CHAPTER 18

Bird Introductions

Kristopher Poole

Introduction

The variety of birdlife in Britain today results largely from a process of extinction and arrival stretching over 2500 years. Humans have been complicit in many of these changes, several species disappearing through predation (Serjeantson, this volume), whilst over three hundred have been intentionally imported (Dudley *et al*. 2006). Although many of these species have had little impact on peoples' lives, others have developed closer relationships with humans, a statement perhaps more true of the Galliformes than any other order. This chapter focuses on the most notable Galliformes: domestic fowl (*Gallus domesticus*), common pheasant (*Phasianus colchicus*), blue peafowl (*Pavo cristatus*), turkey (*Meleagris gallopavo*) and helmeted guinea fowl (*Numida meleagris*). Understanding the timing and motivations behind each arrival is complicated by problems of identification in the archaeological (they are osteologically similar and the remains of domestic fowl and pheasant, and peafowl and turkey are notoriously difficult to separate), documentary and iconographic records. It is only by combining these sources that we can begin to tell the story of how these particular birds became so important in human history.

Domestic fowl

Although widely used for food today, domestic fowl may initially have been more important as sacrificial and fighting birds (Simoons 1994, 145). Yalden and Albarella (2009, 99–102) have recently summarised archaeological and genetic evidence for the species, which suggests that these birds were first domesticated in south-east Asia in the sixth millennium BC, from where they spread gradually, perhaps through southern Russia, to south-east Europe (Figure 41). According to Benecke (1993, 21) domestic fowl arrived in the Mediterranean around the eighth century BC, and central Europe by the seventh century BC. In Britain, the earliest records date to the Early Iron Age, as at Blackhorse Road, Hertfordshire (Legge *et al*.1989) and Houghton Down, Hampshire (Hamilton 2000). At the latter site, one pit was found to contain the skeletons of a cockerel, a hen and a few possible immature fowl bones, indicating that breeding may have been taking place in Britain, although there is little evidence to suggest

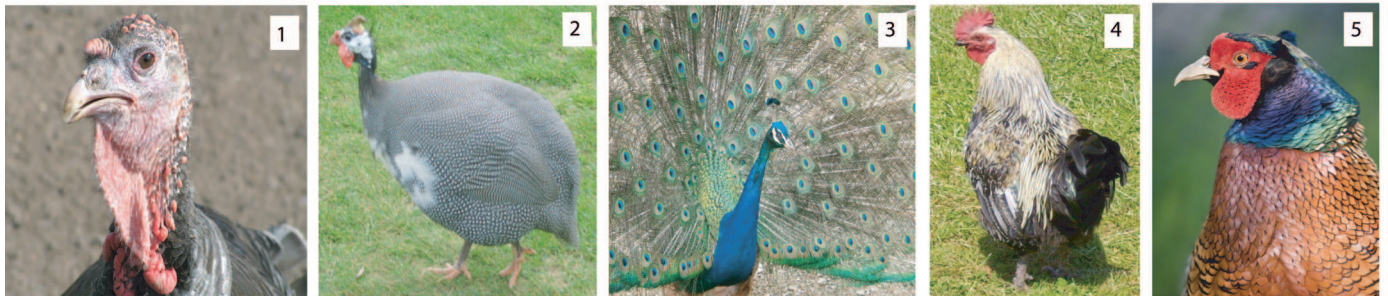

FIGURE 41. Origins and route of bird introductions:
1) Turkey,
2) Guineafowl,
3) Peafowl,
4) Domestic fowl
5) Pheasant

1 BY TOM HARTMAN
3 BY KIM VICKERS
5 © ALEX HYDE, ALEX HYDE PHOTOGRAPHY

that populations were established at this point. Indeed, the scarcity of domestic fowl in Early Iron Age Britain may be the very reason that the Houghton Down animals were selected for burial; animal burials are a feature of European Iron Age sites and are often interpreted in ritual terms (Hill 1995).

