

Identification of Azores Gull

Peter Adriaens, Peter Alfrey, Chris Gibbins & Daniel López-Velasco

Yellow-legged Gull *Larus michahellis* is a familiar species in many European countries. However, the identification, taxonomy and distribution of its various subspecies have received comparatively little attention and a number of important issues still remain clouded in considerable uncertainty. Recent authoritative literature on gulls does not agree on the number of subspecies: Howell & Dunn (2007) recognize nominate *L m michahellis* and the Atlantic subspecies *L m atlantis* (hereafter *atlantis*) but Olsen & Larsson (2004) and Olsen (2018) include a third one, *L m lusitanus* (hereafter *lusitanus*) from north-western Iberia. There are particular problems and uncertainties associated with *lusitanus*, a taxon that we will consider in some detail here. The taxon has been poorly described, and is not recognised by many authors (eg, Howell & Dunn 2007, Dickinson & Remsen 2013, Gill et al 2020). Moreover, there does not seem to be agreement on the precise breeding ranges of the different subspecies, with authors variously restricting *atlantis* to only the Azores (Dubois 2001, Yésou 2002, Olsen 2018), to all of the Macaronesian islands (Dwight 1922, 1925, Cramp & Simmons 1983, Grant 1986, Garner & Quinn 1997, Jonsson 1998, AERC TAC 2003, Olsen & Larsson 2004, Howell & Dunn 2007), to the Macaronesian islands and coastal north-western Africa (Collinson et al 2008) or all of these locations with the coasts of north-western Spain and Portugal sometimes included (Stegman 1934, de Knijff et al 2001, Liebers et al 2001, Sternkopf et al 2010). Most recently, Stoddart & McNerny (2017) highlighted uncertainties over the distribution and taxonomic status of *atlantis* in their review of records of this taxon in Britain.

This paper focuses on the identification of *atlantis*, to which we refer as 'Azores Gull'. Other authors have sometimes referred to this taxon as Atlantic Gull, Atlantic Yellow-legged Gull or Azorean Yellow-legged Gull (eg, Stoddart & McNerny 2017; www.dutchavifauna.nl/wpvogelnamen). In order to treat its identification in a comprehensive way, we needed to make sense of Mediterranean *michahellis*, birds on other Macaronesian islands, as well as the gulls that occur in Portugal and north-western Spain. Looking at this regional variation caused us to also assess vocalisations, and the results of these analyses led us to reconsider

the taxonomy of Yellow-legged Gulls. As well as dealing with the identification of *atlantis*, we therefore offer some views on taxonomic relations between the various populations we have analysed. However, we stress that we are field ornithologists rather than taxonomists and are mainly interested in how distinctive a certain taxon is in the field or, in other words, whether we can determine the geographic origin of an individual bird with any degree of certainty. To our eyes, it is mainly the birds from the Azores that look sufficiently different from nominate *michahellis* to be identifiable away from their breeding range and this is our focus. The specific aims of this paper are: **1** to present solid identification criteria for vagrant Azores Gull; and **2** to use these criteria, voice and genetics to comment on taxonomic relations between the various Yellow-legged Gull taxa and on the vagrancy of Azores Gull.

Material and methods

Sample data

The authors have extensive field experience with Yellow-legged Gulls, from the Azores east to the Black Sea coast of Georgia. Daniel López-Velasco lives on the Cantabrian coast in Asturias, Spain, and is thoroughly familiar with the local Yellow-legged Gulls. This paper is based on many trips to the Azores, including a specific one in February 2015 to study and photograph Azores Gulls, several trips to Portugal (Porto, Peniche and Algarve coast) and Morocco, and eastwards to Turkey and Georgia. We also checked skins of adult birds from the Azores, the Canary Islands, Madeira and Iberia in the Natural History Museum at Tring, England, and we received data from Andres Bermejo, Pim Edelaar and Bert Saveyn who examined skins in Estación Biológica de Doñana at Sevilla, Spain, and Museo Nacional de Ciencias Naturales at Madrid, Spain. In addition, we received and collected numerous photographs from the Atlantic and Iberian breeding range taken throughout the year, including many from the Canary Islands, Madeira and the Gibraltar area.

Photographs and our field observations were used to distill features for each age type that offer most help with the identification of out-of-range birds. For all immature age classes this was done

qualitatively, and accordingly, in the text that follows, we simply describe these features. Many of the birds that we looked at were not ringed, so the usual caveats about classifying immature birds into the correct age class apply (see also Arizaga et al 2019). However, it goes without saying that we have taken utmost care when assigning birds to a certain age type. Because adult plumage traits are more amenable to quantitative analysis, we adopted a different approach for this age class, scoring the primary pattern of a large sample and assessing the frequency of different primary patterns in the various populations. This is detailed in the following section. We also include scores for the upper-part grey tones of adult birds based on a Kodak grey scale applied to museum skins.

For practical reasons, we use the classification in cycles (first-cycle, second-cycle and so on) to age birds, rather than the classic system of first-winter, first-summer, second-winter and so on (cf Dutch Birding 1985), because the cycle classification fits the complex moult cycles of gulls better (cf Howell et al 2003, Howell 2010, Adriaens & Gibbins 2016).

Scoring system for adult birds

Using high quality photographs, we examined the wing-tip pattern of a total of 959 adult Yellow-legged Gulls from the Macaronesian islands, Iberia, Morocco, Croatia, Greece, Israel and Turkey. Sample sizes for each region are presented in table 1, and sample locations are shown in figure

1. Birds showing signs or remnants of immaturity were excluded from the samples (except those with a few thin dark streaks on primary coverts, which can be shown by very old gulls; cf Muusse et al 2011). All birds examined were photographed during the breeding season, except for a number of birds from the Macaronesian Islands (see table 1). Since the latter populations are isolated and largely sedentary (see section 'Movements and vagrancy'), we felt that Macaronesian birds photographed at any time of the year could safely be included in the sample.

Specifically, we looked at the following features that we deemed most useful for identification: **1** the length of the pale tongue (= wedge) on the underside of the outermost primary (p10) compared with the length of the feather (from tip to primary coverts); **2** the presence and extent of a white mirror on p9; **3** the length of the black pattern on the outer web of p8 (again compared with the length of the feather); and **4** the presence and extent of a black pattern on p3-4. The categories for each of these criteria are presented and illustrated in table 5; for topography of a gull wing, see Olsen & Larsson 2004 (p 21). We also systematically noted the presence of thin dark streaks on the primary coverts, but these turned out to be irrelevant for identification purposes.

Analysis of calls

We examined the display calls ('long calls') of adult Yellow-legged Gulls from 126 recordings.

FIGURE 1 Sample locations of adult Yellow-legged Gulls *Larus michahellis* used for scoring of primary patterns. Green = proportion of birds from the breeding season; blue = proportion of non-breeding birds. The size of each pie chart reflects sample size (see table 1). Azores unsp. = Azores unspecified (no exact location given).



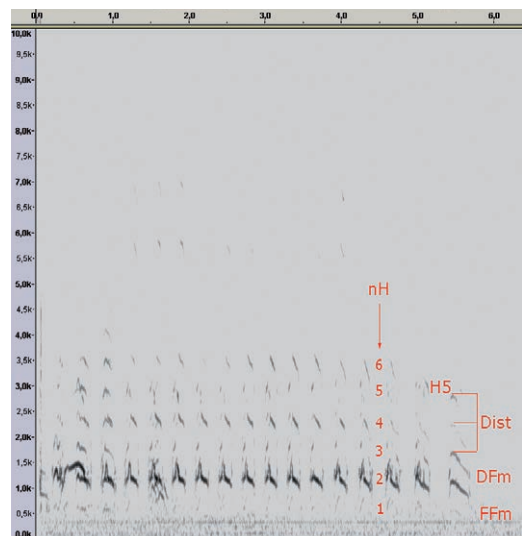
TABLE 1 Summary of all locations and sample sizes (n) for adult Yellow-legged Gulls *Larus michahellis* included in analysis of wing-tip patterns. * = non-breeding birds.

location	n	location	n
Azores, Corvo	1+4*	Gibraltar	10
Azores, Faial	3+1*	Ceuta	22
Azores, Flores	3*	subtotal Gibraltar	32
Azores, Graciosa	1+1*	Madeira	30+59* (=89)
Azores, Pico	12+1*	Morocco (Casablanca - Agadir)	33
Azores, Santa Maria	3	Portugal (Peniche)	103
Azores, São Miguel	12+21*	Spain, Galicia	28
Azores, Terceira	5+108*	Spain, País Vasco	89
Azores, unspecified	25*	subtotal northern and north-western Spain	117
subtotal Azores	37 + 164* (=201)	Spain, Andalucía	31
Canary Islands, El Hierro	2*	Spain, Catalunya	113
Canary Islands, Fuerteventura	4+11*	subtotal michahellis Spain	144
Canary Islands, Gran Canaria	1+10*	Croatia	55
Canary Islands, La Gomera	1	Greece	22
Canary Islands, La Palma	3+5*	Israel	30
Canary Islands, Lanzarote	19+32*	Turkey	20
Canary Islands, Tenerife	2+20*	subtotal 'eastern michahellis'	127
Canary Islands, unspecified	3*		
subtotal Canary Islands	30 + 83* (=113)	TOTAL	959

The number of recordings that we obtained from each region is shown in table 2. Some recordings were made by us (Azores, February 2015) but most were either sent to us or were obtained from the Xeno-Canto website (www.xeno-canto.org). Long calls of immature birds were excluded from the analysis. Research on calls of Yellow-legged Gulls was published by Teyssèdre (1983, 1984). She compared recordings of the calls of 30 Yellow-legged Gulls from a breeding colony in País Vasco (Basque country), northern Spain, with 30 from Camargue, Bouches-du-Rhône, France, and eight from Ile d'Oléron, Charente-Maritime, France. In order to obtain results that could be compared with her work, we adopted the same analytical methods. Thus, we looked at the following elements of the long call on sonograms: **1** maximum frequency of the fundamental (FFm), ie, the lowest harmonic (lowest layer) of each call note on the sonogram; **2** maximum frequency of the dominant harmonic (DFm), ie, the most visible, boldest harmonic; **3** number of harmonics (nH) visible in the sonogram (for each call note); and **4** prominence/visibility of fifth harmonic (H5) in the sonogram (categorized as 0 = weak/absent, 1 = intermediate, 2 = strong/bold). Harmonics are layers of sound that show up in a sonogram one above the other; they are also called overtones. The more nasal a call note, the more harmonics it will show in a sonogram. We added one more feature to the analysis: **5** distance between the harmonics (Dist), which was not examined by Teyssèdre (1983,

1984). This was analysed by measuring the distance between DFm and the first harmonic above it, although generally the distance between all harmonics is roughly the same. Because the number of harmonics visible in the sonogram tends to vary with distance to the bird, only good quality record-

FIGURE 2 Long call of adult Azores Gull *Larus michahellis atlantis*, Terceira, Azores, 18 February 2015 (Peter Adriaens). Example of sonogram analysis.



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TABLE 2 Locations and numbers of recordings (n) of display calls of adult Yellow-legged Gulls *Larus michahellis* analysed for this paper.

location	n	location	n
eastern Spain	2	La Palma	1
south-eastern France	7	Fuerteventura	5
Bulgaria	2	Lanzarote	3
Switzerland	2	Lobos	3
Italy	2	subtotal Canary Islands	12
subtotal michahellis	15	Madeira	8
Galicia	19	Morocco	3
País Vasco	2	Berlengas	7
Asturias	1	Peniche	7
subtotal northern and north-western Spain	22	Sagres	6
Terceira	7	Lisboa	3
São Miguel	1	subtotal Portugal	23
Santa Maria	5	Cádiz, near Gibraltar	11
Flores	19		
subtotal Azores	32	TOTAL	126

TABLE 3 Kodak grey scale values of upperparts of adult Yellow-legged Gulls *Larus michahellis*; skins examined mainly at Natural History Museum (Tring, England), Estación Biológica de Doñana (Sevilla, Spain) and Museo Nacional de Ciencias Naturales (Madrid, Spain); * subadult bird.

location	sample size	Kodak grey scale value	sources
Azores	>15	7-9	own data; Olsen & Larsson 2004
Canary Islands	7	7-8	own data; Andres Bermejo unpublished data; Pim Edelaar & Bert Saveyn unpublished data
Madeira	2	8-9	own data
Western Sahara, Morocco	1*	7	Pim Edelaar & Bert Saveyn unpublished data
Portugal	?	6.5-8	Olsen & Larsson 2004
Galicia (north-western Spain)	15	5.5-7	own data; Andres Bermejo unpublished data; Pim Edelaar & Bert Saveyn unpublished data
Asturias (north-western Spain)	3	6.5-7.5	own data
Cantabria (northern Spain)	1	5	Andres Bermejo unpublished data
País Vasco (northern Spain)	1*	5	Pim Edelaar & Bert Saveyn unpublished data
western Mediterranean (nominate <i>michahellis</i>)	25	5-7	own data; Andres Bermejo unpublished data; Pim Edelaar & Bert Saveyn unpublished data

ings were used that were taken at close distance. An example of the analysis is shown in figure 2. The results are discussed in the section on ‘Voice’.

