Alfred Russel Wallace and His Collections in the Malay Archipelago, with a Proposal for International Cooperation to Produce a Digital Catalogue

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Abstract During 8 years (1854–1862) spent in the Malay Archipelago, Alfred Russel Wallace's main object was to acquire specimens of 'natural history' for his personal collections and for sale to museums and amateur enthusiasts. His final list amounted to 310 specimens of mammals, 8050 birds, 100 reptiles (a group in which he included amphibians), 7500 molluscan shells, 13,100 Lepidoptera, 83,200 Coleoptera and 13,400 other insects, totalling 125,660 "specimens of natural history". His field records of these collections held by the libraries of the Natural History Museum and the Linnean Society of London have been digitised and are available on line, as is his *Journal*, a chronological record of his travels from Bali to Buru. As an alternative archive of Wallace's achievement, this paper focuses on the origin and later history of his specimens, their impact on the scientific and naturalist community and their permanent significance in zoological nomenclature. His collecting practices and field skills are examined, along with the contribution of his assistants. His London agent Samuel Stevens played an important role in publicising Wallace's achievements during his travels and, as his specimens arrived, in disposing of duplicates to wealthy buyers, while retaining the best for his personal collection. Many new scientific names were described in lists and catalogs by authors Including, in some instances, Wallace himself. Records are traced to confirm the present whereabouts of specimens that can be located and authenticated. These specimens are still valuable for regional and national policy-making in matters such as nature conservation and species protection, and useful for practical applications, e.g. in integrated pest management. A bold initiative is proposed to make this resource widely available where it is needed by providing digitised images

The main object of all my journeys was to obtain specimens of natural history, both for my private collections and to supply duplicates to museums and amateurs (Wallace 1869, Preface).

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of these specimens and making these available on the web. It is suggested that the Sarawak State government, in co-operation with the Natural History Museum, London, and Oxford University Museum, could take a lead, perhaps through ASEAN scientific cooperation. An exercise to compile and disseminate a comprehensive digitised catalog of Wallace's Archipelago collections, with emphasis on the irreplaceable type specimens, would be a fitting centennial memorial for his indefatigable enterprise. It would also provide an invaluable asset for regional biologists, zoogeographers, conservationists and wildlife managers.

1 Introduction

Reflecting on his career in old age, Alfred Russel Wallace (henceforth ARW) claimed that the years[1] spent in the Malay Archipelago "constituted the central and controlling incident of my life" (Wallace 1905, 1: 336). During his travels he maintained an active correspondence[2] with his agent, Samuel Stevens, his family, friends and professional colleagues and acquaintances, including Charles Darwin (Berra 2013).[3] He also sent an impressive number of works for publication: progress reports on his collections (Wallace 1855a, c, 1856a, b, 1858), descriptions of new species (Wallace 1855b, 1860a), his developing ideas on classification and zoogeography (Wallace 1856c, 1859, 1860b) and, of course, his influential papers on the moot topic of the origin of species (Wallace 1855d; Darwin and Wallace 1858). Although his letters and publications were important for communicating his thoughts and emerging theories during his travels (Fagan 2008; Cranbrook 2013), writing was subsidiary to ARW's chief objective which was the accumulation of a rich and varied collection of natural history specimens as a means of securing his livelihood. By his own account, his collections in the Archipelago ultimately amounted to 310 specimens of mammals, 8,050 birds, 100 reptiles (a group in which he included amphibians), 7,500 molluscan shells, 13,100 Lepidoptera, 83,200 Coleoptera and 13,400 other insects, totalling 125,660 "specimens of natural history" (Wallace 1869: Preface).

From the start of his travels, in Singapore in April 1854, ARW kept field records of his collections in small notebooks. Two of these, generally known as the *Species Registry*, are now in the Natural History Museum, London.[4] The Linnean Society of London holds four further notebooks of similar size and appearance, three of which contain mainly lists and descriptions of species and specimens. The fourth, which has been described as the *Species Notebook* (McKinney 1972), is filled with a mix of short jottings, passages from his readings, field observations and reflections on

[1] From arrival at Singapore on 18th April 1854 to final departure on 8th February 1862.

