VAGRANCY MECHANISMS IN PASSERINES AND NEAR-PASSERINES

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Blue-winged Warbler by James Gilroy

Britain is exceptionally well placed to receive vagrant birds. Its position on the edge of Europe combined with constantly changing weather patterns and army of amateur and professional ornithologists conspire to produce perhaps the richest vagrant avifauna anywhere on Earth.

Britain and Ireland receive vagrants from every possible direction: species from the high Arctic, Nearctic, North Africa, Central Asia and Siberia, and wanderers from the world's oceans. Some species that breed no nearer than the Urals, such as Yellow-browed Warbler, are regular passage migrants; others, such as Crested Lark, breed as close as Northern France yet remain extreme vagrants here.

Of the 580 bird species officially recorded in Britain up to the end of July 2008, 50 per cent are rare vagrants. That 289 full species are considered here is testament to the reliance on vagrants of our avifaunal lists. There are a further 32 subspecies and undefined visitors, for example albatrosses. Sixteen per cent of recorded birds have occurred on fewer than five occasions: an amazing 92 full species in Categories A to D have occurred on one to four occasions.

Since 1980 more than 80 new species have been added to the British and Irish lists, including new vagrants and those resulting from taxonomic splits. New species are recorded on an annual basis. There are many mechanisms by which vagrant birds can come to find themselves apparently hopelessly lost in this part of Europe. Some arrivals are related to population growth or range expansion. Others are driven by food shortages or unusual weather events. Many birds undoubtedly arrive here as a result of internal errors in their migration apparatus, causing them to depart on deviant headings. These broad mechanisms have been discussed in detail in several previous works on vagrancy (for example, Cottridge and Vinicombe 2001). In this account, we endeavour to take a more direct look at the patterns of vagrancy occurring in these islands, addressing questions relating to causes of rare bird occurrence on a regional basis. The mechanisms discussed here relate to passerines and near passerines; vagrancy in non passerines will be covered in Volume 2.

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NEARCTIC VAGRANCY

Autumn Vagrancy Patterns

The appearance of Nearctic landbirds in Western Europe represents one of the most amazing feats of vagrancy performed by any species. The regular arrival of small-bodied passerines and near-passerines from North America on our shores is truly remarkable. The best explanation for their occurrence lies close to the old and oft-quoted adage that vagrant birds are simply blown off course. Arrivals of North American passerines show a strong peak in autumn, and are almost always associated with a specific set of weather conditions described comprehensively by the work of Norman Elkins (Elkins 1979, 1988 and 1999).

Elkins explains how many species of migratory bird breeding in the northern part of North America follow a relatively similar migratory pattern in autumn: moving across eastern North America and funneling east towards the Atlantic seaboard. The birds then turn southwards to move en masse along the coast towards their winter quarters. During this coast-hugging – for some species trans-oceanic – phase of the migration, birds become vulnerable to the changeable weather patterns that occur in the Atlantic region. Storms are relatively frequent throughout the autumn on the east coast of North America. Many weather systems are fierce and fast moving enough to entrain and displace birds from their normal flight path. When a specific set of weather conditions are met, large numbers of migrating birds may be displaced in our direction.

Migrants typically depart to the southeast on coast-hugging flights in relatively clear weather associated with high-pressure systems. Such weather patterns offer ideal conditions for normal migration: light tail winds and clear skies allow easy navigation. Given the changeable nature of the Atlantic weather, these conditions are often short-lived. Southbound birds are frequently caught up in cold frontal zones associated with offshore low-pressure systems. Deep cloud often builds up around these cold fronts, reducing the birds' capacity to navigate using the stars.

In such conditions, birds are likely to be drifted farther and farther out to sea, particularly as strong westerly winds often occur along such cold fronts. The weather systems typically move east from coastal areas towards the edge of the warm waters of the Gulf Stream, where they strengthen and deepen, and generate frontal waves. These waves are formed around pockets of warm air on the southern side of low-pressure systems. The associated cloud, precipitation and winds are intensified. Disorientated migrants within these eastbound weather systems can be drifted rapidly eastwards across the open ocean. With favourable tailwinds the birds may eventually complete a transatlantic crossing (Elkins 1979).

This weather-based theory is strongly supported by the pattern of occurrence of recorded autumn North American passerine vagrants in the British Isles. Virtually every multiple arrival of passerine and near-passerine vagrants from the west occur following spells of prolonged westerly gales at mid latitudes, associated with Atlantic depressions that cross from the North American eastern seaboard at high speed. Most individuals brought to the British Isles by such weather systems are discovered on western headlands and islands. It has also been suggested that some individuals may reach us by traveling in the high-level jet stream, which generally flows west to east across the Atlantic at similar latitudes (Newton 2007).

Wood Thrush by James Gilroy

Westerly jet stream winds reaching 250 km an hour could potentially bring migrants over 5,000 km from Atlantic Canada to the UK in less than 24 hours. The problem with this theory is that conditions within the jet stream, including extreme wind speeds and low air temperatures, are likely to threaten the survival of small birds. Very few passerines would be able to survive such conditions long enough to make a crossing. Moreover, in some years North American landbirds arrive concurrently with monarch butterflies, which could not possibly survive jet-stream conditions, again hinting that most bird species probably travel below jet-stream altitudes.

Further evidence that virtually all of our autumn North American vagrants are brought by Atlantic depressions comes from analysis of the range of species that occur here and their relative frequency in comparison to the overall community of birds passing down the North American eastern seaboard. McLaren *et al* (2006) carried out the most detailed analysis of Nearctic passerine vagrancy in Europe yet published. They found that the range of species occurring on this side of the Atlantic includes a significant over-representation of over-ocean migrants: species such as Blackpoll Warbler and Grey-cheeked Thrush that are known to routinely take the transoceanic shortcut directly between the northeastern seaboard and their winter quarters or staging grounds in the Caribbean. This finding supported previous suggestions (for example Robbins 1980 and Elkins 1979) that most Nearctic vagrants reaching the UK originate in flights off southeastern USA and are displaced downwind (northeastward) across the North Atlantic. Given favourable tailwinds, it is estimated that this journey could be completed in around two days.

Many of the long-distance migrants involved in vagrancy events to Europe carry enough stored fat to enable them to fly non-stop for 30 to 50 hours or longer (Nisbet 1963) and consequently are capable of making such a crossing unaided. Many of these vagrants are found in a similar state of exhaustion, with no remaining fat reserves, to individuals arriving in their normal winter quarters. That some do not recover suggests that they have not only burnt up all fat reserves but also metabolised vital tissues. McLaren *et al* (2006) found that the most commonly occurring autumn transatlantic vagrants were larger-bodied long-distance migrants (mostly boreal breeders) that were common in late autumn in the North American migration watch points.

Typically these included longer-distance migratory species that winter in the Amazon basin (Yellow-billed Cuckoo, Grey-cheeked Thrush, Red-eyed Vireo and Blackpoll Warbler), the Andes (Swainson's Thrush and Rose-breasted Grosbeak) or even farther south in South America (Bobolink).