As Yalden and Albarella (2009, 101 and especially table 5.1) show, it is not until the Late Iron Age that domestic fowl begin to appear more frequently on British sites, their increased representation reflecting the Roman influence which saw fowl-keeping become common across continental Europe (Benecke 1993, 24). Domestic fowl had been present in Italy since at least the sixth century BC (West and Zhou 1988, 525). By the second century BC they were being used for sport (Toynbee 1973) and intensive poultry rearing was well established by the first century BC (White 1970, 322–327). They also acquired great religious significance, the cockerel being associated with the cult of Mithras and the god Mercury.

Escalating trade between Britain and continental Europe from around 100 BC or before (Potter and Johns 1992, 26) was probably linked to the native elite's increasing desire for exotic food and drink, which they utilised as a marker of social distinction (Hill 2002). Although domestic fowl remains are still scarce on Late Iron Age sites, it seems that fowl keeping was beginning to become established in Britain, domestic fowl finds from across the country suggesting multiple introductions. Whether domestic fowl were initially exploited in quite the same way as elsewhere is unclear. Many researchers quote Julius Caesar's words from *Gallic Wars*, that Britons did not regard it right to eat chickens, geese and hares, but the reason he gives, '*animi voluptatisque causa*', is ambiguous. Butchery marks on domestic fowl bones from archaeological sites around the time of Caesar's visit indicate that if he was implying that their consumption was taboo, this was not strictly applied (Albarella 2007, 396). Coupled with the fact that the word 'voluptas' refers to sports, shows or festivals, it is highly likely that Caesar was referring to cockfighting (Serjeantson 2000a, 499).

This sport was certainly popular in parts of the Roman Empire, and the high numbers of cockerels at late Roman Silchester, Hampshire, for example, may indicate birds used in this way (Serjeantson 2000a, 499). The religious significance of cockerels in Roman Britain is attested by large numbers of their remains recovered at the Uley shrines in Gloucestershire, which were dedicated to Mercury (Levitan 1993). Birds, especially chickens, were also by far the most common offering in Romano-British graves (Philpott 1991, 201). On settlements, chickens are more frequent in major towns, military sites and villas, than rural and nucleated sites (Maltby 1997, 412), perhaps due to their use to feed the non-productive population (Grant 1989, 144). From this period through to the Middle Ages and beyond, chickens featured regularly in diets, although some areas were slow to adopt fowl husbandry, such as north and west Scotland where chickens were rare until the later Middle Ages (Serjeantson 1988). The overall picture, however, is of these birds becoming firmly entrenched in everyday British life, a legacy that endures into the present day.

Common pheasant

The common pheasant is seen by many as the quintessential English game bird, a fact belying its natural range, which probably stretched in a wide, discontinuous belt from the Pacific Ocean to the Black Sea (Blank 1984, 312). Present in Greece at least since the fifth century BC, the pheasant was first mentioned in Roman Italy by Pliny, Statius and Martial in the first century AD (Zeuner 1963, 458), likely spreading from there to other parts of the Empire. For Roman Britain, pheasant remains have been reported at a small number of sites: Yalden and Albarella (2009, 107) list eight, to which can be added finds at Clausentum (Macdonald 1958) and Silchester (Maltby 1984), both in Hampshire, and Chilgrove in Sussex (Outen 1979). Notably, most identified pheasant remains have been recovered from high-status settlements, perhaps suggesting that pheasants were imported as 'luxury' goods – certainly they were employed as a motif on mosaics of elite residences, although Witts (2005, 106) has argued that some of the pheasant-like birds may represent peacocks. There is currently little evidence to indicate that breeding populations were established in Roman Britain but it is possible that their distribution was wider and has simply been obscured by the problems of identifying their remains.