[2] Available online through the NHM Wallace Correspondence Project, http://www.nhm.ac.uk/research-curation/scientific-resources/collections/library-collections/wallace-letters-online/database.html

[3] See also http://wallace-online.org

[4] Z MSS 89, O WAL.

biological topics including zoogeography and the origin of species. This notebook has been reproduced in facsimile, with annotations, by Costa (2013). The Linnean also holds four slightly larger volumes of a *Journal*.[5] The *Journal* does not cover the entire period of ARW's travels in the Archipelago but starts, after some miscellaneous notes, with his arrival at Bileling on the north coast of Bali on 13th June 1856 and closes, on a torn last page of the fourth notebook, on leaving the village of Kayeli, Buru, 19th May 1861. The main text consists of sequentially numbered entries, varying in length from a single paragraph to several pages, covering his travels and collections – often written in retrospect. The whole was transcribed by Pearson (2005) and images of the original are now available on line.[6] Unlike the narrative in *The Malay Archipelago* (Wallace 1869, henceforth *MA*), this *Journal* is a chronological record of ARW's travels.[7] It later provided source material for narrative passages of *MA*. Apart from the first volume, its pages have been cancelled by oblique lines, presumably as they were transcribed. The *Journal* is a contemporary record of what he did, when, where and with whom. For this reason, it is cited as primary source material in the following pages.

Given the wealth of biographical literature treating his life, his writings, his character and opinions (including George 1979; McKinney 1972; Clements 1983; Wilson 2000; Raby 2001; Shermer 2002; Slotten 2004; Smith 2004; Smith and Beccaloni 2008; van Wyhe 2013), ARW's specimens provide an alternative material legacy of enduring value. In his time, mid-nineteenth century, ARW's collections had a marked impact on the scientific and naturalist community, among whom there was intense curiosity about the diversity of animal life in those parts of the world newly reached by exploration, trade and expanding colonial rule, particularly the tropics. Many of his specimens were described as types of species new to science (including syntypes and holotypes), giving them permanent significance in zoological nomenclature. In the following pages, an account is given on ARW's practices in acquiring his varied collections, their reception in Britain and, as far as can be ascertained, the present location of surviving specimens.

The richness and variety of ARW's natural history collections from the Malay Archipelago reflected multiple factors. One was the efficiency of his preparations and effectiveness of his equipment for collecting, preserving and identifying target groups of animals. Paramount was his personal field skills and dedication as a naturalist-collector, and his delight in the richness of animal life – especially when dead in his hands! A moderating influence (because he needed sales, to cover current expenses and to provide future income) was his perception of the market value

[5] Linn Soc library ms 178a,b,c,d, referred to as the *Malay Archipelago Journal*.

[6] Linnean-online.org. Wallace notebooks. 54017–54020. Where there are spelling changes, cross references were provided by Pearson (2005).

[7] Wallace (1869: Preface): "I visited some islands two or three times at distant intervals, and in some cases had to make the same voyage four times over. A chronological arrangement would have puzzled my readers. They would never have known where they were; and my frequent references to the groups of islands classed in accordance with the peculiarities of the animal productions and of their human inhabitants, would have been hardly intelligible." His itinerary has been summarised by Collar and Prys-Jones (2013).

of different organisms. Very relevant were the abilities of assistants, on whom he came to rely to a considerable extent (Cranbrook and Marshall 2014). A decisive key to the success of his enterprise lay in the promotional and marketing proficiency of Samuel Stevens, who handled the specimens once they reached London. These are the first subjects covered below. This section is followed by an overview of the subsequent dispersal of his collections, the published lists and catalogs by authors Including, in some instances, ARW himself, with a preliminary account of the present whereabouts of specimens that can be located and authenticated. There is emphasis on Sarawak, as the first island destination that ARW visited, and the location where he spent a longer time and made collections as remarkable as at any other place in the Archipelago.

