

The type and other early specimens of Grey Falcon *Falco hypoleucos*

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Received 10 November 2009

SUMMARY.—The origin, identity and current location of the type specimen of Grey Falcon *Falco hypoleucos* and three further specimens known to John Gould, collected in 1839–45, are investigated. The specimen hitherto considered to be the holotype, held at the Academy of Natural Sciences of Philadelphia, is almost certainly not the type but a bird secured by Charles Sturt. The holotype almost surely is missing. The two specimens at Philadelphia are almost certainly those secured by Sturt at Depot Glen. The fourth specimen, collected by John Gilbert in 1842, almost definitely is the only specimen of the species held at the National Museums Liverpool. That specimen was considered missing but was re-found during this work.

After John Gould sold his collection of Australian birds to Dr Thomas B. Wilson of Philadelphia in 1847–48, it was sent to the firm Maison Verreaux, taxidermists in Paris. The consequences were unfortunate for the history of Australian bird collections. Data were lost and some specimens disappeared. Gould's Australian collection numbers over 300 type specimens, thus the transfer has had significant negative consequences for taxonomists studying Australia's avifauna. Historical facts are obscured by ambiguous and inconclusive texts, by contradictory statements, and missing evidence such as letters, lists, specimens and labels. The four Grey Falcon specimens known to Gould in writing *The birds of Australia* (1848b) are affected by these problems. Their origin and fate are investigated here.

Materials and methods

I studied photographs of specimens in collections and compared them with personal observations of wild and captive birds, and researched published and unpublished materials, including notes by John Gilbert. Unpublished printed and reproduced or archived materials are listed as [notes] under 'References'.

Results

The holotype.—At a meeting of the Zoological Society of London on 24 November 1840, John Gould exhibited a specimen of Grey Falcon. The species' description appears on pp. 162–163 of Part 8 of the *Proceedings of the Zoological Society of London*, dated 1840 but published in July 1841 (Zoological Society of London 1893). The description and the specific epithet refer to the specimen's juvenile plumage; underparts white with spatulate black spots, upperparts dark grey, tail grey with obscure brown bars, tipped buff (Marchant & Higgins 1993). Gould did not mention bare-part colours. Measurements are given in Table 1. Gould (1841b) stated that the specimen was the only example available, but in the *Handbook to the birds of Australia* (Gould 1865: 25), he added that he had characterised 'this species by . . . a young female then in my possession'. Morphological differences between the sexes appear to be limited to the reversed sexual size dimorphism typical of many raptors, with no sex-related plumage differences known (Marchant & Higgins 1993).

TABLE 1
Measurements: Gould's type (1840) versus VN 96 / ANSP No. 2099

Gould's type vs. VN 96	Total length	Wing	Tail	Bill	Tarsus
Gould's type (1840)					
inches	17	12 1/2	7 1/2	1 1/4	1 3/4
converted to mm	431.8	317.5	190.5	31.8	44.5
range in mm (i.e. $\pm 1/16''$)	430.2–433.4	315.9–319.1	188.9–192.1	30.2–33.3	42.9–46.0
VN 96 / ANSP 2099 (in mm)					
Meyer de Schauensee (1957)	–	326	157	19	49
Fisher	444.5	324	187	31.8	49.2
Rice	–	314.5	166.5	18.8	–

Note that only Rice measured the specimen according to known procedures and precision. The precision of Gould's measurements is assumed to be to the nearest eighths of an inch, i.e. $\pm 1/16''$.

Measurements.—Although it is unknown who took the measurements published in the *Proceedings*, they are assumed to be Gould's. Compared with other species described in part 8 of the *Proceedings*, it appears safe to presume that they were taken to the nearest eighth of an inch, i.e. to a precision of $\pm 1/16''$.

Total length is strongly dependent on the method of specimen preparation and is therefore generally disregarded here. Although the bill does not normally change shape after death, there are several different ways to measure length (Baldwin *et al.* 1931, Winker 1998). The resulting differences are considerable. As Gould's methodology is unknown no interpretation is possible. It is unclear how wing length was measured. If it was maximum chord then 12.5 inches lies within the range for juvenile females (Marchant & Higgins 1993), but is above that for juvenile males, given the assumed precision of Gould's measurements. If natural chord was measured, then the maximum chord would be even greater. Tail length is difficult to take accurately because it is not always obvious where the feathers erupt from the skin (R. McGowan pers. comm.). Gould measured this as 7.5 inches (190.5 mm), i.e. considerably greater than the range given by Marchant & Higgins (1993), of 161–170 mm for juvenile females ($n=3$) and 156–176 mm ($n=10$) for adult females. Either the type was measured differently or it has indeed such a long tail that the bird is perhaps female, or 7.5 inches is incorrect, or the skin was damaged. Consequently the measurement is disregarded. The length of the tarsometatarsus is given as 1.75 inches (42.9–46.0 mm, if accurate to the nearest eighth of an inch). This range overlaps slightly with males (≤ 43.6 mm, ages combined) and slightly more with females (≥ 44.6 mm, ages combined) (Marchant & Higgins 1993). Consequently, this measurement is inconclusive as to sex.

Winker (1998) pointed out that 'a single measurement taken to represent individual size (e.g., wing chord) is not sufficient for careful studies.' He suggested that 'multivariate approaches are preferable'. This, together with the uncertainty over Gould's methodology and his precision, makes a definitive conclusion as to sex on the basis of his measurements impossible. There is a moderate probability, however, that it is a female on wing length.

