be found on both.

Most *heinei* combine a type 1 tail with little or no dark on the outer tail-feather (the type 1 outer tail-feather pattern was found in 90% of birds) and either no or very few dark spots on the uppertail-coverts (type 1 is the modal category). None of the *heinei* in our sample had type 3 or 4 patterns on the uppertail, while only 4% had any vermiculation or barring on the outer web of the outer tail-feather. *Brachyrhynchus* is at the other end of the spectrum. Most *brachyrhynchus* in our sample had an almost wholly dark tail (type 4 is the modal category), outer tail-feathers that were either more or

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Overall appearance of upperside of first-cycle Mew Gulls / Stormmeeuwen *Larus canus* in flight. **64** nominate *canus*, Aberdeen, north-eastern Scotland, 26 October 2014 *(Chris Gibbins)* **65** *kamtschatschensis*, Jamunjin, South Korea, 4 January 2015 *(Chris Gibbins)* **66** *heinei*, Poti, Georgia, 31 January 2014 *(Peter Adriaens)* **67** *brachyrhynchus*, Bodega Bay, California, USA, 9 December 2012 *(Chris Gibbins)*. This *heinei* and *brachyrhynchus* rather typical; this nominate *canus* fractionally more well marked than many but easily within range for this taxon; this *kamtschatschensis* more deeply pigmented than many, so tail very dark (type 4) and wing-coverts little browner than seen on most individuals, though still with white fringes to greater coverts. Note that outer web of innermost primary is pale in this *brachyrhynchus*.

FIGURE 4 Tails of first-cycle Mew Gulls / Stormmeeuwen *Larus canus*. Each row shows single taxon, with examples chosen to illustrate variability in uppertail pattern, pattern on outer tail-feathers and extent of markings on uppertail-coverts. Upper row: *heinei*; second row: nominate *canus*; third row: *kamtschatschensis*; bottom row: *brachyrhynchus*. Note overlap between nominate *canus* and *kamtschatschensis*.

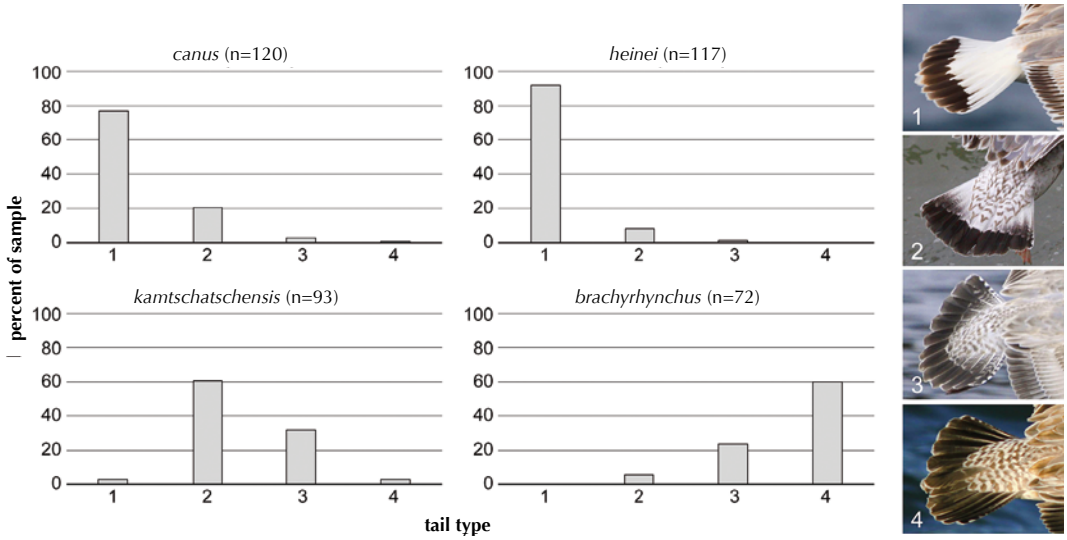

FIGURE 5 Frequency of different tail patterns in Mew Gull *Larus canus* taxa. Sample sizes are given in parentheses. Statistics are produced from birds observed in Scotland (*canus*), Istanbul, Turkey, and Georgia (*heinei*), Japan (*kamtschatschensis*) and western USA (*brachyrhynchus*). Pattern types: ***1*** simple dark band on otherwise unmarked tail; ***2*** dark band but with adjacent stippling to some or all feathers forming shadow effect; ***3*** extensively dark basal portion to tail, resulting from dense stippling or barring; and ***4*** more or less wholly dark tail, with just few pale notches on outer feathers.

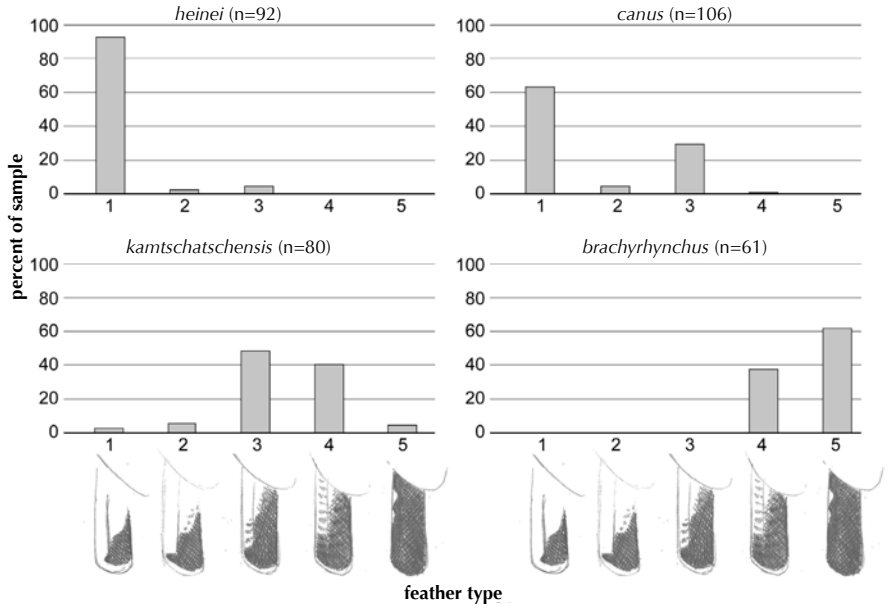

FIGURE 6 Frequency of different outer tail feather patterns on Mew Gull *Larus canus* taxa. Illustration shows leftmost tail-feather. Sample sizes are given in parentheses. Statistics are produced from birds observed in Scotland (*canus*), Istanbul, Turkey, and Georgia (*heinei*), Japan (*kamtschatschensis*) and western USA (*brachyrhynchus*). Pattern types: ***1*** wholly white outer web or with clean black connected to that on inner web; ***2*** as type 1 but with small amount of stippling adjacent to dark on inner web; ***3*** dark stippling or barring along outer web, extending for less than half of visible feather; ***4*** as type 3, except that stipples or bars extend for more than half of visible feather; and ***5*** wholly dark feather except perhaps for some pale notches on outer web.

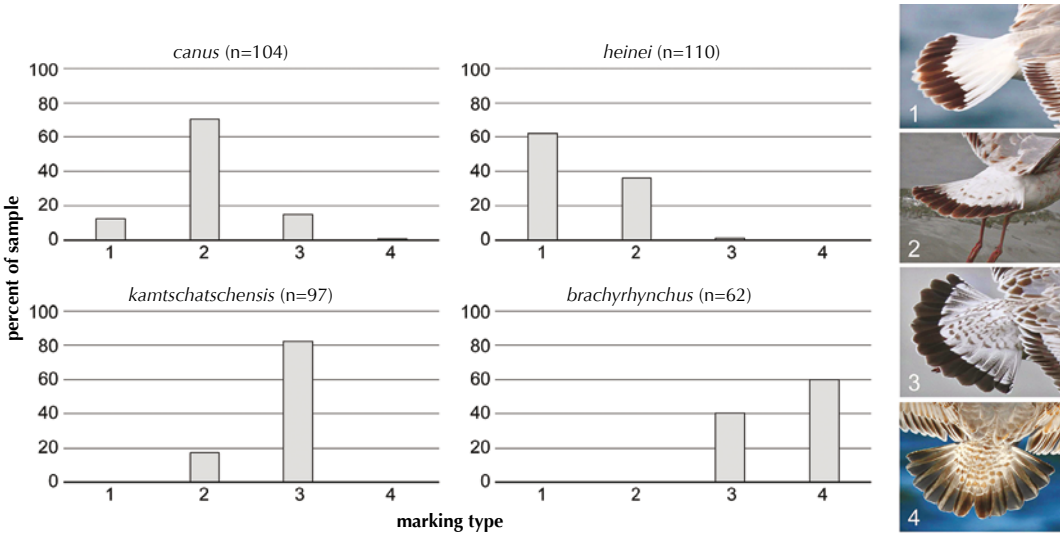

FIGURE 7 Frequency of different types of markings on the uppertail-coverts of Mew Gull *Larus canus* taxa. Sample sizes are given in parentheses. Statistics are produced from birds observed in Scotland (*canus*), Istanbul, Turkey, and Georgia (*heinei*), Japan (*kamtschatschensis*) and western USA (*brachyrhynchus*). Marking types: ***1*** unmarked; ***2*** few isolated spots or crescents; ***3*** extensive crescents or banding but pale ground colour still dominating over dark; and ***4*** banding, with dark bands more or less equal to or broader than pale bands in between.

less wholly dark (type 5 was the modal category) or with barring all or most of the way up the outer web (type 4), and uppertail-coverts that were heavily barred (type 5 is the modal category).

The other two taxa sit between these two extremes, in terms of uppertail and uppertail-covert patterns. *Canus* is most similar to *heinei*, although most birds have a degree of spotting or light barring on the uppertail-coverts (type 2 was the modal category in our sample) and it is easier to find *canus* with rather extensive barring (type 3). As is evident from the birds in figure 4, *canus* overlaps a lot with *kamtschatschensis* – probably more than previously recognised. For instance, c 20% of our sample *canus* have the type 2 tail pattern that is typical of *kamtschatschensis*, while a few (2.5%) have very dark tails (type 3). Similarly, a few *canus* can be found with well patterned (type 4) outer tail-feathers, while some also have heavily banded uppertail-coverts. Importantly, we have seen *canus* with largely dark tails and dark stippling for most of the length of the outer web of the outer tail-feather on Scottish breeding grounds and along the Scottish coast in August, immediately after birds leave the colonies. In addition, one juvenile *canus* from Murmansk, Russia, collected in August had an extensively dark tail (type 3) and obviously barred tail-coverts (type 3).

