

Unpublished drawings of the Dodo *Raphus cucullatus* and notes on Dodo skin relics

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The Dodo *Raphus cucullatus* was an endemic giant flightless pigeon from Mauritius that died out within 100 years of its discovery in 1598 (Moree 1998, Hume *et al.* 2004). It has become a metaphor for extinction, exemplifying man's destructive capabilities on endemic oceanic island species (Fuller 2002). Our scant knowledge of the Dodo's morphology and autecology is derived largely from historical accounts, including contemporary paintings and ships' records, although there has been debate as to their scientific accuracy (Kitchener 1993). Knowledge of the skeletal anatomy of the Dodo is more detailed, being derived mainly from fossil remains discovered in the Mare aux Songes in the 1860s (Owen 1866). Very few Dodo remains reached European shores, and thus very few scientists have ever had 'hands-on' experience of this enigmatic bird. Such was the paucity of tangible evidence for the existence of the Dodo that in the early 19th century many considered the species to have been mythical (Strickland & Melville 1848). Here we announce the discovery of 19th-century illustrations of a Dodo foot, executed by John Edward Gray, while searching the archives in the general library of the Natural History Museum, London.

Although a number of exotic species were brought back to Europe in historic times, the inability to keep animals alive, or to preserve dead material on long sea voyages in the 1600s, resulted in comparatively few zoological specimens reaching European shores. Despite suggestions to the contrary (e.g. Hachisuka 1953), as few as four or five Dodo specimens—maybe even fewer—reached Europe, and only one perhaps two birds arrived alive (Hume in press). Amongst the imported birds was the so-called 'Oxford Dodo', a specimen which today comprises the only extant skin remains. It has been suggested that the Oxford example is the same Dodo as that seen alive in London in 1638 (Strickland & Melville 1848), but no substantive evidence to support this claim exists. Further examples of soft tissue dodo specimens once existed in Copenhagen (head) and Prague (beak and foot), but today only the bones are preserved and their histories are uncertain. Furthermore, at least one other specimen of a dodo, if indeed it was actually so, was reported to have been deposited at the Anatomy School, Oxford (e.g. Newton & Gadow 1896), but again, its provenance and subsequent history are unknown.

Brief historical review

The Oxford Dodo has a complex history, having been exhibited as a stuffed bird in the collection of horticulturist John Tradescant (Tradescant 1656), in 1656, and bequeathed to Elias Ashmole in 1659 (Strickland & Melville 1848). The specimen remained in the Ashmolean Museum until its transfer to the Oxford University

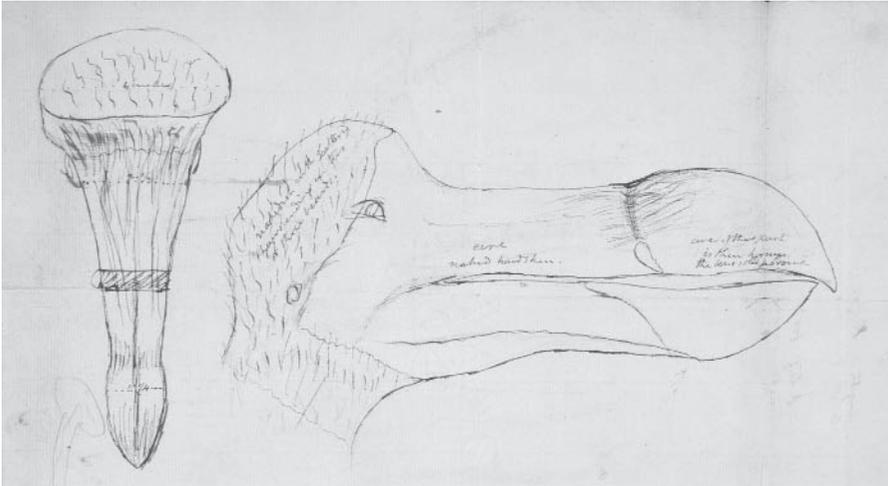
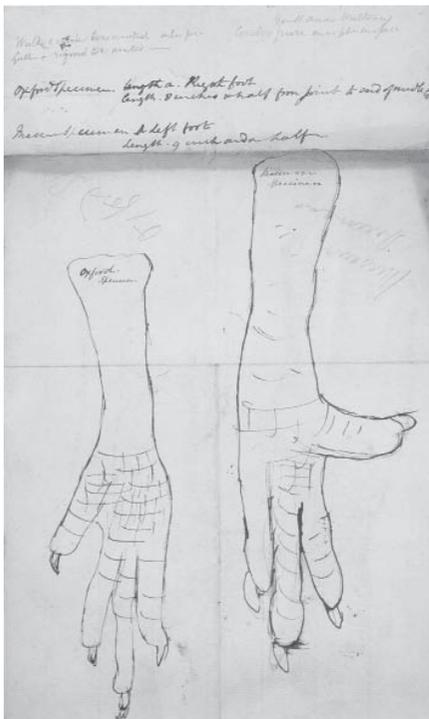