Regional variation

Adults

In this section we first provide details of the nature and extent of variation found across the geographic range occupied by Yellow-legged Gulls. This assessment is then used in the second section as the platform from which to approach the identification of vagrant adult Azores Gulls.

Regional variation throughout Iberia and Atlantic
Most books and many websites only depict nominate *michahellis*, which has a relatively homogeneous appearance throughout its extensive breeding range. It should be noted, however, that small differences exist in primary pattern between western and eastern adults of this taxon. There are, for example, differences in the pattern of p10, with nearly 17% of a sample of 121 adults from Istanbul, Turkey, having a wholly white tip (ie, birds lacked any black terminal marks on this primary) compared with only 1% of 99 birds from Catalunya, Spain. Eastern birds also tend to have longer

TABLE 4 Measurements (in mm) of adult Yellow-legged Gulls *Larus michahellis* from various locations (sexes combined). Given are mean and range.

location	sample size	wing length	tarsus length	bill depth at gonys	sources
western Mediterranean	388	451.4 (410-485)	68 (58-80)	18.4 (16-20.5)	Andres Bermejo unpublished data; Isenmann 1973, Cramp & Simmons 1983, Carrera et al 1987, Bosch 1995
País Vasco, Spain	252	425.7 (399-471)	64.5 (55.5-80.5)	19 (14-24)	Mínguez & Ganuza 1995, Arizaga et al 2008, Galarza et al 2008
Asturias, Spain	12	428.3 (407-446)	62.9 (58.9-68.4)	17.1 (15.2-20.1)	Andres Bermejo unpublished data
Galicia/Portugal	111	420.5 (337-454)	63.4 (55-75.4)	18.1 (11.5-20.5)	Andres Bermejo unpublished data; Cramp & Simmons 1983, Carrera et al 1987
Morocco	?	428.5 (410-445)	63.3 (61.6-65)		Andres Bermejo unpublished data; Urban et al 1986
Canary Islands/Madeira	>30	424.8 (395-450)	64.4 (60-69.5)	18.4 (16.6-20.1)	Andres Bermejo unpublished data; Volsøe 1951, Bannerman 1963, Cramp & Simmons 1983
Azores	>34	417.5 (395-438)	64 (59-68)	18.25 (16.5-20.5)	Dwight 1922, 1925, Vaurie 1965

pale tongue on p10. However, these differences make eastern birds much less like Azores Gull and so they are not considered in further detail here. Further studies may reveal additional differences but they are not the focus of this paper. In the westernmost part of its range, however, Yellow-legged Gull shows more variation and there appear to be several populations that differ in plumage and voice (discussed later).

STRUCTURE

Measurements of adult Yellow-legged Gulls from various populations are shown in table 4. Compared with nominate *michahellis*, Macaronesian, Atlantic Iberian and Moroccan birds all average appreciably smaller with shorter wing length and shorter tarsus. Among the 'Atlantic' populations themselves there are no real differences in structure, although birds from País Vasco appear to show a rather deep bill by comparison, at least as heavy as in *michahellis*, which is remarkable given the smaller overall size of these birds and because birds from Asturias, which is only slightly further west, on average seem to have the most slender bill of all. The sample size from the latter region is very small, however, and no clear differences in bill depth are evident between birds from País Vasco and those from Galicia.

HEAD STREAKING

Compared with nominate *michahellis*, adult Yellow-legged Gulls from the Atlantic region tend to show more head streaking in autumn. This is especially true for Azores Gull, which regularly exhibits a hood of strong streaking that is restricted to the head and that covers the forehead, lore and chin. Often, the malar area is distinctly streaked. In other populations, the head streaking is usually not so intense, although a few birds from the Canary Islands, Madeira and even Galicia can show a very similar strong hood, so this character seems not restricted to the Atlantic islands. We have seen several birds in Galicia with such a head pattern; since their mantle colour was the same as in the local Yellow-legged Gulls, these were probably just local birds. In addition, a few colour-ringed birds born in Asturias have shown rather strong streaking not just around the eye but also on forehead, lore and malar area (although not the chin/throat). However, most have shown some streaking on hindneck too, making the hood look less neatly demarcated than in Azores Gull. Such birds were young adults when sporting such a head pattern, in their fifth- or sixth-cycle. Even subadult *michahellis* can show a hood, though only rarely so (plate 409). Along the Iberian Atlantic coast, head streaking can be much more extensive than in *michahellis*, reaching far down onto the lower



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404 Azores Gulls / Azorengelpootmeeuwen *Larus michahellis atlantis*, adult, Terceira, Azores, 21 February 2015 (Chris Gibbins). In addition to their dark, slaty-grey upperparts and deep yellow leg colour (in breeding plumage), adult Azores also typically show extensive black at base of wing-tip (just visible here below tertials). **405** Azores Gull / Azorengelpootmeeuwen *Larus michahellis atlantis*, adult, Azores, 15 October 2016 (Asier Aldalur). In autumn, head streaking typically forms isolated hood that does not reach down to lower neck area and that covers entire head including area around bill base. A few birds are already white-headed by this time of year though. **406** Azores Gull / Azorengelpootmeeuw *Larus michahellis atlantis*, adult, Azores, 14 October 2016 (Asier Aldalur). Although autumn birds often show eye-catching head pattern, identification can be problematic since outer primaries are still growing and primary pattern is therefore incomplete. Note, however, that dark 'shin pads' still remain on tarsus of this bird. **407** Azores Gull / Azorengelpootmeeuw *Larus michahellis atlantis*, adult, Terceira, Azores, 18 February 2015 (Peter Adriaens). Nearly one out of every two birds lacks grey base on outer web of p8. There is usually only one white mirror, black spot on p4, and grey tongue on underside of p10 is very short.

neck, where it may even form a brown 'shawl' (plate 414). Some adult birds from Atlantic Iberia may retain head streaking until February, i.e. much longer than in *michahellis* and birds from the Azores, which both often become white-headed by November.

IRIS

As already noted by Dubois (2001), the iris of adult Azores Gull is often slightly paler than in *michahellis*, sometimes even whitish. However, some birds in the Canary Islands, Madeira, Morocco and the Iberian Atlantic coast can show a similarly pale iris. Nominate *michahellis* shows a yellow iris,

sometimes with dark pigmentation. Differences are (very) subtle though, and we did not score the iris colour in our sample of birds.

UPPERPARTS

Kodak grey scale values of the upperparts of all groups studied are shown in table 3. Adult birds from the Azores have clearly darker grey upperparts than nominate *michahellis*; their upperparts can be nearly as dark as in British Lesser Black-backed Gull *L. fuscus graellsii*, although with a more bluish tinge. Birds from the Canary Islands and Madeira are similarly dark, as are many birds from Portugal and Morocco. Birds from Galicia



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408 Azores Gull / Azorengeelpootmeeuw *Larus michahellis atlantis*, adult, Terceira, Azores, 18 February 2015 (Peter Adriaens). Another bird with typical primary pattern, showing only one white mirror on each wing, black spot on p4, very short tongue on p10 and full black outer web of p8 up to primary coverts. **409** Mediterranean Yellow-legged Gull / Mediterrane Geelpootmeeuw *Larus michahellis michahellis*, (sub)adult, Port de Palma, Mallorca, Balearic Islands, Spain, 4 November 2006 (Maties Rebassa). Relatively paler, more bluish-grey upperparts, big white primary tips and location make this most likely nominate bird but its head pattern could certainly cause confusion with Azores Gull *L. m. atlantis*. **410** Yellow-legged Gull / Geelpootmeeuw *Larus michahellis*, adult, with Lesser Black-backed Gull / Kleine Mantelmeeuw *L. fuscus*, Ares, Galicia, Spain, 19 November 2007 (Antonio Guttierrez). Ringed as pullus near Xove, Galicia; at time of photograph, it was young adult (in its fifth-cycle). Note very extensive streaking on head and neck. **411** Yellow-legged Gull / Geelpootmeeuw *Larus michahellis*, adult, Sagres, Portugal, 8 November 2018 (Peter Adriaens). Birds wintering in mainland Portugal can show extensive head streaking, though it tends to be sparser and more diffuse around bill base (as can be seen on chin of this bird) and often extends down on neck.

and Asturias, Spain, show more intermediate upperparts coloration, overlapping with darker examples of nominate *michahellis*. Contra Olsen & Larsson (2004) and Olsen (2018), their upperparts do not appear paler in the field; rather, when ringed adult *michahellis* turn up in Galicia, it is often apparent that the local Yellow-legged Gulls appear subtly darker. By contrast, adults from Cantabria and País Vasco in northern Spain look rather pale, not much darker than British Herring Gull *L. argentatus argenteus* and overlapping with paler nominate *michahellis*.

PRIMARY PATTERN

Details of the primary pattern of adult birds throughout the Atlantic and Iberian region are shown in table 5. Birds from the Azores show the most extensive black on the outer primaries. Most of the adult Azores Gulls (94%) in our sample lacked a white mirror on p9, most showed some black pattern on p4 (78%) and, importantly, nearly half showed an entirely black outer web on p8. In adult *michahellis* throughout the entire Mediterranean region, only 19-26% lacked a white mirror on p9, only 24-38% showed some black on p4 and in only one bird (0-1%) the outer web of p8

TABLE 5 Frequencies of different wing-tip features of adult Yellow-legged Gulls *Larus michahellis* included in our analysis; values show percentage of sample birds showing each feature. For sample sizes, see table 1.

feature	category	pattern	illustration	Azores	Canary Islands	Madeira	Bedeias (Portugal)	Morocco	North-western Spain	Eastern Spain	Gibraltar	Eastern Mediterranean
p10	A	tongue > 1/2 of length of feather		0%	0%	0%	1%	0%	0%	1%	10%	10%
	B	tongue 1/3-1/2		4%	33%	39%	12%	56%	28%	38%	40%	41%
	C	tongue < 1/3		93%	67%	61%	84%	44%	71%	61%	50%	49%
	D	no pale tongue		2%	0%	0%	2%	0%	1%	0%	0%	0%
p9	A	no mirror		94%	61%	78%	73%	63%	43%	26%	23%	19%
	B	mirror confined to one web		5%	23%	10%	22%	31%	33%	31%	26%	37%
	C	mirror on both webs		2%	16%	11%	6%	6%	24%	43%	52%	44%
p8	A	entire outer web black to primary coverts (PC)		42%	9%	1%	10%	0%	3%	1%	0%	0%
	B	black reaches PC only along outer edge		17%	11%	10%	32%	13%	6%	5%	4%	1%
	C	black falls up to 1/3 of length of feather short of PC		41%	76%	85%	56%	75%	83%	80%	76%	74%
	D	black falls >1/3 to 1/2 short of PC		0%	4%	3%	2%	13%	7%	13%	20%	25%
	E	black falls > 1/2 short of PC		0%	0%	0%	0%	0%	0%	1%	0%	0%
p4	A	no black		23%	45%	55%	64%	44%	78%	72%	71%	62%
	B	black spot on only one web		73%	54%	41%	35%	50%	18%	26%	26%	33%
	C	both webs but broken		3%	1%	4%	1%	6%	3%	2%	3%	5%
	D	complete band		3%	0%	0%	0%	0%	1%	0%	0%	0%
p3	A	no black		95%	100%	100%	100%	100%	100%	100%	100%	100%
	B	black spot on only one web		5%	0%	0%	0%	0%	0%	0%	0%	0%

was fully black up to the primary coverts. The combination of these characters is useful for identification, and is discussed in the next section.

