

Difficulties in determining the age of Common Terns in the field

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ABSTRACT Large numbers of Common Terns *Sterna hirundo* of known age were studied during the breeding season at Seaforth Nature Reserve, Liverpool, Merseyside. Detailed observations of key plumage and bare-part features were recorded, and compared with published criteria for ageing terns. It was found that the majority of second-summer birds were in full breeding plumage and were therefore indistinguishable from adults; and that many first-summer birds exhibited some breeding-plumage features and were therefore confusable with some second-summers. A few second-summer birds were in non-breeding (winter) plumage and were therefore inseparable from similar first-summers. It is concluded that no individual Common Tern, except those first-summers which retain juvenile features, can be aged safely, and we propose that ageing terminology be amended to take this into account. Previous estimates that only about 1% of first-summer Common Terns return to the breeding grounds were confirmed, but, contrary to some previous studies, the majority of second-summers did so.

The literature on Common Terns *Sterna hirundo* commonly states that the majority of immature birds remain in their winter quarters during the breeding season, and that most first- and second-summer individuals that do reach northern latitudes can be identified as such (e.g. Cramp 1985; Scott & Grant 1985).

Despite the early recognition of plumage variability among immature (post-juvenile) Common Terns, and of the existence of intermediates (Grant *et al.* 1985; Kaufman 1990), the notion that age-related plumages can be safely determined for terns, in the same way as they can for gulls (Laridae), has become commonplace among birdwatchers. Indeed, recent identification guides (e.g. Mailing Olsen & Larsson 1995; Svensson *et al.* 1999) imply that most Common Terns, during the breeding season, can be assigned to one of three distinct plumage stages: 'first-summer' (referring to individuals in their second calendar-year), 'second-summer' (third calendar-year), or 'adult' (fourth calendar-year or older). Whereas gulls show a regular sequence of immature plumages before reaching adulthood, however, these supposed plumage stages of terns relate either to the presence of juvenile feathers or to the degree to which non-breeding-plumage features are retained during the breeding season.

First-summer terns are said to be characterised by the retention of juvenile remiges and rectrices, including the primaries (which can be distinguished by their very dark and worn appearance) and secondaries (which form a dark secondary-bar in flight); and also by non-breeding-plumage features, especially a complete white forehead, reduced depth of the dark cap, a dark bill, a dark carpal bar and white underparts. In short, they resemble what was formerly termed the '*portlandica*' plumage (Scott & Grant 1985; Grant *et al.* 1985).

Second-summer terns are said to look more like adults, but to be frequently distinguishable by one or more of a range of non-breeding-plumage features: a variable amount of white on the forehead, a darker bill, patchy grey-and-white underparts, and darker outer primaries. They are said typically to be intermediate between first-summer and adults.

Our study demonstrates that such a categorisation is oversimplified. Clear-cut, age-related plumages do not exist for Common Terns during the breeding season, and the overlap in appearance between different age categories is so large that only a very small minority of individuals can safely be aged in the field.

Methods

Between 1994 and 2000, detailed observations of Common Terns of known age were carried out at Seaforth Nature Reserve, Liverpool, Merseyside. The terns were aged by reading their metal-ring numbers in the field; only those ringed as chicks or juveniles, and therefore of known age, were included in the analyses. These observations made it possible to test the accuracy of previous assumptions about the appearance of different age classes of Common Terns, and the feasibility of distinguishing these accurately in the field.

On the first observation date, the following data were collected for each individual:

- *The amount of white on the forehead.*
This was scored from 1 to 4, as follows:
 1. no white feathers
 2. variable amounts of white flecking
 3. solid white patch
 4. non-breeding-plumage pattern, with solid white forehead and reduced cap size, often indicated by the presence of a dark 'lobe' on the ear-coverts
- *The amount of black on the bill.* This was scored from 1 to 4, as follows:
 1. wholly orange-red bill
 2. the 'normal' dark-tipped pattern of adult breeding plumage
 3. largely dark bill (50% or more)
 4. completely dark bill
- *The number of outer primaries not replaced during the pre-breeding moult.* Unmoulted outer primaries appear contrastingly darker.
- *The degree of contrast between the dark outer primaries and grey inner primaries.* This was scored on an ascending scale from 1 (low contrast) to 3 (high contrast).