More rarely, representatives of a group of species that winter farther north – predominantly in the Caribbean and Central America – visit the British Isles. These include Northern Parula, Northern Waterthrush, Common Yellowthroat and a number of species that have been recorded on just a handful of occasions. Given the relatively short distance of their normal migration in comparison to those species wintering in South America, these species are evolutionarily less well-equipped for making long-distance sea crossings. It is unsurprising that they survive trans-Atlantic crossings only very rarely.

The occurrence of the more southerly breeding species is thought to be associated with a specific set of meteorological conditions causing reversed northeastward passage – known as downwind flight or retrograde migration – along the North American Atlantic seaboard. This phenomenon, revealed by radar studies, occurs when flights of southbound migrants are blown backwards by strong opposing winds (Gehring 1963; Larkin and Thompson 1980). Such wind vectors off southern parts of the US east coast can carry disorientated birds north into the region off the northeast seaboard where most of our more regular northern vagrants are thought to originate. From here, flights of retrograde migrants can get caught up in eastbound Atlantic depressions and are consequently brought to Europe. This phenomenon is likely to have been the principal cause of major influxes in 1976, 1985, 1986 and 1995, all of which involved a wide range of species (and were dominated by more southern species such as Red-eyed Vireo and Baltimore Oriole). In more typical years this strong southerly vector does not develop and arrivals on this side of the Atlantic tend to be of lower magnitude and dominated by trans-oceanic migrants such as Grey-cheeked Thrush and Blackpoll Warbler intercepted by eastbound frontal waves during their normal southward passage over the ocean.

Previous authors (Cottridge and Vinicombe 1996; Newton 2007) have speculated about apparent northern or southern biases in occurrence of some species noting, for instance, that all our Tennessee Warblers have occurred in Scotland and most of the Red-eyed Vireos have occurred in the south. A plausible explanation for this pattern is that many individuals travel along innate deviant headings caused by some form of genetic mutation or other in-built anomaly.

It has been argued that if a proportion of individuals set off on a deviant heading – for example, a 180° reversal of the normal route – vagrants might move along species-specific trajectories, giving rise to patchy distributions of records (Cottridge and Vinicombe 1996). Although theoretically possible, there are several problems with this hypothesis. Firstly, for a small bird to maintain such a specific direct heading across the Atlantic in stormy conditions is likely to be near impossible, particularly given the unpredictable movement of the storm systems that evidently carry these birds here.

Secondly, the hypothesis is based on a small sample size and data from elsewhere in Western Europe do not necessarily support the assertion. Although the Red-eyed Vireo is decidedly rare in Northern Britain, it is the commonest transatlantic vagrant to Iceland (where there have been 19 birds) and records extend south to the Azores (10 records, all in recent autumns). Likewise, although the first five records of Tennessee Warbler were all from northwestern points (Fair Isle, Orkney, Iceland and the Faeroes) the most recent was on the Azores. Until a fuller pattern emerges, it remains tenuous to speculate on patterns with so few occurrences in a system with so much potential noise created by changing distribution patterns of observer effort, weather patterns and population fluctuation in the breeding range.

The spectre of ship-assistance often hangs over the occurrence of Nearctic vagrant landbirds, but for long-distance over-water migrants at least it seems probable that most occur here entirely unassisted. Falls of passerine migrants occur quite regularly on ships, particularly during unfavourable weather conditions. But most accounts of such falls state that the majority of individuals do not remain on board for long periods (Durand 1972). Transit times for fast vessels are in the order of five to seven days. Both insectivorous and granivorous species have been recorded surviving such crossings, but granivorous species are much more likely to remain on deck for long periods, particularly in spring (Durand 1963, 1972).

Durand (1972) recorded 58 species of landbirds on transatlantic crossings, including 21 species not yet recorded in the British Isles. Some regular transatlantic vagrants were never recorded landing on vessels (for example Grey-cheeked Thrush), while the most abundant species recorded was White-throated Sparrow. This latter species routinely incriminates itself by appearing near ports. Many other Nearctic species, particularly sparrows, have turned up at major ports such as Seaforth, Felixtowe and Southampton, suggesting that a proportion of individuals arrive here via ship-assistance. Many more are likely to leave their carrier boats within sight of land, and might therefore arrive well away from major ports.

Durand (1963) lists an interesting example of a Baltimore Oriole in October 1962 which he noted "*did not join the Mauretania until 40°W (3,000 km from New York), stayed for several days, pecking at limes and toast on the open decks, and left in very good shape within an hour or two of the Irish coast to make a very probable, though unrecorded, landfall*".

Despite such evidence, the fact that the vast majority of autumn transatlantic arrivals are associated with specific weather events suggests that the most species – long-distance migrants at least – arrive here unaided.

Several of the Nearctic species that have occurred here in autumn, particularly those arriving later in the season, are not classed as long-distance Neotropical migrants. These include Mourning Dove, Belted Kingfisher, Yellow-bellied Sapsucker, Buff-bellied Pipit, Northern Mockingbird, Brown Thrasher, Varied Thrush, American Robin, Red-breasted Nuthatch, Savannah Sparrow, Song Sparrow, White-crowned Sparrow and White-throated Sparrow.

The occurrence pattern of some species – in particular Mourning Dove, Yellow-bellied Sapsucker, Buff-bellied Pipit, American Robin and Savannah Sparrow – mirrors that of the more expected long-distance migratory vagrants from North America. Records in western Britain and Ireland match the typical time window and follow the passage of deep Atlantic depressions. Although we do not know the extent of their physiological capabilities, the pattern of occurrence suggests that many may have crossed the Atlantic unassisted.

Speculation on the origins of other species is constrained by small sample sizes. Brown Thrasher in Dorset and Red-breasted Nuthatch in Norfolk arrived around the time one would expect unassisted vagrants to occur, but they were recorded at atypical locations reasonably close to major ports. Neither species has much of a history of long-distance vagrancy in North America and both are short-distance migrants at best, although Red-breasted Nuthatch is irruptive and has also occurred in Iceland (and Bermuda, around 1,000 km from the mainland, at least three times 1975, 1977 and 1978). Such irruptive boreal species can on occasion make huge trans-continental movements, but are not evolutionarily adapted to long water crossings. Unassisted vagrancy would therefore seem unlikely on current knowledge, and in both cases birds were likely to have crossed the Atlantic at least partly aboard ship; Durand (1972) recorded both on ships.

The case for unassisted vagrancy for Northern Mockingbird is even more tenuous. This species is largely sedentary and rarely occurs as a vagrant even into the Canadian interior. The existing accepted autumn record, although from a likely location (Cornwall), was very early in the autumn. However, it occurred at the same time as Black-billed Cuckoo and Black-and-white Warbler in the region and the three non-accepted records of Northern Mockingbird (Kent 1851, Norfolk 1971 and Wales 1978) were also in August, highlighting how difficult it is to ascertain origins in such species.