Collection.—The first information about the type is found on a collection data sheet¹ written by John Gilbert, probably in 1839, just after obtaining the specimen. Gilbert was Gould's principal collector in Western Australia.

¹The following was recorded on a collection data sheet by Gilbert, probably in 1839: Falco. Aboriginal name. Gwet"=el=bur (Mountain) Colonial White Falcon. A very rare visitants [sic] in this country. I saw no other specimen in any collection. this [sic] specimen was killed over the Mountain about 60 Miles from the Coast. Presented by Mr L. Burgeß [sic]. Source: 'Papers [microform]: [M725–727], 1835–1876. Mfm M726, No. 1.e'. (University of Cambridge, Department of Zoology.) Australian Joint Copying Project, Canberra.

Lock C. Burgess, 1813–86 (Whittell 1938, Fisher 1992, Sauer 1999), lived near York, east of Perth in Western Australia, where he moved in 1836 (Whittell 1938). Although Gilbert did not expressly state that Burgess collected the specimen, it appears a safe assumption. The specimen was presented to Gilbert in 1839, during his first visit to the Swan River Colony, between 6 March 1839 and 29 January 1840 (Chisholm 1938). Gould (1841b) repeated the information provided by Gilbert, writing that Burgess ‘stated that it had been killed over the mountains about sixty miles from the coast.’

It is very likely that Burgess collected the specimen near York, which is on the Avon River, c.87 km from Perth or slightly further from the coast, consistent with Gilbert’s ‘60 miles’ when travelling overland to the east. It is inland of the Darling Range, consistent with ‘over the Mountain’. Gilbert may have met Burgess during a trip inland in June 1839, when Gilbert passed through York on 20 June (Fisher 1992). The precise date is unclear. It was not until September 1839 that Gilbert mentioned ‘a *Falcon* like *Gyrfalco*’ to be one of the latest additions to his collection² (Whittell 1941). The specimen was shipped on the *Lord William Bentinck* to England, in 1840³.

The type locality had been incorrectly assumed by some to be the vicinity of the Moore River, but was clarified by Whittell (1938). G. M. Mathews may have been responsible for this. In his *The birds of Australia* (1915–16), he cited the relevant sentence in Gould with incorrect punctuation: ‘The specimen . . . was presented to Mr. Gilbert by Mr. L. Burgess, who stated that he had killed it over the mountains, about sixty miles from Swan River: [sic] subsequently it was obtained by Mr. Gilbert himself in the vicinity of Moore’s River in Western Australia’. The locality was correctly given by Meyer de Schauensee (1957), Condon (1975) and Debus (*in del Hoyo et al.* 1994) as York.

Illustration.—Gould’s wife Elizabeth lithographed the specimen. The plate is titled ‘FALCO HYPOLEUCUS: Gould.’, marked ‘J&E. Gould del. et lith.’, and shows a juvenile. It is the first plate in Part 5 of Gould’s *The birds of Australia* (1840–48), published on 1 December 1841. The illustrated bird’s plumage matches Gould’s (1840) description. Obvious are the white underparts with the prominent spatulate spots typical of juveniles, as are the dark grey upperparts. Unmentioned in the description were the bare-parts colours. As illustrated, the cere is the same yellow as the toes. The bill is mostly pale grey, becoming dark grey to almost black at the tip. The side of the basal lower mandible, i.e. ‘below’ the cere, is illustrated as being the same yellow as the cere. The orbital ring is pale grey, the adjacent bare skin slightly darker. Noteworthy is that no yellow or orange is shown around the eye. That, together with the upper mandible lacking any yellow, indicates that the type is in its first year. Young Grey Falcons initially lack any yellow or orange around the eye and upper mandible, but acquire such colour later (*pers. obs.*). I have found no evidence of any notes on the appearance of the plumage and bare parts, neither of the live bird nor of the fresh specimen.

The text to the plate reads: ‘*Falco hypoleucus* [see Name, spelling and citation], Gould. White-breasted Falcon. The only specimen of this genuine and noble Falcon in my collection, or indeed that has ever come under my notice’, and continues ‘to all appearance, my specimen, which is rather less than a male Jerfalcon, has the adult plumage.’ and is

²Gilbert, J. (1839) Letter to John Gould, from Perth, Western Australia, 3 September 1839. In ‘Papers of Gregory M. Mathews, 1900–49 [manuscript]. MS 1465, series 24, folder 7’. National Library of Australia, Canberra.

³The Burgess specimen was shipped on the *Lord William Bentinck* to England, in 1840. Gilbert’s ‘List of Specimens sent by [?] . . . to London from Sydney’ contains ‘1 Falco (White)’. Source: Gilbert, John (Australia) 8 ms booklets, c.1841–45.’ In ‘John Gould (1804–81). Papers and correspondence, Z MSS GOU A and B [microform]: [M2888–2902]. Mfm M2902, No. 10’. Australian Joint Copying Project, Canberra.

followed by a description of the specimen similar to the English text in Gould (1840), again omitting mention of the bare-parts colours. The sex is also not mentioned.

Thus, it appears that the type is a juvenile, probably a female on wing measurement, and was collected by Lock Burgess near York, Western Australia, in 1839. It is the holotype being the only specimen available to Gould in describing the species; there are no paratypes.