Pheasant remains are rarer still for the Saxon period, which led Yapp (1981, 31) to argue that the term *fasianus*, found in eighth- and tenth-century AD vocabularies, referred to capercaillies rather than pheasants. Since the publication of Yapp's (1981) book, however, pheasant remains have been reported at Fishergate in York (O'Connor 1991a) and at Flixborough (Dobney *et al.* 2007) and Lincoln (Dobney *et al.* 1996), both in Lincolnshire. Yalden and Albarella (2009, 107) also mention the purported specimen from Lewes, Sussex (Bedwin 1975), but this should be viewed with caution as the assemblage is largely post-Conquest in date, and re-analysis of the material revealed a high level of misidentification in the original analysis (N. Sykes pers. comm.). Of the Anglo-Saxon specimens that are confidently dated and identified, it may be significant that they come from sites with evidence for long-distance trade, perhaps suggesting that pheasants were occasionally imported as exotica. It is still unclear, therefore, whether pheasants became established in Britain shortly before AD 1066 (as suggested by Yalden and Albarella 2009, 107) or shortly after the Norman Conquest (Rackham 1997, 50). Until a comprehensive and detailed review of the zooarchaeological evidence is undertaken, it seems unlikely that this question will be answered (Sykes 2007, 63). As with chickens, pheasants were probably introduced later to Scotland than England, the earliest reference dating to AD 1578 (Lever 1977, 337–8), although probable pheasant feathers were recovered from fifteenth century AD Pluscarden Priory (Cerón-Carrasco 1994, 414).

Whilst the introduction date of the pheasant is unknown and may remain so, both the historical and archaeological evidence point to an increasing representation of pheasants through the course of the medieval period (Yalden

and Albarella 2009, 101, table 5.1). For England, a charter from AD 1098 assigned 16 pheasants to monks in Rochester; a licence dated 1100 granted the Abbot of Malmesbury permission to kill hares and pheasants; and in 1249 the Sherriff of Kent was commanded to produce 24 pheasants for a feast for Henry III (Lever 1977, 336), although for Henry's 1251 Christmas feast, the number had risen to 290 (Rackham 1997, 119). The large numbers of pheasants mentioned in the historical sources are not mirrored in the archaeological record but this must surely be related to problems of identification. It seems likely that sizeable pheasant populations were maintained in the parks that became so common in the landscape from the twelfth century onwards (Rackham 1997, 123). The remains of three pheasants (two male, one female) recovered from thirteenth-century levels at King John's Hunting Lodge, Writtle, Essex (Bramwell 1969), which had a park, may be an example of this. Within these spaces, access to pheasants could be controlled, and the aristocracy could hunt them with hawks. Yet by the late fifteenth century the Crown had given legal protection to pheasants (Lever 1977, 377), suggesting that they had already established feral breeding populations. Through a mixture of these feral birds, and those bred for sport, the pheasant has become so widespread that it is now almost synonymous with the British countryside.

Blue Peafowl

Unlike pheasants, blue peafowl have never become established in Britain, retaining elite associations throughout their tenure. A native species of India, they were imported into Mediterranean countries from at least the time of the Persian Empire, gradually spreading west to Roman Italy, where they were bred in huge flocks during the late republican and early imperial periods (Toynbee 1973, 250). Peacock feathers were likely desirable items in themselves, and in many areas people could have been familiar with these before the live animal (Jackson 2006, 21), but feathers are seldom preserved archaeologically, a rare example being recovered from a mid-fourteenth century context in London (Egan 1998).

From Italy, live birds were distributed throughout Europe, although their bones are rare: there are only three examples for Roman France (Lepetz and Yvinec 2002, 35), three for Roman Britain, and two for Saxon Britain (Table 10). In contrast, peafowl remains on five sites dating to within a hundred years of the Norman Conquest support the idea of a Norman re-introduction (Sykes 2007, 63). The number of subsequent examples (Table 10) indicates that breeding populations must have been established soon after 1066. At Henry III's 1251 Christmas feast, 120 peafowl were served, and 104 peacocks were consumed at a feast for the Archbishop of York in the fifteenth century (Mead 1967, 33). That peacocks were high-status birds is clear from manuscripts, the iconographic evidence (e.g. the Bayeux Tapestry shows two peacocks in association with William I's palace), and the fact that peafowl bones are overwhelmingly