Winter Vagrancy

Every so often an American landbird is found wintering in the UK. Such events invariably send birders into a furore of excitement during the normally dull winter period. Such birds are typically granivorous or frugivorous species – such as White-crowned and White-throated Sparrows, Dark-eyed Junco and Baltimore Oriole – found attending garden bird feeders. More typical autumn vagrants such as Catharus thrushes and Dendroica warblers are found much more rarely in the winter, suggesting that most either continue moving south after making landfall or perish while attempting to winter when they fail to find sufficient food. Many individuals could also remain undetected away from garden feeding stations, where they are less likely to cross paths with observers. It may be that most Nearctic vagrants perish after using up their pre-migratory fat deposits during the ocean crossing. Certainly this seems to be the case for both Yellow-billed and Black-billed Cuckoos, which are typically found exhausted. Temperate winter conditions are probably not suitable for wintering by insectivorous species adapted to spend the winter in the Neotropics, although singles of four species of wood warbler have been discovered surviving well past mid winter. Survival rates may be higher in the mildest winters. In the winter of 1988-1989, one of the mildest on record, three species of Nearctic vagrant attempted to winter (Golden-winged Warbler, Common Yellowthroat and Baltimore Oriole). The preceding autumn was a particularly good one for vagrants (Elkins 1999).

While it can be safely assumed that most of the wintering Nearctic passerines discovered here arrived in the preceding autumn, some species could conceivably cross the Atlantic during winter. American Robin is abundant in the southeastern USA in winter and regularly undertakes cold weather movements en masse. A coasting bird could easily be swept eastwards into developing wave depressions along the Gulf Stream boundary, from which a transatlantic crossing in warm sectors may be initiated (Elkins 1979). Dark-eyed Junco is another regular late-season vagrant that might arrive by a similar crossing, but as with the other sparrows (and American Robin) ship-assistance may be the norm rather than the exception.

Spring Vagrancy

Spring vagrancy of North American passerines is more rare and less predictable than in autumn. The species composition is also markedly different, with Nearctic sparrows predominating. Indeed, the fact that American sparrows are generally rare or absent within major autumn arrivals of other Nearctic vagrants suggests that something different occurs with this group. The paucity of records of these species from classic sites for transatlantic vagrants, such as the Isles of Scilly, and the bias towards areas in close proximity to major ports suggests that many sparrows arrive on boats. Considering the lack of suitable wave depressions across the Atlantic during spring, generally clear sunny weather along the US east coast, the predominantly overland spring passage of most species in North America and a bias in records towards the east coast and Shetland, it seems likely that birds do not routinely make unassisted transatlantic crossings in spring.

Elkins (1979) found little relationship between the occurrences of suitable wave depressions and the arrival of Nearctic migrants in spring. Many individuals were recorded during or after blocking situations, such as prolonged easterlies, where unaided passage would be very unlikely. The only exception is an apparent spring fall of Nearctic vagrants in 1977, when conditions were conducive to transatlantic vagrancy. Four Nearctic passerines were recorded: Yellow-rumped Warbler on Fair Isle; Dark-eyed Junco in Highland; and two White-crowned Sparrows, in Yorkshire and on Fair Isle. The possibility of partial ship assistance seems likely for some or all of these birds (Elkins 1979).

The lack of spring records of the typical autumn vagrants such as cuckoos, Grey-cheeked Thrush, Red-eyed Vireo and Bobolink is interesting. Perhaps they suffer a high degree of mortality after arrival in autumn or attempt to re-orientate and maybe even attempt a sea crossing at lower latitudes. Most of the Nearctic species that occur in spring are those that typically winter in central or North America. These may

be more adapted to the conditions occurring in a typical western European winter (Elkins 1999).

Some spring vagrants might overshoot up the eastern seaboard and continue across the Atlantic, resulting in landfall in northern Scotland along a rhumb line (a straight line rather than a great circle) route. This hypothesis is unlikely, as the subset of species involved is not of typical long-distance migrants. Perhaps more importantly, the birds are not likely to be assisted by favourable winds.

Spring records of some strongly migratory species – for example Eastern Phoebe, Tree Swallow, Yellow-rumped Warbler and Cape May Warbler – are perhaps the best candidates for overshooting. However, these records could also have involved birds that arrived in the previous autumn and moved north in the following spring. Ship-assistance could also conceivably have occurred in these cases, although all are medium-range migrants that did not occur in close proximity to major ports (unlike spring records of Blackpoll Warbler and Lark Sparrow).

VAGRANCY FROM THE EASTERN PALEARCTIC

Autumn Vagrancy

One of the most prominent features of the British Isles avifauna is the extensive roll call of passerine vagrants from the Eastern Palearctic. We are visited regularly by species from across Asia from the northern extremity of the Siberian tundra to the arid steppes and deserts of southern central Asia. Among them are species with ranges so far removed from western Europe that one would perhaps never expect them to occur here of their own volition. The distances travelled by some of these errant individuals are staggeringly huge, and their occurrence represents one of the most interesting quirks of our natural history.

The causes behind autumn long-range vagrancy from the east remain poorly understood and a matter of much debate. Of all forms of vagrancy discussed here, the arrival of eastern species is perhaps the least likely to be caused directly by weather patterns. Unlike passerine vagrants from the Americas that are brought to the British Isles primarily by weather events, species from Asia are very unlikely to be influenced by the weather in such a significant way. Our weather systems are seldom linked to those of the regions where these birds originate. It is extremely rare that a single wind connects our islands to the parts of Asia typically occupied by our eastern vagrants (Elkins 1988).

Many of our most regular Asian visitors breed no nearer than central Russia, and in these cases it is simply impossible for wind drift to be responsible for bringing birds across the entirety of their journey. Winds inevitably cause migrants to deviate from their desired course, but such effects are only likely to last for long periods when individuals have simply no choice but to fly with the wind, as with sea crossings. Over the land most migrants can avoid prolonged drifting by simply grounding and waiting for more suitable weather conditions before continuing their journey.

Weather systems are unlikely to be the root cause of vagrancy from Asia, but they certainly play a significant role in influencing the number of vagrants that arrive here. Any birder who has spent time on the east coast of Britain will know that the weather has an enormous impact on the arrivals of migratory species, both common and rare.

The effects of weather can be rapid and dramatic. In the right conditions, our coastlines can be transformed from birdless wastelands to bountiful havens teeming with continental migrants. There are almost always a few vagrants caught up in such movements, and there can be no doubt that these weather systems play an important role in carrying vagrants to us from the continent. It is likely that many eastern vagrants passing through Europe get entrained in movements of more local migrants and become affected by the same weather patterns that give rise to common migrant falls on our coastlines. Several vagrant species that breed on the near continent, such as Thrush Nightingale, probably arrive primarily as a result of wind drift in such conditions in autumn (Williamson 1959).

Interestingly, the biggest arrivals of eastern vagrants tend to occur when anticyclonic conditions prevail over the continent and eastwards towards Siberia (P. Harvey in litt). These anticyclones are usually associated with clear weather and light winds over Scandinavia and central Europe. Such conditions are not particularly conducive to drifting birds off their normal headings. These weather patterns are, however, suitable for facilitating the passage of birds that are already moving westward across Europe on a deliberate heading. This again suggests that although weather conditions play a role in assisting the arrival of eastern vagrants, wind drift is not the ultimate causal factor. Indeed, a good proportion of vagrants arrive in weather conditions that are far from ideal for falls of continental migrants (Nisbet 1962, Elkins 2005).