According to Mathews (1913), 'Gould figures the bird from West Australia beautifully in his *Birds of Australia* [part 5 of Gould 1840–48]. This plate he afterwards cancelled, and later [part 36 of Gould 1840–48] figured the birds collected by Captain Sturt at the Dépôt, South Australia. Those who, like myself, have the cancelled plate, can see the difference by comparing the two.' In that final part 36 (Gould 1848a), a new plate and new letter press were published. The new plate is entitled 'FALCO HYPOLEUCOS: *Gould.*', marked 'J. Gould and H. C. Richter del. et lith.', and shows two birds. Following the completion of the 36 parts of *The birds of Australia* (1840–48), Gould published the material in seven volumes under the same title (Gould 1848b). He directed the binder that 'the Plate and Description . . . of *Falco hypoleucus* in Part V. are to be cancelled, and the Plate and Description of . . . *Falco hypoleucus* in Part XXXVI. inserted in lieu thereof.' (Sauer & Evans 1989). Hence the seven-volume edition also includes Richter's plate; it is plate 7 in volume 1.

The four specimens mentioned by Gould.—Gould (1848a) stated: 'Up to the present time only four examples of this fine Falcon have been procured'. In the letter press to the Grey Falcon plate, he wrote: 'Of this rare and beautiful Falcon I have seen only four examples, three of which are in my own collection, and the fourth in that of the Earl of Derby. The specimen from which my description in the "Proceedings of the Zoological Society" was taken, was presented to Mr. Gilbert by Mr. L. Burgess, who stated that he had killed it over the mountains, about sixty miles from Swan River; subsequently it was obtained by Mr. Gilbert himself in the vicinity of Moore's River in Western Australia; and my friend Captain Sturt had the good fortune to secure a male and a female during his late adventurous journey into the interior of South Australia.' Gould did not clarify which of the four was in the collection of the Earl of Derby. We have only the certainty that Burgess' specimen was in Gould's collection.

Gilbert's specimen.—In August 1842, during his second stay at Swan River Colony, Gilbert visited the Moore River, north of the settlement, with James Drummond, the Government Botanist of Western Australia. Gilbert had not been that far north before. On 29 August, at or near a place called Nugadrine or Mugadrine (Drummond 1842, 1844), Gilbert shot a Grey Falcon.

In a letter to Gould, dated Perth, 13 September 1842 (Sauer 1999), Gilbert reported his collection of 'a beautiful Specimen of *Falco hypoleucus*'. He wrote: 'we reached a large River & Lakes nearly forty miles farther North than the Moore's River, where I for the first time saw & Shot the beautiful species of Falcon mentioned above . . . The *Falco hypoleucus* which I killed differs a good deal from your Plate, perhaps in consequence of Age; It is of a uniform ashy grey, *all over* . . . with very narrow lines of black running down the Centre of each feather, not, as in your plate, a pure white; It may be a new species, I wish it may, I assure you I never gazed with more delight on any Specimen I ever Shot, than on this Bird . . . the rich orange-yellow of the whole of the Face, & Legs contrasting beautifully with its delicate plumage. To sum up all, it was one of the most beautiful Birds I ever gazed on.'

He gave further details in another letter dated 9 October 1842, '*Falco hypoleucus*. The following is the description of my Specimen before skinning. Its length was 15 Inches; Wing 12 3/4, Tail 6 1/4; Bill 2 1/2; Tarsus 1 3/4; metatarsus 2 1/4; Irides dark-brown; cere, all

of the naked space around the Eyes, gape and usual [erroneous transcription for 'basal'] portion of Bill & Legs & feet brilliant orange-yellow. The yellow from the base of the Bill becomes gradually lighter, as it approaches the black tip of both mandibles, claws black' (Sauer 1999).

In a manuscript, Gilbert⁴ mentioned that a 'mature specimen killed at the Moore's river was of much lighter colour than the foregoing description [a transcription of Gould 1840], and rather smaller in size, measured before skinned. Length, 15; wing, 12 1/2; tail, 6 1/2; bill, 2 1/4; tarsi, 1 3/4.' The discrepancies between Gilbert's two sets of measurements are not readily explained.

Regardless of the discrepancies, the wing and tail measurements indicate a female. The bill length appears erroneous, and the tarsus measurement is inconclusive regarding sex. If Gilbert had determined the sex of his specimen, e.g. by examination of the gonads, there is no mention of it in his notes and correspondence.

Nugadrine / Mugadrine (or Mugradine as misspelled by Whittell 1942) is unknown to me. A map of Gilbert's August route gives the final and northernmost point of the party's trip as the vicinity of Lake Dalaroo near the town of Moora, on the main (northern) branch of the Moore River (Whittell 1942). General direction and approximate distances from reference points given by Gilbert are consistent (Drummond 1842, 1844, Sauer 1999).

In sum, this specimen might be female based on the wing and tail measurements, despite Gilbert's impression of its smaller size compared to the type. From the plumage it is undoubtedly an adult. Gilbert collected it in August 1842 at or near the Moore River, around Moora, Western Australia.

The specimens from Depot Glen.—The two remaining specimens, secured by Captain Charles Sturt, 'were shot at the Dépôt on a Sunday in May 1845, just after service' (Gould 1848a). Sturt (1849) wrote: 'This beautiful bird was shot at the Dépôt, at which place, during our long stay, Mr. Piesse, my storekeeper, was very successful with my gun. A pair, male and female, were observed by him one Sunday in May, whilst the men were at prayer, hovering very high in the air, soon after which he succeeded in killing both.' These two are, according to Mathews (1913), figured in *The birds of Australia* (Gould 1848a,c); the illustration shows an adult in the right foreground and a young bird at the rear. In reporting them 'hovering', Sturt most probably confused the term with soaring; the species is not known to hover but does soar very high (Schoenjahn in press).