Results

Information was gathered on 1,001 individual Common Terns, many of which were seen in several years, yielding a maximum sample size of 1,591. Not all of the four features described above were noted on every individual, so that sample size is variable.

Frequency of occurrence of immatures

More than half (632 out of 1,001, or 63%) of the individual Common Terns of known age in our study at Seaforth have first been seen as second-summers, and about 40% (632 out of 1,591) of all observations (including birds seen in more than one year) have been of second-summer birds. Contrary to some of the statements in the literature, it seems highly likely that the vast majority of, if not all, second-summer Common Terns return to the breeding grounds at some time. Of 80 individuals which were ringed as chicks at Seaforth and seen there subsequently, all but eight were first recorded again in their second summer.

First-summer birds are considerably rarer, with only nine (0.9% of individuals and 0.6% of all observations) recorded at Seaforth during our study. Survival rates for immature Common Terns are not known, but annual mortality of adults is approximately 8-16% (Cramp 1985). Assuming that most birds do return in their second summer, and that immature mortality rate matches that of adults, then the potential number of first-summer individuals that could have been seen at Seaforth had they returned would have been around 700-800. It therefore appears that about 1% actually do return in their first year. This is supported by the absence of sightings at Seaforth of first-summers ringed as chicks at this site, compared with sightings of 72 second-years; and

by the recording of three first-summers ringed at Shotton Steelworks, Flintshire (from where most terns seen at Seaforth originate), compared with 414 second-years ringed there.

Head pattern

Very few adult (third-summer or older) Common Terns show any white on the forehead during the early part of the breeding season. Less than 1% of adults seen before 30th June did so, and none had any completely white feathers but, rather, narrow white tips to otherwise black feathers.

Among adults, the onset of the post-breeding moult of the head feathers may occur in early July. In 1999-2000, one-third (30 out of 96) of the Seaforth terns showed some white on the forehead by the end of July, but their visible loss of feathers made them easily distinguishable from individuals which had acquired white feathers during the pre-breeding moult.

Most second-summer birds arrive at Seaforth in June and July, on average about three to four weeks later than adults (SIW, unpublished data). Their post-breeding moult also begins later than that of adults: during 1999-2000, none exhibited any sign of head moult during July and only about one-fifth (16 out of 78) did so by the end of August. Comparisons between adults and second-summers are therefore based on observations made prior to the end of June and the end of July, respectively.

Table 1 (on page 272) illustrates the wide variation in head pattern of second-summer Common Terns in the early part of the season. A clear majority, almost two-thirds, are indistinguishable from adults. Most of those which can be identified as immatures show rather limited amounts of white on the forehead, with fewer than 10% exhibiting the

156. Second-summer Common Tern *Sterna birundo*, Seaforth, Liverpool, Merseyside, June 1999. A typical early-breeding-season individual, with fully 'adult' head and body plumage. The only clues to its immaturity are the relatively large amount of black on the bill and the moderate contrast between the moulted (P5) and unmoulted (P6-P10) primaries. *Steve Kowng/Birdwatch*

157. First-summer Common Tern *Sterna hirundo*, Seaforth, Liverpool, Merseyside, June 1995. This individual shows a mixture of non-breeding plumage (a reduced black cap, white underparts and a carpal bar) and breeding plumage (relatively bright bare parts). It is in active moult, with P5-P7 newly replaced and P8 dropped. Note the heavily worn two outermost juvenile primaries (P9-P10). Primary moult was almost complete when the bird was last seen at this site, on 22nd August. This was the first proven record of a first-summer Common Tern at Seaforth; happily, it lives on, having been trapped and released by ringers in Huelva, Spain, in late August 2000. *Steve Kwwg/Birdwatch*



Table 1. Head pattern of second-summer and adult Common Terns *Sterna hirundo*, Seaforth, Merseyside.

Pattern	Number of individuals (%)	
	Second-summers (to 31st July)	Adults (to 30th June)
1. Solid black cap	285 (65.7)	690 (99.3)
2. White flecks on forehead	111 (25.6)	5 (0.7)
3. White patch on forehead	30 (6.9)	0
4. Non-breeding-plumage pattern	8 (1.8)	0
Totals	434	695

supposedly classic 'second-summer' head pattern. Finally, a small minority are essentially in non-breeding plumage.

Bill colour

Observations at Seaforth indicate that, unlike the head pattern, which remains stable between the pre- and post-breeding moults, the bill colour of both adult and immature Common Terns often changes during the breeding season. The dark tip of the bill is pro-

gressively lost in the early months, before the bill darkens again once breeding is completed.