recovered from high-status sites, in Britain and France (Sykes 2007, 63). However, it was not enough for a person simply to own a peacock; they also had to be *seen* to do so (Appadurai 1986, 31), the bright, distinctive plumage making them particularly attractive for display. A Roman recipe, adopted in the medieval period, recommends carefully removing the feathers before roasting the bird whole, then replacing the skin, and presenting the bird, often with considerable ceremony (Mead 1967, 88). Peacocks, however, had more than a purely aesthetic appeal; since early Christian times, they were considered symbolic of eternal life and Christ, and often depicted in funerary contexts. This may explain the use of peacock feather fans in Christian liturgical contexts, both in Italy and in England where one was in the possession of St Paul's Cathedral, London in AD 1295 and another at the abbey of Bury St Edmonds in AD 1429 (Green 2006, 45). However, attitudes to peacocks were also ambivalent, for their habit of strutting around displaying their tail feathers meant they were considered to symbolise the sin of Pride (Jackson 2006, 105). 'Proud as a peacock' is a well-known saying, and this bird continues to stand out from others. Whilst society has changed since it first arrived, its status as an exotic bird arguably has not.

Turkey

Turkeys also initially enjoyed an elevated status, although today they are seen as much more mundane. Imported from North America, these birds were originally thought to be either guinea-fowl, being termed *meleagris*, or a cross between a rooster and a peafowl, hence the term *gallopavo* (Crawford 1984, 326). Similarly, the name 'turkey' was also used to refer to the guinea fowl (Donkin 1991, 79) and so it is difficult to be certain to which bird the records relate. The earliest *certain* documentary evidence we have for turkeys dates to AD 1511 in Spain (Crawford 1984, 325), and 1541 in England, with the earliest bone finds dating to the mid-sixteenth century (Table 11). As suggested by Zeuner (1963, 457), the arrival of the turkey seems to have signalled a decline in the popularity of peacock, a shift in tastes that is reflected in the zooarchaeological record with the greater representation of turkey bones on post-medieval sites. However, peafowl were still served on special occasions in the eighteenth century AD, according to Oliver Goldsmith (Grahame 1984, 317). Turkey breeding populations seem to have been established quickly in many parts of Europe, with large flocks kept on the lower Rhine in 1571 (Zeuner 1963, 459). It is reasonable to assume that breeding was also taking place in Britain, with fragments of both turkey bones and eggshell recovered from 1560–1635 contexts at the Royal Navy Victualling Yard, London (West 1995).

As with pheasants and peacocks, the turkey's initial popularity amongst the upper classes likely derived from its relative rarity. From there, it gradually became more widely available, first appearing on the English Christmas menu in 1585 (Zeuner 1963, 459), and becoming a traditional Christmas food at some point in the early eighteenth century (Simon 1944).