It is not infrequent that eastern vagrants are discovered on days when few other migrants are found, particularly at remote migration watchpoints or small islands, where coverage is regular and birds are easier to detect due to a lack of cover. In some cases, vagrant birds seem to have actively battled against the weather in order to arrive on our shores. Given that observer coverage decreases dramatically on our coasts when conditions are not ideal for drifting continental migrants, it must be assumed that many of these eastern vagrants go undiscovered during periods of apparently unsuitable weather.

If the weather is not directly responsible for bringing many eastern vagrants to the British Isles, what is? This question has been a cause of great debate and interest throughout the history of ornithology. A fully satisfactory answer remains elusive. There are numerous theories relating to types of navigational error that could give rise to the patterns of vagrancy that we encounter, and there remains considerable argument over their relative merit. Before considering these issues in detail, it is worth considering a few broader points that have significance to the overall frequency of vagrancy from the east.

A starting point in understanding why so many eastern vagrants reach our shores is to consider a basic feature of geography: landmass. Asia is a very big place. Not only

is Asia large, but much of the continent remains relatively untouched by man, a vast and biodiverse wilderness. Northern Asia remains dominated by wild primary habitats: forests, swamps and tundra that stretch unbroken across many millions of square kilometres. As a consequence, the region supports truly enormous populations of birds, and passerines in particular. Although figures are difficult to estimate, common species such as the Yellow-browed Warbler and Pallas's Warbler must have world populations numbering in the tens of millions. Another important element is the climate. The region endures extremely cold winters and consequently most of the passerines breeding in the mid and high latitudes are strongly migratory. In combination, these factors contribute to the propensity for vagrancy among passerines from the east. With such large populations performing long distance movements, it is inevitable that a significant number of individuals will make mistakes during the course of their migration. It is unsurprising that the species occurring here most frequently tend to be those that are most abundant within their home range.

Pallas's Reed Bunting by James Gilroy

Another simple geographical feature that predisposes the British Isles to receive far-eastern vagrants is our position at the western extremity of the Eurasian landmass. Unlike most Nearctic vagrants, eastern species face few genuinely significant barriers on their way here. There are no great oceans or deserts to cross. Birds can exploit constant re-fuelling opportunities in order to continue their great journey. The only really significant obstacle before arriving on the British east coast – the North Sea – could even be helpful in terms of increasing the proportion of eastern vagrants that are discovered by birders after arrival. Although only a short crossing, it presents enough of a barrier that passerines making the crossing are often tired enough to seek refuge in the first patches of coastal scrub available. Thus they make landfall in fringe coastal areas where they can be found more readily, rather than melting away into the interior landscape.

These basic principles contribute to the high propensity for vagrancy from the east, but what are the underlying factors causing vagrancy to occur in the first place? Studies of the navigational capacities of migratory birds have revealed that they are increibly complex. Experiments have revealed that birds can draw on a wide range of cues, stimuli and internal mechanisms to determine their position, route and timing (see Newton 2007). They may use multiple sensory organs in order to navigate, including vision, olfactory receptors and even specialised eye cells that can detect magnetic fields. With such a complicated array of inter-related navigational machinery, it is perhaps unsurprising that many things can go wrong.

It is likely that within each migratory population variation will exist in the accuracy of navigational tools as a result of genetic mutation or other factors influencing a bird's development. This variation could take many forms, given the wide range of variables associated with migration behaviour.

One particular navigational error that has attracted particular attention as a likely cause of vagrancy is the phenomenon of reverse migration. This occurs when an individual makes a 180° miscalculation in orientation, causing it to perform the exact opposite of its intended migration route (Rabol 1980). It is a relatively simple error for an individual to mistake north for south. The potential significance of this navigational error becomes clear when we examine the normal migratory trajectories of most eastern vagrants that regularly reach western Europe. On the whole, these species breed in Siberia and migrate to winter in southern Asia. In many cases, a reversal of this normal journey brings the birds directly to Western Europe (Figure i).

The most frequently cited example in support of reverse migration as a primary cause of vagrancy concerns the occurrence patterns of Red-breasted and Collared Flycatchers in the British Isles (Cottridge and Vinicombe 1996). Red-breasted Flycatchers breed abundantly from central Europe eastwards. They migrate southeast from these breeding grounds to spend the winter in southern Asia. A reversal of this normal migration route brings birds straight to western Europe, where they are relatively common as autumn vagrants.

The breeding range of Collared Flycatcher is similar, but this species winters exclusively in East Africa. Consequently, the entire population migrates almost due south in the autumn. As such, the reverse migration shadow for Collared Flycatcher barely brushes the British Isles, being orientated more towards Scandinavia. As expected under reverse migration theory, Collared Flycatcher is practically unknown in the British Isles in autumn. With this compelling evidence, the reverse migration shadow has been used widely as an explanation for patterns of autumn vagrancy. It has even been suggested as a tool to predict which vagrants could occur here naturally and which are likely to occur only as escapes from captivity (Cottridge and Vinicombe 1996).

Being a relatively simple error to make, one would expect reverse migration to be a relatively common cause of vagrancy, as suggested by many authors. However, the extent to which it can be used as a blanket explanation for patterns of vagrancy from the east is debatable. Many patterns of vagrant occurrence do not follow the predictions of the theory. Even the classic Red-breasted and Collared Flycatchers example does not bear up to close scrutiny. It is indisputable that Red-breasted Flycatcher is the commoner of the pair in the British Isles in autumn. However, the same is also emphatically true across the whole of Scandinavia, even within Collared Flycatcher's reverse migration shadow: there are no autumn records of Collared Flycatcher in Norway and only one from Finland, but many hundreds of records of Red-breasted Flycatcher. The rarity of Collared Flycatcher could be explained by the fact that they are extremely difficult to distinguish from the much commoner Pied Flycatcher in autumn. Never the less, the fact that there is no evidence for Collared Flycatcher being

any more common within the reverse migration shadow than outside greatly weakens the strength of the example in support of the reverse migration theory (Gilroy and Lees 2003).

Many other occurrence patterns concerning eastern species also indicate that reverse migration is not the sole cause of autumn vagrancy. Several eastern species that occur regularly in the British Isles follow a north-south migration in autumn, and therefore cannot occur here as a result of simple reverse migration (Figure ii). These include Richard's, Blyth's and Olive-backed Pipits and Black-throated Thrush. Several of our other regular autumn vagrants, including Pied Wheatear and Isabelline Shrike, migrate from central Asia to eastern Africa in a south-westerly direction, such that a 180° reversal would take them far to the east of Britain (Figure iii).

Peaks in occurrence of vagrants may occur in certain directions as a result of regularly occurring errors, including reverse migration, but it is clear that vagrancy in most migratory species can occur in almost any direction outside the normal migration route (Gilroy and Lees 2003). The causes of these aberrations remain poorly understood, but presumably often relate to genetic mutations or abnormalities that influence any of the many components of birds' navigational instincts.

