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Reply to Lee & Holyoak: how definite are 20th-century reports of Chattering Kingfisher *Todiramphus tutus* from Tahiti?

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SUMMARY.—Lee & Holyoak (2017) focused on Lesson as a source that we had neglected in our discussion of Chattering Kingfisher *Todiramphus tutus* on Tahiti. They are apparently confident in the accuracy of specimen labels from Lesson's era despite that the labelling of even Lesson's own specimens is poor. Based on meticulous notes taken during the Whitney South Sea Expedition by Beck and Quayle in the early 1920s, as well as their specimen material, we demonstrate that they never collected *T. tutus* on Tahiti, where they collected only Society (Tahitian) Kingfisher *T. veneratus*. Lee & Holyoak's suggestion that both species occurred in the Society Islands but became extinct in either the western Leeward Islands (*veneratus*) or eastern Windward Islands (*tutus*) seems to be a case of selective extinction following an established biogeographical divide. We believe that the observed pattern is best explained by the fact that *veneratus* was never present on the Leeward Islands and *tutus* never occurred on Tahiti: this represents the most parsimonious interpretation of the available data.

Lee & Holyoak's (2017) commentary on our papers concerning the occurrence of Chattering Kingfisher *Todiramphus tutus* raises many interesting points. Let us first summarise our original findings. For 115 specimens of Chattering Kingfisher *T. t. tutus* (hereafter *tutus*) in museums worldwide, we compiled data on collection locality, collector and date. For at least eight specimens reportedly taken on Tahiti (of 13 specimens labelled such), we identified problems of provenance. For the remaining five, no collector was mentioned, preventing our researching their precise locality. Problems also arose with the provenance of the only two specimens reported from the atoll of Tupai. We concluded that *tutus* never occurred on Tahiti or Tupai (Jansen & van der Vliet 2015, van der Vliet & Jansen 2015). Another important conclusion was that the oldest two specimens of *tutus* were probably collected by George Bass, who visited French Polynesia, including Tahiti, in 1802 (Jansen 2014). It is unfortunate that Lee & Holyoak (2017) neglect this point because he appears to have been an important source of bird specimens from this region in the period between Cook and Lesson. This brings us to Lee & Holyoak's (2017) arguments. Some of these appear to represent long-standing misconceptions (for example, concerning the use of label data on old specimens), while others relate to the situation in French Polynesia (e.g. biogeography of the Society Islands).

Poor labelling: Lesson's specimens as an example

Lee & Holyoak (2017) are apparently confident in the accuracy of specimen labels in the early era of collecting. This is strange because, for specimens of *tutus*, even Holyoak himself (*in* Thibault & Holyoak 1984: 138) alluded to the possibility that 'beaucoup de vieux specimens libelles <<Otahtiti>> ont pu être collectes ailleurs dans les Iles de la Société' (many old specimens labelled << Otahtiti >> could have been collected elsewhere in the Society Islands), without providing details. In that sense, our papers can be considered a follow-up

to his statement. In them, we referred to, for example Rasmussen & Prÿs-Jones (2003), who demonstrated that poor labelling was almost common practice in the early collecting era. Many cases of simply inaccurate labelling, rather than fraudulent activity, are known, even in the modern era (e.g. Peterson *et al.* 2004, Boessenkool *et al.* 2009).

As Lee & Holyoak (2017) discuss Lesson, his specimens in Muséum national d'Histoire naturelle, Paris (MNHN) well illustrate this point. The voyage of *La Coquille* took Lesson around the world between 8 November 1822 and 24 March 1825, visiting amongst others the Falklands, Chile, Peru, Tuamotu, Tahiti, Bora Bora, several islands in New Guinea and Indonesia, Australia (Sydney), New Zealand, Mauritius, Réunion, St. Helena and Ascension (Cretella 2010). From our research at MNHN, we have concluded that Lesson twice donated specimens from the *La Coquille* expedition to the museum: in April 1825 (168 specimens of 139 species) and on 24 August 1825 (416 specimens of 252 species) (Ms in MNHN Lab, Catalogue 1823 à 1829), i.e. 584 specimens arrived at MNHN, of which many were used for exchange. None of Lesson's specimens has an original label. The only information available, for some, is on the base of their pedestals, but this was added later by someone else, in some instances years after the specimen was collected. It is easy to imagine that mistakes were made during the process. It is also difficult to interpret specimen dates from acquisition books as these were commenced only in c.1854 (Jansen 2014), i.e. Lesson's specimens had already been present in excess of 25 years.