Site	Site type	Date of specimen(s)	Reference
Portchester Castle, Hampshire	Fort	Late third-fourth century A.D.	Eastham 1975
Great Staughton, Cambridgeshire	Villa	Fourth century A.D.	Bramwell 1994
Winterton, Humberside	Villa	Roman	Hamilton-Dyer & Serjeantson pers comm.
Wicken Bonhunt, Essex	Rural/high status	A.D. 650–850	Crabtree 1996
Thetford, Norfolk	Urban	Late Saxon	Jones 1984
Nantwich, Cheshire	Urban/Castle	Tenth-early twelfth century A.D.	Fisher 1986
Westminster Abbey/Palace	Urban/Royal	*c.* A.D. 1040–1150	Reilly 2006
Faccombe Netherton, Hampshire	Manorial	A.D. 1070–1204	Sadler 1990
Carisbrooke Castle, Isle of Wight	Castle	Eleventh century A.D.	Serjeantson 2000b
Ludgershall Castle, Wiltshire	Castle	Early-middle twelfth century A.D.	Poole n.d.
Hereford, Herefordshire	Urban	Late eleventh-thirteenth century A.D.	Bramwell 1985
Guildhall, London	Urban	*c.* A.D. 1140–1230	Reilly 2007
16–22 Coppergate, York	Urban	A.D. 1150–1250	Bond & O'Connor 1999
Eastgate, Beverley, Humberside	Urban	Twelfth-fourteenth century A.D.	Scott 1992
Windsor Castle	Castle – Royal	Twelfth-fourteenth century A.D.	Baker pers comm.
Canterbury Cathedral Precincts, Kent	Urban/Ecclesiastical	Late twelfth–early fourteenth century A.D.	Driver 1990
Rattray Castle, Aberdeenshire	Castle	Early thirteenth–fifteenth century A.D.	Hamilton-Dyer *et al.* 1993
Manor of Beaurepaire, County Durham	Manorial	A.D. 1250–1400	Gidney 1995
York Minster, York	Urban/Ecclesiastical	Thirteenth century A.D.	Rowland pers comm.
Pevensey Castle, Sussex	Castle	Thirteenth-fifteenth century A.D.	Powell & Serjeantson n.d.
Cuckoo Lane Site A, Southampton	Urban/Wealthy	A.D. 1300–1350	Bramwell 1975a
Dudley Castle	Castle	A.D. 1321–1647	Thomas 2005
BC72 Site, London	Urban/Wealthy	Mid fourteenth century A.D.	Egan 1998
Wells Museum Garden, Somerset	Urban/Ecclesiastical	A.D. 1360–1370	White n.d.
Kingston Lacey Estate, Dorset	Manorial	Fourteenth-fifteenth century A.D.	Locker 1994
Brighton Hill South, Hampshire	Village	Late fourteenth-mid/late fifteenth century A.D.	Coy 1995

TABLE 10: Results of literature survey for sites where peafowl have been identified.

Helmeted Guineafowl

More than any other of the birds discussed here, the history of guinea fowl in Britain is beset by documentary and skeletal identification problems. Originating from Africa, where they are/have been known in sub-Saharan areas and the Atlas Mountains, and possibly present in the Nile Valley during

Site	Site type	Date of specimen(s)	Reference
1–5 Aldwark, York	Urban	Late fifteenth century A.D.	Bond & O'Connor 1999
Odiham Castle, Hampshire	Castle	Late fifteenth century A.D.	Hamilton-Dyer n.d.
Wickham Glebe, Hampshire	Manorial	Early/Mid Medieval	Coy 1985
Wickham Glebe, Hampshire	Manorial	Late Medieval	Coy 1985
Middleton Stoney Castle, Oxfordshire	Castle	Late Medieval	Levitan 1984
Barnard Castle, County Durham	Castle	Medieval	Jones *et al.* 1985
Castle Rising Castle, Norfolk	Castle	Medieval	Jones *et al.* 1997
Town Ditch, Newcastle-Upon-Tyne	Urban	Medieval	Gidney 1989
Baynard's Castle, London	Urban/Castle	*c.* A.D. 1520	Bramwell 1975b
Castle Ditch, Newcastle-Upon Tyne	Castle	*c.* A.D. 1525–1550	Alison 1981
Finsbury Pavement, London	Urban	Sixteenth century A.D.	Locker & Reilly 1997
Castle Rising Castle, Norfolk	Castle	Sixteenth century A.D.	Jones *et al.* 1997
Royal Navy Victualling Yard, London	Urban	A.D. 1560–1635	West 1995
Camber Castle, East Sussex	Castle	Mid sixteenth century A.D. –A.D. 1637	Connell *et al.* 1997
Eynsham Abbey, Oxfordshire	Wealthy	Mid sixteenth-mid seventeenth century A.D.	Ingrem 2003
Gold Hill, Shaftesbury, Dorset	Urban	Sixteenth-seventeenth century A.D.	Serjeantson 1985
Norton Priory	Wealthy	Late sixteenth-seventeenth century A.D.	Greene 1989
Castle Bastion, Newcastle-Upon-Tyne	Castle	Seventeenth century A.D.	Rackham 1983
Chantry House	Urban/wealthy	Seventeenth century A.D.	Curl pers comm.
York Minster, York	Urban/Ecclesiastical	Seventeenth century A.D.	Rowland pers comm.
London Aldgate	Urban	A.D. 1670–1700	Armitage 1984
Castle Rising Castle, Norfolk	Castle	Post-Medieval	Jones *et al.* 1997
Aldwark, York	Urban	Post-Medieval	O'Connor 1984a
Town Wall, Coventry	Urban	Eighteenth century A.D.	Bramwell 1986
Bewsey Old Hall, Warrington	Wealthy	Eighteenth century A.D.	Roberts 1986
Sackler Library, Oxford	Urban	Early nineteenth century A.D.	Charles and Ingrem 2001