Another intriguing possibility is that local irregularities in Earth's magnetic field can influence the development of navigational apparatus. Birds reared in areas with anomalous magnetic field patterns could theoretically develop navigational mechanisms that differ from the population average, potentially leading to localised vagrancy. This hypothesis is given tantalising support by the fact that parts of Siberia, where so many of our regular vagrants originate, are known to have high levels of magnetic irregularity (Alerstam 1990). However, the true influence of these features on bird migration remains unknown, and any speculation is purely conjectural.

Whatever the underlying cause, it is clear that autumn vagrancy is a relatively common phenomenon amongst migratory species from the Eastern Palearctic, and that there is a significant element of randomness in the course that such birds can take. Indeed, records of species from the very far east, for example Chestnut-eared Bunting, underline that distance is no barrier to such movements.

All evidence points to the conclusion that there are few limits to the realms of possibility concerning long-distance vagrancy. There remains considerable potential for further species to reach us from the east, given that such a diverse community of long-distance migrants exists at the opposite end of the Palearctic landmass from us. As birder coverage and knowledge increases, we can look forward to more additions to our avifauna. This extensive shopping list of tantalising and exotic species such as Forest Wagtail, Siberian Bush Warbler, Dark-sided and Siberian Flycatchers and White-throated Rock Thrush cannot be too far away from delivery to our door.

Winter and Spring vagrancy

Despite their relative abundance during the autumn migration period, passerine and near passerine vagrants from the East Palearctic are surprisingly infrequent in the British Isles during winter and spring. A handful of species, particularly those most abundant in autumn – such as Richard's Pipit and Yellow-browed Warbler – are now found wintering almost annually in very small numbers, a phenomenon that may be increasing in response to a recent series of mild winters. Most of our other regular Siberian vagrants have been found over-wintering occasionally, particularly granivorous or frugivorous species (especially buntings and thrushes) that are more likely to find sufficient food resources during the British winter than insectivorous species.

Overall, though, the frequency of occurrence of Siberian species in winter is surprisingly low in light of the number of birds that must occur each autumn. This is likely to be related to the relative harshness of our winter climate being unfavourable for species that generally winter in the tropics. In addition, the likelihood of detection for wintering passerines must decrease once they have moved away from our well-watched coastlines.

The same arguments also apply to many of the North American passerines over-wintering in the British Isles, many of which are extremely rare as autumn vagrants. It is remarkable that tropical-winterers such as Black-and-White Warbler, Baltimore Oriole and even Golden-winged Warbler have been discovered over-wintering here, and yet much commoner Siberian species such as Citrine Wagtail and Radde's Warbler have not. This discrepancy is difficult to account for, but could perhaps be related to the more cryptic appearance of these Siberian species in relation to their gaudy North American counterparts.

In most years a small trickle of passerine vagrants from the East Palearctic is recorded in the early spring. Most are short-stay appearances at coastal watch points in southern areas of the British Isles. These records almost certainly relate to vagrants that arrived in Western Europe in the preceding autumn and which are performing a return passage after wintering somewhere farther south.

Later in spring, records of passerine vagrants from Siberia generally tail off. It is surprising just how rare East Palearctic species are during the late spring period. A handful of eastern species that breed relatively close to the British Isles in Scandinavia – for example Thrush Nightingale, Greenish Warbler and Rustic Bunting – are recorded quite frequently. These species are found most often when anticyclonic weather conditions give rise to easterly winds over the near continent, conditions that are conducive to drifting northbound migrants across the North Sea. However, the suite of East Palearctic species that occurs so frequently during similar weather conditions in autumn remains extremely rare here in spring.

VAGRANCY FROM THE NEAR CONTINENT

Migratory Species from the Mediterranean

Vagrants from the Mediterranean occur regularly in the British Isles. Most records concern long-distance migrants that breed across the region and winter in tropical Africa. Interestingly, patterns of vagrancy in species from this region are distinctly

different from those of the other geographical areas we have dealt with. One principal difference is timing. Vagrants from points east and west tend to show a strong peak in autumn, but many Mediterranean species occur just as frequently or even more regularly in spring. The regularity of spring vagrancy from areas south of the British Isles can be explained by the phenomenon of overshooting.

The arrival of spring vagrants from the Mediterranean is often linked closely to weather patterns. Most arrivals occur when high-pressure systems over the continent bring warm southerly or southeasterly winds up from the Mediterranean. Such conditions are ideal for encouraging northward migratory flights to take place. It seems likely that with a strong backing wind, favourable weather patterns can carry a proportion of individuals much farther north than they would otherwise intend, bringing them beyond their normal breeding grounds and into northwest Europe (Elkins 2005). It is quite common for such weather systems to bring multiple arrivals of Mediterranean species to southern parts of the British Isles, often with many individuals arriving synchronously.

Although it is tempting to assume that spring overshooting from the Mediterranean is principally a weather-driven phenomenon, this is unlikely to be fully the case. The distances travelled by some individuals are very large, particularly in the case of species from the eastern Mediterranean, and are unlikely to be the result of wind carriage alone. Another possible cause of overshooting is that a proportion of individuals simply fail to turn off their migratory instinct on arrival in their normal breeding grounds, and continue moving along their original migratory trajectory (Cottridge and Vinicombe 1996). This scenario implies that an innate error can occur within an individual's migratory apparatus in a similar way that internal navigational errors are thought to contribute to long-distance vagrancy by birds in autumn.

A further possibility is that overshooting may occur when individuals fail to find a mate or suitable territory within their breeding grounds. Such individuals might continue moving ever farther along their original migratory trajectory in search of breeding opportunities. This scenario is perhaps most likely to occur in conjunction with short distance weather-driven overshooting; individuals that pass over the bulk of their breeding range may consequently find themselves having difficulty locating a mate or suitable breeding habitat. If these individuals fail to compensate for their original overshoot by backtracking, they may continue moving along their original route and venture well beyond their normal range.

There are several lines of evidence supporting this hypothesis. One is that for most species the majority of spring overshoots are males (Newton 2007). Populations of most bird species are male-biased (Donald 2007) and, therefore, it is normal for a surplus of unmated males to be present on the breeding grounds. These unmated males are perhaps the most likely individuals to be driven beyond their normal range in the continuing search for mates.

Secondly, arrivals of overshoots in the British Isles often peak somewhat later than arrival times in the Mediterranean. Although many southern vagrant species can occur

any time from late February onwards, there is a general peak in late May and early June. This is at least a month later than the principal arrival period for most migrants in the Mediterranean. The suggestion is that overshooting peaks at a time when most birds on the breeding grounds will be already paired up, driving remaining individuals to move beyond their normal range in a vain search for breeding opportunities.

Some species whose centre of abundance lies in the Mediterranean region number among our more regular vagrants: species such as Alpine Swift, Hoopoe, Short-toed Lark, Red-rumped Swallow, Subalpine Warbler and Woodchat Shrike. Many other abundant and strongly migratory species from the region are surprisingly rare in the British Isles. Geographically the Mediterranean basin and the British Isles lie very close together, at least in the context of avian vagrancy.