The adult fits the description of adult Grey Falcon (Marchant & Higgins 1993), except that the yellow cere, the base of the upper mandible, bare ocular skin, and the toes are paler than the bright orange-yellow of wild birds (pers. obs.). Sturt (1849) also noted the vivid yellow cere and legs of the two birds. This slight discrepancy might have resulted from post-mortem changes during the c.3 years between the bird's collection and the illustration. It is unknown whether Richter, the illustrator, was provided with Sturt's description.

The plumage of the young bird in the illustration resembles both the description of juvenile (Marchant & Higgins 1993) and the description of the type (Gould 1840). However, the young bird in the illustration shows the same colour of the cere, upper mandible and skin around the eye as the adult bird in the illustration; that is consistent with Sturt's description (above). As previously mentioned young birds first have grey or light grey bills and grey skin around the eye; they acquire the yellow later. Therefore the young bird from Depot Glen is presumably older than the type.

The sex of both birds from Depot Glen is unclear. In the letter press to the Grey Falcon plate, Gould (1848a) noted: 'The Plate represents the two sexes of the natural size'. Sturt also

⁴Ornithological Notes—Gilbert. p. 19. Queensland Museum Library, Brisbane.

referred to 'a pair, male and female', but it is unknown how he reached that opinion. No measurements were recorded for the two specimens.

In the letter press, Gould correctly described the differences between adults and juveniles. Unfortunately however, he neither mentioned the method used to sex the birds, nor did he inform which bird on the plate is, in his opinion, the male and which the female. Measurements taken from the illustration reveal that the two individuals are very similar in size, *contra* Meyer de Schauensee (1957).

Depot Glen, on Evelyn Creek, was within the boundaries of New South Wales at the time of Sturt's expedition in 1845–46 (Archer 1847) as it still is today (*cf.* North 1912).

Whereabouts of the four specimens.—In 1847–48, Gould's collection of Australian birds, including three specimens of *F. hypoleucos*, was sold to Philadelphia, after the British Museum had declined Gould's offer. The fourth specimen, being part of the collection of the 13th Earl of Derby, was transferred to the Derby Museum at Liverpool (Gould 1865) after the earl's death in 1851. The identities of the four specimens are now discussed.

Academy of Natural Sciences of Philadelphia (ANSP).—Gould sold his collection to Edward Wilson of Pembrokeshire, on behalf of his brother Dr Thomas B. Wilson of Philadelphia, a supporter and subsequent president of ANSP (Gould 1848c, Stone 1899, 1913). Before they reached Philadelphia, the specimens were sent to the firm Maison E. Verreaux in Paris, an emporium and dealership in natural history specimens run by three brothers. The specimens were mounted and shipped to Philadelphia with a complete list⁵ handwritten by Jules Verreaux (Stone 1913). The three specimens of *F. hypoleucos* were listed as: 94, (Falco) Hypoleucus, (upside-down symbol for female, indicating male), W. Australia. 95, dito dito, ♀, S. Australia. 96, dito dito, (upside-down symbol for female, indicating male), W. Australia. The current designations are VN 94, etc.

Maison Verreaux.—At the Maison Verreaux, the specimens were 'mounted on wooden standards according to the custom of the times.'⁶ Unfortunately all labels were removed, information lost, misinterpreted, or transcribed incorrectly. Some specimens disappeared. At the end of the 19th century Witmer Stone catalogued the entire ANSP bird collection including Gould's birds. In a number of papers, Stone described the fate of the specimens, though somewhat inconsistently.

Stone (1899) explained: 'Gould's collection, after purchase, was sent to Verreaux for mounting, and the original labels were removed, and their contents (or part of it) transcribed on the base of the stands, every specimen being marked "Type. Gould's *Birds of Australia*," no matter whether the species was Gould's or not!' Later he wrote: 'Verreaux prepared a manuscript-catalogue of the collection based, as some memoranda show, on an original catalogue of Gould's, which was apparently never sent over to America. The information contained in this catalogue is transcribed on the bottoms of the stands, and consists of the number, name, sex and locality of each specimen, with the addition of the legend: "Type, Gould, Bds. of Australia"—every bird being so marked regardless of whether it was the type of the species or not. The localities are usually very general, and are abbreviated. . . "W. Australia," or "S. Australia." . . . It is easy to see how a slight error in copying from the original catalogue would make "N. Australia" into "W. Australia," etc. . . . That a few errors

⁵In a handwritten catalogue (held at ANSP), presumably by Jules P. Verreaux, of the Maison E. Verreaux, Paris, and probably in 1848, the entire collection of Gould's Australian birds was listed.

⁶Academy of Natural Sciences of Philadelphia (undated). Verreaux, Jules, 1807–73. Catalogs of birds, 1846–47. 24 items. In 'Archive list of the Academy of Natural Sciences of Philadelphia'. p. 36. Academy of Natural Sciences of Philadelphia, Philadelphia, PA.

have resulted from these causes is evident' (Stone 1913). We may assume that those errors were made by the Verreaux brothers as well as by Stone himself.

I could not verify the existence of an 'original catalogue of Gould's'. It might seem plausible that Gould would have kept such a catalogue, especially when offering the collection for sale. The 'memoranda' mentioned above by Stone could include a document prepared by J. E. Gray, Keeper of Zoology at the British Museum. When Gould offered his collection to the British Museum in a letter dated 9 April 1847 (Datta 1997), Gray wrote to the museum's trustees next day, stating that the museum already possesses 'full two thirds if not more of the specimens offered' (Datta 1997). However, judging by the impreciseness of his estimate and the extremely short time to prepare the memorandum, Gray had not made an accurate comparison of the two collections, whether Gould provided a catalogue or not, meaning that this should not be seen as evidence for the existence of such a catalogue. Recent extensive searches for it at libraries and archives in England, Paris and at ANSP were fruitless, although J.-F. Voisin (*in litt.* 2009) informed me that he was aware of the original catalogue. Furthermore, the wooden stands inscribed with data cannot now be traced at ANSP (L. Joseph pers. comm.).