TABLE 10 continued.

Roman times (D. Yalden pers. comm.), these birds had reached Greece by the fifth century BC, and Roman Italy by the first century AD (Zeuner 1963, 457). The only possible evidence from elsewhere in Europe is a mosaic in Cologne, Germany, and 'leg bone' at the Roman frontier camp at Saalburg in Germany (Donkin 1991, 22). Whether this reflects true scarcity or misidentification is impossible to say, although guinea fowl were something of a rarity even in

Site name	Site type	Date	Reference
Hull Magistrates Court	Urban/Ecclesiastical	*c.* A.D. 1310–1600	Dobney n.d.
Castle Mall, Norwich	Urban	Mid/late fourteenth–mid sixteenth century A.D.	Albarella *et al.* 1997
Whitefriars, Coventry	Urban	A.D. 1545–1558	Rackham 2005
Barnstaple, Devon	Urban	Sixteenth century A.D.	Bourdillon n.d.
Beeston Castle, Cheshire	Castle	*c.* A.D. 1500–1600	Dobney n.d.
Manor of Beaurepaire, County Durham	Wealthy	*c.* A.D. 1500–1600	Gidney 1995
Durham Cathedral	Urban/Ecclesiastical	*c.* A.D. 1500–1600	Dobney n.d.
Royal Navy Victualling Yard, London	Urban	A.D. 1560–1635	West 1995
Heigham Street, Norwich	Urban	*c.* A.D. 1575–1625	Weinstock 2002
Hull Magistrates Court	Urban	*c.* A.D. 1500–1750	Dobney n.d.
Preceptory of the Knights Hospitallers, Beverley	Urban	*c.* A.D. 1500–1750	Dobney n.d.
South Castle Street, Liverpool	Urban	*c.* A.D. 1500–1750	Dobney n.d.
Exeter, Devon	Urban	Mid sixteenth century A.D.	Maltby 1979
Camber Castle	Castle	Mid sixteenth century A.D. –A.D. 1637	Connell *et al.* 1997
Hereford, Herefordshire	Urban	Sixteenth century A.D. and later	Noddle and Hamilton-Dyer 2002
Reading Abbey	Wealthy/urban	Sixteenth–seventeenth century A.D.	Coy 1986-90
Castle Ditch, Newcastle	Urban	Late sixteenth–seventeenth century A.D.	Allison 1981
Norton Priory	Wealthy	Late sixteenth–seventeenth century A.D.	Greene 1989
Alms Lane, Norwich	Urban	A.D. 1600–1675	Harman 1985
Royal Navy Victualling Yard, London	Urban	A.D. 1635–1726	West 1995

TABLE II: Results of literature survey for sites where turkey has been identified.