As the crow flies, the English coastline lies just 750 km from the nearest stretch of the Mediterranean Sea in France. Countries as close as Spain, Italy and Greece host a whole suite of common migratory passerines that remain extremely rare stragglers to Britain. Given the huge distances travelled by many of the most regular Siberian vagrants that reach here, one would expect that the British Isles would be well within range for any Mediterranean species adapted for long-distance migration. Pallas's Warblers must travel at least 5,000 km from their nearest breeding grounds to reach us; the length of journey travelled by the much rarer Western Bonelli's Warbler from France may be only a few hundred kilometres.

Other examples include both eastern and western forms of Black-eared Wheatear, Olivaceous and Orphean Warblers, as well as Rufous-tailed Rock Thrush, Rufous-tailed Scrub Robin and many more. Most of these species migrate broadly due south to winter in Africa, some moving extremely long distances into the far south of the continent.

Invoking the standard explanation for patterns in autumn vagrancy – reverse migration likelihood – does not help to explain why some Mediterranean species are so rare in northern Europe. The British Isles is well placed to receive reverse migrants from species migrating south from the western Mediterranean to Africa (Figure iv). One theory to explain this pattern was put forward by Thorup (2004), who argued that navigation along direct north-south migration routes is easier than it is for species with more complex routes involving an east-west component, as occurs in most Asian migratory species.

The relative rarity of migratory species from the Mediterranean may also be explained by global population sizes. In contrast to most of our eastern vagrants, Mediterranean specialists have small ranges and inevitably smaller global population sizes. In particular, species limited to the eastern Mediterranean – such as Rüppell's Warbler, Olive-tree Warbler, Cretzschmar's Bunting – are all limited to a relatively small breeding area and have comparatively small global populations. Consequently it is unsurprising that such species are some of the most rare of our vagrants.

Population size can explain several other apparently confusing patterns of vagrancy from the Mediterranean. That British records of Western Bonelli's Warbler greatly out-

number those of Eastern Bonelli's ties in neatly with the fact that the global population of Western is estimated to be 10 times higher than that of Eastern (Snow and Perrins 1997). The same is true for Western and Eastern Olivaceous Warblers, but this time in reverse: the eastern form has a much larger world population and is thought to account for all records to date.

In other cases, population size seems to shed little light on vagrancy patterns. Black-eared Wheatear is abundant in areas as close as Iberia, and yet remains very rare in the British Isles. Black-eared Wheatear is rarer than its closest relative, the Pied Wheatear, which has a similar world population size but breeds much farther away. Perhaps the most extreme example is the Orphean Warbler, with a population of up to 10,000 pairs breeding as close as France and yet only four accepted British records.

Plausible explanations for the surprising rarity of these species are lacking. These patterns serve to underline how little is understood about the underlying causes of avian vagrancy.

It is evident from ringing recoveries and observations at migration watchpoints that some bird species migrate across a much wider spread of directions than others, depending at least partly on the location and distribution of their wintering areas (Busse 2001). The underlying causes of this variation both within and between species remain unclear.

VAGRANCY IN SEDENTARY SPECIES OR SHORT-DISTANT MIGRANTS

There are a few species that are extremely rare vagrants to the British Isles and yet are common residents on the near continent as little as 41 km from the Kent coast. Crested Lark and Short-toed Treecreeper are prime examples, breeding commonly almost within sight of our southern coastline. These birds' rarity here can be explained fairly simply by their highly sedentary habits. Physiologically, there is no reason why they should not cross the Channel, but rates of long-distance dispersal are so low in these species that they are apparently strongly disinclined to do so. Short-toed Treecreeper is probably under-recorded here on account of its cryptic similarity to Common Treecreeper, which by and large precludes the identification of non-vocal individuals.

Zitting Cisticola is another largely sedentary species, but one that occasionally makes irruptive movements. It has spread north in Europe over many years, and is regularly touted as a candidate species to colonise the UK in the wake of continued climatic amelioration. However, this species is extremely prone to local extinction following harsh winters. It spread as far north and east as Belgium in the 1970s, subsequent cold periods extirpated these peripheral populations. Despite expanding its range up as far as the Channel Coast, it remains extremely rare in the UK.

The case of the Penduline Tit is similar, although this species is also a true migrant, with central European and Scandinavian populations wintering in Southern Europe. At least some of the occurrences in the UK originate from these migratory populations, as is evident from ringing recoveries. Formerly an extreme vagrant to the UK, this species also underwent a large range expansion north and west and is now a regular breeder as close as the Netherlands. British records are unsurprisingly concentrated along the south and southeast coasts adjacent to the breeding areas.

The occurrence of each of these largely sedentary species in the British Isles is likely to be associated with exploratory dispersal. In almost all species, full-time residents included, a proportion of individuals will undertake some amount of dispersive movement when trying to locate a suitable territory or home range. Dispersal usually takes the form of post-fledging movement of juveniles in the late summer and autumn, and to a lesser extent post-breeding dispersal of adults. The distances involved are typically small, and the direction taken apparently random.

Dispersal in migratory species often occurs towards the wintering area and is typically over longer distances (Paradis *et al* 1998). It is uncertain what the adaptive value of such flights might be, but potential reasons include prospecting for a suitable territory site, fluctuations in food supply and avoidance of competition and inbreeding (Williamson 1959; Baker 1978; Greenwood 1980). Failure to switch off this dispersive urge might cause nominally 'resident' birds to move hundreds or even thousands of kilometres from their place of birth.

The lack of records of several resident species from the near continent in the British Isles – most notably Black, Middle-spotted and Grey-headed Woodpeckers – can be attributed to their extremely low rates of dispersal and avoidance of sea crossings apparent in most typical woodpeckers. Dispersal distances have been found to be greater in species living in wet habitats than those living in dry habitats, perhaps because of the greater patchiness of wet habitats both temporally and spatially (Paradis *et al* 1998). Low rates of dispersal in insectivorous woodland species such as the woodpeckers, tits and Short-toed Treecreeper may reflect this trend, particularly given that historically most of Western Europe was covered in forest, rendering pointless long-distance dispersal to find new forest patches.

SEDENTARY SPECIES FROM THE MEDITERRANEAN & NORTH AFRICA

Among the species recorded occasionally in the British Isles are a number of largely sedentary species that breed in the Mediterranean basin and farther south in arid North Africa. This group includes Lesser Short-toed Lark, Blue Rock Thrush, White-crowned Black Wheatear, Marmora's Warbler, Trumpeter Finch, Spanish Sparrow and Rock Sparrow. None breed any closer than southern France and all are exceptional vagrants to the British Isles and elsewhere in Northern Europe. Differences in the relative frequency of vagrancy amongst these species appear to be correlated with the magnitude of migratory tendencies they show.

Some species – for example Sardinian, Spectacled and Marmora's Warblers – are at least partially migratory and are unsurprisingly more common as vagrants than the highly sedentary species such as Rock Sparrow. Records of these partially migratory species tend to be concentrated in spring and often occur during periods of weather

suitable for encouraging overshooting. This suggests that most vagrant individuals come from migratory populations that are more likely to be prone to overshoot their normal breeding grounds.