Second-year birds do have a significant tendency (chi-square = 22.03, $p < 0.0001$, df 2) to have more black on the bill than adults (table 2), but the difference is small and the majority of both age groups show similar dark-tipped bills. Of 250 second-summers which had a fully black cap, 68 (27.2%) had a mostly or wholly dark bill. This is significantly more than for adults, but not sufficient

Table 2. Bill colour of second-summer and adult Common Terns *Sterna hirundo*, Seaforth, Merseyside.

Pattern	Number of individuals (%)	
	Second-summers (to 31st July)	Adults (to 30th June)
1. Completely orange-red	0	18 (5.0)
2. Dark tip	254 (67.4)	279 (77.7)
3. 50% (or more) dark	118 (31.3)	62 (17.3)
4. All dark	5 (1.3)	0
Totals	377	359

for this character to be of use for reliable determination of age. No adults had a wholly dark bill, and only a minority of first-summers did so.

Primary moult

Before their return to the breeding grounds, Common Terns moult and replace a variable number of inner primaries. These fresh, grey feathers contrast with the unreplaced dark outer primaries, giving rise to the species'

characteristic dark outer wing, or 'primary wedge', in flight.

The outer primaries darken with age as the greyish bloom which initially covers them wears away. The contrast between these older outer primaries and the new inner primaries should, therefore, increase in line with the disparity in the age of the two series of feathers.

Some previous authors have described the outer primaries of second-summer terns

158. First-summer Common Tern *Sterna hirundo*, Seaforth, Liverpool, Merseyside June 1999—An essentially non-breeding-plumaged individual. Note that, in contrast to the bird in plate 157, this one has replaced all the juvenile primaries. It first arrived on 31st May, earlier than any other British-ringed immature Common Tern at Seaforth. Within a week, what was probably this bird was back at its natal colony at Pennington Flash, Greater Manchester. *Steve Young/Birdwatch*

159. Non-breeding-plumaged Common Tern *Sterna hirundo*, Seaforth, Liverpool, Merseyside July 1998. The age of this individual is unknown, but it is probably a first- or second-summer. No adult has been recorded in full non-breeding plumage this early in the year. The relatively fresh and evenly aged outer primaries are a good, but not conclusive, indicator of immaturity. *Steve Kwrag/Birdwatch*



Table 3. The degree of contrast between inner and outer primaries of second-summer and adult Common Terns *Sterna hirundo*, Seaforth, Merseyside.

Contrast	No. of birds(%) to 30th August		No. of birds (%) to 31st August	
	Adults	Second-summers	Adults	Second-summers
1. Low: outer primaries pale grey	2 (1.6)	33 (52.3)	3 (1.1)	101 (35.1)
2. Moderate: outer primaries dark grey or blackish	83 (68.6)	27 (43.5)	151 (52.2)	172 (59.7)
3. High: outer primaries black	36 (29.8)	2 (3.2)	135 (46.7)	15 (5.2)
Totals	121	62	289	288

as being markedly darker than those of adults. Our study reveals the opposite to be true: second-summers are significantly more likely to show less contrast both early in the year (up to 30th June; chi-square = 75.18, $p < 0.0001$, df 2) and throughout the breeding season (up to 31st August; chi-square = 189.71, $p < 0.0001$, df 2). The results are summarised in table 3.

During the breeding season as a whole, most Common Terns (of all ages) showed moderate primary contrast. A large proportion of second-summers had barely contrasting inner and outer primaries, however, and very few had solidly black outers. On adults, these proportions are reversed. Although the outer primaries of both adults and second-summers darken as the breeding season progresses, second-summers show, on average, less contrast than do adults.

Underpart colour

Many previous authors have claimed that immature Common Terns usually show white, blotchy or paler grey underparts compared with adults. This proved to be extremely difficult to judge on perched birds in the field. Our observations suggested that the only difference was that individuals (of any age) which exhibited a high number of other non-breeding-plumage features also showed white or paler grey underparts, while all others had somewhat darker under-

parts and were indistinguishable from one another in this respect.