Kamtschatschensis is darker on average than *canus*: the vast majority of our sample (97%) had type 2, 3 or 4 tails, extensive barring or mostly dark on the outer web of the outer tail-feather (93% of our sample had type 3, 4 or 5 patterns) and well barred uppertail-coverts (80% had type 3 pattern). Nonetheless, some *kamtschatschensis* are rather pale: 3% of our sample had type 1 tail patterns while 17% had only light spotting on the uppertail-coverts; moreover, 8% lacked any barring or stippling on the outer web of the outer tail-feather. Thus, there is considerable overlap between *canus* and *kamtschatschensis*. One potentially useful point for separating these taxa is that on the latter the markings on the uppertail-coverts tend to be slightly paler rusty, unlike the typically blackish or grey brown markings of dark *canus*. But again there is overlap.

Upperwing

The upperwing pattern is stressed in the literature as being useful for identification of first-cycle birds. However, in our opinion the importance of some upperwing features has been rather overstated while the value of others has been overlooked. Tove (1993) and Olsen & Larsson (2003) describe first-cycle *kamtschatschensis* as having lesser and median coverts with triangular dark centres, unlike the more rounded centres of *canus* and more reminiscent of Ring-billed Gull. It is cer-

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68 Common Gull / Stormmeeuw *Larus canus canus*, first-cycle, Visé, Liège, Belgium, 17 February 2013 *(Peter Adriaens)*. Very normal nominate *canus* with streaked crown and ear-coverts, barred flank, unmarked white vent, clean grey scapulars and brown median and lesser coverts with dull grey fringes.
69 Common Gull / Stormmeeuw *Larus canus canus*, first-cycle, Newburgh, north-eastern Scotland, 1 November 2014 *(Chris Gibbins)*. Tail invites confusion with *kamtschatschensis* but note that all wing-coverts are very dark and brown. Frequency with which nominate *canus* shows this type of tail pattern has probably been underestimated in the past.
70 Common Gull / Stormmeeuw *Larus canus canus*, first-cycle, Peterhead, north-eastern Scotland, 9 November 2014 *(Chris Gibbins)*. Rather typical nominate *canus* showing brown tips to many underwing-coverts but note that these are not so deep that brown dominates over paler ground colour. Brown wing lining, secondaries and outer primaries do not contrast much with ground colour of underwing. Outer tail-feather is conveniently displaced, and shows 'type 1' pattern on outer web, typical of this taxon and *heinei* but unlike the other two Mew Gull taxa.
71 Common Gull / Stormmeeuw *Larus canus canus*, first-cycle, Peterhead, north-eastern Scotland, 1 November 2014 *(Chris Gibbins)*. Rather typical nominate *canus*, with underwing pattern very like bird in plate 70. Secondaries rather pale. In addition, note very white, unmarked belly, vent and undertail-coverts, and brown spots on flank. Head pattern is typical.

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72 Common Gull / Stormmeeuw *Larus canus canus*, first-cycle, Oldmeldrum, north-eastern Scotland, 9 August 2014 *(Chris Gibbins)*. Rather dark, Scottish reared nominate *canus* on breeding grounds. Dark body is reflection simply of date, and much of this pigmentation will be lost in post-juvenile moult. More interesting, in terms of possible confusion with *kamtschatschensis*, are rather dark looking underwing, and barring extending for around half of outer web of outer tail-feather, demonstrating unequivocally that nominate *canus* can show some *kamtschatschensis* features. Note, however, that despite dark body, area between legs remains pale and axillaries lack barring.
73 Russian Common Gull / Russische Stormmeeuw *Larus canus heinei*, first-cycle, with Caspian Gull / Pontische Meeuw *L cachinnans* and Black-headed Gulls / Kokmeeuwen *Chroicocephalus ridibundus*, Poti, Georgia, 26 January 2014 *(Peter Adriaens)*. Example of most striking and distinctive type of *heinei*, with completely unmarked head and underparts except for few brown spots on lower hindneck. Very dark brown greater coverts contrast strongly with clean white flank. Quite a few scapulars show pale brown fringe. Clinching identification requires details of tail, uppertail-coverts and underwing.
74 Russian Common Gull / Russische Stormmeeuw *Larus canus heinei*, first-cycle, Batumi, Georgia, 2 February 2014 *(Peter Adriaens)*. Differs from nominate *canus* by elongated shape with long wings, white head sharply set off from brown spots on lower hindneck, dark wing-coverts contrasting with predominantly white underparts, and somewhat brighter pink bill base. Some first-cycle *heinei* show very dark, worn tertials without any pale fringes, like this bird and bird in plate 73.
75 Russian Common Gull / Russische Stormmeeuw *Larus canus heinei*, first-cycle, with Black-headed Gulls / Kokmeeuwen *Chroicocephalus ridibundus*, Poti, Georgia, 30 January 2014 *(Chris Gibbins)*. Bird with pale wing-coverts and some brown streaking on nape, making it more difficult to distinguish from nominate *canus*. However, note very delicate pattern of sharp, thin dark streaks on lower hindneck, bright pink bill base, predominantly white underparts and several second-generation scapulars with dark centre.

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76 Russian Common Gull / Russische Stormmeeuw *Larus canus heinei*, first-cycle, Istanbul, Turkey, 7 January 2014 *(Chris Gibbins)*. Some first-cycle *heinei* (like this one) can be remarkably striking. Head is pure white, set off by neat 'boa' of streaks around nape, while uppertail-coverts and basal part of tail are unmarked white. Although not visible in this photograph, body, undertail-coverts and underwing also virtually unmarked.
77 Russian Common Gull / Russische Stormmeeuw *Larus canus heinei*, first-cycle, Poti, Georgia, 29 January 2014 *(Peter Adriaens)*. Some *heinei* (like this one) have chocolate-brown greater coverts. This feature is shared with some nominate *canus* and in itself not useful for separation. However, it becomes significant in combination with clean white head, underparts and uppertail-coverts as in this bird because, in nominate *canus*, dark brown greater coverts tend to correlate with dark, well-marked head and body.
78 Presumed Russian Common Gull / vermoedelijke Russische Stormmeeuw *Larus canus heinei*, first-cycle, Istanbul, Turkey, 2 January 2014 *(Chris Gibbins)*. Not all *heinei* are distinctive. This is example of bird with more streaked head, neck and body, well-marked underwings including some dark barring on axillaries, and spotted undertail-coverts, overlapping with nominate *canus*. Note contrastingly dark secondaries though.

tainly the case that many are like this. However, *canus* is rather variable, with some birds showing dark triangular feather centres. In fact, more useful for picking out a first-cycle *kamtschatschensis* in Europe is the very pale 'frosty sand' look to the (fresh) coverts (plate 83-85). The greater coverts are almost invariably very pale and sandy, sometimes virtually white. Such pale greater coverts are shown occasionally by *canus* and *heinei* but are very typical of *kamtschatschensis*. Many *kamtschatschensis* also have extensive whitish fringes on the median and lesser coverts which subsume the darker centres, making most of the visible wing on standing birds look very pale. Even when the plumage is very fresh, they often have a sun-bleached look that extends across all of their coverts, a very striking feature on an otherwise dark bird (with dark mantle and underparts). Conversely, on those *kamtschatschensis* that have less well marked underparts and the paler-looking type of mantle, the pale coverts add a strangely pallid feel overall that is very unlike *canus*; this can be very distinctive when combined with the dark tail and uppertail-coverts (eg, plate 87). In contrast, those *canus* with dark bodies and tails (which in these respects look most like *kamtschatschensis*) are dark overall and so tend to have dark brown or slate grey wing-coverts without the whitish fringes (plate 69) seen on *kamtschatschensis*.

Brachyrhynchus vary from having diffusely dark-centred lesser and median coverts with just the hint of a dark shaft streak, to sharp and distinct anchor patterns (dark shaft breaking into a subterminal dark band; plate 97). The greater coverts are typi-

Underwings of first-cycle Russian Common Gull / Russische Stormmeeuw *Larus canus heinei*. **79** Istanbul, Turkey, 28 December 2013 *(Chris Gibbins)* **80** Rumelifeneri, Turkey, 4 January 2014 *(Chris Gibbins)* **81** Anaklia, Georgia, 25 January 2014 *(Peter Adriaens)*. Bird in plate 79 shows very white underwing typical of *heinei*, and also contrastingly blackish secondaries. However, there is variability and occasionally birds with very banded (plate 80) and, rarely, uniformly brown (plate 81) underwing are encountered. Bird in plate 80 is presumed *heinei* based on location and very dark remiges but an intergrade with *canus* cannot be excluded. Notable feature on bird in plate 81 is that, despite its completely dark underwing, it retains very white head and body.

cally pale, so more worn individuals that have the more lightly marked covert pattern can have an overall appearance rather like *kamtschatschensis*. However, their median and lesser coverts tend to show sandy brown fringes rather than extensive white ones, so there is usually no impression of a large whitish wing-panel as there often is in *kamtschatschensis*. Conversely, some *brachyrhynchus* are strongly marked, with an anchor type pattern extending to the inner two or three greater coverts.

Olsen & Larsson (2003) state that the greater coverts of *heinei* 'average darker, deeper brownish tinged' (than *canus*), and that the lesser coverts 'are darker brown than in *canus*, creating a stronger dark leading edge to the inner wing'. Certainly, many *heinei* have a rather dark upperwing including very dark greater coverts, and this can result in a starkly contrasting bird because of the clean white head and body (plate 77). However, many have pale grey greater coverts and others sandy ones, while *canus* has greater coverts which can range from pale, silvery grey to very dark brown. Thus, the greater covert pattern is not particularly useful for identifying *heinei* in Europe.

Tertials

All taxa share a common, rather simple tertial pattern, with a narrow pale fringe which broadens or expands to form a diffuse pale tip to each feather. We have found no consistent differences in the tertial patterns of *canus*, *heinei* and *kamtschatschensis*. On many *brachyrhynchus*, however, the impression is more of a simple and distinctly thin fringe which does not broaden at the tip (plate 97). On some *brachyrhynchus*, each tertial has a complex pattern, with a combination of pale fringe, darker sub-terminal anchor and thumb print; this pattern mirrors that seen on the wing-coverts. Such birds are distinct from the other taxa.

