

Short communication

Establishing extinction dates – the curious case of the Dodo *Raphus cucullatus* and the Red Hen *Aphanapteryx bonasia*

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Recent publications (Roberts & Solow 2003, Hume *et al.* 2004) on the putative extinction date of the Dodo *Raphus cucullatus*, the iconic large flightless pigeon from Mauritius, have mentioned (but not fully explored) an identification problem arising from a name transfer to another species, the Red Hen *Aphanapteryx bonasia*, a large rail which was once the other common flightless bird on the island. This problem compromises all post-1662 'dodo' records, and renders the recently discovered accounts from the 1680s, claimed by Hume *et al.* (2004) to extend the Dodo's survival to at least 1688, open to alternative interpretation (Cheke 2001, 2004, below).

The estimated date of an animal's extinction is normally based on the last date on which it was reliably observed. However, any observation not backed up by specimen or photographic evidence is open to question; this is particularly true of 17th century accounts made, often by travellers with little natural history training, before systematic collections existed, and before the species they were discussing had been formally described. A further complication is that many of these accounts simply use an animal's name without any accompanying description, leaving the context as the only way of interpreting the sense in which the observer used that name. Both name transfer and simultaneous use of the same name for different species may make interpretation difficult.

In the history of Mauritius two other cases have bedevilled the literature. The 17th century Dutch use of 'Indiaensche/Indische Raven' misled Strickland (in Strickland & Melville 1848) into supposing there had been hornbills there – the term (and its English and French cognates) was widely used at the time for large Asian *Buceros* spp. (e.g. Ray 1678), and also in tropical America for macaws *Ara/Anodorhynchus* (C. Mourer-Chauviré, *in litt.*). The Mauritian bird turned out, once subfossil bones were found, to be a large endemic parrot *Lophospittacus mauritianus* (Hachisuka 1953, Cheke 1987). Buffon (1770–83) thought that the term referred to unidentified corvids. The Marquis

Duquesne (1689) changed 'flamant' (=flamingo) to 'géant' when plagiarizing Dubois's (1674) description of Réunion for an island settlement scheme. Adopted by his protégé Leguat (1707) for birds seen in Mauritius and Rodrigues, this name change, together with a borrowed illustration, led to a whole literature for and against the former existence of the 'géants', as large long-legged rails, which lasted into the 1990s (Cheke 1987, North-Coombes 1991). A more familiar example of name duplication is the transfer of names from European originals to quite different and often unrelated 'robins', 'sparrows', [meadow]-'larks', 'blackbirds', 'warblers', etc., in North America. Lockwood (1984) noted a number of cases within the UK where names of vanishing birds transferred to other, commoner, species.

Until I re-examined the question in the 1980s (Cheke 1987), the generally accepted last record for the Dodo was from English sailor Benjamin Harry, visiting Mauritius in 1681. He reported that of 'winged and feathered fflow the less passant [=excellent] are Dodos, whose fflsh is very hard', listing also better-tasting geese, teal, curlews, flamingos, doves and bats. However, the German pastor on Mauritius in the mid-1670s, Johann Hoffmann (1680, Grandidier *et al.* 1903–20) described 'a particular species of red bird that are called Toddärsche and which are the size of an ordinary hen'. 'Toddärsche' is a German version of 'dodaers/en', Dutch for Dodo, but the bird described is the Red Hen, a much smaller bird than the grey goose-sized Dodo. Newton (1868: 480) noted perceptively that '... it would appear from this that in Hoffmann's time in Mauritius [1673–5 (Moree 1998)] one common name for the Dodo had been transferred to another species of bird in accordance with that odd process of substitution which has obtained in so many countries, where the rightful owner expiring bequeaths (as it were) its titles to a survivor'. Unknown in the 1860s, English traveller John Marshall had already noted in 1668 that in Mauritius 'here are also great plenty of Dodos or red hens which are larger a little than our English henns, have long beakes and no, or very little, tayles ... they are good meat when roasted, tasting something like pig, and their skin, like pig skin when roasted [*sic*] being hard' (Khan 1927, Cheke 1987). I have argued (Cheke 1987) from these two independent accounts that any reference to dodos/dodaersen after the mid-1660s should be treated with great caution, and that Benjamin Harry's 1681 story probably referred to Red Hens – even his culinary assessment recalling Marshall's fuller description. This position was accepted by subsequent monographers (van Wissen 1995, Ziswiler 1996, Fuller 2002), but has begun to be questioned since reports of 'dodaersen' recorded by governor, overseer Lamotius in the 1680s have been discovered in his manuscripts in the State Archives in Capetown (Moree 1998, den Hengst 2003, Hume *et al.* 2004).