Of the kingfishers among these 584 specimens, in the MNHN archives we have located three documents relating to the first batches (varying in content and with different numbering) and an incomplete manuscript, drafted by Lesson in 1824. The latter excludes the Pacific section of the voyage (Bibliothèque centrale, MNHN, Ms 354). Table 1 shows that Lesson sent 26 kingfisher specimens to MNHN of which 14 were mounted for the galleries (leaving 12 for exchange). Nine of these (cat. nos. 73–78) arrived with the first donation, and the rest (cat. nos. 135–142) with the second. From Table 1, it is clear that four kingfishers

TABLE 1

Details of kingfisher specimens in the Catalogue 1823 à 1829, collected by Lesson and which arrived at the Muséum national d'Histoire naturelle (Paris) in either April 1825 (pp. 100–101) or 24 August 1825 (p. 132). Presented are page number, catalogue number, name, original collection location as drafted, the number of individuals and any additional information.

Catalogue 1823 à 1829					
Page	Cat. no.	Name	Locality	Ind.	Additional information
100–101	73	Martin Pêcheur	Waigeo	1	Guadicaud
100–101	74	Martin Pêcheur	Nelle Irlande	1	(mounted for the galleries)
100–101	75	Martin Pêcheur	de Cap	1	
100–101	76	Martin Pêcheur	Otahite et Bourbon	4	à tête verte
100–101	77	Martin Pêcheur	de Bourbon	1	
100–101	78	Martin Pêcheur	de BoraBora	1	(mounted for the galleries)
132	135	Martin-chasseur	N. G.	3	Guadicaud (mounted for the galleries)
132	136	Martin-chasseur	Waigeo	1	
132	137	Martin-chasseur	N. G.	1	(mounted for the galleries)
132	138	Martin-chasseur	Malouines	3	à tête verte (one mounted for the galleries)
132	139	Martin-chasseur	N. Ze	4	(mounted for the galleries)
132	140	Martin-chasseur	Taiti	2	(mounted for the galleries)
132	141	Martin Pêcheur	Bourou	2	tamatioïde
132	142	Martin Pêcheur	N. Guinée	1	(mounted for the galleries)
Total				26	

TABLE 2

The number of kingfisher specimens collected during the *La Coquille* voyage (1822–25), with the current scientific name, acquisition book number or recent renumbered registration number, collection location based on the acquisition book and the type catalogue in which the specimens were published in.

Species	Acq. book no.	Location	Type catalogue
<i>Melidora macrorrhina</i>	MNHN-ZO-2006-563	Nlle Guinee	Voisin & Voisin (2008: 3)
<i>Syma torotoro</i>	MNHN-ZO-2006-562	Nlle Guinee	Voisin & Voisin (2008: 5)
<i>Todiramphus albicilla albicilla</i>	MNHN A.C. 3467	Nelle Irelande	
<i>Todiramphus veneratus veneratus</i>	MNHN-ZO-2006-561	BoraBora	Voisin & Voisin (2008: 7–8)
<i>Todiramphus tutus</i>	MNHN-ZO-2006-545	BoraBora	Voisin & Voisin (2008: 5)
<i>Todiramphus tutus</i>	MNHN-ZO-2006-544	BoraBora	Voisin & Voisin (2008: 5)
<i>Todiramphus sanctus vagans</i>	MNHN-ZO-2006-564	Nelle Zelande	Voisin & Voisin (2008: 8)
<i>Alcedo meninting</i>	MNHN A.C. 3506a	Nlle Guinee	

from Tahiti and Bourbon (Réunion) were registered under one entry, probably meaning that they concerned similar-coloured species like Collared *T. chloris* or Sacred Kingfishers *T. sanctus*. In Table 1 note also the mention of both the Malouines (Falkland Islands) and Bourbon (Réunion) where no kingfishers occur, although both localities were visited by Lesson on *La Coquille*, illustrating just one way in which errors of location can find their way into history.

At present (June 2017) only eight of these kingfishers are present at MNHN (Table 2). Note that both *Todiramphus albicilla* and *Alcedo meninting* do not occur in New Ireland and New Guinea, respectively, contrary to what is mentioned in the acquisition books.