Underwing

Each taxon has a characteristic underwing pattern, although there is considerable variability and a degree of overlap. In keeping with their other characteristics, *heinei* is typically the palest and *brachyrhynchus* the darkest and most uniform, with *canus* and *kamtschatschensis* in between.

The underwing of *heinei* (plate 79-81) can appear gleaming white as a result of virtually unmarked underwing-coverts and axillaries. These are the most striking and distinctive birds. Most, however, have small dark tips to their coverts and axillaries which contrast starkly with the white ground colour. The secondaries may look contrastingly dark from the underside, nearly blackish, and together with rather dark inner primaries can form a broad dark trailing edge to the wing that contrasts markedly with the white underwing-coverts and underparts. Darker birds have more extensive brown tips to the underwing-coverts

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82 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, first-cycle, Jamunjin, South Korea, 8 January 2015 *(Chris Gibbins)*. Virtually no saddle effect because second-generation scapulars have very broad, diffuse pale fringes, and many have clear brown cast to central part of feather; these patterns disrupt uniformity of grey saddle, giving altogether more messy impression than nominate *canus*. Greater coverts, as is very typical of this taxon, are creamy white and more or less unmarked. Strong spotting on white head together with bright pink bill base may recall same-aged Ring-billed Gull *L delawarensis*.

83 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, first-cycle, with Black-tailed Gull / Japanse Meeuw *L crassirostris*, Choshi, Japan, 27 December 2011 *(Chris Gibbins)*. Very dark-bodied individual with many remaining juvenile scapulars. Despite dark body, still extensive white fringes to all wing-coverts present. Pattern of undertail-coverts continues across vent and reaches legs. Black-tailed Gull allows useful size comparison, showing bird's large size.

84 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, first-cycle, Choshi, Japan, 7 March 2012 *(Peter Adriaens)*. Very typical bird, showing extensively pale frosty (almost white) wing-coverts, many with little or no dark internal markings. Saddle effect is broken up by combination of many retained first-generation (rear) scapulars and pale fringing to second-generation ones, many of which also have clear dark shaft streak. Even though undertail-coverts show only thin brown markings, pattern still continues across vent.

85 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, first-cycle, Jamunjin, South Korea, 8 January 2015 *(Chris Gibbins)*. Bird showing very typical bleached looking wing-coverts, yet these feathers are still fresh as they show clear-cut brown centre. In this bird, white wing-panel contrasts with dark grey saddle. Note also that strong head streaking and strong, pink bill recall Ring-billed Gull *L delawarensis*.

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86 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, first-cycle, Gangneung, South Korea, 31 December 2014 *(Chris Gibbins)*. Differences in extent of post-juvenile moult are not diagnostic in Mew Gull taxa, although, as in this individual, *kamtschatschensis* often retains many first-generation mantle and scapular feathers through its first winter. Note pattern of tail and rump, as well as clean white fringes to most wing-coverts.
87 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, first-cycle, Jamunjin, South Korea, 31 December 2014 *(Chris Gibbins)*. Individual with blackish-brown tail-band accompanied by 'five o'clock shadow'. In addition, outer tail-feathers have barring along outer web and uppertail-coverts spotted, all typical *kamtschatschensis* traits but they are also shown by many nominate *canus*. Other features therefore needed for identification. Useful features visible here are mantle pattern and scapular pattern (as described for plate 82) and extensive whitish wing-panel.
88 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, first-cycle, Choshi, Japan, 28 December 2009 *(Chris Gibbins)*. Powerful looking individual, with much length in front of wings. Most of underbody heavily marked and underwing appears strongly barred, as result of deep blackish tips to underwing-coverts and axillaries. Note that not just undertail-coverts but also lower belly and vent are spotted brown.
89 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, first-cycle, Jamunjin, South Korea, 8 January 2015 *(Chris Gibbins)*. Note that longest axillaries are strongly barred, which is regular feature of this taxon, especially in those birds with extensively brown underwing-coverts.

90 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, first-cycle, Gangneung, South Korea, 31 December 2014 (*Chris Gibbins*). While fresh juvenile *canus* can show brown plumage like this, note striking white fringes to upperwing-coverts, brown belly extending well behind legs, and brown spots not just on undertail-coverts but equally prominent on vent. Extensively dark tail is shown by small minority of *canus* only.

which create alternating bands of pale and dark running along the wing, like those seen in many *canus*. Barring or stippling on the axillaries is rare in *heinei* (just one bird in our sample). The very darkest birds can have a uniform brown wash to the whole of the underwing (plate 81); such birds look quite bizarre since their all-brown wings contrast strongly with their white body.

The typical pale underwing of *heinei* is very different both from *kamtschatschensis* and especially *brachyrhynchus*. The general impression of *brachyrhynchus* is of a rather uniform, chocolate or smoky underwing (plate 99). Only two birds in our sample showed any barring or stippling on the axillaries, and even on these two individuals it was so subtle as to be visible only on close-up images. Paler *brachyrhynchus* have less extensive fringes to their underwing-coverts and so can overlap with darker examples of the other taxa. Nonetheless, they retain a rather sullied greyish ground colour so the contrasts are not marked. An example of one such bird is shown in plate 100; notably this bird was also less marked in the tail and uppertail-coverts than typical for this taxon.

The underwing of *kamtschatschensis* (plate 88-93) is closest to *brachyrhynchus* but usually paler overall and less uniform. The ground colour is off-white, with extensive dusky feather-tips and fringes creating scales, bars or banding. Many birds, including even some that otherwise have rather pale underwings, have some barring or coarse stippling on the axillaries, unlike *brachyrhynchus*. The darkest birds can appear to have very dark underwings. Some of these are still easily told by their strongly barred axillaries but in a few birds the pattern can be very uniform, making them look identical to typical *brachyrhynchus* in this respect. In all first-cycle *kamtschatschensis*, even the palest ones, at least the lesser underwing-coverts remain extensively brown.

Canus (plate 70-72) is the problem taxon, as its underwing overlaps extensively with both darker *heinei* and paler *kamtschatschensis*. Many can look very pale, with only small dark tips to the underwing-coverts and axillaries, and so resemble some *heinei*. Conversely, darker *canus* are a very good match for typical *kamtschatschensis*, including some individuals with barring on the axillaries.

91 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, first-cycle, Choshi, Japan, 7 March 2012 (*Peter Adriaens*). Typical, heavily marked bird. Compared with nominate *canus*, note that barring of undertail-coverts continues up to belly. Differs from *brachyrhynchus* in paler tail, more coarsely marked underparts, longer, brighter bill, more sloping forehead and slightly barred pattern of axillaries.

Primaries
All four taxa have a dark tip on their inner primaries but in *brachyrhynchus* the pattern is often quite unique. The dark tips are often well demarcated and extensive, spreading equally across both the outer and inner web of each feather; this may create the impression of a dark trailing edge to the inner hand, especially when the inner primaries are pale grey, as they often are in this taxon. In the other three taxa, the dark pattern is generally more confined to the outer webs only, reducing the effect of a trailing edge. In addition, quite a few first-cycle *brachyrhynchus* (though far from all) have a distinctive, wholly pale innermost primary (except for the dark tip) (plate 98 and 100). This is very rare in the other three taxa, which nearly always have a dark outer edge to this feather.

Bill colour
First-cycle *canus* and *brachyrhynchus* have a fleshy or dirty flesh basal portion to their bill; on the former, this portion is occasionally greyish or even blue grey. *Heinei* often have a very bright bill, with several birds in our sample having a rather yellow or orangey tone. Some *kamtschatschensis* have a rather bright pink bill, recalling Ring-billed Gull. These bare part tones can be useful when combined with plumage details; they may be what initially draws attention to an interesting bird.

Voice
We examined 15 recordings of the display call (better known as the 'long call') of *canus* (from European breeding colonies), six of *heinei* (from Russian breeding colonies), nine of *kamtschatschensis* (Japan and South Korea, winter), and 20 of *brachyrhynchus* (from Alaska, USA, and Yukon, Canada). Most recordings were found on the internet (Xeno-Canto and Macaulay Library) but none appeared to be available of *kamtschatschensis* so we recorded display calls of this taxon ourselves.

The long call of *canus* consists of an initial series of short units which become longer and more drawn out, ending in rapidly repeated, short, soft sounds; hence *kiä*, lengthening to *kiiija*, and ending in *kiakiakia kia* (figure 8-9). It is fairly similar to

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92 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, first-cycle, Choshi, Japan, 30 December 2009 *(Chris Gibbins)*. Many paler-bodied *kamtschatschensis*, like this one, retain isolated brown patch on belly. This 'Dunlin *Calidris alpina* patch' helps to separate them from nominate *canus*, which typically has brown streaks confined to breast and flank. This bird is unusual in that it lacks barring on axillaries, even if underwing is extensively brown.
93 Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, first-cycle, Choshi, Japan, 30 December 2009 *(Chris Gibbins)*. Very dark-bodied bird, with pigmentation all way down belly and reaching behind legs. Head heavily streaked and streaking extends to malar region and throat. Longest axillaries are barred.
94 Short-billed Gull / Amerikaanse Stormmeeuw *Larus (canus) brachyrhynchu*s, first-cycle, Bodega Bay, California, USA, 9 December 2012 *(Chris Gibbins)*. Overall impression of soft, subtly patterned gull. Head and body have rather more uniform wash than seen in other Mew Gull taxa and second-generation mantle and scapulars have sandy, rather than pure grey, feel. In this pose, all-dark tail is visible. These features, together with high domed head and petite bill, make identification of typical birds like this straightforward. Note also that upper tertials show only very thin white fringe.
95 Short-billed Gull / Amerikaanse Stormmeeuw *Larus (canus) brachyrhynchu*s, first-cycle, Pillar Point, California, USA, 27 January 2011 *(Peter Adriaens)*. Strikingly dark-bodied individual, with uniform chocolate wash extending around neck and down belly as far as legs. Note pattern of upper tertials and almost completely dark undertail-coverts.