The lack of a white mirror on p9 is also a notable feature in many adult Yellow-legged Gulls from Madeira and Portugal and, to a lesser extent, the

Canary Islands, while about half of the birds from Madeira and the Canary Islands showed some black on p4.

Although there is considerable overlap, the primary pattern of adult Yellow-legged Gulls from northern and north-western Spain differs subtly from nominate *michahellis* in that more birds (43%) lack a white mirror on p9 and in more birds (71% versus 49-61%) the grey tongue on the inner web of the outermost primary (p10) is short, ie, less than one-third of the length of the feather. Andres Bermejo (in litt) found a similar result in that 49% of his sample of 111 adult birds from north-western Spain lacked a white mirror on p9.

It is worth noting that we could not find any clear differences in primary pattern between the birds from País Vasco in our sample and those from Galicia, while birds from Portugal differed from the Basque birds by being less likely to show a white mirror on p9 and a bit more likely to show some black pattern on p4. Garner & Quinn (1997), quoting Teyssèdre (1983), also pointed out slight differences in primary pattern between birds from Portugal, País Vasco and nominate *michahellis* from southern France. However, their notes are puzzling since they describe the op-

posite of our results, as they report Basque birds averaging more extensive white on p9 than *michahellis* and tending to show a longer grey tongue on p10. Their description was copied by Olsen & Larsson (2004) and Olsen (2018) but we have no way of confirming it; in our samples the Basque



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412 Yellow-legged Gull / Geelpootmeeuw *Larus michahellis*, adult, Sagres, Portugal, 7 December 2016 (*Peter Adriaens*). This bird shows quite extensive black on outer primaries including black spot on p4 but, on outer web of p8, black colour does not reach primary coverts. **413** Presumed hybrid gull / vermoedelijk hybride meeuw *Larus*, adult, Rotterdam, Zuid-Holland, Netherlands, 31 March 2014 (*Merijn Loeve*). This colour-ringed bird (ringed as adult) was breeding in harbour of Rotterdam annually in 2014-16. Its primary pattern is very similar to typical Azores Gull *L. michahellis atlantis* but note thin sliver of grey at base of p8. **414** Yellow-legged Gull / Geelpootmeeuw *Larus michahellis*, (sub)adult, Sagres, Portugal, 27 November 2016 (*Peter Adriaens*). A few birds wintering in mainland Portugal show impressive brown 'shawl' on neck, which, together with pale, staring iris, may even be reminiscent of American Herring Gull *L. smithsonianus*. **415** Putative 'Macaronesian' Yellow-legged Gull / mogelijke 'Macaronesische' Geelpootmeeuw *Larus michahellis*, subadult, with adult Yellow-legged Gull / Geelpootmeeuw in background, Cariño, Galicia, Spain, 4 January 2012 (*Antonio Gutierrez*). This bird still showed signs of immaturity, such as extensive black on primary coverts and alula, which means that large amount of black on outer primaries cannot be considered diagnostic of Azores Gull *L. m. atlantis* here. Still, head pattern with restricted hood that is solidly dark in front of eye, as well as slaty-grey upperwings clearly darker than in local Yellow-legged Gulls seem to indicate this subspecies or at least seem to point to Macaronesian origin.

birds (n=89) tend to show a little more black on the outer primaries than *michahellis*, not less (see table 5). A sample of 26 adult birds from Cantabria (*Andres Bermejo* in litt) further corroborates our results (half of his sample birds lacked a mirror on p9, and 85% showed only a short grey tongue on p10). In another sample of 155 adult birds from País Vasco (*Arrizaga et al* 2008), 34% were found to lack a mirror on p9, ie, again a bit more frequently than in *michahellis*. The problem seems to be that Teyssèdre's (1983) data from País Vasco was based on only 12 birds, too few for meaningful

conclusions, but several subsequent works have relied on these data so the 'myth' has perpetuated.

Our small sample of adult Yellow-legged Gulls from Morocco (n=33) suggests that the primary pattern may be rather similar to that of *michahellis*, with 56% of these birds showing a similar, distinct grey tongue on p10 (longer than one-third of the length of the feather). However, the Moroccan birds less frequently show a white mirror on p9 (absent in 63%) and more often have some black pattern on p4 (in 56%).

The primary pattern of birds in the Gibraltar-



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416 Azores Gull / Azorengelpootmeeuw *Larus michahellis atlantis*, first-cycle, Azores, 10 October 2016 (*Asier Aldalur*). In early autumn, first-cycle birds are often less characteristic than during winter since their greater coverts are still fresh, with barred pattern. In this respect, they do not differ from Madeiran, Canarian or even Iberian birds, which may complicate identification. As an aside, this bird shows advanced moult: not only scapulars but also many median and lesser coverts have been replaced. **417** Azores Gull / Azorengelpootmeeuw *Larus michahellis atlantis*, first-cycle, Terceira, Azores, 21 February 2015 (*Chris Gibbins*). During winter, wing-coverts become worn and look uniformly brown, almost oil-stained. Note also zebra-like barring on flank (above legs). **418** Azores Gull / Azorengelpootmeeuw *Larus michahellis atlantis*, first-cycle, Terceira, Azores, 16 February 2015 (*Peter Adriaens*). Note dusky head with dark forehead and distinct streaking on throat, dark scapulars, chestnut colour of wing-coverts which lack clearly barred pattern, and breast pattern recalling that of Eurasian Scops Owl *Otus scops*. Like this bird, Azores can look quite dainty and short-legged. **419** Azores Gull / Azorengelpootmeeuw *Larus michahellis atlantis*, first-cycle, Terceira, Azores, 21 February 2015 (*Peter Adriaens*). Very typical bird with dusky forehead and lore, streaked throat, dark, messy pattern on scapulars, uniformly chestnut brown wing-coverts, 'zebra pattern' on flank, and smooth grey-brown colour on upper mantle.

Ceuta area appears to be identical to that of nominate *michahellis* but our sample from this region was small (n=32). Our sample from western Andalucía (Cádiz, Huelva) was too small (n=10) to analyse these birds separately, so we included them with our Spanish sample from the Mediterranean region. However, it is interesting to note that the primary pattern of these 10 birds was clearly more

similar to *michahellis* than to the breeding birds from Portugal (despite the latter being geographically closer).

In summary, if we rank the populations we have sampled from most extensive black to least extensive black on the outer primaries, the order is roughly as follows: **1** Azores; **2** Madeira, Canary Islands and Portugal; **3** Morocco; **4** northern and



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420 Azores Gull / Azorengelpootmeeuw *Larus michahellis atlantis*, first-cycle, with Lesser Black-backed Gull / Kleine Mantelmeeuw *L. fuscus*, first-cycle, Terceira, Azores, 16 February 2015 (Peter Adriaens). This photograph allows interesting comparison. Lesser Black-backed in background shows whiter lore and chin and more regular pattern on scapulars than Azores in front. It also has fresher, darker wing-coverts with bold white fringes, and lacks vertical barring on flank. **421** Azores Gull / Azorengelpootmeeuw *Larus michahellis atlantis*, first-cycle, Terceira, Azores, 17 February 2015 (Peter Adriaens). In flight, upperwing looks almost uniformly dark, with very dark greater coverts and inner primaries, and tail often shows broad dark band and fairly extensive dark spotting on outermost tail-feather. This bird has unusually pale and neat pattern on scapulars. **422** Azores Gull / Azorengelpootmeeuw *Larus michahellis atlantis*, first-cycle, Terceira, Azores, 21 February 2015 (Chris Gibbins). Very typical individual with plain brown upperwings, broad dark tail band, extensive dark centre on scapulars, brown head and uniformly grey-brown collar around neck. **423** Azores Gull / Azorengelpootmeeuw *Larus michahellis atlantis*, first-cycle, Terceira, Azores, 17 February 2015 (Peter Adriaens). Underwing is usually very dark brown. Note distinct, dense 'zebra barring' on rear flank of this bird.

north-western Spain; **5** eastern Spain/Gibraltar (ie, western Mediterranean region); and **6** eastern Mediterranean.

MOULT

Yellow-legged Gulls in the Mediterranean region have a rather early breeding season and their annual complete moult is therefore also earlier than

in many other European gulls. Egg-laying starts in early April and the primaries are moulted between late April and early November. In the Atlantic region, however, the climate is different, and breeding generally starts later, which also delays the complete moult. In the Azores and Madeira, egg laying starts from mid-April at the earliest, while in Portugal, Cantabria and País Vasco it is even later,



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424 Azores Gull / Azorengeelpootmeeuw *Larus michahellis atlantis*, first-cycle, Vestmannaeyjar, Iceland, 1 May 2010 (Omar Runolfsson). Vagrant bird found almost 3000 km from Azores and constituting northernmost accepted record of this taxon. It shows classic dusky brown head (including dark lore and chin), dark, heavily marked underparts including breast, plain chestnut brown wing-coverts and extensive dark scapular centres. Other photographs of this bird revealed dark inner primaries, white tail with contrasting, well demarcated black band, and a few moulted wing-coverts in right wing. **425** Yellow-legged Gull / Geelpootmeeuw *Larus michahellis*, first-cycle, Madeira, 15 January 2016 (Merijn Loeve). Differs from typical Azores Gull *L. m. atlantis* in its overall slightly paler brown plumage with paler lore, throat and breast. Lack of bold dark centre on scapulars is also good feature here. **426** Yellow-legged Gull *Larus michahellis*, first-cycle, Sagres, Portugal, 30 November 2016 (Peter Adriaens). Ringed as juvenile near Olhão, southern Portugal. Head and underparts quite dark but note barred pattern on greater coverts and neat, regular pattern on scapulars. **427** Yellow-legged Gull / Geelpootmeeuw *Larus michahellis*, first-cycle, Sagres, Portugal, 31 October 2018 (Peter Adriaens). Another dark bird from mainland Portugal, with rather dusky face and heavily marked underparts, including *Otus* owl-like pattern on breast. Differs from typical Azores Gull *L. m. atlantis* in bold white fringes on wing-coverts, neat, regular anchor pattern on scapulars, and more widely spaced vertical barring on rear flank.

from late April to early May.

In Portugal and Galicia, it is not unusual to see adult birds still completing their primary moult in late November or even early December (own data; Teyssèdre 1983, Pons et al 2004, Arizaga et al 2012). In Morocco, some adult birds start moulting their innermost primary in late April but moult

must vary considerably, because in late November some Yellow-legged Gulls have still not completed the moult of the outermost primaries (own observations). In the Canary Islands, which are further south than all other breeding areas, egg laying starts in early April as in *michahellis*, and moult is similar to this taxon (Aldalur 2016).

Identification

Characteristic features of adult Azores Gull

In this section, we focus on traits that might allow vagrant Azores Gulls to be identified. Even though adult Azores Gulls have the most extensive black on the primaries of all Yellow-legged Gulls and have rather distinctive head streaking in autumn, birds of this age class are among the most difficult to identify in a vagrant context, due to wide overlap with other populations and due to the limited number of useful features.

In autumn, the head pattern, with strong streaking creating a restricted hood and the neck being clean white, may be the first thing that catches the eye. Importantly, the lore and forehead often show dark markings, and the malar area is streaked. Still, some birds from the other Atlantic islands and from Atlantic Iberia can look similar, and even the occasional (subadult) *michahellis* can look hooded (cf plate 409). Therefore, as many features as possible should be considered when dealing with a bird outside of its normal range, including upperparts and primary pattern. The following combination of features in the primary pattern provides a firm basis for identification: **1** no grey tongue or just a short one on p10 (shorter than one-third the length of the feather); **2** no white mirror on p9; **3** fully black outer web on p8 up to primary coverts (ie, no grey visible at base of outer web); and **4** black spot or band on p4. This combination was shown by 37% of the adult Azores Gulls in our sample and by only one bird from other populations (from the Canary Islands).

An additional character worth mentioning is that Azores Gull seems to be the only Yellow-legged Gull in which the adults sometimes show a black mark on p3. Nevertheless, this remains rare in Azores Gull, shown by only 5% in our sample; thus, one would be lucky to encounter such a bird out of range.