Lee & Holyoak (2017) appear surprised that we did not refer to Lesson (1827), wherein he described the genus *Todiramphus*. We did, of course, read this paper but, as our concern was not taxonomic, there was no reason to cite it. Furthermore, the descriptions Lesson gave of both species are not type descriptions as is abundantly clear from our papers. However, we might note that Lesson's paper appeared in 1827, four years after his visit to the Society Islands and two years after his return to Europe. Given all of the problems with Lesson's labelling, we are less certain than Lee & Holyoak (2017) that Lesson had his collection localities right for each specimen. For the same reason, we do not believe that much can be inferred from Lesson's texts quoted by Lee & Holyoak.

Arrival of rats (*Rattus* spp.) in the Pacific

Lee & Holyoak (2017) afford extra significance to Lesson's specimens from French Polynesia because, according to them, they were collected in an environment free of Black Rats *Rattus rattus*. They state that Lesson's 'timing was critical because it took place just a few years (c.10) before the invasion of Black Rat'. Lee & Holyoak (2017) rightly state that the arrival of this invasive species had 'a devastating impact on the avifauna of eastern Polynesia'. Whether Brown Rat *R. norvegicus* or Black Rat arrived first is potentially important because predation of landbirds by Brown Rats is much less severe than by Black Rats.

Quoting Sparrman, who accompanied Cook on his second circumnavigation, Atkinson & Atkinson (2000) reported that rats were already a great pest on Tahiti in 1773. These probably concerned Polynesian Rats *R. exulans* introduced by local Polynesians. Furthermore, Atkinson (1973) noted (quoting Cook 1785: 81 discussing his third voyage) that Cook let rats ashore on (at least) Raiatea and Moorea. Because Polynesian Rats did not occur in Cook's port(s) of departure and other ports of call, these must have been Brown or

Black Rats. Black Rat had been established in Britain for centuries, while Brown Rat was a relative newcomer, with the first reliable reports in England in 1730 (Hedrich 2006). Being the more aggressive species, Brown Rats outcompeted Black Rats relatively quickly almost everywhere in Europe including Britain. However, how strong the resulting decline of Black Rat had been when Cook set sail in 1776 is unclear.

Based on interspecific competition and the start of intercontinental travel by ship, Atkinson (1985) concluded that Brown Rat would have been first to arrive on the Pacific islands. However, Atkinson & Atkinson (2000) noted that Brown Rats did not appear to reach the Pacific islands until the 19th century. It can be deduced that those rats that Cook introduced in the Society Islands, prior to Lesson's visit, may have been Black Rats, which therefore could have arrived much earlier in French Polynesia than Lee & Holyoak (2017) acknowledge. This means that assumptions by Lee & Holyoak (2017) regarding Lesson visiting islands not impacted by predatory rats, is not necessarily true. This furthermore indicates that their conclusions based on this assumption are not necessarily valid. In reality, however, it is impossible to be certain which species (Brown or Black Rat) was introduced first in the Society Islands.

Variation in Tahitian Kingfisher *Todiramphus veneratus*

Lee & Holyoak (2017) provide a very brief description of the kingfisher that Holyoak claims to be *tutus*. It does not add much to those details provided by Holyoak (1974) and Holyoak & Thibault (1984). No photographs, videos or specimens are apparently available. The level of detail provided by Holyoak is in our view insufficient to claim these birds as *tutus*. That Holyoak does not doubt his own sightings is not necessarily sufficient for them to be accepted. He describes in Lee & Holyoak (2017) that '*tutus* was recognised [by him] by its white collar around the nape (lacking in *T. veneratus*), combined with brighter blue back and wing-coverts.' In response to several recent claims of *tutus* in 2002–08, Cibois & Thibault (2009) already noted plumage similarities between *tutus* and *veneratus*. They emphasised, for example, that *veneratus* can show bluer upperparts than previously known. A study into kingfisher taxonomy led us to study 82 specimens of *veneratus*. Full details will be published elsewhere, but focusing on the important feature of the neck-band, most specimens of *veneratus* lack a neck-band or even an indication of one. However, a few show some white spots, a clear small white neck-band or, very rarely, a distinctly coloured neck-band (orange / green / white). That *veneratus* can show a white neck-band means that it can resemble *tutus* in this respect, as alluded to by Lee & Holyoak (2017). However, unlike Lee & Holyoak (2017), we believe this reflects variation within *veneratus* rather than hybridisation between *veneratus* and *tutus* as suggested by Lee & Holyoak (2017).