Among typically sedentary species, vagrancy is most likely to arise through extreme dispersal events, particularly involving young and inexperienced individuals that may fail to suppress the urge to move randomly away from their natal area in search of suitable territories or mates. Such movements may be assisted by weather. The first and only British record of White-crowned Black Wheatear and first British record of Marmora's Warbler occurred within a few weeks of each other in spring 1982, associated with a period of abnormally dry and sunny weather from a very warm air stream originating in North Africa; the first week of June was the hottest for 35 years (Brown 1986).

Some species from this region, most notably Trumpeter Finch, are known to be partially nomadic within their normal range. Nomadism is most common in ecosystems with high variation in resources such as food and water over time and space, forcing birds to undertake unpredictable movements that track these fluctuating resources. Nomadic birds tend to occur in ecosystems associated with low, variable, and unpredictable rainfall patterns such as deserts and semi-deserts. Periodic irruptions of species such as Trumpeter Finch often coincide with periods of extreme climatic conditions within their normal range. Various other desert or semi-desert specialists are known to make similar irruptive movements periodically, including Desert Lark and Temminck's Horned Lark; these should be considered potential vagrants to the British Isles in future years.

Alpine Vagrants

Five species of largely resident alpine birds occur as vagrants to the UK: Alpine Accentor, Wallcreeper, Citril Finch and Rock Bunting. Of these, Alpine Accentor occurs the most frequently and also undertakes the most pronounced altitudinal migrations, with birds wintering widely but uncommonly in the Iberian and Balkan lowlands. Wallcreeper shares a similar range and movements within Europe, but has a smaller population size and thus a limited pool of individuals available for vagrancy (assuming that 'our' vagrants come from Europe and not farther east). Citril Finch is more abundant than either of these two species but occurs at lower altitudes and does not undertake pronounced movements, although it does apparently winter regularly south to southern Spain and even North Africa (Benoit and Märki 2004, Navarrete *et al* 1991).

Rock Bunting breeds closer to the UK than others of this group, but is still exceedingly rare. As with Citril Finch, it occurs at lower elevations in winter and northern populations are most prone to dispersal, so its rarity in the UK and elsewhere in northwest Europe is quite puzzling. These vagrancy events as far as the UK may not be the results of extreme weather conditions but extreme exploratory movements of the nature of those described under Vagrancy from the near continent. The establishment of a population of White-winged Snowfinch in the Corsican mountains (Thibault and Bonaccorsi 1999) also demonstrates that long-distance movement by sedentary

montane birds may occur from time to time. This last species, which has occurred as a vagrant north to Helgoland (Coues 1895), should also be expected as an extreme vagrant to the UK.

Boreal and Arctic Irruptive Species.

A major driver of population trends and hence vagrancy potential of birds breeding in the Boreal and Arctic zones is high annual variability in food resources: voles and lemmings for raptors and owls; berry and pinecone crops for a variety of passerines. Both of these groups specialise on food resources that may fluctuate regionally more than one hundred-fold from one year to the next. These fluctuations are often regionally independent, such that poor food supplies in one region may coincide with good supplies in another. In such cases birds can move hundreds or thousands of kilometres from one breeding area to another in search of suitable breeding conditions (Newton 2007).

An irruptive migration occurs in years of widespread food shortage or when population levels outstrip food supply. Irruptions may extend across millions of square kilometres, resulting in population-level displacement to lower latitudes. The UK is within the regular irruptive range of many northern species – Rough-legged Buzzard, Common Crossbill and northern Bullfinch to name three – and lies on the periphery of the range of others.

Some irruptive species that breed very close to us on the near continent remain extremely rare here because they have low population sizes, do not tend to disperse far or show a reticence to cross large water bodies. Most boreal owls appear to fall within this category.

Small mammals, voles in particular, are known for their regular multi-annual population fluctuations, with a periodicity of between three and seven years documented in several countries. In Northern Scandinavia, abundance cycles of microtine voles generally increase in length and magnitude as a function of latitude. Most predator species occurring in the northern part of Fennoscandia are specialised in utilising this resource; more generalist predators dominate farther south. The greater proportion of generalist predators is assumed to stabilize rodent populations in the south, as predators can switch to several alternative prey species when rodent numbers fall (Hanski *et al* 1991, Turchin and Hanski 1997).

In the far north, where fewer alternative prey types are available, predators will continue to target rodents even when the populations are crashing. Once rodent numbers are sufficiently low, the predators have no alternative but to move off in search of new feeding grounds. Winter irruptions of species such as Tengmalm's Owl will occur during such periods of low abundance of small mammals within the northern part of their range (Mikkola 1983). In contrast, Tengmalm's Owl populations in southern areas (as close to the UK as Belgium) have a wider range of bird and mammal species on which to prey and are, therefore, much less prone to long-distance irruptive movements. As such we can assume that the Tengmalm's Owls occurring extralimitally

in the UK and elsewhere in Western Europe come not from the proximate resident populations but from the distant irruptive ones. The extralimital occurrence of Hawk Owl is tied to similar fluctuations in prey abundance. At least one individual of this species has been assigned to the Nearctic subspecies, demonstrating that food shortages may even prompt transatlantic vagrancy.

Snowy Owl is a strongly nomadic inhabitant of the tundra, moving frequently in search of areas of high lemming population density and breeding only in peak years of lemming abundance (Watson 1957, Portenko 1972). Snowy Owl irruptions in North America have been documented since about 1880 and occur every three to five years (Newton 2002). Irruptions into the British Isles seem to occur over a longer timescale, probably as sea crossings are only likely to be attempted during the largest irruptions. Arrivals here appear to fluctuate according to the relative severity of the winter: records peaked during the relatively cold period in the 1960s and 1970s when an invasion lead to extralimital breeding in Shetland. Historically most records come from the Northern Isles, but Snowy Owls also reach our western coasts, suggesting that many may be of Nearctic origin. Transatlantic ship assistance is known to have occurred on at least one occasion, in Suffolk in 2001.

The second important group of boreal irruptive vagrants is passerines that are dependent on tree-fruit or seed crops. Trees of many species require more than one annual cycle to accumulate sufficient nutrient reserves to produce a fruit crop; in any given area most of the trees of a given species (or even different species) fruit simultaneously, being exposed to the same weather conditions. This results in a profusion of tree fruits in some years and a near-complete absence in others. As a result, these boreal irruptive migrants typically show a wide spread of random dispersive headings, as is apparent both from observations and from ring recoveries.

Some of the long-distance movements involving boreal irruptive passerines are truly spectacular: a ringed Bohemian Waxwing was recorded travelling 6,000 km from Ukraine to Siberia; and a Eurasian Siskin moved 3,000 km from Sweden to Iran. Most striking were a ringed Common Redpoll that moved 8,350 km from Belgium to China and another that moved 10,200 km from Siberia to Canada (Newton 2007). Such long-distance movements in Siberia may be more likely to occur on an east-west axis as movement to the south takes dispersers into the arid lands of Central Asia where suitable foraging opportunities for these species would be severely limited.