Italy, according to Roman writers (Zeuner 1963, 457). After the Roman period, there is no evidence of guinea fowl in Europe until the Middle Ages, when late fourteenth- and fifteenth-century French references are thought to be reliable (Donkin 1991, 43). By the sixteenth century they had reached Britain, although confusion over naming means we cannot be certain of the exact date. As today, whilst the turkey was widely adopted throughout Europe for food, the guinea fowl was probably more prized for display (Donkin 1991, 84).

Site name	Site type	Date	Reference
Camber Castle	Castle	A.D. 1637+	Connell *et al.* 1997
Exeter, Devon	Urban	A.D. 1660–1700	Maltby 1979
Worcester Cathedral, Worcester	Urban/Ecclesiastical	Seventeenth century A.D.	Thomas 1999
Castle Bastion, Newcastle-Upon-Tyne	Urban	Mid seventeenth century A.D.	Rackham 1983
Aldgate, London	Urban	Late seventeenth century A.D.	Armitage 1984
Cook's Green, Winchelsea, Sussex	Rural	Seventeenth century A.D.	Clements 1990
St Ebbe's, Oxford	Urban	Seventeenth century A.D.	Wilson 1984
Castle Mall, Norwich	Urban	Late sixteenth–eighteenth century A.D.	Albarella *et al.* 1997
Skeldergate and Walmgate, York	Urban	Late seventeenth century A.D.	O'Connor 1984b
Christchurch, Dorset	Urban	Seventeenth–eighteenth century A.D.	Coy 1983
Alms Lane, Norwich	Urban	A.D. 1720–1750	Harman 1985
Exeter, Devon	Urban	A.D. 1660–1800	Maltby 1979
Castle Mall, Norwich	Urban	Late sixteenth–eighteenth century A.D.	Albarella *et al.* 1997
St Mary's Guildhall, Lincoln	Urban	Late seventeenth–late nineteenth century A.D.	O'Connor 1991c
St Peters Lane, Leicester	Urban	Eighteenth century A.D.	Gidney 1992
Bewsey Old Hall, Warrington	Wealthy	Eighteenth century A.D.	Roberts 1986
Westgate Road, Newcastle	Urban	Mid/late eighteenth century A.D.	Gidney 1994
Launceston Castle, Cornwall	Urban	Eighteenth–nineteenth century A.D.	Albarella & Davis 1996
The Bull Ring, Birmingham	Urban	Eighteenth–nineteenth century A.D.	Baxter 2009

TABLE II continued.

Conclusion

Despite the many problems of identification, the legacy of domestic fowl, pheasant, peacock, turkey and guinea fowl introductions is clear. All have affected British society in some way, whilst their relative importance varied over time. At first, all would have been rare, and sought after by elites as a way of constructing their social position. As some, namely chickens and turkeys, became more accessible to other sections of society, their roles as status markers would have diminished, although they remained significant, both in the diet, and symbolically.

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Preface

All books are a labour of love, and this one has been particularly protracted. It has taken longer than usual to bring to press, thanks in part to the usual exigencies of competing demands (and childbirth on the part of at least two contributors), and in part to the developments and new finds that are constantly being made in the field. Even at the time of writing, we are aware of new discoveries that (fortunately) strengthen the arguments made in this volume. Studies of wildlife are becoming more aware of, and informed by, the long-term record provided by historical and archaeological sources, and we hope that this volume will be seen as a timely addition.

We thank the many contributors for their expertise and patience, and thank Windgather Press and subsequently Oxbow Books for theirs, and for supporting the project. We are grateful to staff and students, in particular Tom Hartman and Alex Hyde of the University of Nottingham's MSc in Biological Photography and Imaging, who provided some of the beautiful images for this book. We thank all of those who have given permission for their images to be used here, in particular Julie Curl, whose illustrations for Figures 31 and 40 add art to this work of, we hope, science. Figures 22, 23, 34 and 42 are by TPOC. NS would like to thank both the University of Nottingham and the Arts and Humanities Research Council who supported the period of research leave in which this volume was edited.

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