Biogeography of the Leeward and Windward Islands

Lee & Holyoak (2017) appear to dispute the different biogeographical histories of the western Leeward Islands and eastern Windward Islands. While it is difficult to draw firm conclusions from an impoverished biological class like birds, Hembry & Balukjian (2016) analysed a wide range of taxa. Their conclusion, that 'the most common phylogeographical division seen in Societies taxa is between the Windward and Leeward Society Islands', supports our assumptions based on a small number of bird species. They specifically mentioned Grey-green Fruit Dove *Ptilinopus purpuratus* as a probable example of this biogeographical pattern, while they considered *Acrocephalus* reed warblers to be also consistent with it. Both of these examples were also given by us (van der Vliet & Jansen 2015). We concur with Lee & Holyoak (2017) that not all landbird species on the Society

Islands display this biogeographical pattern, as is evident from the genus *Ducula*. However, the example of Blue Lorikeet *Vini peruviana* to demonstrate their point is less fortunate because this species can cover relatively large distances over water (up to five km regularly recorded, but it is perhaps capable of larger distances; Ziembecki & Raust 2006).

The Whitney South Sea Expedition in the Society Islands

One important point of reference is the visit by the Whitney South Sea Expedition (WSSE) to the south Pacific (including the Society Islands) in the early 1920s, collecting birds for the American Museum of Natural History (AMNH), New York, in the process discovering many taxa described as new to science. The expedition was not without its controversy though, and the number of specimens taken by WSSE sparked outrage even at the time, with New Zealand denying the expedition collecting permits in the Cook Islands (Collar 2000). Rigorous collecting by WSSE in areas they visited, combined with their equally detailed record-taking (see below), means that we attach high value to their results.

At AMNH, the kingfishers that WSSE collected on the Society Islands numbered 71 *veneratus* from Tahiti (6 October 1920–13 January 1923), 30 *youngi* on Moorea (13 June 1921–5 November 1921) and 14 *tutus* on Raiatea (10 December 1921–10 January 1922) and Bora Bora (12–13 January 1922). Due to their efficient labelling, we can deduce that all of their *veneratus* were assigned to Tahiti, all *youngi* to Moorea and all *tutus* to Raiatea or Bora Bora. The principal collectors were Rollo Beck and Ernest Quayle. The diaries of both men are available.

From Beck's diaries, it is evident that both he and Quayle visited highland areas on Tahiti up to 1,220 m, i.e. the elevation where Holyoak sighted his kingfishers. This is reinforced by Quayle's diaries as detailed by Monnet *et al.* (1993). Lee & Holyoak (2017), emphasising the broadly circular shape of Tahiti Nui, note that the sites of Holyoak's observations and those of unverified sightings in 2002–08, would have been 'at similar altitude and approximately similar distances inland'. Due to the size of the island, Lee & Holyoak (2017) conclude that the locations would have been close together. Because Beck and Quayle visited sites at similar elevations, these were probably also close to those of Holyoak's sightings. If *tutus* was really that readily encountered at that elevation in that region of Tahiti (as seems to have been the case based on the numbers observed by Holyoak), it is very surprising that WSSE did not collect it there. Despite staying c.9 months on Tahiti spread over several visits between September 1920 and April 1923, WSSE did not collect a single specimen of *tutus* on Tahiti.

Quayle's diaries reveal that he 'was primarily engaged in collecting, but he evidently noted all of the land and freshwater bird species he encountered' (Monnet *et al.* 1993). Again, according to Monnet *et al.* (1993), Quayle '... explored the island more intensively than the other members of the expedition, and in his journal, he noted ecological observations as few naturalists did at this time. [...] He mentioned 19 localities where he collected (or observed) birds.' Monnet *et al.* (1993) identified 15 of Quayle's collecting sites, with four being impossible to determine, and investigated 14 of the known localities between 1986 and 1991, but not the 15th, Vaiote. Because this site is in the smaller, eastern part of Tahiti (Tahiti Iti), where Holyoak did not observe kingfishers, it is of no concern here. Like WSSE, Monnet *et al.* (1993) failed to observe *tutus* on Tahiti.