Some species have very narrow diet specialisations within their normal ranges. Irruptions may consequently depend on seed or fruit crops of a single species, for example, irruptions of Spotted Nutcracker tend to be triggered by failures in the seed crop of the Siberian Stone Pine. Epic irruptive movements also occur in boreal-breeding species in the Nearctic: a ringed Pine Siskin travelled 3,950 km between Quebec and California; and an Evening Grosbeak travelled 3,400 km between Maryland and Alberta.

Such movements hint at the possibility of transatlantic vagrancy in species such as Pine Siskin and support the already documented occurrence of Cedar Waxwing, Red-breasted Nuthatch, Evening Grosbeak and Varied Thrush here in Britain. However, as these species are not adapted to long over-water sea-crossings, such records could be related at least partially to ship-assisted passage.

Steppe Irruptive Species

Three species restricted to the grassy steppes of central Russia occur as vagrants to the UK and elsewhere in Western Europe. These species – Pallas' Sandgrouse and White-winged and Black Larks – are among the most charismatic of all British vagrants. All are extremely scarce, poorly known and rarely seen by western ornithologists even on the breeding grounds. White-winged Lark is the most migratory of the three. It winters in Ukraine, Crimea, Caucasus, Transcaspia and Iran (although some remain within the breeding range all year). Black Lark is more sedentary, but a proportion of the population moves a short distance to the west or southwest in September and October, with some wintering in Ukraine and southeastern regions of European Russia (Lindroos and Tenovuo 2002).

Both these larks show a bias towards spring occurrences in Europe, but considering the location of their breeding and wintering grounds and migratory heading are very unlikely to occur as overshoots. Koistinen (2002) compared the European records of the two species and could only find one instance of simultaneous vagrancy, although several recent records of both species occurred during periods of prolonged south-easterly winds. Koistinen postulated that extreme winter weather conditions within the normal wintering area (heavy snow or deep frost) could inhibit foraging and spur long-range dispersal to alternative feeding areas.

The vagrancy pattern of Pallas's Sandgrouse is arguably even more enigmatic. Exceptional numbers arrived in Western Europe in eight years between 1859 and 1908. It even bred in the UK. Subsequently it has returned to the status of an extreme vagrant. These mass irruptions have been attributed to a lack of food within the normal range, particularly the abundance of the seed-bearing Orache plant *Agriophyllum squarrosum*. Collapses in the abundance of this food source are thought to result from either prolonged drought (Newton 2007) or heavy snowfalls (Dementiev and Gladkov 1951). A trend towards the gradual desiccation of the Aralo-Caspian region at the western part of the sandgrouse's range may have reduced the chances of regular vagrancy to the west (it also occurs as an irruptive vagrant to the east, to Japan for instance). However, heavy snowfalls in the source region for vagrancy may still periodically produce small westerly incursions of this species: such conditions were associated with the occurrence of a Pallas's Sandgrouse in Kent in 1964.

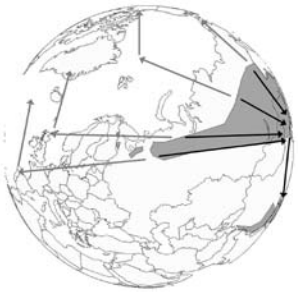


Figure i: Red-flanked Bluetail reverse migration projection. On normal migration, westernmost populations head on an initial heading of almost due east in order to avoid crossing inhospitable desert and mountain regions in Central Asia. A 180° reversal of this route would bring birds directly to Western Europe.

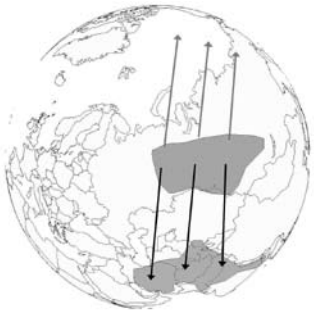


Figure ii: Black-throated Thrush reverse migration projection. This strong-flying species moves directly south from the breeding grounds in autumn. Reverse migrants would move into northern Siberia and beyond. In fact, vagrants of this species have been recorded in almost all compass directions outside the normal route. (Gilroy and Lees 2003)

Figure iii: Rufous-tailed Scrub Robin reverse migration projection. Despite being a relatively common long-distance migrant with an apparently ideal reverse migration shadow, this species is phenomenally rare in Northern Europe.

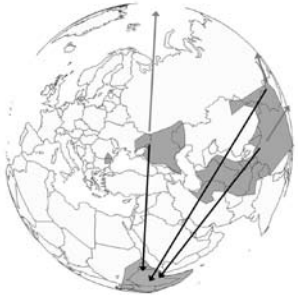


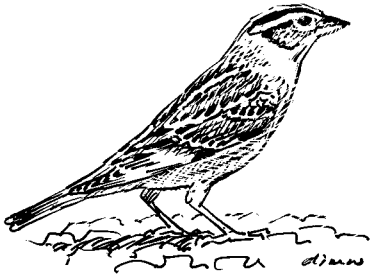
Figure iv: Pied Wheatear reverse migration projection. This regular vagrant is one of several central Asian species that winter predominantly in East Africa. Individuals in Western Europe in autumn appear to have made 90° misorientation away from their normal route.

SUMMARY

There can be little doubt that long-distance vagrancy, particularly among small-bodied passerine birds, represents one of the most fascinating and intriguing features of the natural world. Birders with an interest in vagrancy in Britain & Ireland are extremely lucky on several counts. Not only are we ideally placed to receive vagrants from across the globe but also we have the benefit of a vast databank of previous records, thanks to the efforts of hundreds of amateur and professional enthusiasts, dating back hundreds of years. Despite this wealth of data, there is much to be learned about the underlying causes of these remarkable movements. The issues raised in this account represent the mere tip of an iceberg, and a great number of questions remain to be answered. It is hoped that with the ever-increasing popularity of birding, particularly in continental Europe, our understanding of bird movements and occurrence patterns will improve greatly in future years, bringing new insights into these amazing phenomena.

THE BRITISH ORNITHOLOGISTS' UNION RECORDS COMMITTEE (*BOURC*)

Bob McGowan, Chairman BOURC



Rock Sparrow by Ian Wallace

Professor Alfred Newton founded the British Ornithologists' Union (*BOU*) in 1858. It is one of the oldest and most respected ornithological societies. Its aim is to promote ornithology to the scientific and birdwatching communities, which it achieves primarily through publication of its quarterly journal *Ibis* (available online at *http://www.ibis.ac.uk*). *BOU* also organises regular meetings and conferences, and funds ornithological research projects.

Function, History and Operation

The Records Committee (*BOURC*) is a standing committee of the *BOU*. Its function is to maintain the official list of birds occurring in Britain. The first official *British List* of birds was produced in 1883; the 7th edition (*Ibis* 148: 526-563) was published in 2006. A *BOU* List Committee existed prior to the Records Committee, publishing its first report in *Ibis* in 1956. Prior to 1956 there were 22 reports from the Committee on the nomenclature and records of occurrences of rare birds in the British Isles, the first