When combined with head streaking, primary pattern should help to secure identification. However, there is something of a 'catch 22' in that head streaking is only present in autumn (August–November), when birds are actively moulting their primaries. This means that in many birds not all features will be visible; in autumn one or two crucial primaries may be missing and, conversely, when all primaries are in place, head streaking is lost. This problem can make it impossible to distinguish a genuine Azores Gull from the odd Yellow-legged Gull from the Canary Islands with maximum amount of black, unless a black mark on p3 is also present. Fortunately, the proportion of birds

from the Canary Islands with maximum amount of black on primaries is very small (less than 2%) and the population appears to be largely sedentary (see 'Movements and vagrancy'). Another difficulty is that correct ageing is essential, because subadult Yellow-legged Gulls can show very adult-like plumage but with more extensive black on primaries and with stronger head streaking. Still, subtle features will usually give away the age of such birds, such as bold black markings on the bill, black pattern on the alula, thick black streaks on the primary coverts or brown pattern on a few wing-coverts. It should be noted that adult Yellow-legged Gulls from the Atlantic region regularly show black shaft streaks on the primary coverts but these are only thin.

In bad light, when the colour of the upperparts cannot be judged accurately, separation from British Lesser Black-backed Gull can be problematic but, in normal conditions, the upperparts of adult Azores Gull will always look slightly paler with a more bluish tinge, and in flight the wing-tip contrasts more strongly with the rest of the upperwing and, particularly, underwing. Autumn head streaking usually differs in that in Azores Gull it is concentrated on the head and face while the neck is clean white. The body is often a little bulkier, more robust, and the white scapular and tertial crescents tend to be slightly narrower than Lesser Black-backed Gull.

Characteristic features of other 'Atlantic' gulls in adult plumage

Most adult Yellow-legged Gulls from populations other than the Azores cannot safely be told from nominate *michahellis* in a vagrant context, although a few birds from Atlantic Iberia show such an extensive brown 'shawl' on lower hindneck that their origin could at least be suspected (plate 410 and 414). Also, it is worth mentioning that a handful of birds from the Canary Islands (2%), Madeira (2%) and Portugal (6%) sported a combination of three features in the primary pattern that was not shown by any of the adult nominate *michahellis* in our samples: **1** no white mirror on p9; **2** completely black outer web on p8; and **3** black spot or band on p4.

Hybrid problems

Adult hybrid 'yellow-legged' gulls have been documented in breeding colonies in Belgium and the Netherlands (Cottaar 2004, Adriaens et al 2012, Cottaar et al 2019). They are assumed or have been proven to be the result of mixed breeding between European Herring Gull *L. argentatus* and



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428 Yellow-legged Gull / Geelpootmeeuw *Larus michahellis*, first-cycle, Sagres, Portugal, 8 November 2018 (Peter Adriaens). Ringed as pullus on Berlenga Islands, Portugal, illustrating how heavily marked tail base can be in Atlantic-Iberian region. Note that separation of such birds from Lesser Black-backed Gull *L. fuscus* in the field can be nearly impossible. **429** Yellow-legged Gull / Geelpootmeeuw *Larus michahellis*, first-cycle, Galicia, Spain, 6 December 2015 (Pierre-André Crochet). Dark individual but with barred pattern on greater coverts, distinct white fringes on wing-coverts, and regular pattern on scapulars. **430** Mediterranean Yellow-legged Gull / Mediterrane Geelpootmeeuw *Larus michahellis michahellis*, first-cycle, Sagres, Portugal, 26 November 2016 (Peter Adriaens). Ringed as pullus near Malaga, southern Spain, and should therefore be considered nominate *michahellis*. Note dainty and elongated structure with short legs though, quite similar to Lesser Black-backed Gull *L. fuscus*. Note also dark shin pads on tarsus. **431** Lesser Black-backed Gull / Kleine Mantelmeeuw *Larus fuscus*, first-cycle, Daytona Beach, Florida, USA, 11 February 2019 (Will Chatfield-Taylor). Bird showing some similarities to Azores Gull *L. michahellis atlantis*, such as extensive streaking on head including forehead, lore and throat, and *Otus* owl-like pattern on breast. There are clear differences too, however, like barred greater coverts, distinct white fringes on many wing-coverts, regular pattern on scapulars, and more widely spaced barring on rear flank.

Lesser Black-backed Gull or between Yellow-legged and either of these two species, with Yellow-legged x Lesser Black-backed Gull being the most frequent one. This hybrid combination can be problematic with regard to the identification of adult Azores Gull, since such hybrids have shown a mantle colour intermediate between that of the two parent species, bright yellow legs, bright

red orbital ring, large red gonys spot and extensive black on the outer primaries. Hybrids have also been documented backcrossing with Lesser Black-backed and successfully rearing young. Mixed pairs of Yellow-legged and Lesser Black-backed have also been reported from the Berlengas, Portugal, and Galicia (Paterson 1997) but descriptions or photographs of the offspring of these birds



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432 Lesser Black-backed Gull / Kleine Mantelmeeuw *Larus fuscus*, first-cycle, Portimão, Portugal, 10 October 2018 (Carl Baggott). Bird ringed as pullus in Longford, Ireland. It is included here as example of pale end of variation: very pale new scapulars, whitish head with dark eye mask, one newly moulted median covert, and worn tertials and inner greater coverts make this bird extremely similar to Yellow-legged Gull *L. michahellis*. It has retained a few juvenile scapulars but that can also be the case in Cantabrian or Portuguese Yellow-legged Gulls at this date. **433** Azores Gull / Azorengeelpootmeeuw *Larus michahellis atlantis*, early second-cycle, São Miguel, Azores, 10 August 2005 (Pierre-André Crochet). In summer of their second calendar-year, many Azores acquire uniform dark brown plumage without any grey on upperparts. Head is still very brown and typically darkest in front of eye. Note also extensive dark centres on scapulars, as well as zebra-like barring just above legs. Some birds show even darker greater coverts than this individual, lacking any pale barring. Other populations of Yellow-legged Gull *L. michahellis* do not normally become this dark and uniform. **434** Azores Gull / Azorengeelpootmeeuw *Larus michahellis atlantis*, second-cycle, Terceira, Azores, 20 February 2015 (Chris Gibbins). When moult to second winter plumage has finished, plumage is variable and shows lots of overlap with other populations of Yellow-legged Gull *L. michahellis*. However, birds like this one, showing isolated brown belly patch in combination with isolated hood of head streaking and uniformly dark greater coverts (at most with minimal white peppering along edges), can be assumed to be from Azores population. Note also dark 'shin pads' in this bird. **435** Azores Gull / Azorengeelpootmeeuw *Larus michahellis atlantis*, second-cycle, Terceira, Azores, 20 February 2015 (Peter Adriaens). Very typical individual with plain dark brown greater coverts, isolated brown belly patch, concentrated streaking on head (heaviest in front of eye and on throat), dark 'shin pads' on tarsus, and dark slaty-grey upperparts.



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436 Azores Gull / Azorengelpootmeeuw *Larus michahellis atlantis*, second-cycle, Terceira, Azores, 17 February 2015 (Peter Adriaens). Note belly patch and extensive head streaking. Greater coverts form rather solid dark wing-panel. **437** Azores Gull / Azorengelpootmeeuw *Larus michahellis atlantis*, second-cycle, Terceira, Azores, 18 February 2015 (Chris Gibbins). Another bird showing typical combination of features on head, belly and greater coverts. Inner greater coverts show only minimal white peppering, while outer ones are solidly dark. Underwing very dark, and tail showing extensive black band. **438** Azores Gull / Azorengelpootmeeuw *Larus michahellis atlantis*, second-cycle, Terceira, Azores, 21 February 2015 (Chris Gibbins). Brown greater coverts of this bird show minimal white peppering. **439** Azores Gull / Azorengelpootmeeuw *Larus michahellis atlantis*, second-cycle, Terceira, Azores, 17 February 2015 (Peter Adriaens). Note same features as in plate 434-438, including solid dark panel on greater coverts.

have not been published. In addition, mixed breeding between Yellow-legged Gull and Armenian Gull *L. armenicus* has been proven in central Turkey (Liebers & Helbig 1999), and the hybrid offspring may theoretically resemble Azores. However, Armenian Gull tends to show a dark iris, and nominate Yellow-legged Gull has rather dull yellow iris, so hybrids can be expected to show a slightly darker eye colour than adult Azores. Armenian has a restricted, eastern range in the Western Palearctic, and its offspring is probably not very likely to reach the Atlantic region. Mixed

breeding of Yellow-legged Gull with Caspian Gull *L. cachinnans* and European Herring Gull is known from Poland (Neubauer et al 2010) but such hybrids do not show dark grey upperparts nor extensive black on outer primaries and so do not really match Azores.

We examined the primary pattern of 37 adult hybrid gulls breeding in colonies in Belgium and the Netherlands and found that none showed the characteristic combinations of features discussed for 'Atlantic' Yellow-legged Gulls. All showed some grey at the base of the outer web of p8 and/



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440 Yellow-legged Gull / Geelpootmeeuw *Larus michahellis*, second-cycle, Canary Islands, 16 January 2010 (Eric Didner). From this angle, this bird with its isolated brown belly patch, isolated hood and very dark underwing looks identical to Azores Gull *L m atlantis*. Other photographs, however, revealed distinct white fringes to outer greater coverts, as well as rather bold white spotting on inner. For this reason, we feel that it is more likely local bird than vagrant from the Azores, although we admit that difference is subtle here. **441** Yellow-legged Gull / Geelpootmeeuw *Larus michahellis*, second-cycle, Madeira, 16 January 2016 (Merijn Loeve). Although dark head of this bird might suggest Azores Gull *L m atlantis*, it clearly differs from identifiable types in plate 433-438 because neck and breast are heavily marked and brown pattern on belly is not isolated (as streaking continues up to breast). Note also white barring on one inner greater covert, as well as broad white tips to outer ones. **442** Yellow-legged Gull / Geelpootmeeuw *Larus michahellis*, second-cycle, Sagres, Portugal, 30 November 2016 (Peter Adriaens). Bird ringed in its first-cycle near Olhão, Portugal, in December 2015. In autumn or early winter of their second-cycle, many Portuguese birds show only limited grey on upperparts. This, together with their rather brown underparts can make them quite similar to European Herring Gull *L argentatus* but they usually show bold, rounded dark spots on lesser coverts (as in this bird, on outer feathers). **443** Yellow-legged Gull / Geelpootmeeuw *Larus michahellis*, second-cycle, Sagres, Portugal, 5 November 2018 (Peter Adriaens). Rather dark bird, which overlaps with some Azores Gulls *L m atlantis* in plumage, although that taxon usually shows less white in wing-coverts. Still, birds like this are one of reasons why only second-cycle Azores of type shown in plate 434-439 can be safely identified in vagrant context.

or a white mirror on p9. One bird from the Netherlands wearing a white leg ring with black inscription 9.8 (plate 413) looked most similar to Azores Gull but still sported a thin sliver of grey at the base of the outer web of p8. Only a few of these

hybrids have been documented in autumn and winter so far but those that exhibited head streaking differed from Azores in that streaking extended onto the neck. However, one colour-ringed bird from the Netherlands (green AH6) already sported



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444 Azores Gull / Azorengeelpootmeeuw *Larus michahellis atlantis*, third-cycle, Azores, 10 October 2016 (Asier Aldalur). In vagrant context, identification of third-cycle Azores is generally not possible but birds with blackish bill, isolated hood of head streaking, dark slaty-grey upperparts and dark 'shin pads' on tarsus can readily be assumed to be from Macaronesian islands. This combination of features is not common, however. **445** Azores Gull / Azorengeelpootmeeuw *Larus michahellis atlantis*, third-cycle, Azores, 15 October 2016 (Asier Aldalur). Note blackish bill, very dark hood, whitish iris and dark brown greater coverts of this bird. Aged by adult-like inner primaries. **446** Yellow-legged Gull / Geelpootmeeuw *Larus michahellis*, third-cycle, Lanzarote, Canary Islands, 4 February 2017 (Juan Sagardia). This bird also shows combination of extensive head streaking, large amount of black on bill, slaty-grey upperparts and dark 'shin pads'. Iris is very pale. Compared with Azores Gulls *L m atlantis* in plate 444-445, loreal area and chin are whiter, and only distal half of bill is black. Other Canarian and Madeiran birds are trickier though, and suggest that there may be complete overlap with birds from Azores. **447** Yellow-legged Gull / Geelpootmeeuw *Larus michahellis*, third-cycle, Sagres, Portugal, 20 November 2016 (Peter Adriaens). Bird with blackish bill and dark 'shin pads' but with dark iris and lacking strong dark hood. Upperparts also slightly paler grey than in most Macaronesian birds.

an immaculate white head and neck on 24 December 2001 and again on 10 January 2003 (Adriaens 2003), ie, early in winter like Azores. An additional, relatively helpful feature is that the white tertial and scapular crescents of hybrids tend to be a little wider than in Yellow-legged, sometimes obviously so.