Overall, we still find it difficult to credit that WSSE would not have collected *tutus* on Tahiti, had it occurred there, given their intensive collecting and visits to appropriate elevations, especially as WSSE worked on Tahiti 50 years earlier than Holyoak. The field work and collecting practice of WSSE reinforces a point discussed earlier: if collectors record data precisely during field work, few (if any) errors occur during subsequent labelling with

respect to, for example, date and locality. Because data for specimens collected during WSSE can be checked against the diaries of Beck and Quayle, in our opinion they can be deemed trustworthy.

A case of selective extinction?

Lee & Holyoak (2017) mention three implicit or explicit hypotheses in our papers. Foremost, we propose that (1) *tutus* never occurred on Tahiti or (2) on Tupai. Lee & Holyoak (2017) furthermore state that (3) *veneratus* never occurred on the Leeward Islands should be considered a further conclusion. In contrast, they advance a scenario where *veneratus* and *tutus* occurred in sympatry on both the Windward and Leeward Islands (except perhaps for *tutus* occurring on Moorea). They rightly state that this occurs elsewhere in Oceania, despite that kingfishers are territorial predators. While we obviously agree that this trait does not exclude sympatry, it also means that kingfishers are often clearly detectable by all observers.

Knowledge of both species in the Society Islands in the 1800s was scant to say the least. Most if not all contemporary literature considered that *veneratus* occurred on the Society Islands, and *tutus* (or taxa with which *tutus* was synonymised) also on Tahiti (e.g. Gray 1859, Finsch & Hartlaub 1867, Sharpe 1868, 1892, 1906, Wigglesworth 1891). These sources often referred to the less precisely delineated 'Society Islands' among which, for biogeographical reasons outlined above, it is important to distinguish the Leeward and Windward groups. Confusion in that era was exaggerated because several influential works disagreed as to the specific status of *tutus*, sometimes considering *veneratus* and *tutus* as conspecific; hence our quotation of Sharpe (1868), repeated by Lee & Holyoak (2017). This was still true in 1904 when S. B. Wilson visited the Society Islands (Wilson 1907). Wilson (1907) described both *veneratus* and *tutus* as (fairly) common in the Society Islands, noting that *veneratus* was 'fairly common, especially on the island of Bora-Bora'. As noted above, even WSSE was unable to collect any *veneratus* on Bora Bora or the other Leeward Islands, only 20 years later.

Considering the present-day distribution of both taxa, the scenario outlined by Lee & Holyoak (2017) represents a case of selective extinction, wherein *veneratus* must have died out quite rapidly between Wilson's visit in 1904 and that by WSSE in 1921–22 to Raiatea and Bora Bora. Furthermore, according to their scenario, *tutus* must have become extinct on Tahiti alone (given the lack of credible reports since Holyoak's in 1972) whereas it still thrives in the Leeward group. Yet, this selective extinction occurred in the presence of the same predators (rats) on both groups and coincidentally followed an established biogeographical divide between the archipelagos. We consider this to be an unrealistic scenario not supported by facts, and we do not agree with Lee & Holyoak (2017) to consider the current distribution of *veneratus* as a working hypothesis. We believe that the available facts support only one plausible hypothesis, namely that (1) *veneratus* never occurred on the Leeward Islands, while (2) *tutus* was never present on Tahiti. Reaching this conclusion we cannot help wondering how Lee & Holyoak believe that *tutus* became extinct on Tahiti so soon after Holyoak's sightings, but also how *veneratus* on Bora Bora slipped to extinction so swiftly after Wilson's sightings, despite being considered common?

Our conclusions are supported by the WSSE results. As stated, we believe their data are trustworthy and therefore that accurate distributions can be inferred from their specimens. In this case, based on their data concerning kingfishers collected in the Society Islands, we conclude that *veneratus* occurs only on Tahiti, *youngi* only on Moorea, and *tutus* does not occur on Tahiti and Moorea, but in the Leeward group. From van der Vliet & Jansen (2015) we contend that nominate *tutus* not only occurs on Raiatea and Bora Bora (where

WSSE collected it) but also on Huahine, Maupiti and Tahaa. For *veneratus*, this follows all modern world checklists (e.g. Peters 1955, Dickinson & van Remsen 2013, del Hoyo & Collar 2014, Clements *et al.* 2016, Gill & Donsker 2017) and other literature (e.g. Pratt *et al.* 1987, Fry *et al.* 1992). That *tutus* never occurred on Tahiti is the most logical explanation for the observed distributional pattern, and represents the most parsimonious interpretation of the available data.

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