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96 Short-billed Gull / Amerikaanse Stormmeeuw *Larus (canus) brachyrhynchus*, first-cycle, Bodega Bay, California, USA, 9 December 2012 *(Chris Gibbins)*. Although wash to body little paler than in plate 94, note how undertail-coverts are still extensively dark. Most of scapulars show sandy brown wash.
97 Short-billed Gull / Amerikaanse Stormmeeuw *Larus (canus) brachyrhynchus*, first-cycle, Bodega Bay, California, USA, 21 December 2008 *(Chris Gibbins)*. As evident here, this taxon frequently shows very narrow and sharply defined fringes to tertials, very different to those typically seen in other Mew Gull taxa. Also note densely marked undertail-coverts, reminiscent of jaegers *Stercorarius*. Uniform brown head striking, and second-generation scapulars brownish rather than grey.
98 Short-billed Gull / Amerikaanse Stormmeeuw *Larus (canus) brachyrhynchus*, first-cycle, California, 3 December 2012 *(Chris Gibbins)*. In addition to dark tail, barred uppertail-coverts and uniform brown colour on body and underwing, note typical pattern of innermost primary (p1) with completely pale outer web and clear-cut dark tip. Also, note that *brachyrhynchus* does not show barring on axillaries.

Herring Gull *L argentatus* but clearly higher pitched.

While there is considerable individual variation in the length of long calls of gulls, this is far less the case for speed of delivery and pitch (Constantine & The Sound Approach 2006). Thus, it is often possible to find differences between gull species, especially when the long calls are visualized by means of a sonagram. Viewed on a sonagram, the distinction between the short notes and the longer, drawn-out notes is clearly visible, and the latter have a fairly consistent shape in *canus*, usually being flat topped and somewhat asymmetrical because the descending part at the end of each note is longer and reaches deeper than the initial, ascending part. The long calls of *heinei* sound extremely similar to *canus*, and sonagrams do not reveal any clear differences (figure 10). The long call of *kamtschatschensis* is basically similar, too. However, in a pair of adults observed well and recorded in South Korea in winter it was preceded and followed by hoarse, guttural *gak* sounds which recalled a domestic goose *Anser* rather than any Mew/Common Gull (figure 11). Further research is needed to find out how common such calls are in *kamtschatschensis* but we have certainly not heard anything like it from the other taxa.

Sibley (2000) already suggested that the voice of *brachyrhynchus* is higher pitched and fuller than that of *canus*. To us, there appears to be a difference indeed, though it is hard to put into words. We think the difference is mainly in the drawn-out notes, which often sound a little more

99 Short-billed Gull / Amerikaanse Stormmeeuw *Larus (canus) brachyrhynchus*, first-cycle, Pillar Point, California, USA, 22 January 2011 *(Peter Adriaens)*. Extensive and smooth brown underwing, as well as body, characteristic of this taxon. Axillaries dark but without barring.

100 Short-billed Gull / Amerikaanse Stormmeeuw *Larus (canus) brachyrhynchus*, first-cycle, Half Moon Bay, California, 19 January 2011 *(Peter Adriaens)*. Less typical *brachyrhynchus* in that it shows extensively pale tail base and rather pale but well-patterned underwing. Still, body pigmentation (especially rear neck and flank) characteristically smooth and underwing retains buffy ground colour. Note also very pale innermost primary.

101 Short-billed Gull / Amerikaanse Stormmeeuw *Larus (canus) brachyrhynchus*, first-cycle, Half Moon Bay, California, USA, 20 January 2011 (*Peter Adriaens*). Overall sandy-brown plumage with all-dark tail. Head smudged brown rather than streaked.

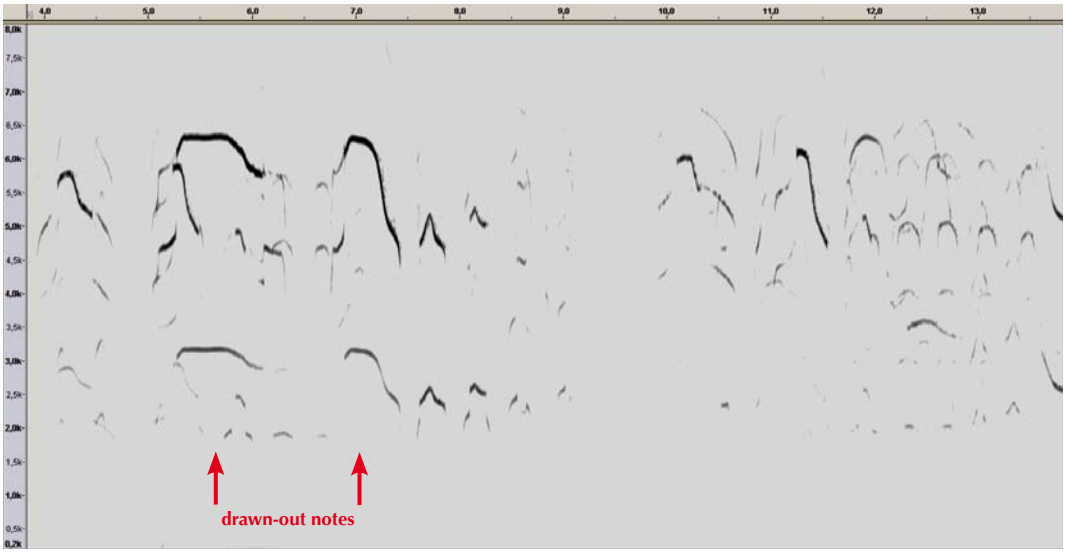
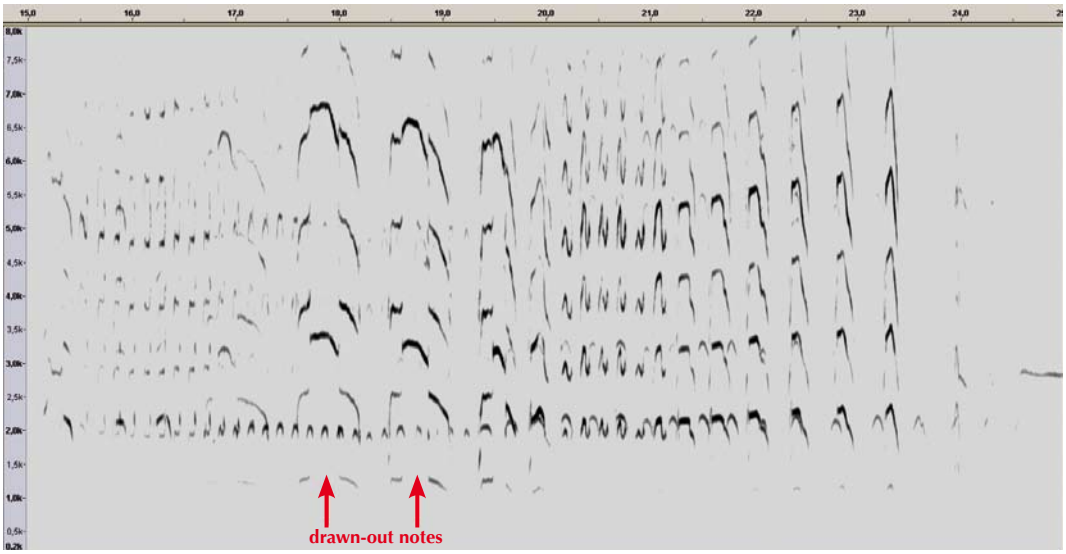


FIGURE 8 Long call of Common Gull / Stormmeeuw *Larus canus canus*, adult, Finland, 20 April 2010 *(Eetu Paljakka/www.xeno-canto.org/208401)*. Drawn-out notes of long call often almost 1 sec long and look rather flat-topped in sonagram. They also look a bit asymmetrical, because descending part at end is longer and stronger than ascending beginning.

FIGURE 9 Long call of Common Gull / Stormmeeuw *Larus canus canus*, adult, Gairloch, Scotland, 8 July 2007 *(David Farrow/www.xeno-canto.org/37449)*. Drawn-out notes bit shorter than usual. Still, over 0.5 sec in length and looking slightly asymmetrical because descending part is longer and less steep than ascending beginning.



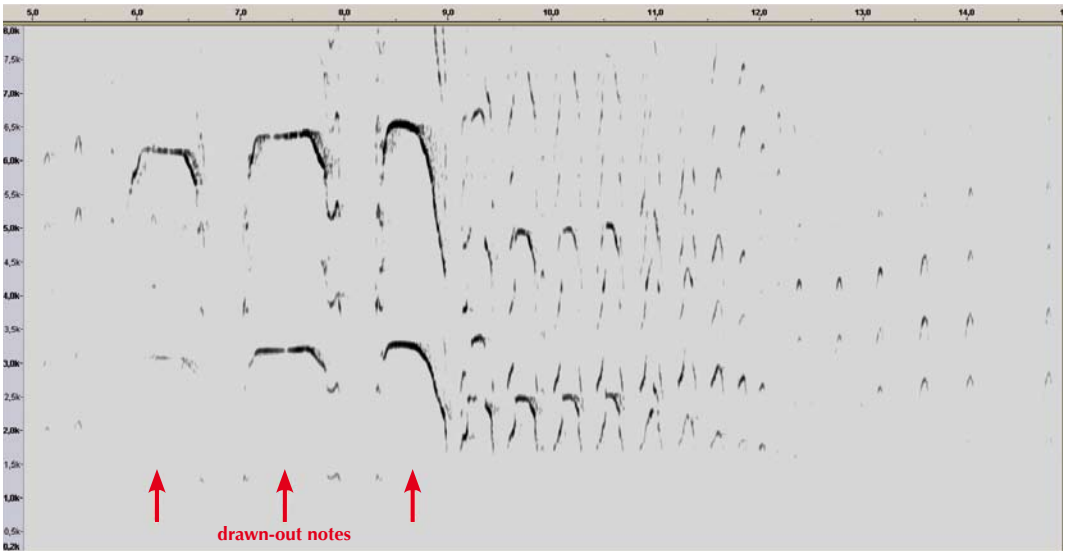
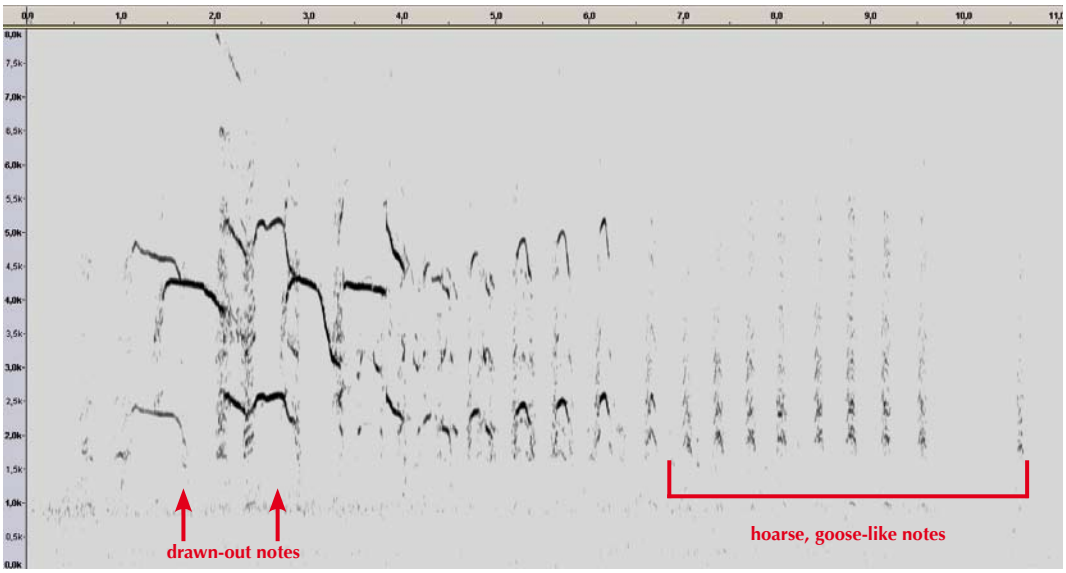