Figure 1. Newly discovered unsigned illustrations of the Dodo *Raphus cucullatus* head in dorsal and lateral views, executed by John Edward Gray, c.1824.



Museum during the 1850s. There was a long-held belief that this, by then unique, stuffed Dodo was thrown onto a fire in 1755, and that only the head and a foot were rescued from the flames (e.g. Strickland & Melville 1848, Fuller 2002). In fact, its removal from exhibition was a curatorial decision made to preserve what was left of the by then highly degraded specimen (Ovenell 1992). The salvaged remains included the skin of the head, some feathers and a foot. Today, all that remains of this specimen are two halves of the skin of the head, now with very few feathers, the skull, and the bones of the right foot with some scraps of skin and sinew (Figs. 4–5).

Figure 2. Only known illustration of the 'Oxford Dodo' foot alongside the 'London foot'. The Oxford foot is more gracile and 11% smaller than the latter. They are here interpreted as male (London) and female (Oxford). Annotations in Gray's hand give dimensions of the feet.

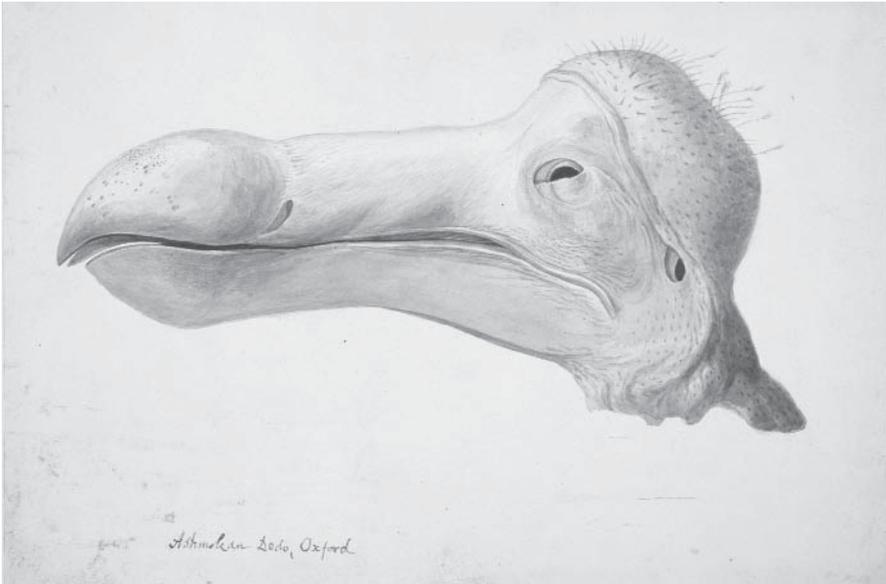
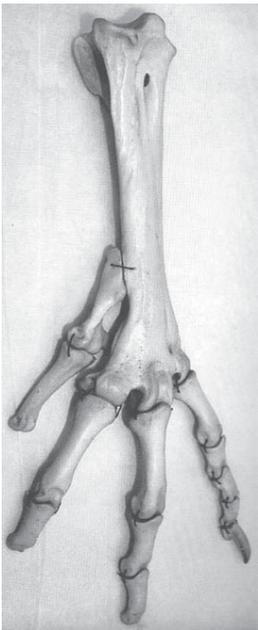


Figure 3. Head prior to dissection, executed by William Clift.