ARW's spelling of places and personal names is generally followed, but has occasionally been changed to modern usage. For brevity, the following abbreviations are used: ARW = Alfred Russel Wallace himself; *MA* = *The Malay archipelago* (Wallace 1869); *Journal* = Linnean Society library MS178a, b, c, d; BM= the British Museum, which later moved from Bloomsbury to South Kensington and became the British Museum (Natural History), and is now the Natural History Museum.

2 Wallace, the Collector

2.1 Preparations

In 1852, having salvaged what he could of four exacting years in Amazonia and the Rio Negro as a naturalist-collector, ARW retained his "earnest desire to visit a tropical country, to behold the luxuriance of animal and vegetable life… and to see with my own eyes all those wonders" (Wallace 1853: Preface). After balancing alternative options, he resolved to make his second venture into the under-collected tropical region of island South-east Asia. Two events may have aroused a special interest in Borneo. First, in an exchange of correspondence in April 1853, Rajah James Brooke wrote that he would be glad to see ARW in Sarawak.[8] Second, on a trip to the west country, ARW met L.L. Dillwyn who was in correspondence with James Motley, a civil engineer stationed on Labuan Island, 1851–1854, with whom he produced a joint publication on the natural history of Labuan and the adjacent Borneo mainland (Motley and Dillwyn 1855; Laverty 2013).[9]

Thirty years old and an experienced traveller, ARW made preparations for the expedition. He invested in reference books: Doubleday and Westwood (1846–1852) and Boisduval (1836) to identify butterflies (George 1979), and Prince Lucien

[8] British Library, Add. MS 46411.

[9] Dillwyn and Motley cooperated in the production of the planned first (but in the event, sole) number. In 1854, Motley moved to Banjarmasin (from where he sent bird skins to Wallace), but here he was murdered, with his family, in 1860 during an event generally called the "Malay insurrection".

Bonaparte's *Conspectus Generum Avium* (Bonaparte 1850, 1857) for birds. The last, he later described as "a large octavo volume of 800 pages, containing a well-arranged catalogue of all the known species of birds up to 1850, with references to descriptions and figures, and the native country and distribution of each species". With the first volume to hand while examining the collections in the BM, he added marginal notes on the distinguishing characters of birds expected in the Malay Archipelago. As a result, he later claimed: "during my whole eight years' collecting in the East, I could almost always identify every bird already described, and if I could not do so, was pretty sure that it was a new or undescribed species" (Wallace 1905: 327).[10]

He ordered labels for his specimens. For pinned insects, he obtained small, blank round discs. When used, the locality was written on individual labels, generally in abbreviated form: e.g. **SAR** for Sarawak (Baker 1995: 173, Table 2). Much later, he recalled that, "The small round locality labels I put on all my insects which were pinned, and either I or my assistant Charles Allen[11] wrote them. I enclose you a list of them as near as I can remember. All were collected by myself except those from Mysol, Salwatty, and a few from Flores, where C Allen went alone, but I selected the series and labelled them where required myself, so that for the whole of my collections, if they have not been changed, I am sure of the Locality tickets being right. Any other labels than the small round ones are not mine, unless perhaps in some very rare cases".[12]

For birds and other vertebrates, he ordered rectangular parchment tags pre-printed with the heading ***Collected by A. R. Wallace 185***, leaving the last digit of the year to be added in due course. As his stay in the Archipelago extended beyond the decade, he obtained a second version, ***Collected by A. R. Wallace 186*** and an alternative, ***Collected for A. R. Wallace 186*** (Cranbrook et al. 2005). Any of these distinctive labels attached to a specimen, invertebrate or vertebrate, confirms its authenticity, but not necessarily that ARW was himself the collector. For instance, among 19 Dusky friarbirds *Philemon fuscicapillus* collected on Morty Island (Morotai) by Charles Allen (see below), the pre-printed labels still attached to ten include both versions, *Collected by … 186* and *Collected for … 186*, all completed by hand by ARW (Besson 2012).