In a North American context, hybridisation be-

tween Lesser Black-backed Gull and American Herring Gull *L smithsonianus* has been documented from Appledore, Maine, USA (Ellis et al 2014), and such hybrids are sometimes referred to as 'Appledore Gulls'. Not much is known about this type of hybrid, since few of them have been ringed or studied on their breeding colonies but, as can be expected of the offspring of two parent species

with heavy head streaking, they seem to show extensive streaking on the neck from late autumn (October) to February. They also appear to moult late, with the occasional bird still growing outer primaries in January. The primary pattern may be helpful: in a sample of 25 adult putative hybrids (22 on eBird.org and three that we observed in Newfoundland, Canada), none showed the characteristic combination of features that we discussed for 'Atlantic' Yellow-legged Gulls, and nearly half of them showed a prominent white tongue tip on p7 – a trait presumably inherited from the American Herring parent, and usually absent in Azores Gull. Leg colour in these hybrids seems to be variable, often being a strange mix of pink and yellow but in some birds it is bright yellow. As in European hybrids, the white tertial and scapular crescents may appear slightly wider and more prominent.

First-cycle birds

First-cycle Azores Gulls look quite different to first-cycle *michahellis*, especially after the post-juvenile moult, when the pattern of the new scapulars adds to the difference. Contra Dubois (2001), Olsen & Larsson (2004) and Olsen (2018), we found no Azores that retained a largely juvenile plumage into the winter; our observations indicate that birds start replacing their scapulars (and wing-coverts) in July-August and finish in October-November, ie, slightly later than *michahellis*. In a sample of 151 first-cycle Azores from October, 150 were actively moulting their scapulars and 88 were also replacing wing-coverts. In our February visit to the Azores, most showed a full set of new scapulars.

First-cycle Azores Gulls show darker plumage overall than *michahellis*, with dusky face, solid brown ear-patch, solid grey-brown hindneck and upper mantle (which may even recall American Herring Gull), and rather dark brown breast and belly. In fresh juvenile plumage, the greater wing-coverts tend to be more densely barred than in *michahellis*. From October onwards, these feathers wear to a very uniform brown colour and then become a typical chestnut brown, often looking as if they are oil-stained. Unlike *michahellis*, these feathers tend to lack pale fringes when no longer fresh. Some birds show a dense pattern of dark streaks and crossbars on the breast, almost recalling that of some owls (notably Eurasian Scops Owl *Otus scops* or Eastern Screech-Owl *Megascops asio*). After the post-juvenile moult, the scapulars usually show a messy, mixed pattern with various extensive dark centres to many of these feathers,

quite unlike the regular anchor pattern seen in first-winter *michahellis*. From October onwards, some birds show bold, 'zebra-like' vertical barring on the rear flank; these 'black-and-white' bars contrast against the relatively plain brown belly and fore flank. *Michahellis* often shows vertical barring too but it is generally thinner, paler, more widely spaced and does not contrast as much. Many Azores (but far from all) show dark 'shins' (dark bars across the tarsus) throughout the entire first-cycle, which are seen in few *michahellis* only (but see plate 430). Some birds already show a somewhat pale, amber-coloured iris during their first winter. In flight, first-cycle Azores generally shows a broader black tail band than *michahellis*, and some birds even show dark barring or spotting at the base of the outermost tail-feather (unlike *michahellis*, which usually has a clean white base). Rump and uppertail-coverts can look barred (versus spotted in *michahellis*). Note that nominate *michahellis* typically combines solid, heart-shaped spots on uppertail-coverts with a clean white tail base, a combination that is less common in other populations of Yellow-legged Gull (especially Azores Gull) and in Lesser Black-backed Gull (see figure 3). The underwing-coverts usually look darker brown than in *michahellis*, and the inner primaries tend to be darker too, with very little colour difference between inner and outer webs.

First-cycle Yellow-legged Gulls from the Canary Islands and Madeira are generally more like *michahellis* than Azores Gull, although they frequently show a broad black tail band (sometimes with extensive pattern on outermost tail-feather too) and rather dark underwing-coverts. They usually show a pale head and neck like *michahellis*, pale fringes on the wing-coverts, and contrasting, regular anchor pattern on the post-juvenile scapulars. However, a few birds from Madeira show confusingly dark plumage with dusky head and neck, plain tawny brown wing-coverts or dark, messy pattern on replaced scapulars. Such birds will still differ from typical Azores in their pale chin and throat, lacking the prominent dark streaking. Also, it is very rare to see these unusual features combined in one bird; usually birds from Madeira with dark, messy scapular pattern will show pale fringes on their wing-coverts, and birds with dark, plain wing-coverts are likely to show a regular anchor pattern on scapulars.

First-cycle birds from Portugal are rather variable. Many are similar to *michahellis* but slightly smaller, with shorter legs and more gently rounded head; some are darker though, with dark, streaked head, and may, in fact, look so similar to Lesser



FIGURE 3 Comparison of tail patterns of first-cycle Azores Gull / Azorengeelpootmeeuw *Larus michahellis atlantis* (first column; Chris Gibbins), Yellow-legged Gull / Geelpootmeeuw *L. michahellis* (second column; all nominate *michahellis* except for bottom bird, which was photographed in southern Portugal; Peter Adriaens) and Lesser Black-backed Gull / Kleine Mantelmeeuw *L. fuscus* (third column; Peter Adriaens)

Black-backed Gull that they become practically impossible to tell from this species in the field. While most have a rather *micahellis*-like tail pattern, some do show a broad black band and extensive barring on outermost tail-feathers (plate 428). They can show boldly spotted rump and uppertail-coverts and may also show an *Otus* owl-like pattern of crossbars on the breast. However, even the darkest birds still differ from typical Azores Gull in several features: poorly streaked chin and throat, cleaner, more regular pattern on the post-juvenile scapulars, prominent pale fringes to the wing-coverts, and thinner, less contrasting barring on rear flank (if present). For the sake of completeness, we should also mention that some first-cycle birds from Portugal show a pale plumage with neatly barred greater coverts that is similar to European Herring Gull – although the inner primaries are darker. From experience, we can safely say that trying to find a first-cycle European Herring Gull in Portugal is hard work!

Like those in Portugal, first-cycle Yellow-legged Gulls from northern and north-western Spain are variable, though dark individuals seem to be much rarer, especially along the Cantabrian coast. Some birds, even pale individuals, show a broader black tail band than *micahellis*, and the outer tail-feathers can be extensively barred.

An important pitfall for Azores Gull is the appearance of dark first-cycle Lesser Black-backed Gulls. Such birds can show a dark, densely streaked head and thus suggest Azores. Size and shape are not always helpful since there is a rather wide overlap in structure between Yellow-legged Gulls of the Atlantic region and Lesser Black-backed. However, dark individuals of the latter species will usually still differ from typical Azores in the following ways: **1** the face does not usually look as dusky due to paler lore, forehead, malar area and chin (first-cycle Lesser Black-backed tends to have whitish feathers around the bill base, and its head pattern looks streaked rather than solidly dark); **2** even when worn, the juvenile wing-coverts and scapulars generally retain white fringes and therefore do not give an oil-stained impression (many birds show prominent pale barring on the greater coverts, which is something that Azores mainly shows in fresh juvenile plumage); **3** the breast is often paler than in Azores; a few birds show the *Otus* owl-like barred pattern but most look streaked or show V-shaped dark marks; **4** after the post-juvenile moult, the scapulars may show large dark centres but usually in a neatly arranged, regular pattern; in dark individuals, replaced scapulars and wing-coverts tend to show a greyish or dark

beige base colour; **5** only relatively few birds show vertical barring on rear flank and, if present, the dark bars tend to be thin and widely spaced; also, the belly is only rarely uniformly dark; and **6** the post-juvenile moult is somewhat later than in Azores and less extensive; it is rare to see birds with replaced wing-coverts in August-September.

As an aside, it is worth noting that some Lesser Black-backed Gulls acquire very pale, even whitish scapulars in their post-juvenile moult, with only thin dark anchors (see plate 432). Such birds, if they are a bit bulkier than average and show a rather strong bill, may not be distinguishable from Ibero-Atlantic Yellow-legged Gulls, since plumage features including tail pattern are of no real use. Plumage wear and extent of moult will often differ but it is not a good sign if one has to rely on moult as the only identification feature. Moreover, Yellow-legged from northern and north-western Spain can retain several juvenile lower scapulars well into their first winter, sometimes even into April of their second calendar-year. Also, a few colour-ringed Portuguese birds have been documented with a nearly full set of juvenile scapulars in mid-November (Carl Baggot in litt).

Due to their overall dark, uniform plumage, first-cycle Azores Gulls could conceivably be confused with American Herring Gull. However, their vent, undertail-coverts and uppertail-coverts always look contrastingly white, the underparts are more coarsely marked, the inner primaries are rather uniformly dark (lacking the bold dark subterminal spots of American Herring), and the tail looks more contrastingly patterned. The bill usually looks darker throughout the whole first-cycle, more blackish and often with a thin sliver of pink at the base of lower mandible only. The legs often retain dark shins all throughout the first-cycle. The post-juvenile moult progresses more rapidly and often includes some wing-coverts (though a few American Herring also appear to replace a small number of wing-coverts during their first winter, as we have observed).

First-cycle Kelp Gull *L. dominicanus* may also be quite similar to Azores Gull and could present a pitfall in some regions (eg. along the Atlantic coast of Morocco (Cape Gull *L. d. vetula*), or in south-eastern USA (nominate *L. d. dominicanus*)). Kelp, however, has a different structure with heavier bill and bulbous gonys. The body is bulky and the wings are so broad that in many standing birds the secondaries become visible below the greater wing-coverts. Even in fresh juvenile plumage, the face is usually whitish and contrasts against the brown mask around the eye. During the first-cycle,

head and breast quickly wear to whitish. Although the wing-coverts are rather uniformly dark, they do not give an oil-stained impression. The tail is often all dark. The flank lacks the barred pattern shown by many first-cycle Azores. After the post-juvenile moult, the scapular pattern is variable but generally regular (not messy) and dark, sometimes already blackish.

The appearance of first-cycle hybrids is not really known. European hybrids are not likely to cause more problems than Lesser Black-backed Gull, since their plumage is not likely to be darker than this species. Four first-cycle hybrids and back-crosses were shown in Adriaens et al (2012); these birds did not really suggest Azores Gull. The situation might be worse in North America, however, where mixed pairing between American Herring Gull and Lesser Black-backed could theoretically produce something that resembles Azores. In this context, the zebra-like barring on the rear flank, sooty face, plumage wear, extent of post-juvenile moult, as well as the colour and pattern of the wing-coverts all become critical features. As far as we know, only two such hybrids of known origin have been photographed during their first-cycle: both had been colour-ringed on Appledore Island, Maine, one with code F02 and one F07 (photographs on www.gull-research.org). F02 was photographed in March of its first-cycle and looked rather like Lesser Black-backed (although with whitish base colour to scapulars, making it very similar to Yellow-legged Gulls from the Ibero-Atlantic region); F07 was photographed as a fresh juvenile in August and appeared intermediate between both parent species. It did not really suggest Azores since its face already looked pale, the brown patch behind the eye was small, the tertial centres had distinctly jagged edges, and the wing-coverts showed broad pale fringes.

Second-cycle birds

Only a proportion of second-cycle Azores Gulls can be identified with confidence out of range. Separation from typical Mediterranean *melanotos* is rather straightforward, and in most cases they are also rather distinct from birds belonging to other populations. Nevertheless, there is a significant degree of overlap and only birds showing certain diagnostic combinations can be identified safely.