Dr T. B. Wilson formally presented the collection to ANSP in 1860 (Stone 1938). The specimens were initially exhibited as prepared by Verreaux, though later removed from their stands and relaxed as skins (N. Rice *in litt.* 2009). Stone (1913, 1938) pointed out that 1,858 specimens arrived at the ANSP, and that only a few were lost. Gould mentioned to the British Museum that his Australian collection consisted of nearly 1,800 specimens (Datta 1997).

Two of the three Gould specimens sent to ANSP are extant, VN 95 and VN 96. They are mentioned in Ingersoll & Fisher (2006) as ANSP 2098 (VN 95) and ANSP 2099 (VN 96). The latter is listed as the holotype, following Stone (1913) and Meyer de Schauensee (1957).

VN 94.—Meyer de Schauensee (1957) noted that VN 94 'cannot now be found and must have disappeared before 1890 for it was never entered in the Museum register when the collection was catalogued.' This was confirmed by a more recent search (Ingersoll & Fisher 2006). It seems likely that the specimen disappeared prior to 1890 with no evidence that it ever left ANSP (N. Rice *in litt.* 2009). It might never have reached Philadelphia. It was claimed that the age of VN 94 was specified in Verreaux's manuscript catalogue as adult (Meyer de Schauensee 1957), though this was not the case⁵ (*cf.* Stone 1913).

ANSP 2098.—This specimen has one white label, bearing the imprint 'Academy of Nat. Sciences Philadelphia'. The label data are: 2098 Gould Coll. TYPE / ♀ *Falco hypoleucus* Gould / S. Australia Pres. by Dr. T. B. Wilson / and on the reverse, Verreaux catalogue number '95'. It is an adult. Measurements taken by N. Rice according to the specifications in Marchant & Higgins (1990) are: bill (C) 19.86 mm; wing (maximum chord) 318.5 mm; tail 158.0 mm. All three measurements fall well inside the respective ranges given by Marchant & Higgins (1993) for adult females. The locality is given as 'S. Australia', meaning either South or southern Australia. Of the four specimens, only one adult is from southern Australia, that from Depot Glen. Given the circumstances of Sturt's expedition 'into the interior of South Australia', Gould presumably assumed that the location is in South Australia and labelled it accordingly. On the basis of the plate by Richter (Gould 1848a) the sex of the Depot Glen adult cannot be determined. It is clear that ANSP 2098 is an adult on plumage and a female on measurements. The specimen is, very probably, the adult collected by Sturt's storekeeper Piesse, at Depot Glen in May 1845.

ANSP 2099.—Hitherto considered to be the holotype (Stone 1913, Meyer de Schauensee 1957, Fisher 1992, Ingersoll & Fisher 2006), this specimen is VN 96 of the Verreaux

catalogue. It bears two labels, white and red, both with the imprint 'Academy of Nat. Sciences Philadelphia'. The data on the white label are: Gould Collection TYPE / ♂ *Falco hypoleucus* Gould / W. Australia / and, on the reverse, the Verreaux catalogue number '96'. The data on the red label are: TYPE OF *Falco hypoleucus* Gould / P.Z.S. 1840. p.162. The plumage matches Gould's description of the type and fits a juvenile (Marchant & Higgins 1993), especially the bold black spots on the white underparts. Bare-parts colours are: cere yellow; maxilla and mandible rich orange-buff at the base, nearly black at the tips. The ocular skin is dark orange-buff, and the legs / toes are concolorous with the bill. The specimen was measured by N. Rice (Table 1) whose data are all well inside the respective ranges for juvenile females, and outwith those for juvenile and adult males. It was also measured by Meyer de Schauensee (1957) and by C. Fisher. Table 1, however, demonstrates the problems associated with such measurements and the uncertainties regarding technique and precision employed. But, VN 96 / ANSP 2099 is a young bird based on plumage and a female on measurements.

National Museums Liverpool specimen.—One of the four specimens known to Gould was held in the collection of the 13th Earl of Derby. Concerning this bird, in 1865 Gould added in a footnote: 'The last-mentioned specimen is now in the Derby Museum at Liverpool, to which town his Lordship bequeathed his fine collection.' (Gould 1865). Gould omitted the origin of that specimen.

Lord Stanley, who became the 13th Earl of Derby in 1834, died in 1851. The donation of his natural history collection to Liverpool led to the foundation of the Derby Museum, now part of the National Museums Liverpool. The Earl, President of the Zoological Society of London from 1831 until his death, was a great supporter of Gould (Fisher 1987). He subscribed to all of Gould's work and bought many specimens from him. In his preface, Gould (1848c) wrote 'the Earl of Derby, who has at all times most readily submitted to my inspection every collection of which he has become the possessor . . . allowed me the free use of any objects desirable for the enhancement of the "Birds of Australia"'. Mearns & Mearns (1998) noted that the Earl 'bought 230 of the bird and mammal specimens John Gilbert sent to Gould' and 'became one of Gould's best customers.'