To defray the cost of travel to the East, ARW sought help from the president of the Royal Geographical Society,[13] Sir Roderick Murchison, who ultimately obtained passages for ARW and Charles Allen by the P & O 'overland' route. This involved

[10] After ARW's death, this book was acquired from the sale of his library by Thomas Henry Riches who presented it, with the later index by Finsch (1865), to the Linnean Society, In its present state the book consists of both volumes, bound in brown buckram, with the title on the spine in gold lettering, simply CONSPECTUS/GENERUM AVIUM/BONAPARTE. It was repaired and re-backed in November 2008. Linnean library shelf mark 598.c BON.

[11] Charles Martin Allen, was "a London boy, the son of a carpenter who had done a little work for my sister, and whose parents were willing for him to go with me and learn to be a collector" (Wallace 1905 i:340). ARW thought Charles was an under-sized 16-year-old, but in fact he was born June 1839–thus only 14 at the time (van Wyhe 2013: 41).

[12] ARW, Letter to Poulton March 15th 1896 (Oxford University Museum archive).

[13] ARW was elected a Fellow of the Royal Geographical Society in February 1854.

sailing to Alexandria, onward by boat to Cairo, then in four-horsed, two-wheeled 'omnibuses' with six passengers each, for the desert road to Suez. Here they re-embarked via Aden to Galle (Sri Lanka), where they transhipped again to another P & O paddle steamer for the final stage to Singapore (van Wyhe 2013). Here ARW found accommodation in the French Jesuit Mission[14] and also met Rajah Sir James Brooke, currently in Singapore, who repeated his offer of hospitality in Sarawak.[15]

Having experienced the support and personal kindness of Samuel Stevens as agent during and after his years in Brazil, ARW renewed this agreement. Stevens (1817–1899) operated as a Natural History Agent from 24 Bloomsbury Street, London, conveniently close to the British Museum. His brother, J. C. Stevens, was an auctioneer with premises in King Street. Samuel Stevens retired in 1867, selling his business to Edmond T. Higgins. As well as acting as his agent for the sale of natural history specimens, and thereby funding ARW's travels and further collecting, Stevens obtained and shipped supplies and equipment, and even dealt with a broken pair of spectacles.[16] Importantly, Stevens was also a respected member of several scientific bodies, where he mingled with leading scientists and 'amateur' naturalists, some of whom indulged their passion by lavish purchases. Several were probably as knowledgeable as the staff of the museums they patronised. As ARW progressed through the Archipelago, his letters were read and his specimens were exhibited at meetings of the Entomological Society, the Linnean Society and the Zoological Society of London, and his progress was charted in naturalists' journals such as the *Zoologist* and *Annals and Magazine of Natural History* – both of which also accepted and published contributions directly from him.

Successive shipments of specimens by ARW to Stevens during his travels have been cataloged from records in his notebooks by Baker (2001). Consignments could be sent by the more expensive but faster 'overland' route, the reciprocal of ARW's P & O outward journey involving the land link between Cairo and Suez,[17] but ARW generally used the cheaper sea journey round the Cape of Good Hope which took about 4 weeks longer. As specimens began to arrive and were displayed at society meetings by Stevens, the calibre and quantity of ARW's collections roused excite-

[14] There is still a church and active community centre on the site, although the surrounding country no longer consists of hills topped by stands of virgin forest, "much frequented by wood-cutters and sawyers", which offered excellent opportunities for collecting.

[15] The Rajah was in Singapore from the end of August to 3rd December 1854, attending the Commission of Enquiry into his affairs, appointed by Parliament. The two Commissioners, the Advocate General of India, C. H. Prinsep, and a government agent H. N. Devereux, sat from 11th September to 21st November, and their final report was favourable to Brooke (Runciman 1960).