Another Dodo foot termed the 'London foot', which could be seen in a residence formerly called the Music House, situated near the West End of St Paul's church, London, was collected by Hubert alias Forges (Forges 1665). It was presented to the Royal Society of London and transferred to the former British Museum, where it was exhibited along with the most famous Dodo painting (Strickland & Melville 1848), once owned by George Edwards and affectionately known as 'George Edward's Dodo', painted by Roelandt Savery in *c.*1626 (still held in the library of the Natural History Museum [NHM]). The last definite mention of this specimen including the soft tissue was *c.*1848 (e.g. Richardson 1851). The foot was mentioned again by Newton & Gadow (1896) as 'still reposing in the British Museum, but without its integuments'. This suggests that like the Oxford specimen, the London specimen's soft tissue had decayed or been dissected and in fact the foot, as originally depicted in Strickland & Melville (1848), no longer

Figure 4. Oxford foot bones.

existed. Therefore it is likely that today the so-called missing foot (e.g. Fuller 2002) consists only of bone (after being cast) and researchers looking for the soft tissue specimen are, in fact, searching for the wrong type of material. Thus, by the end of the 1800s very little tangible non-fossil Dodo material was available for study.

The Oxford Dodo head was dissected and illustrated in 1847, along with the London foot (Strickland & Melville 1848). The Oxford foot was also dissected, but by this time it lacked most of its soft tissues and, until recently, was never thought to have been illustrated with integuments.

Newly discovered illustrations

During a search of the zoological drawings held at the NHM, London, one of us (AD) discovered a folder entitled '*Didus*' (Linnaeus's second but junior synonym for the dodo) compiled by John Edward Gray (1800–75). Gray joined the staff of the then British Museum (now NHM) as an assistant in 1824, becoming Keeper of Zoology in 1840 until his retirement in 1874 (Anon. 1904). Gray amassed a large collection of published natural history illustrations in scrapbooks and also produced some drawings of his own. The '*Didus*' folder contained one double-sided sheet measuring 340 × 210 mm with illustrations in black ink on paper bearing an 1824 watermark (Figs. 1–2). Gray presented these dodo illustrations to the Zoological Club of the Linnean Society on 24 April 1828 (Anon. 1828) and, therefore, the pictures must have been executed during this four-year period. A short note was published and this is the only mention made of Gray's dodo sketches we have managed to trace:

'At the request, of the Chairman, Mr. Gray exhibited a sketch of the foot of the dodo, *Didus ineptus*, L., [*Raphus cucullatus*] preserved in the British Museum, and another sketch of that contained in the Ashmolean Museum of Oxford, and also a head remaining in the latter collection. He remarked that the feet agreed so perfectly



Figure 5. Dissected Oxford head.

in characters as to leave no doubt of their having belonged to the same species, but that although they were of opposite sides, the one being left and the other right, they must have been obtained from different individuals, the Oxford specimen being one inch shorter than that of the British Museum.'

On one side of the drawings is illustrated the Oxford head in dorsal and lateral views (Fig. 1) whilst the other side illustrates, uniquely, the Oxford and London dodo feet (Fig. 2), with accompanying annotations including measurements. On the first sheet accompanying the dodo feet the following measurements are presented:

Oxford Specimen. Length a. Right foot Length. 8 inches & half from joint to end of middle toe Museum [London] Specimen. B. left foot Length. 9 inch and a half.

On the second sheet accompanying the dodo head drawings the following notes are made: [dorsal view, left] *4 inches* [across head], *2.1/4* [in front of eyes], *1.1/4* [across tip of bill]. [lateral view, right]; *nakedish with scattered hairs ending in two or three heads* [written on head]; *cere naked hard skin* (in the middle); *cover of this part is thin. horny. the bone solid. porous* [on bill tip]

Whilst examining Sir Richard Owen's correspondence in the same library, JPH found a hitherto unpublished illustration of a Dodo head. The watercolour is signed 'WC' (William Clift, 1775–1849, conservator of the Hunterian collection, London) and comprises an illustration of the head of the Oxford Dodo specimen prior to its dissection (Fig. 3). Of particular note in this illustration is the presence of many head feathers that have subsequently disappeared. The discovery of Gray's previously unpublished illustrations constitutes the only scientific documentation of all known skin specimens of the Dodo illustrated together. This is particularly important for comparative study.

Discussion

Based on the handwritten measurements by Gray, the Oxford right foot is *c.*11% smaller and more gracile than the London left foot, yet the tarsometatarsus bone of the Oxford foot has fully-fused epiphyses, indicating the animal to be adult (Fig. 4). Such a size discrepancy in a Columbiform has been interpreted as representing sexual dimorphism (Livezey 1993). Gray's illustration certainly indicates that the London foot is larger than the Oxford foot, but virtually nothing is known of dodo ecology. Therefore, any interpretations based on these drawings must be made cautiously.

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