The following text concentrates on second-cycle birds over the autumn and winter period (approximately October to April) but first we need to point out the distinctiveness of moulting birds in summer. Formally, birds enter their second-cycle once

the innermost primary has been dropped in April-May of their second calendar-year. The complete moult is well advanced by July, such that most of the feathers they had over the winter (their first winter of life) will have been replaced. At this time (July-August), the patterns on these new feathers make second-cycle Azores Gull look very dark, heavily marked on the head and body including upperparts, and brown overall (plate 433). The forehead, lore and chin often remain distinctly streaked, unlike in other Yellow-legged Gull taxa of the same plumage type, and obvious whitish barring on wing-coverts or scapulars is usually absent. The scapulars often show a dark, messy pattern. Birds from Madeira and the Canary Islands tend to look paler at this time of year, with whitish face, rather streaked hindneck (instead of blotchy or uniform brown as in Azores Gull), some whitish barring on wing-coverts and more regular barring on those scapulars that are not plain grey yet. Our collection of photographs of immature birds from the Canary Islands and Madeira from the summer period is small, admittedly, but it suggests they do not acquire the very dark plumage that 'first-summer' Azores show. The first British record of Azores was of such a dark second-cycle bird, which lingered for several months in Cornwall, England, over the summer and autumn of 2008 (Elliott 2008).

In early autumn, birds undergo a partial moult which is critical from an identification perspective, as it is one of the things that creates the distinctive appearance of many second-cycle Azores Gulls over the winter period. In very simplified terms, there are four 'types' of second-cycle Azores. These types, and their frequencies, are illustrated in figure 4: **type 1** birds with a distinct hood and belly-patch, dark brown wings and grey saddle; based on our own observations and photographs from the Azores in February, this type is numerically dominant (c 60% of all birds photographed); **type 2** a variable group of birds that lack both hood and belly patch; they are typically rather scruffy looking, with no striking features – they can look rather like European Herring Gulls or Cantabrian birds and so are quite different from type 1; **type 3** birds that show *either* a belly patch or a hood but not both and so are rather intermediate/show mixed characters; and **type 4** advanced, clean-looking birds with bright bare parts; overall, they resemble typical Mediterranean birds.

While we are not suggesting that Azores Gulls have 'morphs' or 'forms' *sensu stricto*, grouping them broadly in these four types is a helpful way to approach identification of out of range birds; the

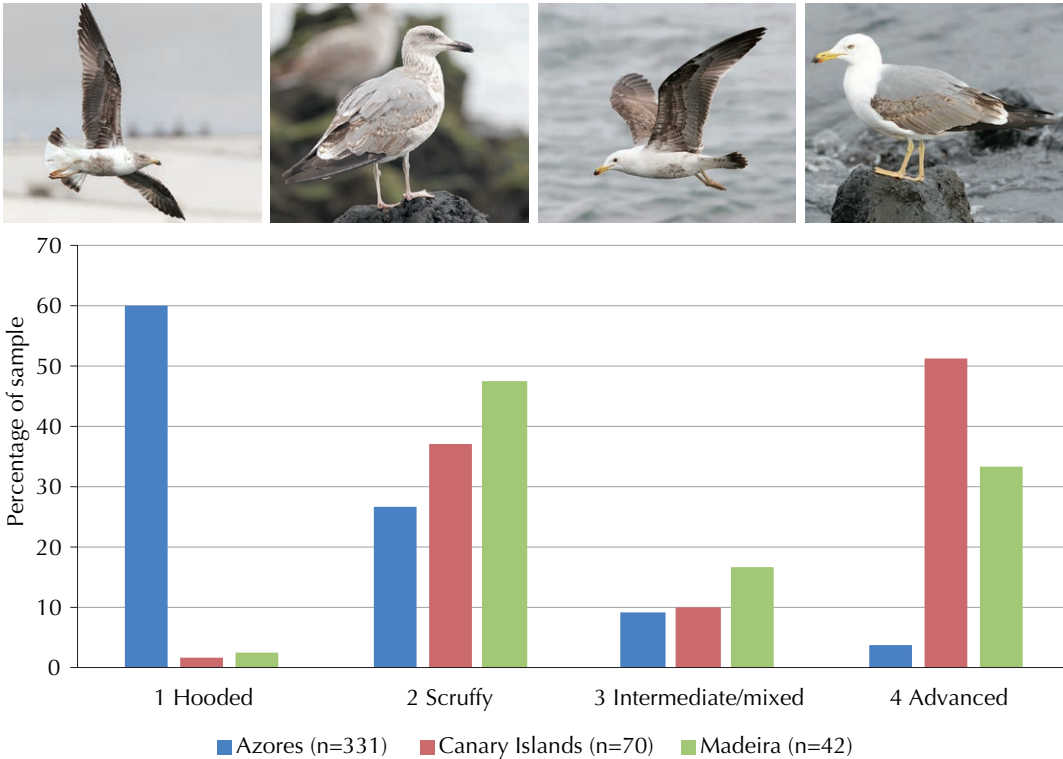


FIGURE 4 Frequency of different plumage types in second-cycle Azores Gull *Larus michahellis atlantis* relative to birds from Canary Islands and Madeira. Sample of Azores Gull consists of total of 331 birds photographed in February; samples of birds from Canary Islands and Madeira were taken from photographs supplied to us by numerous photographers, all from winter period (November-March). Photographs included here are all examples drawn from sample from Terceira, Azores, in February 2015 (Chris Gibbins). **1** classic type of *atlantis* with both hood and 'Dunlin patch'; **2** resembles European Herring Gulls *L. argentatus* or some Yellow-legged Gulls *L. michahellis* from north-western Spain; **3** shows either hood or 'Dunlin patch' but not both; **4** matches Yellow-legged Gulls from other populations, appearing unstreaked, and typically having bright bare parts and much grey on upperparts.

search image for second-cycle Azores should be type 1, as these are the only ones that show diagnostic combinations of features.

The following features, when combined, are diagnostic for second-cycle Azores Gull: **1** dark hood of streaks restricted to the head and including the chin and throat; **2** isolated, dark 'Dunlin *Calidris alpina* patch' on belly; and **3** solid, dark brown band on greater wing-coverts. The hood is clearly demarcated from the neck, with a very sharp border. It is separated from the dark belly patch by an area of unmarked white on the breast. The dark hood tends to accentuate the pale (typically steely-grey or silver) eye. The dark belly markings appear as a solid, isolated patch. The last important and characteristic feature of Azores is an extensive dark panel on the wing formed by the plain brown greater coverts. Pale notches or bar-

ring are almost absent. It is quite common for such birds to have a few grey feathers on the inner greater coverts (two to three feathers) but these tend not to contrast too much with brown ones as they are darker grey than other taxa and often have a distinct brown cast. This extensive brown panel, when combined with the fact that the inner primaries tend to be very dark (see below) creates an impression on flying birds that is unlike *michahellis*, namely that of a uniformly brown upperwing, contrasting with a grey saddle. When added to the hood and belly patch, the combination of features can be very distinctive.

Second-cycle Yellow-legged Gulls from the Mediterranean should not present any serious identification problems in relation to type 1 Azores Gull; they are not hooded and do not have a belly patch. The problem comes with certain birds from

the other Atlantic islands and to a lesser degree some from Portugal and north-western Spain. As shown by figure 4, type 2 and 3 birds occur in populations in the Azores and Canary Islands with equal frequency and so such birds are not those to look for. The relative frequency of type 1 and 4 birds is, however, reversed: around half of all birds from the Canary Islands are type 4 ('advanced') whereas only c 5% of Azores are like this, and while most from the Azores are type 1, birds with such a pattern are rare amongst populations from the Canary Islands. The sample from Madeira is interesting, as it suggests that birds from here are a little more like Azores, in that advanced types are less frequent than on the Canary Islands and Azorean-like type 1 birds are a little more frequent. Samples sizes are, however, rather small and it would be good to investigate this intermediacy in greater detail with a better sample. Nevertheless, the overriding message is that c 1-2% of second-cycle birds from the Canary Islands and Madeira will have both a hood and belly patch and so it is critical that the greater covert pattern of a suspected vagrant matches Azores.

In addition, there are some other plumage features shown by many Azores Gulls that can be used to support identification, though as they are shared with some birds from other populations they are not in themselves critical either way (ie, the presence of a hood, belly patch and dark wing-panel would override these).

Upperwing

The inner primaries have a strong brown cast on most Azores Gulls. Some have a slight grey cast, but these feathers are only rarely as contrastingly clean grey as seen in typical Mediterranean *machahellis*. Brown inner primaries can be shown by the other populations of Yellow-legged Gull, however.

Underwing

Very often looks uniform and dark overall, strikingly so for anyone familiar with Mediterranean *machahellis*. Nevertheless, the pattern is extremely variable in all populations and should not be used as a firm identification criterion.

Bare parts

Dark areas on the front of the tarsus are a feature of first-cycle Azores Gull and in fact these 'shin pads' are regularly also present in second-cycle birds. However, they occur in other Yellow-legged Gull populations of this age class too so are of no real significance for identification.

Other features

Other features that we looked at, such as the presence of a pale tongue on p10, tail pattern, bill colour, pattern of longest undertail-coverts, number of brown tertials, and the number of grey greater coverts all appeared too variable to be of any use in the identification process.

The appearance of typical, type 1 Azores Gulls is distinctive and should easily rule out Lesser Black-backed Gull, which also shows slightly darker, slaty-grey upperparts from its second-cycle on. Hybrids in this plumage are, again, poorly known but are unlikely to show the distinctive combination of features described above. A second-cycle backcross from Zeebrugge, West-Vlaanderen, Belgium, looked identical to Lesser Black-backed (Adriaens et al 2012), and a second-cycle hybrid Lesser Black-backed x American Herring Gull from Appledore Island appeared intermediate between its parents (Ellis et al 2014). This was the bird with code F02 that was also photographed during its first-cycle (discussed earlier). In its second-cycle, it showed extensive brown spotting on the underparts (including breast), somewhat paler head, dense brown barring on uppertail-coverts, pale inner primaries, and some obvious, pale vermiculations on greater coverts – all unlike the typical type 1 Azores.

Third- and fourth-cycle birds

Subadult Azores Gulls (third- and fourth-cycle) are the most difficult age group to identify, since their primary pattern has not fully developed yet and their plumage features overlap completely with birds from the Canary Islands and Madeira. On current knowledge, most birds of this age class cannot be identified safely, at least not to the exact island group. Some (a small minority – see below for percentages) appear distinct from the mainland populations, although more research may be needed into the variation of the subspecies *lusitanus*.

In autumn (August-December), many third-cycle Azores Gulls show distinct dark head streaking forming a well-demarcated hood, while the neck is often mainly white. However, such a hood is also shown by some birds from the Canary Islands, Madeira, Galicia and even the odd nominate *machahellis* (plate 409). By winter, the head becomes whiter due to a partial body moult.

On the Macaronesian Islands as a whole, a small proportion of subadult birds show an eye-catching combination of features, namely: **1** dark streaking on head, including forehead, lore and

TABLE 6 Results of sonagram analysis of long calls in various Yellow-legged Gull *Larus michahellis* populations; see section Material and methods for meaning of abbreviations in headings. Given are mean and range (for H5 only mean).

location	FFm	DFm	FFm = DFm	nH	H5 (mean)	Dist
Galicia	1.27 (0.7-1.7)	1.60 (1.1-3.7)	63%	5.37 (3-9)	0.37	0.93 (0.4-1.5)
Portugal	1.19 (0.6-1.7)	1.54 (1.2-2.4)	57%	6.70 (4-10)	1.09	0.84 (0.4-1.5)
Madeira	1.49 (1.2-1.8)	2.35 (1.3-3.9)	50%	6.25 (5-9)	0.75	0.74 (0.5-1.0)
Azores	1.08 (0.5-1.7)	1.77 (1.1-3.9)	38%	7.38 (4-13)	1.03	0.63 (0.4-1.1)
Morocco	1.20 (0.8-1.5)	1.67 (1.2-2.5)	33%	8.67 (5-13)	0.67	0.63 (0.4-1.0)
Canary Islands	0.97 (0.6-1.7)	1.76 (1.3-2.3)	8%	7.75 (5-10)	1.17	0.61 (0.5-0.8)
south-western Spain	0.92 (0.7-1.6)	1.53 (1.3-1.8)	9%	8.36 (6-11)	1.18	0.60 (0.4-1.0)
nominate <i>michahellis</i>	0.66 (0.5-1.1)	1.45 (1.1-2.8)	7%	8.47 (6-14)	1.60	0.54 (0.4-0.7)

chin, well demarcated from the white neck; **2** dark grey upperparts (slightly darker than *michahellis*); **3** blackish bill; and **4** dark 'shin pads'. This combination was shown by c 9% of the subadult Azores Gulls in our photograph collection, 9% of birds from Madeira and 5% of birds from the Canary Islands. We did not find it in the other Yellow-legged Gull populations. A few birds with all of these features combined have been photographed in Galicia; since they differed from local birds in not just one but multiple features, it seems justified to consider them vagrants from Macaronesia.