Despite the name transfer I accepted (Cheke 1987, 2001, 2004), following Pitot (1905), that the *dodaersen* reported to Hugo as seen twice between 1663 and 1674

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by a slave recaptured after 11 years on the run were in fact Dodos. It is not known when during the interval the sighting was made, so the end-date of 1674, often used, cannot be inferred. The grounds for believing that Hugo and the slave discussed real Dodos (not Red Hens) were that the latter were known from Hoffmann's account to be still common at that date, and thus would hardly require special comment by Hugo. However, we only have Pitot's edited version to go on, so until Hugo's manuscript is published in full this record should perhaps also be treated with caution (as did Roberts & Solow 2003). Hugo, island governor 1673–77 (Moree 1998), is only known to have mentioned *dodaersen* on one other occasion, equally without description (in 1673, Hume *et al.* 2004), and as Hoffmann, who used the dodo name for Red Hens, was pastor during Hugo's governorship, one might reasonably conclude that 'toddärsche/dodaers' was the standard name for Red Hens in the small Dutch community at that time. It should be remembered that there was no continuity of settlement in Mauritius from the time when Dodos were still regularly seen. The first Dutch establishment lasted from 1638 to 1658. The island was then uninhabited until the Dutch re-established a station (with different personnel) in 1664. In the interval, sailors from the shipwrecked *Arnhem* spent some months there in 1662–3 (Moree 1998). One of these (Volkert Evertsz) provided the last unequivocal record of Dodos on the offshore islet of Ile d'Ambre (Cheke 1987, 2004, below). Some were rescued by Hugo himself on his first visit to the island (in November 1662, Moree 1998). Evertsz and his friends had left on an English ship in May, so Hugo picked up a group who had not been to the islet; he will thus not have heard first-hand reports of Dodos then.

In 1668 John Marshall must have picked up the name 'dodo' for Red Hens from the new Dutch settlers, so it was presumably already the standard local term. There is no recorded mention of Dodos by Dutch settlers even in the earlier phase (1638–58), apart from a live bird sent from their eastern capital of Batavia [=Jakarta] to Japan in 1647 (Millies 1868; Cheke 1987); we have no idea when the bird left Mauritius. The Batavia *Dagh-registers* (daily log-books) have been published, so the record is fairly complete (references in Moree 1998). In fact, Dodo records were already sparse by the late 1630s: Peter Mundy (1608–67), who had seen captive birds in Surat (India) in c. 1628, saw none in a brief visit in 1638, though a French ship that stayed for several months later that year was probably the source of Cauche's (1651) notes on the bird's call, nest and egg. Cauche's claimed itinerary is very doubtful (Lougnon 1970, Linon-Chipon 2003), but there is a good Dutch report of his associates' visit in 1638 (Bonaparte 1890, from the *Dagh-registers*).

Twenty-four years after the last reliable report from the mainland, Evertsz and his group of *Arnhem* survivors found Dodos only on Isle d'Ambre (Cheke 2004), an offshore islet that they waded to at low tide, and proceeded

to kill them (Cheke 1987, 2004, van Wissen 1995). There were goats but no pigs there, which is significant as feral pigs are generally considered to have been the principal cause of the Dodo's extinction, preying on eggs and young of this flightless ground-nester (Newton 1888, Cheke 1987). Pig predation of tortoise and turtle eggs was documented in the 1670s by Hugo and others (Pitot 1905, Cheke 1987), but there is no direct evidence for Dodos. Introduced in 1606 (Pitot 1905, Cheke 1987), pigs had reached high densities by the 1620s (Cheke 1987); by the 1640s Dodos on the mainland were probably largely elderly birds rarely, if ever, breeding successfully.