Carpal bar

During the seven years of the study, no adults showed any sign of a carpal bar during the breeding season, i.e. before about mid July. Observations of this feature on second-summer terns were not comprehensive, but no individual with a full cap also had a carpal bar, while all those with non-breeding-type head plumage did have. A total of 16 birds with some degree of white on the forehead was noted as having a carpal bar, although this is probably an underestimate. Nonetheless, the proportion of second-summers exhibiting this feature appears to be too small for it to be of value in determining their age.

First-summer birds

The number of known first-summer Common Terns observed at Seaforth is small, and it is impossible to draw firm conclusions from such a sample. Even from this small sample, however, certain patterns are apparent (table 4 on page 276).

Only two of the nine terns definitely had retained juvenile outer primary feathers. One of these (the individual in table 4 first observed on 29th June; plate 157) was actively replacing its outer primaries throughout the summer, having dropped P9

160. Common Terns *Sterna hirundo*, Seaforth, Liverpool, Merseyside, September 1998. The individuals in this photo exhibit a variety of stages of moult between breeding and non-breeding plumages. Their ages are unknown. *Steve ftwwg/Birdwatch*.

161. Common Tern *Sterna hirundo*, age unknown, Seaforth, Liverpool, Merseyside, September 1998. This individual shows full breeding plumage on head and body and bright bare parts very late in the season, perhaps indicating that it is a second-summer rather than an adult. It also has only three unmoulted outer primaries, and no adult has yet been recorded at Seaforth with fewer than four. *Steve feKreg/Birdwatch*



Table 4. Characteristics of nine first-summer Common Terns *Sterna hirundo*, Seaforth, Merseyside.

Date first seen	31/5	29/6	2/7	25/7	9/8	13/8	18/8	22/8	4/9
Unreplaced outer primaries		6	2	6	6	6	6	6	6
Primary-moult-contrast score		1	3	1	1	1	2	3	? 3
Retained juvenile primaries	No	Yes	No	No	No	?	Yes	?	?
Retained juvenile secondaries	No	Yes	No	?	No	?	Yes	?	?
Head-pattern score		4	3	2	3	3	3	4	2 4
Bill-colour score		3	3	3	3	2	3	4	3 4
Carpal bar	Yes	Yes	No	Yes	No	No	Yes	No	Yes

(primaries numbered descendently, with P10 referring to the outermost) by 11th July and P10 by 22nd August, when P9 was fully regrown and P10 half-grown. The second individual still possessed at least six juvenile outer primaries in mid August. These two terns were the only ones to show a dark bar on the inner secondaries, a result of retained juvenile feathers.

Four individuals had already replaced all juvenile primaries and showed very little moult contrast, indicating that the process had been completed relatively recently.

Although none had a full, adult-like, dark cap, the head pattern of most was indistinguishable from that of some second-summers. Similarly, while bill coloration was generally dark, only two had an all-dark bill. A majority had a dark carpal bar, indicative of non-breeding plumage.

It is clear from table 4 that first-summers are extremely variable. Only three showed a full non-breeding head pattern, and just two of these had an all-dark bill. Significantly, one of these non-breeding-plumaged birds had replaced all its juvenile primaries, suggesting that, in the case of immatures, head and body moult may proceed separately from that of the flight feathers.

Discussion

With the ever-growing interest in identification matters, and the associated recognition of the importance of ageing birds correctly, it has become increasingly frequent for observers to ascribe individual terns to precise age categories. This is due, to a large extent, to the well-founded advances in the identification and ageing of gulls. The analogy between gulls and terns is misplaced, however. Gulls acquire adult plumage through year-by-year changes in plumage and

bare-part patterns, whereas terns do not. All Common Terns, once they have completed the post-juvenile moult, closely resemble adults in plumage. Differences between breeding and non-breeding plumages are far more significant. Immatures in non-breeding plumage are effectively indistinguishable from similarly plumaged adults. The presence of non-breeding-plumage features during the breeding season does, however, allow some individuals to be recognised as immature.

Within a brief period of time - broadly speaking, from April until the end of June - any Common Tern in northern latitudes which shows any more white on the forehead than a few white feather tips can probably safely be aged as immature, i.e. as either a first-summer or a second-summer. By the end of July, at least a quarter of adults are already moulting to winter plumage and are indistinguishable from these immatures.

There is a strong tendency for second-summers to replace more inner primaries than adults before their return to the breeding grounds, this producing a narrower dark wedge on the outer wing. This is perhaps because they remain longer on the wintering grounds. It is most common for adults to have five or six unreplaced outer primaries, and for second-years to have four or fewer (SJW, unpublished data). Nevertheless, a considerable degree of overlap exists, and the average number of feathers replaced varies significantly between years. Primary moult, therefore, cannot generally be used to age Common Terns.