Trying to decide which birds with the above combination are from the Azores and which from Canary Islands/Madeira is probably impossible. In the latter, at most half of the bill seems to be blackish, while in birds from the Azores this colour averages more extensive, but this is a subtle difference and may be more variable than our data suggests. Note also that an extensively blackish bill can be found in all Yellow-legged Gull populations, including subadult nominate *michahellis*.

Voice

Teyssèdre (1983, 1984) demonstrated clear differences in the long call of adult Yellow-legged Gulls from País Vasco compared with nominate *michahellis*. Simply put, the birds from País Vasco she recorded sounded much more like European Herring Gull. Compared with *michahellis*, the number of harmonics in the sonagrams of Basque birds was consistently lower, the fundamental was clearly higher, and the fifth harmonic was absent or weak. In other words, the calls sounded clearer, higher-pitched, and far less nasal than in *michahellis*. We had access to only few recordings from northern Spain (two from País Vasco and one from Asturias) but these corroborate the results from Teyssèdre (1983, 1984): their sonagrams show only four to five visible harmonics, an FFm of 1.2-1.6, an empty space where the fifth harmonic

should be, and more vertical distance between the harmonics (Dist = 0.9-1.2). In addition, their DFm is equal to FFm.

Table 6 shows the results of our sonagram analysis for all other populations of Yellow-legged Gull. The long call of *michahellis* is characterized by a low fundamental, a high number of harmonics (up to 14), a clear H5, and little vertical distance between the harmonics. The DFm is only rarely equal to FFm. The call sounds fairly deep, nasal, and quite like Lesser Black-backed Gull.

In the other populations, the long call sounds more or less intermediate between that of *michahellis* and birds from País Vasco. Birds from the Azores and Canary Islands have rather variable long calls, some sounding similar to *michahellis* and others sounding higher pitched and less nasal, so recalling Basque birds or even European Herring Gull. Birds from Galicia and Portugal (Berlengas, Peniche, Lisbon, Sagres) sound similar to birds from País Vasco (ie, high FFm, few harmonics, large Dist), though a bit more variable, sometimes slightly deeper or slightly more nasal (eg, more prominent H5 in birds from Portugal). The same is true for birds from Madeira, surprisingly. Birds from south-western Spain (Cádiz region, close to Gibraltar) sound very similar to *michahellis*, although slightly higher pitched (higher FFm value). The sample from Morocco is probably too small to allow firm conclusions (only three recordings) but it may be worth mentioning that, although these few birds have rather high pitch, they sound as nasal as *michahellis* (mean nH = 8.67).

In terms of the core focus of this paper, the overall message from this analysis is that the long call of adult Azores Gull offers no staring clues for identification, but that it is interesting to consider the regional variation in calls throughout the whole Ibero-Atlantic region from a taxonomic standpoint.

Discussion

Taxonomic relations between Yellow-legged Gull taxa

It is prudent to use multiple lines of evidence to help assess the taxonomic relations between the gull populations included in this paper. Thus, the following discussion attempts to link our analysis of phenotypic traits and vocalisations to studies of population genetics. Interestingly, several genetic studies have been carried out on Iberian and Atlantic Yellow-legged Gulls but, due to different methodology and different samples, they have reached somewhat different conclusions and have not (yet) led to a well resolved phylogenetic tree.

Liebers et al (2001) and Sternkopf et al (2010) examined mitochondrial DNA (mtDNA) of all populations of Yellow-legged Gull except for those from the Canary Islands. According to their data, all Ibero-Atlantic populations share many haplotypes with nominate *Michahellis* but these haplotypes occur with different frequencies. Some gene flow was found between these two groups, however. All Ibero-Atlantic populations differ significantly from each other in mtDNA, with the exceptions being Madeira clustering with Morocco, and the Azores clustering with Galicia. Birds from Portugal (sampled from the Berlengas) have distinct mtDNA, different from Galicia. Gene flow between birds from Galicia and Mediterranean *Michahellis* seems limited. Hence, the mtDNA does not reflect the current taxonomic borders of the different populations. Birds from the Azores appear to be genetically more closely related to birds from Galicia and even to *Michahellis* from the Mediterranean, rather than to birds from Madeira and Morocco. MtDNA data suggests a significant divide between 'northern *atlantis*' (Azores, Galicia) and 'southern *atlantis*' (Madeira, Morocco). Birds from Gibraltar are considered *Michahellis*; their mtDNA does not differ from birds from the French Mediterranean coast, although it does show significant differences from the populations in Italy and Malta.

Pons et al (2004) compared birds from northern Spain (País Vasco and Galicia) with birds from the Mediterranean. They found no significant differences in mtDNA between these populations but some limited differences in nuclear DNA (nDNA). They suggested recognizing the Atlantic Iberian population as a distinct subspecies, *L m lusitanicus* (after Joiris 1978).

Arizaga et al (2006) looked at nDNA of Yellow-legged Gulls from northern Spain (Gipuzkoa, Biscay and Asturias) and compared it with birds

from the Balearics (nominate *Michahellis*). Their results suggested little genetic variation between these four populations, those from País Vasco (Gipuzkoa and Biscay) being most similar and grouping together, and the other two populations showing more variability. Only the birds from Gipuzkoa differed significantly in their nDNA from Balearic *Michahellis*. They concluded that there is still substantial gene flow along the northern coast of Spain.

More extensive work on genetics is currently being done by a team of Spanish and French researchers. The results are still very preliminary and may be subject to change. They have not been published yet but were presented at the 2018 International Gull Meeting in Bulgaria (Arizaga 2018). Their sample includes birds from the Mediterranean region, northern and north-western Spain, Portugal, south-western Spain (including Gibraltar), Morocco, Canary Islands, Madeira and Azores, with analysis focusing on both mtDNA and nDNA. The preliminary results suggest that three groups can be distinguished on the basis of nDNA: a Mediterranean group, a northern Spanish group (from País Vasco to Galicia), and a Macaronesian group, which also includes the Atlantic coast of Morocco. Birds from Portugal and south-western Spain (including Gibraltar) seem to have rather intermediate DNA and could be assigned to either the Mediterranean or northern Spanish group.

Genetics are only one part of the puzzle though, and we hope that they can be combined with our data on phenotype (not just of adult but also immature birds) and voice. The common message from these three lines of evidence is that variation appears to be largely clinal and so it is difficult to draw the line between the various populations. Our personal interpretation of all the current data on Ibero-Atlantic birds is that: **1** the birds in the Azores are the most distinct population of Yellow-legged Gull, at least in plumage; **2** there is a separate population of Yellow-legged Gulls along the Atlantic coast of Spain and Portugal, with relatively distinct adult plumage, voice, biometrics and nDNA; this group shows clinal variation, ranging from adult birds with relatively paler upperparts and most distinctive long call in País Vasco and Cantabria to adult birds with relatively darker upperparts and more variable long call in Portugal; **3** birds in the Gibraltar area appear very similar to nominate *Michahellis*; and **4** birds in Morocco, the Canary Islands and Madeira all seem rather intermediate and so are difficult to assign to any sub-specific group. While the nDNA of the latter three

populations appears very similar to that of Azores Gull, the mtDNA and phenotypic appearance paint a somewhat different picture and make it difficult to include Azores Gull with the other two Macaronesian and the Moroccan populations.

None of these populations seem distinct enough from *micahellis* to warrant full species status but a classification into three subspecies certainly makes sense to us: **1** nominate *micahellis* in the Mediterranean region and further north and east up to and including Gibraltar and possibly south-western Spain (Mediterranean Yellow-legged Gull); **2** *atlantis* confined to the Azores (Azores Gull); and **3** a third subspecies in Atlantic Iberia. Such a classification raises the question of what name to use for the latter. The name *lusitanus* is available but it was used to describe the Portuguese population (Joiris 1978), which differs subtly from the Cantabrian/Basque birds in morphology, nDNA and voice. The description by Joiris (1978) was very brief, lacking in detail, partly incorrect, and did not include photographs or drawings. It was based on field observations only, not skins. No type specimen was collected. Still, this name is the first one used to describe this local population and therefore has priority. We could consider *lusitanus* a subspecies showing clinal variation in the colour of the upperparts of adult birds and in voice along the Iberian Atlantic coast. A specimen like MNCN 2557 from Suances, Cantabria, preserved at Museo Nacional de Ciencias Naturales (Madrid, Spain) could then become the type. The type specimen of the subspecies *atlantis* was collected on Fayal, Azores, in March 1922 (Dwight 1922).

The other populations (group **4**) are difficult to assign to any subspecies since in morphology, genetics and voice they appear to be intermediate. Should they go with Azores Gull or with *lusitanus*? Olsen (2018) states that birds from Madeira and the Canary Islands are 'almost identical' to nominate Yellow-legged Gull. Our analysis shows that they are rather intermediate in plumage and voice, and this accords broadly with the genetic data. It is therefore hard to make a strong case either way about where they should be placed. Our personal view is that these birds may simply be part of one or two intergradation zones, like for example many European Herring Gulls in the Netherlands, Denmark and Germany can be considered intergrades between *argenteus* and *argentatus*.

Other taxonomic hypotheses are possible too, of course, and we welcome other views and interpretations of the data, especially from taxonomists. We look forward to further results of the colour-ringing projects and the genetic research that are

currently being undertaken by French, Portuguese and Spanish ornithologists.

Movements and vagrancy

On the one hand, our analysis of the appearance and voice of Yellow-legged Gull populations has not shed any strong new light on their taxonomic relations – the evident complexity and resulting uncertainties in the purely genetic studies pervade interpretation of the phenotypic and vocalisation data we have presented. On the other hand, we have been able to isolate a set of 'safe' features that can be used to identify Azores Gull, and point to others which, although often used to support identification, do not stand up to critical scrutiny. In turn, these safe and unsafe features allow us to say something about reports of out-of-range Azores.

Although ringing data suggest that the Atlantic and western Iberian Yellow-legged Gulls are generally resident, there are indications that some birds may wander, especially those from the Azores population. In the Azores, 332 pulli have been colour-ringed since 2017, and none have been observed outside of this island group so far (Aldalur 2019). However, Moore (1996) reported a total of five first-cycle Yellow-legged that followed sea-going vessels for considerable distances between the Azores and mainland Portugal over the course of eight years. One bird followed the ship all the way from the Azores to Madeira; another stayed with the ship for 1120 km when it returned from the Azores to Portugal. One bird followed the ship for 670 km from Madeira towards the Portuguese mainland, and another one did the same for 720 km. In addition, in September 2012 a first-cycle Azores Gull was photographed standing on the bow of a research vessel 1600 km south-west of the Azores. In the Canary Islands, at least 350 pulli have been colour-ringed on Gran Canaria since 2010 (Gutierrez 2012, Aldalur 2016), and 233 pulli have been colour-ringed since 2017 (Aldalur 2019). Several of these birds has been observed outside of the Canaries, but only in Dakhla Bay, Western Sahara. These were all immature birds (Xabier Ramirez pers comm).