FIGURE 10 Long call of Russian Common Gull / Russische Stormmeeuw *Larus canus heinei*, adult, Medvedevskiy rayon, Mari El Republic, Russia, 22 June 2014 *(Albert Lastukhin/www.xeno-canto.org/187416)*. Drawn-out notes extremely similar in structure, length and pitch to those of nominate *canus*.

FIGURE 11 Long call of Kamchatka Gull / Kamtsjatkastormmeeuw *Larus canus kamtschatschensis*, adult, Gangneung, South Korea, 29 December 2015 *(Chris Gibbins)*. The long call, which is similar to *canus* and *heinei*, is followed by a series of hoarse notes that show up as a dense, complicated pattern in the sonagram, almost like Japanese letters.



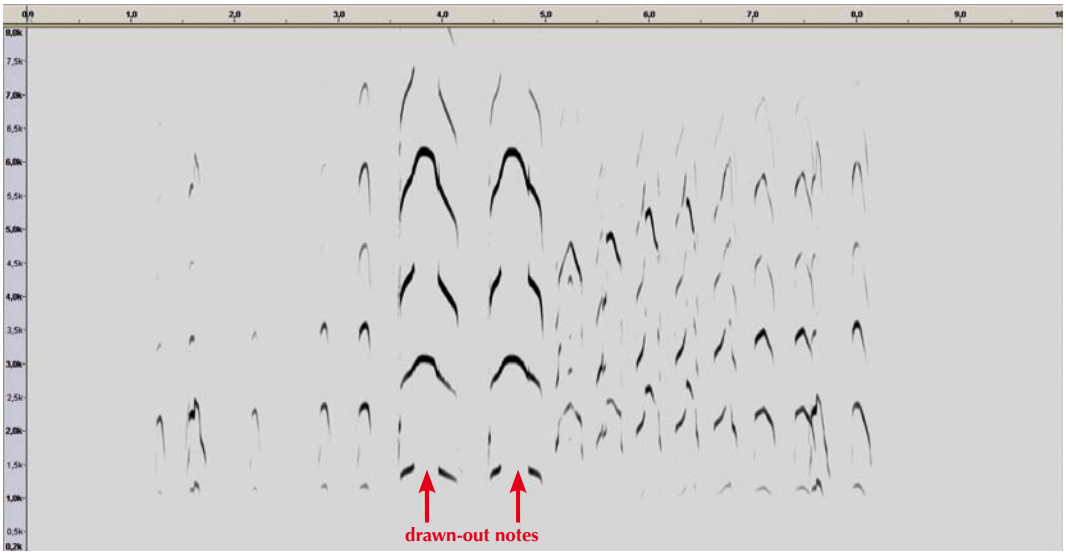
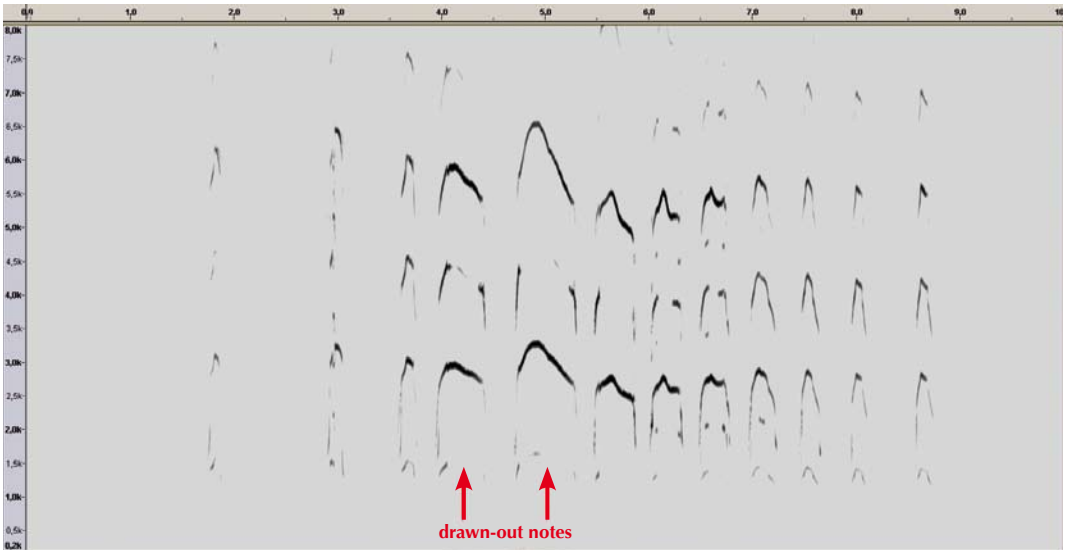


FIGURE 12 Long call of Short-billed Gull / Amerikaanse Stormmeeuw *Larus (canus) brachyrhynchus*, adult, Watson lake, Yukon, Canada, 2 June 2014 *(Andrew Spencer/http://www.xeno-canto.org/189385*. Drawn-out notes of long call have symmetrical, conical shape.

FIGURE 13 Long call of Short-billed Gull / Amerikaanse Stormmeeuw *Larus (canus) brachyrhynchus*, adult, Quartz Lake State Recreation Area, Fairbanks, Alaska, USA, 28 June 2006 *(Michael J Andersen/http://macaulaylibrary.org/audio/132251)*. Drawn-out notes looking clearly pointed, and rising part about as intense as descending one.



hurried than the corresponding notes in *canus* and also more balanced, with equal rising and descending parts. The distinction is clearer on sonagrams: the drawn-out notes often show a symmetrical, pointed or conical shape (figure 12-13). Also, they tend to last for only 0.5 sec or even less. There is, however, some overlap in long calls between *brachyrhynchus* and the Old World taxa, with some sonagrams being hard to tell apart. That said, the drawn-out notes of *brachyrhynchus*, with a nicely symmetrical and conical shape, are not normally shown by those taxa.

In conclusion, we feel that there are marked differences between the long call of *brachyrhynchus* and that of the other three taxa, which may be an indication of the species status of the former. The unique, goose-like notes sometimes uttered by *kamtschatschensis* are very interesting, too; they merit further study, and may lead us to rethink its taxonomic position one day.

Discussion

Geographic variation and intergradation zones

Heinei has a vast breeding range that extends for more than 4000 km in width, from the Moscow region to at least the Lena river. It therefore seems possible that there is some local or clinal variation in this taxon. Our sample from across this area (n=60) is too small to draw any firm conclusions about such variability, but when comparing adult western Russian versus Siberian *heinei* the data seem to suggest that the latter average slightly more black on p4-6. For instance, 16 Siberian birds showed a broken black band on p4, as opposed to none of the western Russian ones, which all showed less black. The black band on p5 seems to be more often complete in Siberian birds (86%, compared with 44% of western Russian ones) and thick (97% compared with 63%). The black pattern on p6 seems more often asymmetrical in Siberian birds, and the black wedge on the outer web of this feather is usually longer than one-third of the feather length (longer in 68% of Siberian birds, versus 30% of western Russian ones).

The breeding range of *canus* is also extensive, being almost 3000 km in width (from Ireland to the White Sea in Russia). When comparing adult *canus* from Scotland (n=250) to those from Estonia (n=94), we found that the latter tended to show slightly more black in the primaries: Estonian birds showed some black on p4 rather more frequently than Scottish ones (27% and 2%, respectively), a complete black band on p5 (42% compared with 14%), an asymmetrical black band on p6 (51% compared with 16%), and there were more birds that lacked the pale tongue on p10 (61% compared with 38%). Birds from Estonia also tend to be larger (Olsen & Larsson 2003; Kalev Rattiste in litt), so in these respects they are somewhat more similar to *heinei* than Scottish breeders. This has clear implications for the identification of *heinei* in Europe.

From current literature, it appears that the exact western boundary of the *heinei* range is unknown. According to Dementiev & Gladkov (1969), the westernmost *heinei* breed at Dvina bay in the White Sea (39°E) and in Kalinin (Moscow region; 36°E). One adult in our data set from Seleger lake, Ostashkov, Russia (33°E), grouped with *heinei* on the basis of the key identification criteria in table 3, rather than with *canus*. Seleger lake is c 320 km north-west of Moscow. However, this bird showed an unusually wide tongue on the underside of p10 and may therefore not have been a pure *heinei*. Another adult from Seleger lake grouped with *canus*, so it appears that both subspecies (or intergrades) breed just west of Moscow. Two out of 20 adults that we observed in the field in Moscow city in late October 2014 clearly matched *canus* in terms of their wing-tip pattern, and most of the others looked like this subspecies in overall terms (pattern of head streaking, bare parts, some wing-tip features). Two, however, showed some characters suggesting *heinei* influence (eg, one with only little grey at base of the outer web of p8). The *heinei* types most different from *canus* appear to breed east of the Ural mountains (59°E), with our data set suggesting that these birds tend to have a little more black in their primaries than those from west of the mountain range. It may therefore be useful to think of *heinei* as a 'Siberian Common Gull' rather than a Russian one.