[16] Letter ARW to Stevens, from Singapore, 10th March 1856: My Dear Mr Stevens, I have received your letter of Jan. 6th, announcing the arrival in good order of the Insects by the "Connubia". At the same time I got the parcel of Books etc. which had been delayed a month as usual at Ceylon. The other shoes etc. do not send till I want something else. Do not send me more B.M. Catalogues, except new ones of Coleoptera, Birds, and Butterflies. The moths have scarcely 50 Indian species in it. I send in the box a pair broken spectacles. Get repaired at the makers, and get another pair exactly like to be sent in next parcel".

[17] In a letter to Stevens (29 October 1858) ARW proposed to send first specimens of his new bird of Paradise (Wallace's Standardwing) by this route (van Wyhe 2013:265–266).

ment among the naturalist community, professional and amateur. Rich collectors were soon paying high prices for these exotic specimens to fill their cabinets, and they and their professional colleagues launched enthusiastically into cataloguing and describing the abundance of new species. The level of activity generated by ARW's collections while he was still travelling into ever less congenial destinations in the Archipelago[18] is demonstrated by the wealth of publications on his material from 1855 onwards (Smith and Beccaloni 2008).

2.2 *In the Field*

ARW was an inspired collector. Insects were his first love, mainly beetles and butterflies, but not excluding other orders; birds also ranked highly. His field equipment was simple: nets for insects and guns for birds.[19] Soon after arriving in Singapore, he and Charles were out in the forest on Bukit Timah: "Insects were exceedingly abundant and very interesting, and every day furnished scores of new and curious forms". He decked himself with collector's paraphernalia: "[a] large collecting box hung by straps over my shoulder, a pair of pliers for Hymenoptera, two bottles with spirits, one large and wide-mouthed for average Coleoptera &c., the other very small for minute and active insects .... These bottles are carried in pockets in my hunting-shirt, and are attached by strings around my neck, and the corks are each secured to the bottle by a short string" (Wallace 1855c). His catch in the first 2 months in Singapore included 700 species of beetles, of which 130 were Longicornia (Cerambycidae) (*MA*), much esteemed by 'amateurs'[20] and therefore prime targets for the naturalist-collector.

From the start of his travels, he sought to maximise the numbers of species represented in his collections. His periodic reports to Stevens and the naturalist community emphasised the diversity of his catch: for example, Singapore and Malacca combined, Coleoptera 940 species, Lepidoptera 353 species (including 273 butterflies), Hymenoptera 173, Hemiptera and Homoptera 228, Neuroptera 72 (Wallace 1855a); on the Aru Islands, Coleoptera 572 species, Lepidoptera 229, Hymenoptera 214, Diptera 185, Hemiptera and Homoptera 130, Orthoptera 18, Neuroptera 18 (Wallace 1857, 1858).

Despite set-backs, bouts of illness, and logistical difficulties, his pleasure in this chosen way of life did not wane, and he pursued a disciplined and selective approach

[18] Criticised for collecting so few birds of Paradise in New Guinea, ARW called it "a horribly wild country" where he would have been totally unsafe outside the settlement of Dorey (Anonymous 1857: 113).

[19] At Lombok in 1856: "After an early breakfast we went out to explore, taking guns and insect nets" (*Journal* #5).

[20] ARW used this word in its true meaning of a person who loves his subject, rather than its modern, slightly derogatory sense of unprofessionalism.

to collecting throughout his travels.[21] His delight showed on New Year's day 1857, his first on Kei Island: "This has been a luxurious day for me as a Naturalist. I have wandered in the forests of an island, which I believe no Naturalist has trodden before me. I obtained about 50 species of insects & four birds none of which I had ever found before though I was acquainted with a few of the Lepidoptera. Among the beetles was a magnificent black *Curculis* blue & black banded and & several pretty insects of a small size. A magnificent yellow and black *Papilio* and the curious *Hamadryas*, the sole representative in the East of the S. American Heliconidae also rewarded my excursion" (*Journal* #51).