A letter from the Earl to Gould, dated April 1842, lists his desiderata, including '*F. hypoleucus*' (Sauer 1999). At the time, the only specimen was Gould's holotype. Hence the Earl must have acquired his specimen thereafter. There is no indication from where it came. Gilbert collected only one specimen, and there is no reason to assume he did not send it to Gould, still awaiting Gould to confirm the species. Further, it is plausible that Gould acquired Sturt's two specimens together, possibly direct. We know that at least one had to be in Gould's collection. It seems unlikely that Sturt, assuming they were a pair, presented only one of his birds to Gould, and the other to the Earl. More plausible is that Gould, after receiving Gilbert's specimen but probably before receiving the two from Sturt, sold Gilbert's specimen from the Moore River to the Earl, knowing that he, Gould, would have access to it should he need.

It also can be assumed that the Earl did not acquire a second Grey Falcon before his death, otherwise Gould would have known about it by 1865. In the *Handbook to the birds of Australia* (1865), Gould re-affirmed: 'In the folio edition of the 'Birds of Australia' I stated that four specimens were all that were then known; in the lengthened interval which has since elapsed, about the same number, and not one more, have come under my notice' (Gould 1865: 25). Although this sentence leaves room for misinterpretation, from the context it is clear that those early four specimens were the only ones Gould had seen when writing the *Handbook*.

The National Museums Liverpool currently holds one specimen of Grey Falcon. The label data represent all known information: 'Falco hypoleucos ♂ Mus. Derbianum. Liverpool.' 'Mus. Derbianum' indicates the collection of the 13th Earl of Derby (C. Fisher *in litt.* 2009). This specimen was considered lost as recently as 2006, with no trace in the Earl's collection at Liverpool or any evidence of an exchange (Ingersoll & Fisher 2006). Fisher located the specimen in March 2009 upon my inquiry. It had been given in error a Derby Collection number, LIVCM D.4001c, which pertained to a missing cuckoo. A new accession number was assigned to the specimen in April 2009, LIV.2009.22 (C. Fisher *in litt.* 2009).

Measurements, taken by C. Fisher in accordance with Marchant & Higgins (1990), are: bill (C) 17.8 mm; bill (front edge of feathers to tip) 20.3 mm; wing (natural and maximum chord) 285 mm for both wings; tail 157 mm, tip of longest tail feather very worn. These measurements of LIV.2009.22 must be considered inconclusive regarding the sex, although it is possibly female. From photographs, the specimen is an adult on plumage.

C. Fisher (*in litt.* 2009) reports that the specimen did not 'feel' like a typical Gilbert skin, being too heavy, though it had been mended *c.*20 years ago. Whether the distinct neatness of the specimen today is a result of its first preparator's expertise or of recent conservation is unknown.

We know with certainty the origin of the four specimens, and that the bird in the Earl's collection is one of the four. In the absence of any contrary evidence, it must be concluded that the Earl of Derby's specimen is LIV.2009.22, which is one of the two adults known to Gould, and either that collected by Gilbert or that secured by Sturt. The putative sex of Gilbert's bird (personally measured by him) is female, but that of LIV.2009.22 (measured by C. Fisher) is considered uncertain (albeit possibly female). In the absence of any measurements for Sturt's bird, the origin of LIV.2009.22 cannot be determined from measurements.

VN 95 / ANSP 2098 is an adult by plumage, a female on measurements and a female according to the Verreaux catalogue, and originates from 'S. Australia', again according to the Verreaux catalogue. Gilbert's specimen, however, also adult, is from Western Australia. This suggests that VN 95 / ANSP 2098 is the adult secured by Sturt. That leaves Gilbert's specimen, the only other adult known to Gould, to be that in the collection of the Earl of Derby and hence almost certainly LIV.2009.22. Because LIV.2009.22 is an adult, it can be deduced that both young birds were in Gould's collection.

Stone's determination of Gould's types.—Stone (1899) wrote: 'By careful study and comparison with the original descriptions it is possible to select the specimen which agrees in plumage, measurements and locality with the description in nearly every case, and such ones I have designated as the type.' With G. M. Mathews, Stone prepared a list of the Australian species described by Gould, noting the location of their types (Stone 1913). The type of *F. hypoleucos* is listed under no. 366. The no. 2099 of the ANSP catalogue is given, followed by the no. 96 of the Verreaux catalogue, the symbol ♂, and the note 'West Australia=Type'.

However, Stone's (1913) list is known to contain errors and inaccuracies (Fisher 1992). Fisher (1992) wrote: 'This is emphasized by a revealing letter from Rudolf Meyer de Schauensee, Curator of Birds at the Academy in the 1950s, to Reg Wagstaffe, Keeper of Vertebrate Zoology at Liverpool in the same period. The letter, sent in October 1956, refers to Stone's (1913) manuscript: "I have always felt this list to be very unsatisfactory, for Stone, as far as I can see, merely selected a type from the Gould series without stating what the probability was that the specimen was really the one used by Gould to describe the species.'" In the case of the Grey Falcon, however, Stone was certain that he identified the type specimen correctly. He closed with the remark: 'This is unquestionably the bird

described by Gould, although in his Handbook [Gould 1865] he says the type was a young female' (Stone 1913).

Importantly, however, VN 94 was already missing when Stone catalogued the collection, meaning that he could only choose from two specimens, one adult and one juvenile, and he therefore chose the only juvenile available. Gould had two young Grey Falcons in his collection, VN 94 and VN 96. Both matched Gould's description of the plumage of a young bird in lacking any reference to the colour of the bare parts. With VN 94 missing, Stone felt certain of his choice.