Kamtschatschensis may be more predominant at the eastern edge of the *heinei* range than generally thought. The Lena (c 123°E) and Aldan rivers (135°E) are said to form the eastern boundary of the *heinei* range, with birds between the Lena, Indigirka (143°E) and Kolyma rivers (158°E) further east in Yakutia considered intergrades between *heinei* and *kamtschatschensis* (Dementiev & Gladkov 1969). The adult birds in our data set from the Kolyma river showed mainly characters of *kamtschatschensis*, and one adult clearly grouped with this subspecies according to the key, while none grouped with *heinei*. Moreover, juvenile birds from south of the Lena river, central Yakutia, that we examined showed the extensive brown belly, spotted tail-coverts and extensive dark tail-feathers of *kamtschatschensis*. The westernmost juvenile that

we have found with strong *kamtschatschensis* characters was from Olyokminsk, western Yakutia (120°E). This suggests that either *kamtschatschensis* breeds further west than generally thought, or that intergrades are very similar to it (and clearly different from *heinei*). Olsen & Larsson (2003) mention that birds from the Alazeya river, between the Indigirka and the Kolyma rivers, are sometimes treated as (pure) *kamtschatschensis*. Conversely, Carey & Kennerley (1996) state that 'birds showing the primary tip pattern associated with *heinei* have been found breeding on the Omolon River (68°30'N, 158°30'E), considerably further east than this form is considered to occur (P. Kennerley pers. obs.)'. However, the only difference in primary pattern that they describe is that *heinei* 'lacks the white wedge that separates the grey base and black subterminal band shown by *kamtschatschensis*'. This is hardly a detailed description, so stronger evidence is needed before it can be widely accepted that *heinei* is breeding this far east. In any case, our data set contained an adult *heinei*-like bird from the Aldan river, central southern Yakutia, as well as a first-cycle *kamtschatschensis*-like bird from Olyokminsk, much further west in Yakutia; these birds suggest that there is some overlap in range between the two taxa.

Birds breeding at Lake Baikal are puzzling. On range, they should be *heinei*, and indeed one of the adults we examined fitted this taxon according to the key criteria. However, four out of 11 juveniles from this region showed strong characters of *kamtschatschensis*, such as extensive brown on their underparts, strongly spotted tail-coverts and largely dark tail-feathers. In terms of tail and uppertail-covert patterns, birds from just east of the Lena river and those around Lake Baikal are certainly interesting (table 5). The collection in Moscow housed only 13 first-cycle birds from this region. Although this sample is too small to say anything definitive about populations here, it is nonetheless obvious that a high proportion show features that are unusual in *heinei*. Type 2 tails are at least as frequent as type 1 in Baikal birds, more than half have extensive stippling or barring on the outer tail-feathers, and one-third have banded uppertail-coverts. Although more marked overall than expected for *heinei*, these birds are slightly less well marked than normal for *kamtschatschensis* (compare the data in table 5 with those in figure 5-7).

TABLE 5 Tail pattern and uppertail-covert pattern shown by first-cycle Mew Gulls *Larus canus* from just east of the Lena river and around Lake Baikal, Russia. Values refer to number of birds, from a total of 13 skins examined. Collection locations are shown in figure 1.

	type 1	type 2	type 3	type 4	type 5
tail	5	6	2	0	(not applicable)
uppertail-coverts	2	7	4	0	(not applicable)
outer tail-feather	5	0	4	4	0

Lake Baikal is far south-west of the main *kamtschatschensis* range but it is not inconceivable that some birds may have reached and perhaps colonized this area by travelling upstream along the Lena river, which has its source only 7 km west of the lake. The distance between Olyokminsk, where birds with *kamtschatschensis* characters occur, and Lake Baikal is c 800 km – nothing insurmountable for a long-distance migrant like *kamtschatschensis*.

Clearly, the collection of Mew Gull skins at the Zoological Museum of Moscow suggests some overlap in the breeding ranges of *canus* – *heinei* and *heinei* – *kamtschatschensis*, and this overlap may even be larger than previously described.

Taxonomy and biogeography

Zink et al (1995) have already drawn attention to apparently diagnostic differences in mitochondrial DNA between *kamtschatschensis* and *brachyrhynchus*. They concluded that 'the mtDNA data suggest that two species are represented', although they did not recommend any formal taxonomic changes because their sample was very small (only three *kamtschatschensis* and one *brachyrhynchus* were examined) and did not include any *canus* or *heinei*. In 2011, however, more extensive DNA research was published by Sternkopf (2011). She studied the mtDNA of all four taxa: her sample included 36 *canus*, 12 *heinei*, five *kamtschatschensis* and four *brachyrhynchus*. Her results confirmed significant genetic differences between *brachyrhynchus* and the other taxa; the other three taxa clustered together, suggesting a certain extent of gene flow between them. She concluded that *brachyrhynchus* should be treated as a full species.

The Bering Sea, with its seasonal sea ice, forms a natural barrier between the range of *brachyrhynchus* and that of the Eurasian taxa. In the latter, such barriers appear to be absent, and the breeding ranges overlap to some extent (both *canus* and *heinei* occur west of Moscow and both *heinei* and *kamtschatschensis* are found in Yakutia and possibly also in the Baikal region). Therefore, intergradation between the Eurasian taxa seems a real possibility.

As we have shown in this paper, *brachyrhynchus* is a morphologically distinct taxon; we believe that it should be possible to identify every individual in the field, of any age group, using a combination of plumage features, size and structure. Its display calls are different from those of the other taxa, and it is genetically distinct. It is also geographically isolated. In conclusion, our data support the status of *brachyrhynchus* as a full species, a treatment indeed already adopted by some authorities (Sibley & Monroe 1997, Olsen & Larsson 2003).

Despite occupying a geographically intermediate position between *canus* and *kamtschatschensis*, *heinei* is certainly not morphologically intermediate between the two. This is evident from the wingtip pattern of adult and second-cycle birds, and also from our analysis of the plumage of first-cycle birds. The fact that the appearance of *heinei* is not intermediate is somewhat curious, and raises an interesting question about the evolutionary history of the three Eurasian taxa. For instance, if they evolved from a single common ancestor which then spread either east or west, evolving different traits as it did so, we might expect *heinei* to be morphologically intermediate between the two other taxa. As this is not the case, it might suggest that a simple ring-species model is not the best to explain the evolutionary history and resulting morphological differences between the three. While we cannot shed any light on this issue using our data, it is evident from what we have learnt about the appearance of *heinei* relative to the others that a spatially extensive genetic study of the type that has been able to chart the evolutionary history and dispersal of the large white-headed gulls would likely prove very insightful for the *Larus canus* complex.

Kamtschatschensis is generally regarded as a subspecies only, and genetic research seems to confirm this idea. In this sense, it is surprising that it appears to have some distinct, unique calls, and it is also worth pointing out that it is actually morphologically not that similar to the taxon it seems to intergrade with, *heinei*. Research in the contact zone between both taxa will likely be needed to clear up the taxonomic confusion.

Vagrancy and identification challenges

A fundamental aim of this paper is to provide a framework that can be used to approach the identification of out of range birds. As an example, plate 17-18 show an adult bird seen in Belgium that can be identified confidently as a *heinei* using the key (see plate captions and table 3). *Heinei* is generally believed or at least suspected to be a regular visitor to western Europe, so it will be interesting to see if more of such birds will be found now that identification does not have to rely solely on measurements. *Brachyrhynchus* has been recorded once in the Western Palearctic, an adult in the Azores in February-March 2003 (Alfrey & Ahmed 2007). There have also been several reports from Japan, one from Hong Kong, China, and at least one from South Korea. It is evident from the analysis of our sample birds that all age groups of this species are distinctive, so observers can approach the identification of a suspected vagrant with confidence. In the past, uncertainty about the key features of *brachyrhynchus* relative to the other taxa has occasionally created problems; as mentioned in the introduction, second-cycle birds seen in Britain with strong tail-bands and black in the secondaries have been mooted as *brachyrhynchus* candidates but it is now clear these are rather typical *heinei* traits. In East Asia, special care is needed due to the variability of *kamtschatschensis*; adult birds can be especially tricky, as their primary pattern can be really similar to that of *brachyrhynchus*. Variation in size and shape of *kamtschatschensis* should also not be underestimated.

First-cycle *heinei* have also been the subject of some uncertainty. Olsen & Larsson (2003) describe this age group as having more well marked tails and uppertail-coverts than *canus*, a description that puts them close to *kamtschatschensis*. As we have shown, *heinei* is actually the palest of all the taxa in the tail and uppertail-coverts, and it is *canus* that overlaps with *kamtschatschensis*. Ringing recoveries have demonstrated that birds from the breeding range of *heinei* occur in Europe in winter, so we hope that a combination of the keys (table 3-4), our descriptions and the statistics on the frequency of different character traits (diagram 1-15) can be used to tackle the identification of all age groups of this taxon in the field. Similarly, we hope that the criteria help in other parts of the world, for example in East Asia, where uncertainty over the separation of *heinei* and *kamtschatschensis* has hindered assessment of their relative abundance.

Kamtschatschensis is also a potential vagrant outside of its normal range. There have been a few well documented (but as yet unpublished) recent records on the East Coast of North America, including one as far east as Newfoundland, Canada, and it may be only a matter of time before one is found in Europe. Dark first-cycle birds occasionally seen in Europe have been the subject of discussion (see Edelaar & Ebels 2009). Plate 69 shows an example of the type of bird that may create

problems: it has a tail, outer tail-feather and uppertail-covert pattern easily within the range of *kamtschatschensis*. However, while it is an eye-catching bird, *kamtschatschensis* can be discounted because of the typical dark brown *canus* upperwing-coverts and neat grey second-generation scapulars. This bird also has an unmarked lower belly and vent, and the overall size and head and bill proportions also indicate *canus* rather than *kamtschatschensis*. See also plate 72, which illustrates that juvenile birds born in a *canus* colony can show features of *kamtschatschensis*.

Conclusions: key features for separating *Larus canus* taxa

The separation of a vagrant Mew Gull is a two-fold problem: first, how can we detect the bird among our local taxa, and second, how will we clinch the identification? On the ground, a vagrant adult is most likely to stand out from local taxa due to some combination of its upperpart tone, bare part colours, head pattern and its size or structure. If the base of the wing-tip is visible (just below the tertials) the extent of grey (or lack thereof) may also be helpful. A second-cycle bird may stand out in much the same way but it may also attract attention due to its strikingly more retarded or more advanced plumage compared with local birds. First-cycle vagrants may stand out from local birds due to the pattern and colour of their wing-coverts and scapulars, and the extent of brown on the neck and lower body, as well as possibly size and structure. Once a promising candidate has been picked out, the second stage requires aspects of the wing and, in immature birds, tail to be recorded in considerable detail. Because of the detail required, not just for adults but every age group, clinching the identification of a vagrant will require a good series of photographs.