By 1673 there were goat-herds stationed on Ile d'Ambre, blamed for wasteful slaughter of tortoises and goats, but Hugo did not mention Dodos (Panyandee 2002). Evertsz, whose description of Dodos is brief but accurate (Cheke 1987, 2004, van Wissen 1995), also saw, on the mainland, *veldthoenders* ['field-hens', used in Holland for partridges], the term used by the Dutch for Red Hens on their early visits (Cheke 1987, 2004); probably for the same species, he used *berghoenders* ['mountain hens'] for birds seen on Ile d'Ambre. Thus, Fuller's (2002) speculation that even Evertsz's *doddaersen* [*sic*] were Red Hens does not hold up, particularly as the Ile d'Ambre Dodos were 'larger than geese'. Evertsz saw no Dodos on the mainland as he explored the east coast (Cheke 2004). The other accounts from the *Arnhem* shipwreck, involving men who did not go to Ile d'Ambre (e.g. Andries Stokram, translated by Panyandee 2002), gave only descriptions blatantly plagiarized from earlier accounts, suggesting their dodo 'memories' were concocted back in Holland (van Wissen 1995; Moree 1998), none had pen or paper in Mauritius.

In contrast to records for Dodos, we have good accounts of Red Hens in 1668 and 1673–5, in both cases called by dodo names. If we discount Benjamin Harry, the only later report is from Leguat (1707), who mentioned 'gelinottes' among birds formerly common but that in 1693 had become rare, the others being geese, ducks and 'poules d'eau'. He used 'gelinotte', a French partridge/grouse name equivalent to the Dutch *veldt/berg-hoender*, for the closely related flightless rail *Aphanapteryx leguati* in Rodrigues; however, he did not describe the Mauritian birds, so the record is not definitive. Leguat did not mention Dodos, which he surely would have, had they survived, given his long description of its relative's (the Solitaire *Pezophaps solitaria*) habits in Rodrigues. Between Hoffmann's and Leguat's accounts the only faunal reports from Mauritius concern game species – Lamotius reported hunters in 1685–88 bringing in 'dodaersen', geese [*Alopothen mauritianus*], teal [*Anas theodori*] and flamingos [*Phoenicopterus ruber*] (Hume *et al.* 2004), the same species mentioned by Harry in 1681 (above) and the log of the *President* (also 1681, Barnwell 1950–54). Deodati, Lamotius's successor, lamented in 1698 the extinction of the geese (Leibbrandt 1890–1906, Barnwell 1948), but otherwise failed to mention wild birds.

Lamotius is known to have had some interest in natural history, notably medicinal plants, timber trees and marine fish (Pitot 1905, Valentyn 1726 [quoted by Grandidier 1903–20], Hume *et al.* 2004), but there is no sign of an interest in birds other than as food. He wrote a detailed report on the island in 1690 that has been published only in paraphrase (Pitot 1905); it may hold more faunal information than has so far been attributed to him. Hume *et al.* assume that Lamotius, an educated man, would be unlikely to confuse the Red Hen with a Dodo – I agree, if the choice had been before him. Given the available prior historical evidence, an absence of description and a lack of any separate reference to Red Hens, their assignment of Lamotius's 'dodaersen' to Dodos seems premature. It is probable that by his time only one flightless bird was present, in local parlance known as 'dodaers', so that is what he too called it – but it is more likely to have been the Red Hen than the Dodo. This is supported by applying Roberts and Solow's (2003) statistical technique to the series of dates that are not in doubt, excluding for the Dodo the isolated Ile d'Ambre population, giving a likely extinction date for mainland Dodos of 1650, but 1689 for the Red Hen (see Appendix).

There seems therefore to be no reason to adjust my earlier conclusion (Cheke 1987) that the Dodo was effectively extinct in the 1640s on the mainland, and finally extinct around 1662 on Ile d'Ambre (Cheke 2004). Mlikovsky (2004) came to much the same conclusion on the mainland extinction, although, like Fuller (2002), he doubted Evertz's dodos, and in addition discounted the 1631 record (but see Cheke 2004 and van Wissen 1995 for their validation). The Red Hen probably survived through the 1680s, and disappeared at or around the time Leguat reported it as very rare in 1693 – he may not have seen any himself. It is likely that cats, probably introduced in the mid-1680s (Cheke 1987 and my unpubl. data), were responsible for eliminating the flightless rails, together with the geese and ducks which vanished around the same time.