Meyer de Schauensee's type specimen.—Critical of Stone's work, Meyer de Schauensee (1957) compiled a list wherein he discussed Gould's types. However, there are grave errors in that work regarding *F. hypoleucos*. For *F. hypoleucos* he specified: 'Holotype.—♂ imm. (= ♀ imm.), No. 2099* (96), West Australia, Gould Collection. Measurements of type.—Wing 326, tail 157, culmen 19, tarsus 49 mm.' He went on to claim that ANSP 2099 'agrees exactly in plumage and almost exactly in wing length (326 mm. = 12.6) with the bird described by Gould.' (Meyer de Schauensee 1957).

Regarding plumage, it is undisputed that both Gould's type and ANSP 2099 are juvenile. As demonstrated above, Gould's description does not mention the colour of the bare parts. Meyer de Schauensee regretted that he had not seen Gould's plate published in 1841 (Meyer de Schauensee 1957).

The wing length reported by Meyer de Schauensee, 326 mm, is in fact equal to 12.8 inches. Therefore, the wing length of Meyer de Schauensee's chosen type differs by one third of an inch, or c.8.5 mm, from Gould's measurement (Table 1).

Meyer de Schauensee (1957) further mentioned the missing specimen VN 94, stating that it was listed by Verreaux as an adult. Ages, however, are not provided in Verreaux's catalogue. Meyer de Schauensee failed to draw any conclusion from what he decidedly had known—that two of the four specimens mentioned by Gould (1848c) were young. Evidently, Meyer de Schauensee's selection of the type is also flawed.

Gould's type.—The type specimen was illustrated by Elizabeth Gould. The only other young bird among the four specimens is that from Depot Glen, illustrated by H. C. Richter. To draw conclusions from the difference of the colour of the bill and the ocular skin between the two illustrations, the artists' accuracy and the effect of post-mortem changes on the skins are discussed here.

Both artists worked from skins. Although the plumage can generally be expected to be depicted fairly accurately, the soft parts and to some extent the bill may have undergone post-mortem changes (R. McGowan *in litt.* 2009). The holotype was illustrated by Mrs Gould within c.2 years of its collection. The two specimens from Depot Glen were illustrated by Richter 2–3 years after collection.

To demonstrate Mrs Gould's accuracy at the time, I investigated her plate of four Satin Bowerbirds *Ptilonorhynchus violaceus* in Gould (1841a). That plate contains an example of a specimen available today that was illustrated by her. The plate is titled 'PTILONORHYNCHUS HOLOSERICUS: Kuhl', and marked 'J&E. Gould del. et lith.' Elizabeth lithographed the plate around the same time as the *F. hypoleucos* plate, during the last year of her life, i.e. after returning to London around 18 August 1840 from Australia (Datta 1999). She died on 15 August 1841. It appears evident that the illustration of the subadult male on the far left was taken from ANSP 3169 of the Gould collection at ANSP (L. Joseph *in litt.* 2009; *cf.* Ornithology at the Academy of Natural Sciences [online bird collection database], available at <http://clade.ansp.org/ornithology/index.php>). Of interest are that the colours of the bill and the soft parts of that specimen, as observed

today, match the illustration very well. As for the accuracy of Richter's work, see the adult *F. hypoleucos* in Gould (1848a). I demonstrated above that this bird most probably is ANSP 2098. The analogous bare-parts colours between the illustration and the specimen are discussed above.

If VN 96 / ANSP 2099 was the type, its bill, since having been illustrated by Mrs Gould, must have changed from being basally grey to rich orange-buff. Furthermore, the bare ocular skin must have changed from dark grey to dark orange-buff. Post-mortem change in the colour of soft parts and, to some extent, of the bill can be expected, but it seems highly unlikely that the changes would be of the magnitude just described. Thus I conclude that VN 96 / ANSP 2099 is almost certainly not the holotype as hitherto assumed, instead the type specimen of *Falco hypoleucos* Gould, 1841, is probably VN 94, which is now missing. Recent extensive searches for it, by N. Rice at ANSP and by J.-F. Voisin at the Muséum National d'Histoire Naturelle, Paris, have proven fruitless.

Name, spelling and citation.—In the first publication concerning the species (Gould 1840), the name was spelled *Falco hypoleucos* and was mentioned just once. According to the *International code of zoological nomenclature* (ICZN 1999) this is the 'correct original spelling' (Art. 32). The spelling of *F. hypoleucos* results from the combination of a Latin generic name with a Greek specific epithet. In Greek, the terminus -os is correct (W. Boles *in litt.* 2009). Although Gould (1840) named the species *F. hypoleucos*, he used -us subsequently (Gould 1841b), which inconsistency was reflected in the literature until about the mid 1970s, since when the correct terminus -os has prevailed. However, -us was used by Gould (1841b), Mathews (1915–16), RAOU (1926), Serventy & Whittell (1948, 1976) and Gruson (1976). Gould (1848a, 1848c) and Cayley (1984) used *hypoleucus* in the text and *hypoleucos* in the title of the illustration. The suffix -os was used by RAOU (1913), Peters (1931), Whittell & Serventy (1948), Clements (1974), Condon (1975), Storr & Johnstone (1979), Howard & Moore (1980), Walters (1980), Sibley & Monroe (1993), Debus *in del Hoyo et al.* (1994), and Christidis & Boles (1994, 2008). According to the *Code*, the following citation is correct (Art. 22): *Falco hypoleucos* Gould, 1841. If the date inscribed on the publication is of interest, *Falco hypoleucos* Gould, 1841 [1840] should be used.