Although we certainly do not want to underestimate our readers, we think it is unlikely that birders will commit to memory all the possible combinations of features that are diagnostic for each age group of each taxon. However, remembering these combinations is not actually necessary as long as birders can remember which feather groups are most important. With this in mind, below we highlight the feather groups which need to be recorded and, ideally, photographed.

Adults

A large proportion of adult birds can be separated using simply the details of the pattern on the upperside and underside of the primaries. Key things to record are:

- Extent of black on outer web of p8-9 extending towards primary coverts
- Length of tongue on underside of p8-9
- Presence and size of mirror on p8-9
- Pattern of black on p4-6
- Presence and size of any white tongue-tip on p7-9

In addition, eye and bill pigmentation can offer useful clues, as can the pattern of winter head streaking.

Second-cycle birds

Identification of second-cycle birds is based upon the same general set of features in the wing-tip as adults but further clues can be found in the tail, primary-coverts and secondaries; the extent of any dark streaks or crescents on head, body, underwing and tail-coverts is also useful, as is the pattern of the wing-coverts.

First-cycle birds

The identification of birds in their first-cycle depends on careful assessment of:

- Extent of dark pigment in tail, and especially outer web of outermost tail-feather
- Extent of barring or spotting on uppertail-coverts and undertail-coverts
- Colour tone and feather pattern of upperwing-coverts
- Extent of dark pigmentation on underwing, especially pattern on axillaries and lesser coverts
- Details of head and body coloration, especially extent of markings on belly, between legs and around vent
- Pattern of scapulars
- Pattern of inner primaries, especially innermost one

Some individuals lack the diagnostic suite of features that allows them to be assigned to a particular taxon, so will not be identifiable. This may be frustrating for birders wanting to resolve the identification of an unusual looking bird but this is how it is. Variation within each taxon and the existence of apparent intergradation zones dictate that birds showing less typical sets of features are likely to be encountered from time to time. In western Europe, it is important to remember that the intergradation zone between *canus* and *heinei* is closer than the range of *heinei*, so birds from that zone may occur with regularity in winter, perhaps more frequently so than typical *heinei* (the 'Siberian Common Gulls' from east of the Ural mountains).

We hope that this paper encourages birders to look at the *Larus canus* complex more closely and that it enables the identification of a suspected va-

grant to be approached with greater confidence than hitherto possible. We encourage birders to test the criteria we have presented, such that they can be validated against larger samples of birds and revised and improved as necessary.

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Samenvatting
DETERMINATIE VAN HET *LARUS CANUS*-COMPLEX Tot op heden is nog maar weinig gepubliceerd over de herkenning in het veld van de verschillende Stormmeeuwen *Larus canus*-taxa. Vooral het totale gebrek aan informatie over de ondersoort *L c heinei* (Russische Stormmeeuw) is daarbij opvallend. Toen Chris Gibbins in de winter van 2011 meeuwen ging kijken in Roemenië merkte hij echter tot zijn verbazing dat de lokale Stormmeeuwen er opvallend anders uitzagen dan wat hij in West-Europa gewoon was. Alles wees erop dat veel van deze exemplaren, die tot *heinei* moesten behoren, herkenbaar waren in het veld. Omdat we ook nog ideeën hadden over de andere taxa besloten we om alles grondig uit te werken en een artikel over het Stormmeeuwen-complex te schrijven. Uiteindelijk maakten we in totaal 12 reizen voor het observeren en fotograferen van de vier taxa (nominaat *canus* (Stormmeeuw), *heinei*, *kamtschatschensis* (Kamtsjatkastormmeeuw) en *brachyrhynchus* (Amerikaanse Stormmeeuw)), waaronder een bezoek aan het Zoölogisch Museum van Moskou, Rusland, waar we een groot aantal balgen van *heinei* en *kamtschatschensis* uit de broedgebieden konden bestuderen. De verschillende landen die we bezochten en de regio's waaruit de balgen en aanvullende foto's afkomstig zijn worden weergegeven in tabel 1 en figuur 1.

Voor adulte en tweedejaars Stormmeeuwen werd een scoresysteem ontwikkeld voor 22 verschillende kenmerken. De steekproefgrootte daarvoor per regio staat in tabel 2; de resultaten zijn te vinden in diagram 1-15. Het handpenpatroon vormt een belangrijk hulpmiddel om de vier taxa uit elkaar te houden maar omdat het vaak een nogal ingewikkelde puzzel is, besloten we om het te presenteren als een determinatiesleutel (tabel 3-4). Bij eerstejaars vogels zijn we meer beschrijvend te werk gegaan, hoewel we ook daar enkele kenmerken – met name het aantal juveniele schouderveren, staartpatroon, patroon van de buitenste staartpen en patroon van de bovenstaartdekveren – hebben opgedeeld in categorieën ('scores'); de resultaten worden weergegeven in figuur 3 en figuur 5-7. Om de vier taxa in het veld van elkaar te onderscheiden moet een combinatie van kenmerken gebruikt worden. Bij adulte vogels zijn dit: ***1*** koppatroon (in winterkleed); ***2*** iriskleur; ***3*** snavelkeur en -patroon ('s winters); en ***4*** handpenpatroon (met name de hoeveelheid zwart op de buitenvlag van p8-9, lengte van de tong op diezelfde handpennen, grootte van de witte spiegel op p9 en eventueel p8, hoeveelheid zwart op p4-6 en grootte van de witte tongtip op p7-9).

Bij tweedejaars vogels zijn in principe dezelfde kenmerken bruikbaar maar het handpenpatroon is nog niet zo ontwikkeld als bij adulte en vertoont een grote mate van overlap tussen de taxa. Er zijn echter nog verschillende bijkomende kenmerken: het patroon van de handpendekveren, armpennen, staart en vleugeldekveren, en de eventuele hoeveelheid bruin op lichaam, staartdekveren of ondervleugel.

Bij eerstejaars vogels zijn de volgende elementen van belang: ***1*** koppatroon ('s winters); ***2*** staartpatroon (vooral patroon van buitenste staartpen); ***3*** patroon van boven- en onderstaartdekveren; ***4*** kleur en patroon van bovenvleugeldekveren; ***5*** patroon van ondervleugel (vooral oksel en kleine dekveren); ***6*** hoeveelheid bruin op lichaam (inclusief anaalstreek); ***7*** patroon van nieuwe schouderveren; en ***8*** patroon van de binnenste handpen.

Verder kunnen bij alle leeftijden ook grootte, bouw en mantelkleur helpen bij de determinatie. Het zal echter lang niet altijd mogelijk zijn om van iedere Stormmeeuw in het veld de ondersoort te bepalen. Meeuwen zouden meeuwen niet zijn als er geen grote mate van overlap in kenmerken was en geen overgangszones met gemengd broeden en intergradatie. Toch stelden we tot onze verbazing vast dat bijvoorbeeld bijna de helft van alle adulte *heinei* in onze steekproef herkenbaar was.

In het artikel gaan we ook in op de geografische spreiding van *heinei* en *kamtschatschensis* en overgangszones tussen beide taxa. Verder hebben we ook de geluiden van elk taxon bestudeerd. Een belangrijke conclusie is dat op basis van reeds gepubliceerd genetisch onderzoek, het grote aantal in het veld herkenbare exemplaren (van alle leeftijden), de verschillen in de baltsroep, en het geografisch geïsoleerde verspreidingsgebied *brachyrhynchus* soortstatus verdient.

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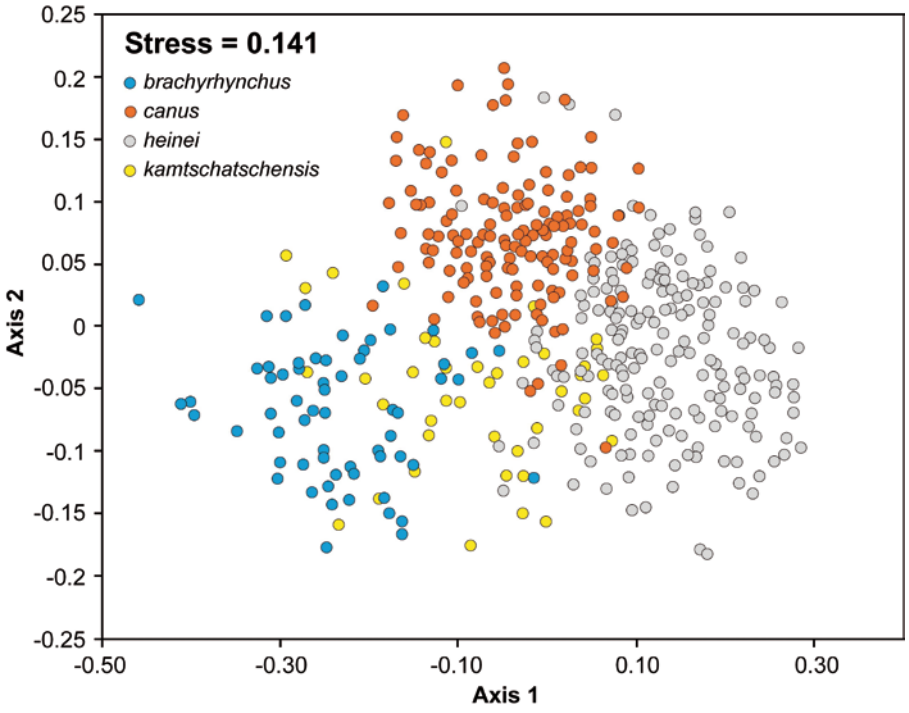
APPENDIX Non-metric Multi-Dimentional Scaling (NMDS)

Methods

Multivariate statistical approaches are useful for helping to visualise patterns of similarity when the sample units (in this case individual birds) are characterised using multiple features. Multivariate ordinations have been applied frequently to birds; eg, to wagtails by Adriaens et al (2010) and to large gulls by Gibbins et al (2011). In addition to simple visualisation, these approaches can highlight which of the features used in the characterisation are most useful for separating between groups of samples (in this case, the four taxa). We used Non-metric Multi-Dimenional Scaling (NMDS) to provide insights into patterns of similarity in the wing-tip patterns of the four taxa and to assess the wing-tip features characteristic of each one.