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REFERENCES

- Barnwell, P.J.** 1948. *Visits and Despatches, 1598–1948*. Port Louis, Mauritius: Standard Printing Establishment. 306 pp.
- Barnwell, P.J. (ed.)** 1950–54. Extracts from ships' logs visiting Mauritius. *Rev. Retrospective Ile Maurice* **1**: 195–198, 259–262, 324–326; **2**: 17–24, 79–84, 139–144, 201–208, 265–270, 317–320; **3**: 17–22, 77–82, 139–146, 199–210, 267–274, 327–332; **4**: 4–6, 131–136, 197–200; **5**: 85–94.
- Bonaparte, R.** 1890. *Le premier établissement des Néerlandais à Maurice*. Paris: [author] 60 pp.
- Buffon, G.-L. LeClerc, Comte de.** 1770–83. *Histoire naturelle des oiseaux*. Paris: Imprimerie Royale. 10 volumes.
- Cauche, F.** 1651. *Relation du voyage que François Cauche de Rouen à fait à Madagascar, îles adjacentes et coste d'Afrique. Recueilly par le sieur Morisot, avec notes en marge*. Paris: Augustin Courbe. x + 194 pp. [English translation in volume 2 of John Stevens (ed.) 1711, *A new collection of voyages and travels ...*; the entire French text was reprinted in Grandidier *et al.* (1903–20, q.v.) **7**: 24–191.]
- Cheke, A.S.** 1987. An ecological history of the Mascarene Islands, with particular reference to extinctions and introductions of land vertebrates. In Diamond, A.W. (ed.) *Studies of Mascarene Island Birds*: 5–89. Cambridge: Cambridge University Press.
- Cheke, A.S.** 2001. Is the bird a Dodo? The wildlife of a mid-seventeenth century drawing of Dutch Mauritius. *Arch. Nat. Hist.* **29**: 347–351.
- Cheke, A.S.** 2004. The Dodo's last island. *Proc. Roy. Soc. Arts Sci. Mauritius* **7**: 7–22
- Dubois.** 1674. *Les voyages fait par le sieur D.B. aux isles Dauphine ou Madagascar et Bourbon ou Mascarenne ès années 1669, 70, 71 et 72*. Paris: Claude Barbin. 234 pp. [the section on Réunion was reprinted in full in Lounnon (1970), q.v.].
- Duquesne, H.** 1689. *Recueil de quelques mémoires servant d'instruction pour l'établissement de l'île d'Eden*. Amsterdam: H. Debordes [reprinted 1995 as an appendix to an edition of Leguat (1707), q.v.].
- Fuller, E.** 2002. *Dodo – from Extinction to Icon*. London: Harper-Collins. 180 pp.
- Grandidier, A., Roux, J.-C., Delhorte, C., Froidevaux, H. & Grandidier, G. (eds)** 1903–20. *Collection des ouvrages anciens concernant Madagascar*. Paris: Comité de Madagascar. 9 Volumes.
- Hachisuka, M.** 1953. *The Dodo and Kindred Birds, or the Extinct Birds of the Mascarene Islands*. London: H.F. & G. Witherby. 250 pp.
- den Hengst, J.** 2003. *The Dodo – the Bird That Drew the Short Straw*. Marum, Netherlands: Art Revisited. 119pp.
- Hoffman, J.C.** 1680. *Oost-Indianische Voyage ...* 1931. Cassel: [author] [reprinted 1931, The Hague: Martinus-Nijhoff; section on Mauritius reproduced (in French) in Grandidier *et al.* (1903–20, q.v.) **3**: 368–380].
- Hume, J.P., Martill, D.M. & Dewdney, C.** 2004. Dutch diaries and the demise of the dodo. *Nature* 101038/Nature0268 [10/6/2004 on-line only: www.nature.com/nature].
- Khan, S.A. (ed.)** 1927. *John Marshall in India. Notes and Observations in Bengal*. Oxford: Oxford University Press. 471 pp.
- Leguat de la Fougère, F.** 1707. ('1708'). *Voyage et aventures de François Leguat & de ses compagnons en deux îles désertes des Indes Orientales*. Amsterdam: J. J. de Lorme. 2 volumes [reprinted 1995, with long introduction by J.-M. Racault – Paris: Editions de Paris, 269 pp.].
- Leibbrandt, H.C.V.** 1896–1906. *Precis of the Archives of the Cape of Good Hope*. Cape Town: W. A. Richards & sons. 17 volumes [references in this paper are from the volumes entitled *Letters received 1695–1708* and *Letters despatched 1695–1708*, both published in 1896].
- Linon-Chipon, S.** 2003. *Gallia orientalis. Voyages aux Indes Orientales 1529–1722. Poétique et imaginaire d'un genre littéraire en formation*. Paris: Presses de l'Université de Paris-Sorbonne. 691 pp.
- Lockwood, W.B.** 1984. *The Oxford Book of British Bird Names*. Oxford: Oxford University Press. 174 pp.