The English name used by Gilbert on his collection data sheet, c.1839, was 'White Falcon' (see footnote 1). Gould used 'White-breasted Falcon' in *The birds of Australia* (1841b). Both these names make effective reference to the type's juvenile plumage. It was only in part 36 of *The birds of Australia* (Gould 1848a) that the name Grey Falcon was introduced, by which time Gould had seen two adults.

Gilbert also noted on the collection data sheet: 'Aboriginal name. Gwet''=el=bur (Mountain)'. Subsequently, he must have realised that 'Gwet-el-bur' may be a general name and probably not specific to *F. hypoleucos*. On a list entitled 'The Birds of West Australia'⁷, item no. 5 is 'Falco melanogenys Gwet''=ul=bur. Aborigines generally.' The 'generally' may refer to its use for all falcons and medium-size raptors, or to its common usage by different language groups, or both. Gilbert also noted: 'Falco hypoleucos. Boor''=ga. Aborigines of Moore's river, in the interior.' This was repeated elsewhere⁸.

⁷The birds of West Australia [ms, presumably 1842]. In 'Gilbert, John (Australia) 8 ms booklets, c.1841–45.' In 'John Gould (1804–81). Papers and correspondence, Z MSS GOU A and B [microform]: [M2888–2902]. Mfm M2902, No. 6'. Australian Joint Copying Project, Canberra.

⁸The birds of Western Australia [ms, presumably 1842]. In 'Gilbert, John (Australia) 8 ms booklets, c.1841–45.' In 'John Gould (1804–81). Papers and correspondence, Z MSS GOU A and B [microform]: [M2888–2902]. Mfm M2902, No. 7' [a revision of 'No. 6']. Australian Joint Copying Project, Canberra.

Discussion

The type specimen of *F. hypoleucos* Gould, 1841, was previously considered to be VN 96 / ANSP 2099 (Stone 1913, Meyer de Schauensee 1957, Fisher 1992, Ingersoll & Fisher 2006). However, the evidence suggests that the holotype is VN 94, which is apparently no longer extant. Two major reasons for the false identifications are identified above. Firstly, none of the previous authors examined the plate by Elizabeth Gould illustrating the type (Gould 1841b, first plate). Secondly, VN 94 was already missing when Stone selected the type. It is the holotype, there are no paratypes.

Gould (1865) claimed that the holotype is female, but without explaining his rationale, although the measurements he had previously provided (Gould 1840) do suggest this probability. Verreaux's catalogue stated the sex of VN 94 as male. It can be safely aged as a juvenile, and the type locality is York, on the Avon River, Western Australia, and not the Moore River as stated by RAOU (1926).

The specimen held at the National Museums Liverpool, LIV.2009.22, almost certainly is Gilbert's specimen collected in August 1842 near Moora on the Moore River, Western Australia. It is an adult. The sex of LIV.2009.22 cannot be determined with certainty, but it is possibly a female based on Gilbert's measurements. The label of LIV.2009.22 specifies male with no indication regarding the source of that information.

The other two of the four specimens are held at the Academy of Natural Sciences of Philadelphia. They are most probably those collected by Sturt's storekeeper, Piesse, at Depot Glen, New South Wales, in May 1845. They were illustrated by H. C. Richter (Gould 1848a,c). One, specimen VN 95 / ANSP 2098, is an adult. The second is younger, and is VN 96 / ANSP 2099. Both are females on measurements, which is consistent with their similar sizes on Richter's plate, but contrary to Gould's statement in the letter press. The sex of VN 95 is consistent with the Verreaux catalogue, but VN 96 is listed in the latter catalogue as male.

Both young birds, VN 94 and VN 96, were listed by Verreaux as males but both are probably females. Because Verreaux did not specify ages it is unknown if he misinterpreted juvenile plumage as pertaining to males.

Age-related variation in plumage and bare-parts coloration in Grey Falcon is poorly documented. Differences in the colour of the soft parts of the two young birds were crucial to the present investigation. Further age-related morphological variation will be discussed elsewhere. That the holotype of *F. hypoleucos* is a juvenile led Mathews (1913) to name a new subspecies, *F. hypoleucos ashbyi*, when presented with an adult specimen. That issue will also be discussed elsewhere.

Acknowledgements

This work would have been impossible without the kind help of many people and institutions. Especially I thank the following: Clemency Fisher, Nate Rice, Penny Olsen, Stuart Molloy, Ben Allen, Hugh Insley, Walter Boles, Ann Datta, Ron Johnstone, Philip Pain, Michael Brooker, Leo Joseph and Ian McAllan. The friendly and helpful staff at the following institutions often searched for non-existing items on my behalf: Lisa Wright at the Department of Environment & Conservation, Perth, Paul Cooper of the Natural History Museum, London, Alison Harding of the Natural History Museum, Tring, Dr Jean-François Voisin of the Muséum Nationale d'Histoire Naturelle, Paris, Alice Lemaire of the Bibliothèque Central du Muséum Nationale d'Histoire Naturelle, Paris, Rose Jones of the Zoological Society of London, and staff at the Western Australian Museum, National Library Australia, State Library of Western Australia, Birds Australia, and University of Cambridge. Special thanks to Bob McGowan for his painstaking work with an earlier draft of this paper. Wayne Longmore is also thanked for his valuable comments and corrections. Field work was undertaken under ABBBS Licence Number 2484, and under all relevant licenses, permits and animal ethics approvals required for New South Wales, the Northern Territory, Queensland, South Australia and Western Australia, held since 2004.

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