Several potential ordination approaches are available but, due to underlying assumptions and the characteristics of individual data sets, not all are necessarily applicable. Also, there is a danger that (because of detailed aspects of their mathematics) different approaches may lead to somewhat different interpretations about patterns of similarity in sample data. Thus, the choice of which approach to use may affect conclusions. We therefore first tested whether interpretations about the similarity of sample birds resulting from two applicable and commonly used approaches might differ. We used Procrustes Analysis to test for differences in the output of a Principal Components Analysis (PCA) and an NMDS. Tests were applied separately to the adult and second-cycle data. Procrustes assesses whether the similarity in the pattern on two ordination plots (in this case, a PCA and an NMDS) is significantly more similar than expected by chance. It does this by comparing the similarity of the ordinations of the two 'real' data sets with randomly generated ones (n = 999). If the real data ordinations are more similar to each other than 99% of the random comparisons, we conclude that the two ordinations are not significantly different, and hence the patterns they depict are similar. The Procustes Analysis indicated that the patterns of similarity did not differ between PCA and NMDS (adult birds: Procrustes sum of squares = 0.1688, correlation = 0.9117, significantly better than random, p = 0.001; second-cycle birds: Procrustes sum of squares = 0.1686, correlation = 0.9118, significantly better than randon, p = 0.001). Thus, the choice of whether to analyse and present the data using the PCA or NMDS ordination does not affect interpretation of the patterns of similarity amongst sample birds. We present results from the NMDS; this ordination has the advantage that there are no assumptions about the characteristics of the data. Values of Bray Curtis similarity were represented in two-dimensional space, with stress values indicating how well the patterns can be captured in these dimensions. All ordinations and the Procrustes tests were applied in

FIGURE 14 NMDS ordination of adult Mew Gull *Larus canus* taxa



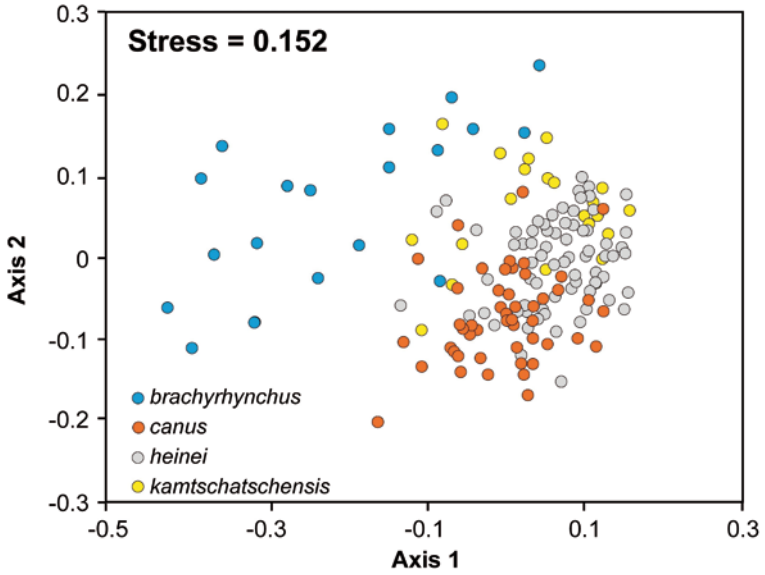


FIGURE 15 NMDS ordination of second-cycle Mew Gull *Larus canus* taxa

the Vegan package within the R environment. Note that not all 20 wing-tip features were recorded for every sample bird. As the analysis cannot be applied where there are missing values, some sample birds were removed from the data set. Similarly, some features were recorded for relatively few birds (depth of black on p5 and p4, p10 tongue shape) and so these features were not included. The final analyses were performed on 484 adult and 196 second-cycle birds, using 17 features.

Results

Adults

General interpretations of the patterns of similarity depicted in figure 14 were given in main results section. The final stress value for the two-dimensional plot is 0.141, indicating that overall patterns of similarity among sample birds can be represented well in two dimensions (any stress value <0.3 is considered robust). To avoid clutter, the positions of the 17 individual features on the plot are not shown. Key points that can be drawn from these positions are as follows: ***1*** the separation of *brachyrhynchus* and *heinei* across the horizontal dimension (axis 1) is related primarily to contrasting p8 and p7 tongue-tip patterns, differences in the the extent of black on p9, p8 and p7, and different p8 tongue lengths; and ***2*** separation in the vertical dimension, which is principally related to the separation of *canus* from the others, is related mainly to the presence of a p8 mirror and the extent of black on p5.

Second-cycle birds

General interpretations of the patterns of similarity depicted in figure 15 were given in main results section. The final stress value for the two-dimensional plot is 0.152, indicating that overall patterns can be represented well in two dimensions. To avoid clutter, the positions of 17 features on the plot are not shown. Key points that can be drawn from these positions are as follows. (i) *brachyrhynchus* separates from the others because of differences in the amount of black on p8 and p9, p8 tongue length, p8 tongue-tip and the shape of black on p8. (ii) the other taxa share many similarities, except that some *kamtschatschensis* separate from *canus* and *heinei* in the vertical dimension due to differences in the amount of black on p3 and p4 as well as by sharing some similarities in the extent of black on p7 and p9 and the shape of black on p8 with some *brachyrhynchus*.

Extra nummer van Dutch Birding – Determinatie van het *Larus canus* complex

Het artikel 'Identification of the *Larus canus* complex' van Peter Adriaens en Chris Gibbins in dit nummer van Dutch Birding is baanbrekend omdat hierin voor het eerst ooit over de volle breedte het Stormmeeuwen *Larus canus*-complex wordt uitgeplozen. De focus ligt op herkenning en kleedvariatie waarbij gedetailleerd wordt ingegaan op combinaties van kleedkenmerken om de verschillende taxa te herkennen. Op basis van de bevindingen wordt ook ingegaan op de taxonomie, waarbij voor *brachyrhynchus* (Amerikaanse Stormmeeuw) soortstatus wordt bepleit.

Al enkele decennia is er veel aandacht voor de taxonomie en herkenning van meeuwen. De meeste aandacht ging tot nu toe naar 'grote witkoppige meeuwen', de groep die vroeger simpelweg uit Zilvermeeuw *Larus argentatus* en Kleine Mantelmeeuw *L fuscus* bestond maar die tegenwoordig als een complex van wel zeven of meer soorten wordt beschouwd. Kleine meeuwensoorten kregen minder aandacht, terwijl ook daar veel vragen bestaan over herkenning en taxonomie. Dit artikel gaat in op een groot aantal van die vragen.

Het artikel helpt bijvoorbeeld om in het veld het taxon *heinei* (Russische Stormmeeuw) te herkennen; de status van *heinei* in West-Europa is nog onduidelijk – dwaalgast of gewone wintergast? De in dit artikel aangeboden kennis is ook van belang om (andere) dwaalgasten te determineren, zoals *brachyrhynchus* in Oost-Azië en West-Europa (dit taxon is al eens in de Azoren vastgesteld), nominaat *canus* (Stormmeeuw) in het oosten van Noord-Amerika, of *kamtschatschensis* (Kamtsjatkastormmeeuw) in het westen van Noord-Amerika of in het westen van Azië (of verder westelijk...).

Dit omvangrijke artikel onderstreept de positie en ambities van Dutch Birding als tijdschrift in de (veld) ornithologische frontlinie, waarbij 'zware' onderwerpen niet uit de weg worden gegaan. Het artikel laat ook zien wat gedreven vogelaars kunnen bereiken als ze voldoende motivatie, kennis en benodigde logistieke en/of financiële ondersteuning hebben. Bestuur en redactie van Dutch Birding zijn blij dat een bijdrage uit het Dutch Birding-fonds heeft geholpen bij de totstandkoming van het artikel. Om alle ruimte te bieden aan de onderzoeksresultaten is besloten om het in een extra nummer van Dutch Birding uit te geven. Gelijktijdig wordt een regulier nummer uitgebracht, zodat er geen vertraging ontstaat in het publiceren van reguliere artikelen en mededelingen. Bestuur en redactie willen naast de auteurs tevens alle abonnees danken. Zonder hun steun zou het niet mogelijk zijn om zulke speciale nummers uit te brengen. BESTUUR & REDACTIE DUTCH BIRDING

Special issue of Dutch Birding – Identification of the *Larus canus* complex

The paper 'Identification of the *Larus canus* complex' by Peter Adriaens and Chris Gibbins in this issue of Dutch Birding is groundbreaking as it treats the entire Mew Gull *Larus canus* complex. The paper's focus is on plumage variation of all four taxa of Mew Gull, providing details on combinations of plumage characteristics to identify each taxon. Based on the findings the taxonomy is discussed as well, and species status is proposed for *brachyrhynchus* (Short-billed Gull).

For several decades, there has been much attention for the taxonomy and identification of gulls. Most attention has been paid to 'large white-headed gulls', the group that once comprised simply Herring Gull *Larus argentatus* and Lesser Black-backed Gull *L fuscus*, but is now considered a complex of seven or more species. Small gull species, however, have received less attention, whereas the recognition and taxonomy of this group also hold many unresolved questions. This paper addresses a large number of these questions.

For instance, the paper helps birders to identify the taxon *heinei* (Russian Common Gull) in the field; the status of *heinei* in western Europe is still unclear - vagrant or regular winter visitor? The paper also presents the knowledge necessary to identify vagrants, such as *brachyrhynchus* in eastern Asia and western Europe (it has been recorded in the Azores), nominate *canus* (Common Gull) in eastern North America, or *kamtschatschensis* (Kamtchatka Gull) in western North America or in western Asia (or further west...).

The publication of this paper emphasizes the position and ambitions of Dutch Birding on the (field) ornithological frontier, with 'heavy' subjects not being avoided. It also shows what passionate birders can achieve when motivation, knowledge and the necessary logistical and financial support are available. Financial support was arranged by a contribution from the Dutch Birding fund. To do justice to this lengthy paper, board members and editors decided to publish it in a special issue, while publishing a regular issue at the same time. For making this special issue possible, board members and editors of Dutch Birding want to thank not only the authors but also the subscribers, without whose support the publication of such a special issue would not be possible. BOARD & EDITORS DUTCH BIRDING