- Lougnon, A.** 1970. *Sous la signe de la tortue. Voyages anciens à l'Île Bourbon (1611–1725)*, 3rd edn. Saint-Denis, Réunion: [author]. 284 pp. [reprinted 1992, with new illustrations added by A. Vaxelaire, as '4th edn'; St. Denis: Azalées Éditions].
- Millies, H.C.** 1868. Over eene nieuw ontdekte afbeelding van den Dodo (*Didus ineptus*). *Natuurk. Verh. K.Akad. Wet., Amsterdam* **11**: 1–20.
- Mlíkovský, J.** 2004. Extinction of the Dodo *Raphus cucullatus* (Aves: Raphidae): dating reconsidered. *Časopis Národního muzea, Řada přírodovědná, Prague* **173**: 111–112.
- Moree, P.J.** 1998. *A Concise History of Dutch Mauritius, 1598–1710*. London: Kegan Paul International and Leiden: International Institute of Asian Studies. 127 pp.
- Mundy, P.** 1608–1667. *The Travels of Peter Mundy in Europe and Asia*. [MS publ. in five volumes, 1905–1936, ed. R. C. Temple. London: Hakluyt Society].
- [Newton, A.]** 1868. Recent ornithological publications. *Ibis* (2) **4**: 472–486.
- Newton, E.** 1888. Address by the President, Sir Edward Newton KCMG FLS CMZS, to the members of the Norfolk and Norwich Naturalists' Society. *Trans. Norfolk Norwich Nat. Soc.* **4**: 537–554.
- North-Coombes, A.** 1991. *The vindication of François Leguat*. 2nd edn, revised. Rose-Hill, Mauritius: Editions de L'océan Indien. 306 pp. [a 3rd edn, 1995, has only minor corrections].
- Panyandee, S.** 2002. *The Dutch Odyssey. Encounter with Mauritius*. Moka, Mauritius: Mahatma Gandhi Institute, 91 pp.
- Pitot, A.** 1905. *T'Eylantt Mauritius. Esquisses historiques (1598–1710). Précédés d'une notice sur la découverte des Mascareignes et suivies d'une monographie du Dodo, des Solitaires de Rodrigue et de Bourbon et de l'Oiseau Bleu*. Port Louis, Mauritius: Coignet Frères & Cie. xv+372 pp.
- Ray, J.** 1678. *The Ornithology of Francis Willoughby ... Wherein All the Birds Hitherto Known ... Are Accurately Described*. London: John Martin [translated and enlarged from Latin edition of 1676].
- Roberts, D.L. & Solow, A.R.** 2003. When did the dodo become extinct? *Nature* **426**: 245.
- Strickland, H.E. & Melville, A.G.** 1848. *The Dodo and its Kindred*. London: Reeve, Benham & Reeve. 138 pp.
- van Wissen, B. (ed.)** 1995. *Dodo *Raphus cucullatus**. Amsterdam: Zoölogisch Museum, Amsterdam University, 102 pp.
- Ziswiler, V.** 1996. *Der Dodo. Fantasien und Fakten zu einem verschwundenen Vogel*. Zürich: Zoölogisches Museum der University Zürich. 94 pp.

APPENDIX

The following date series for Dodo and Red Hen (Strickland & Melville 1848, Cheke 1987 and my unpubl. data) were analysed using Roberts and Solow's (2003) algorithms:

Dodo (mainland only): 1598, 1601, 1602, 1606, 1607, 1616, 1617, 1628, 1629, 1631, 1638.

Red Hen: 1598, 1601, 1602, 1611, 1616, 1617, 1629, 1631, 1638, 1662, 1668, 1674.

This gives an estimated extinction date for the Dodo on the mainland of 1650 (95% confidence limits 1640–1692) and for the Red Hen of 1689 (1675–1743). It suggests, furthermore, that Hugo's escaped slave probably did not, in fact, see Dodos. The upper confidence limit for the Red Hen extends beyond historical possibility. The Dutch left Mauritius in 1710 and were replaced by the French in 1722; there is not the slightest indication that any flightless birds survived into the French period (Cheke 1987).

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