At first, ARW's manner of life in the field was constrained by limited finances. Both the *Journal* and *MA* contain a heartfelt passage, written at Labuan Tring, Lombok, in July 1856, on the difficulties faced by "a travelling collector of limited means like myself": "One small room has to serve for eating sleeping and working, for storehouse and dissecting room; – in it are no shelves cupboards chairs or tables, ants swarm in every part of it & dogs, cats and fowls enter it at pleasure. Besides this it is the parlour and reception room of my host & I am obliged to consult a little his convenience & that of the numerous guests who visit us. My principal piece of furniture is a box which serves me as a dining table, a seat while skinning birds, and is the receptacle of the birds when skinned and dried. To keep them free from the ants we have borrowed an old bench the four legs of which place in cocoa-nut shells filled with water keep us tolerably free from them. These comprise literally the only places where any thing can be put away, & they are generally well occupied by two insect boxes and about a hundred bird skins, … All the animal substances moreover require some time to dry thoroughly, [and] emit a very disagreeable odour whilst doing so … I can assert from long experience that to make anything like extensive collections of birds & insects, keeping brief notes of the most interesting facts connected with them will fill up the time of one person, with two or three native assistants. He absolutely cannot do much else, and is often even obliged to abridge his notes in order to secure the safe preservation of his specimens" (*Journal* # 18).

[21] Thus, the morning after arriving at Dobbo, Aru Is. (January 9th 1857): "I set off for the jungle … My day's captures determined in my mind the success of my Aru journey in an Entomological view. I had taken 30 species of Lepidoptera, a larger number than I had captured since leaving the prolific banks of the Amazon, & my delight may be imagined on having among them some of the rare and handsome species only known by a few specimens form N. Guinea. … Of the other orders I was not so successful obtaining only 17 species of beetles & 20 of all other orders, with nothing remarkable among them except a pretty Longicorn beetle of the rare genus *Tinestiterinis* & a magnificent bug." (*Journal* # 58). Again, in 1858, on a brief stop at Kaioa Is.: "I found a few interesting insects most however of forms & species I was already acquainted with from Ternate & Gilolo. One beautiful new beetle of the genus *Eurycephalus* was however a great prize to me. … on the felled and burnt logs … I found [a] host of interesting Buprestidae of six species only one of which however was new to me & the lot by no means so beautiful as those of Amboyna". The following day, he obtained "about 70 species of beetles of which at least a dozen were new to me & many others rare & interesting" (*Journal* # 155).

Insect pests were a perpetual menace [22] and his health was also affected, sometimes severely.[23]

Of ARW's collecting procedures, watch and wait was most productive, but he adapted to his quarry. He searched suitable habitat by hand,[24] and learnt to use local fruit as baits. Thus, in Celebes, "I found that rotten jack-fruit were very attractive to many beetles, and used to split them partly open and lay them about in the forest near my house to rot". None the less, in Celebes he found "the great & interesting tribe of beetles very scarce, many families absent and those that I could obtain very minute. The Diptera and Hymenoptera however were abundant & in great variety & present a number of new & very curious species. The beautiful and rare butterflies of Celebes were the principal object of my search and I found many species new to me" (*Journal* #107).[25]

Such successes could have a physical effect. On Batchian in 1858 he "saw a very large black butterfly marked with white and yellow spots, which I knew at one to be a new species of the giant *Ornithoptera*[26] the bird-winged butterflies the pride of the

[22] At Dorey: Small black ants "swarm on my table and as I am at work setting out minute insects they carry them off from beneath my nose & even tear them from the cards on which they have been gummed", and blow flies settle "in swarms on my bird skins when first put out to dry & filling their plumage with masses of eggs which if neglected the next day produced maggots. They would get under the wings or under the body of the bird where it rested on the drying board, sometimes raising it up half an inch by the mass of eggs deposited in a few hours all glued to the fibres of the feathers so as to make it a work of much time & patience to get them off without injuring the bird." (ARW Journal #147).