Any individual which has retained juvenile flight feathers (very worn, dark outer primaries, or dark secondaries forming a secondary-bar), however, can safely be aged as first-summer. Such individuals form only a tiny minority, fewer than one in 500 at Seaforth,

and these are the only Common Terns, other than juveniles, that can be aged precisely.

The majority of second-summers cannot be distinguished from adults. Almost two-thirds of second-summers show adult-type head and body plumage. They tend to have more black on the bill than adults, to have replaced more inner primaries and to exhibit less primary moult contrast; but there is a great deal of overlap. This reveals the greatest weakness of the gull analogy: no Common Tern can safely be described as an adult! Differences in appearance between second-summers and adults apply only on average; for most individuals they cannot be used, even in combination, to determine precise age.

The belief that most second-summer Common Terns remain on the wintering grounds may be based upon the false assumption that they can be identified as being of that age. Observations at Seaforth, however, indicate that at least a large majority return to the breeding grounds. The wing-moult strategy of this species is complex (Baker 1993), and its timing and extent in immatures are not well documented, but there is no sufficient reason to believe that, as has sometimes been claimed, the outer primaries of second-years are replaced earlier (and therefore appear darker) than those of adults. Our observations show the opposite to be more often the case, and perhaps suggest that completion of the full wing moult occurs later among second-winter birds than among adults.

Just as adults cannot safely be distinguished from second-summers, some second-summer individuals cannot be separated from many first-summers. The majority of first-summer Common Terns seen at Seaforth have more closely resembled what is traditionally regarded as second-summer plumage. Most first-summers appear to have completed, or to be in the process of completing, the moult of the juvenile flight feathers. Those with retained juvenile features may be aged as first-summers, but many do not exhibit these age-diagnostic features. Since very few first-summer birds return to the breeding grounds, it is possible that those which do so are atypical in other ways and perhaps more 'advanced' in plumage than most, and are therefore not representa-

tive of the age group as a whole.

To add to the confusion, a small minority of second-summer individuals show few or no signs of breeding plumage. Of a total of eleven Common Terns seen at Seaforth which showed the supposedly 'classic first-summer' features of white forehead, reduced black cap, 'lobed' ear-coverts, all-dark bill etc., eight were in fact second-summers. So, although a larger proportion of first-summers resemble '*portlandica*' types in these features, the majority of such terns may actually be second-summers.

In summary, 'first-summer-type' Common Terns are most likely to be second-summers; 'second-summer-types' may be first-summers; and 'adults' may in fact be second-summers. We propose, therefore, that, with the minor exception of individuals with retained juvenile remiges (which thus must be first-summers), the terms 'first-summer', 'second-summer' and 'adult' should cease to be used for field identification of Common Terns, and perhaps also for that of other tern species which share a similar moult strategy. Instead, the term 'adult-summer-type' should be applied to all those displaying full breeding plumage, including, especially, a completely dark cap. Early in the breeding season, when they are safely distinguishable from 'adult-types', all others should be labelled simply as 'immature'.

Acknowledgments

We are grateful for the many helpful comments made by Colin Bradshaw, Tim Melling and Steve Young on earlier drafts of this paper.

References

- Baker, K. 1993. *Identification Guide to European Non-Passerines*. BTO Guide 24.
- Cramp, S. (ed.) 1985. *The Birds of the Western Palearctic*. vol. 4. Oxford.
- Grant, P. J., Scott, R. E., & Wallace, D. I. M. 1985. Further notes on the '*portlandica*' phase of terns. In Sharrock, J. T. R. (ed.), *Frontiers of Bird Identification*. Biggleswade.
- Kaufman, K. 1990. *Advanced Birding*. Boston, USA.
- Mailing Olsen, K. M., & Larsson, H. 1995. *Terns of Europe and North America*. London.
- Scott, R. E., & Grant, E. J. 1985. Uncompleted moult in *Sterna* terns and the problem of identification. In Sharrock, J. T. R. (ed.), *Frontiers of Bird Identification*. Biggleswade.
- Svensson, L., Grant, P. J., Mullarney K., & Zetterstrom, D. 1999. *Collins Bird Guide*. London.

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