The Atlantic Iberian populations generally remain in the Iberian Peninsula all year, with immature birds (particularly first-cycle) covering somewhat greater distances than adults. However, colour-ring projects have shown that long distance movements are possible. For example, birds from the Berlengas, Portugal, have been seen in Britain (Gloucester, England; second-cycle), western France (Île d'Oléron, second-cycle) and Morocco (Oued Souss, two first-cycle birds) (Morais et al

1998). Birds ringed in Galicia have been reported from Morocco (two), Isle of Wight, England, and Den Helder, Noord-Holland, Netherlands (de Juana & García 2015). Yellow-legged Gulls ringed in País Vasco have been observed in Maine-et-Loire (five, all ages; Fossé 2019) and near Paris, France (adult; Thibaut Chansac pers comm), as well as in the Greater London area, England (third-cycle; Peter Alfrey). Birds from Tarifa, southern Spain, have been recovered in Morocco (four, including one as far south as the Agadir region) and Madeira (Cuenca & Delgado 2014).

Until 2019, there have been 15 records of 'Azorean Yellow-legged Gull' in Ireland, three in Britain, one in mainland Spain and one in Iceland (Hobbs & Irish Rare Birds Committee 2016, Hudson & Rarities Committee 2016, Gil-Velasco et al 2017; Omar Runolfsson pers comm). All of these birds have been accepted provisionally as 'showing characters of the Azorean form', without excluding the possibility of an origin from the Canary Islands or Madeira. Nine of the Irish records concerned adult birds, often returning to the same area for several years; the others were of subadult individuals. The British records included one second-cycle and two subadult birds, one of which was also observed in adult plumage in subsequent years. We did not have access to the full documentation of these Irish and British records and therefore cannot comment extensively on them. However, as already mentioned, the British second-cycle bird (Elliot 2008) looks like a typical, dark 'first-summer' type Azores Gull to us. The 2009 Oxfordshire bird certainly appeared to be of the Macaronesian type when it first appeared as a subadult (Lewington 2009) with its extensively blackish bill, streaked hood, dark shins and dark grey upperparts, which is typical of Macaronesian birds in general but does not allow pinpointing the exact origin (see the section on identification of third-cycle birds). This bird returned to the Midlands as an adult in subsequent years (Hudson & Rarities Committee 2016, Holt & Rarities Committee 2017) but we have not seen detailed photographs of its primary pattern. The Spanish bird was also a subadult of the Macaronesian type (and hence not necessarily Azorean). The Icelandic bird was a first-cycle and looks like a typical Azores Gull to us. Since this bird has not been officially published yet, a photograph of it is shown here (plate 424). Furthermore, we have seen photographs of several promising candidate Azores from mainland Portugal, eg, a second-cycle bird ('type 1') from Lagoa on 2 January 2010, and a first-cycle from Olhão on 18 December 2013, and also one possible candi-

date from north-western Spain, a first-cycle bird from A Coruña on 11 October 2004, which is currently being assessed by the Spanish rarities committee. Among the European records, the high proportion of (near-)adult birds is somewhat surprising, firstly because data seems to suggest that it is the immature birds that are more likely to wander, and secondly because these are generally the more difficult plumages in which to identify Azores – although it is true that a few subadults have a rather striking appearance and can at least be suspected to be of Macaronesian origin. In most cases though, identification of adult and subadult birds is complicated by extensive variation in *Iusitanus*. Based on colour-ringed birds from Galicia and a few (unringed) nominate *michahellis* showing strong head streaking (see section on regional variation), it is clear that not every hooded bird is a true Azores, so care should be taken not to put too much weight on this character alone. Also, Portuguese adults can show as much black on the upperside of the primaries as Macaronesian birds.

In North America, Yellow-legged Gull has been considered a nearly annual vagrant to Newfoundland since 1995 (Howell et al 2014). Most records refer to adult birds, probably including returning individuals, with an additional few records of subadults. All are believed to be Azores Gulls. However, the photographs that we have seen of these birds do not show the full suite of characteristic features of this taxon, and we therefore cannot confirm their precise origin. In fact, we cannot even be sure that they are from the Macaronesian islands and not from Portugal, Galicia or Morocco. Elsewhere in North America, there have been two well-documented records of adult Yellow-legged from Quebec, Canada, and one from Washington DC, USA (Wilds & Czaplak 1994), but again the documentation does not allow positive identification as Azores in our opinion. As in Europe, the lack of records of younger birds is puzzling (although some may have been overlooked). Quite a few first-cycle and second-cycle Yellow-legged candidates have been documented from Florida, USA, and, especially, Texas, USA (c 35 individuals) but in the photographs that we have seen of these birds we find it impossible to exclude Lesser Black-backed Gull or, in some cases, hybrid Lesser Black-backed x American Herring Gull.

Summary and conclusions

Not all Azores Gulls can be identified safely. Our data suggest that around one third of adult birds have a combination of wing-tip features that make them identifiable (absent or very short tongue on

p10, no mirror on p9, fully black outer web on p8 reaching primary coverts, and black on p4). Birds with these features, darker upperparts and, at the right time of year, a hood of streaks should prove to be from the Azores. The dark plumage of first-cycle birds has been known for some time, and we provide some additional specific features to support descriptions from earlier literature. We estimate that approximately 50% of first-cycle Azores can be identified in a vagrant context. Second-cycle birds are problematic, especially because of variability and resulting overlap between birds from the various Macaronesian islands; the result is that only birds sporting a hood, 'Dunlin patch' and appropriately dark greater wing-coverts are safe to identify as Azores. For this age class, we would estimate that around 30-40% can be identified. Despite our best efforts, we have been unable to find any safe features for third-cycle (and subadult) Azores (although it is possible to recognize some birds of this age category as belonging to the Macaronesian population in general).

Olsen (2018) presented the most recent synthesis of large white-headed gulls. He gives Azores Gull a separate chapter and states that 'in all plumages they are different' (to Yellow-legged Gull). Although in fact no new detailed empirical analysis of its identification has been published since Dubois (2001), momentum seems to have been building in both the published literature and online for treating Azores as a full species. However, the evidence we have presented here (that the majority of adult and subadult birds appear not to be safely identifiable) rather contradicts this popular consensus.

Our scoring system for the wing-tip pattern of adult gulls was deliberately kept simple, to ease field application. This simplification may mean that it is rather too coarse to detect more subtle differences. Thus, while for the moment we suggest retaining Azores Gull as a subspecies of *machahellis* (albeit the most distinctive one), we recognize that more detailed work may add a different perspective.

We realize that readers probably expect identification criteria not only for Azores Gulls but also for birds from the Macaronesian population as a whole. However, this is fraught with difficulty, not only because the Canarian and Madeiran populations are much more similar to *lusitanus* and nominate *machahellis*, but also because the variation in *lusitanus* and Moroccan birds is extensive and still not fully known. This is an important point. While quite a few Azores Gulls – especially immatures – are distinctive and can be identified with confi-

dence even in a vagrant context, the same cannot be said of birds from the Canaries/Madeira. We have already indicated that Portuguese adults can show as much black on the upper hand as birds from Macaronesia, and that they can sport quite heavy head streaking and dark grey upperparts. In their first-cycle, some Portuguese, Galician and probably Moroccan birds too show an overall very dark brown plumage, rendering the identification of first-cycle Canarian/Madeiran birds unsafe. Only birds combining many distinctive features, such as plain brown wing-coverts (looking 'oil-stained'), sooty face, streaked throat, dark breast, 'zebra barring' just above the legs, dark and messy scapular pattern, very dark underwing and plain dark inner primaries, can be identified as Macaronesian, but such distinctive birds should be from the Azores anyway. In second-cycle, birds of type 1 (hooded, and with isolated 'Dunlin patch') should be the focus of attention, since such birds seem to be very rare on the continent, if they occur at all. We have seen only one example, at Sagres, Portugal, on 27 November 2016, and this may have been a vagrant from Macaronesia. Type 1 birds are rather common in the Azores, making up 60% of second-cycle birds there, but not too many (perhaps only 30%) show the plain dark greater coverts needed to separate them from Canarian/Madeiran birds. If the pattern of the greater coverts can be disregarded for the Macaronesian population as a whole, then quite a lot of Macaronesian second-cycle birds can be identified in a vagrant context. More research into the variation of Moroccan birds and *lusitanus* is needed, especially in colour-ringed birds of known origin. For third-cycle birds, we have already suggested that a combination of blackish bill, dark hood, dark grey upperparts and dark 'shin pads' should indicate a Macaronesian origin, but that this combination is shown by only 5-9% of this age class.

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Samenvatting

HERKENNING VAN AZORENGEELPOOTMEEUW Hoewel Geelpootmeeuw *Larus michahellis* een vertrouwde soort is voor veel Europese vogelaars, is er nog steeds veel onduidelijkheid over het aantal ondersoorten en hun verspreiding. Is Azorengeelpootmeeuw *L. m. atlantis* beperkt tot de Azoren of komt deze zelfs tot op het continent voor? Hoe is die in het veld te herkennen? Is het een ondersoort of aparte soort? Bestaat er zoiets als een ondersoort *L. m. lusitanus*? Tot welke ondersoort behoren de vogels in Marokko?

Op deze vragen probeert dit artikel een antwoord te geven maar de nadruk ligt op de herkenning van Azorengeelpootmeeuw. Onze conclusie is dat alleen de vogels van de Azoren voldoende verschillen van de overige populaties Geelpootmeeuwen om in het veld te kunnen worden herkend. Volgens onze steekproef heeft ongeveer een derde van de adulte Azorengeelpootmeeuwen een uniek handpenpatroon, gekenmerkt door de combinatie van de (vrijwel) volledig zwarte basis van p10, geen witte spiegel op p9, de volledig zwarte buitenvlag van p8 (tot tegen de handpendekveren) en de zwarte tekening op p4. Exemplaren met dit handpenpatroon en erg donkergrijze bovendelen kunnen met zekerheid tot de Azorenpopulatie gerekend worden, zeker als ze ook nog eens de typische, zwaar gestreepte kopkap tonen na de zomerrui. C 50% van de eerstejaarsvogels is te herkennen aan het erg donkere verenkleed met effen donkere vleugeldekveren die met enige verbeelding zelfs onder de olie lijken te zitten, een donker gestreept gezicht (inclusief kin en keel), rommelig donker patroon op de schouderveren, zwaar getekende borst, brede zwarte staartband en vaak ook enige brede zwart-witte, verticale bandering op de achterflank (net boven de poten). Van de tweedejaarsvogels is 30-40% te herkennen aan een donker buikschild, gestreepte kopkap en effen donkere grote dekveren. Bij derdejaarsvogels is er te veel overlap in uiterlijk met de populaties op de Canarische Eilanden en Madeira om een vogel met zekerheid als Azorengeelpootmeeuw te bestempelen.

Op basis van verenkleed, afmetingen, geluid en DNA vormen de vogels van de Azoren weliswaar een opvallende groep maar wellicht niet uniek genoeg voor volwaardige soortstatus. Verder lijkt ook een af-

zonderlijk taxon aanwezig langs de noordelijke en westelijke kust van het Iberisch Schiereiland, van Baskenland tot het uiterste zuiden van Portugal. Deze populatie kan als ondersoort *L. m. lusitanus* worden beschouwd, hoewel het taxon slechts heel summier werd beschreven.

Geelpootmeeuwen in het zuidwesten van Spanje en in Gibraltar en Ceuta tonen vooral kenmerken van nominaat *L. m. michahellis*, hoewel meer onderzoek hier zeker wenselijk is. De populaties van de Canarische Eilanden, Madeira en Marokko vertonen veel intermediaire kenmerken tussen *atlantis* en *lusitanus/michahellis*, en lijken ons moeilijk in te delen bij een bepaalde ondersoort.

Het artikel gaat verder nog in op de dispersie van de verschillende ondersoorten op basis van ringgegevens en waarnemingen (ver) buiten het normale verspreidingsgebied.

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Peter Adriaens, Brusselsesteenweg 31, 9050 Gentbrugge, Belgium (p_adriaens@yahoo.com)

Peter Alfrey, Little Oak, 23 Wood Street, Hackbridge, Surrey, CR4 4JT, UK
(littleoakgroup@btinternet.com)

Chris Gibbins, School of Environmental and Geographical Sciences, University of Nottingham,
Malaysia, 43500 Selangor, Malaysia (christopher.gibbins@nottingham.edu.my)

Daniel López-Velasco, C/Pablo Laloux, 10, 6 izda D Salinas, 33450 Asturias, Spain
(dskater20@gmail.com)