[23] In Ceram: "an inflammatory eruption, brought about by the constant attack of small acari-like harvest-bugs, for which the forests of Ceram are famous, and also by the want of nourishing food while in that island. At one time I was covered with severe boils. I had them on my eye, cheek, armpits, elbows, back, thighs, knees, and ankles, so that I was unable to sit or walk, and had great difficulty in finding a side to lay upon without pain. This continues for some weeks, fresh ones coming out as fast as others got well; but good living and sea-baths ultimately cured them" (*MA*).

[24] In 1858, in New Guinea: "on the last day of June, I brought home no less than 95 distinct kinds of beetles…It was a fine hot day, and I devoted it to a search among dead leaves, beating foliage, and hunting under rotten bark, in all the best situations I had discovered in my walks. I was out from ten in the morning to three in the afternoon, and it took me six hours' work at home to pin and set out all the specimens, and to separate the species. Although I had already been working on this spot daily for two months and a half, and had obtained over 800 species of Coleoptera, this day's work added 32 new ones" (Wallace 1908:510).

[25] The butterflies of Celebes were also hard to catch: "..they were so active & shy as to render it very difficult to capture them. Almost the only place where I could obtain them with any certainty was in the beds of the streams in the forests. Here at damp and muddy pools or even on the dry rocks all sorts of insects could be found. In the adjacent forests are some of the most beautiful butterflies in the world. Three species of the magnificent Ornithopterae measuring seven or eight inches across the wings & beautifully marked with spots or masses of intense satiny yellow on a black ground. They wheel through the thickets with a strong sailing flight & it is only occasionally that a specimen can be captured. About the damp places are to be seen swarms of the beautiful blue banded papilios, the superb metallic green peranthus and pretty little rare swallow tail, all of which, though very active I succeeded in getting very perfect specimens" (*Journal* #107).

[26] On reaching England the new butterfly, Wallace's Golden Birdwing, was formally named *Ornithoptera croesus* by G. R. Gray (1859c). It has a wing span exceeding 15 cm.

Indian Archipelago … At length after two months and a half I hit upon a flowering shrub which attracted these noble insects and after several days watching obtained both the female & the male. The latter I was delighted to find to be perfectly new & most magnificent insect perhaps the most gorgeously coloured butterfly in existence … The brilliancy of this colour is indescribable, & none but a naturalist can appreciate the intense excitement I experienced on at length capturing it. On taking it from my net & opening the glorious wings my heart beat violently the blood rushed to my head & I have never been so near fainting when in apprehension of instant death, as from the excitement produced by what will to most people appear a very absurd & inadequate cause. I escaped however with a headache for the rest of the day." (*Journal* #164).

Each day's catch was routinely processed in the evening.[27] The records of insect collections in the *Species Registry* notebooks are meticulous. For each locality, individual specimens were entered by serial number (repeated on the circular labels), in separate lists for different orders. In early days, notably in Sarawak, key identification features for new or unfamiliar species were illustrated by miniature sketches.

Birds rivalled beetles as desiderata. To obtain birds and mammals, his chosen weapon was the firearm. He was originally equipped with two double-barrelled guns, evidently muzzle-loaded and cap-fired. The smaller gun (80-bore) must normally have been loaded with fine shot to collect birds with minimal damage to the skin and plumage. Both barrels of the larger gun could take a single ball.[28] At Macassar in July 1857, he received a new gun from England. At Ternate in March 1858, among ARW's list of stores prepared for the trip to New Guinea there were two double-barrelled guns, one single barrelled (presumably the addition) and one Colt revolver, with 15 lbs of powder, 6 bags of shot nos. 2–10, 4,000 caps and a bag of bullets (*Journal* #128). In May 1860 at the little island of Kilwaru, "the metropolis of the Bugis traders of the far east", among other goods from Singapore he bought two muskets – not for collecting, but "to satisfy the fears of my crew who insisted on the necessity of being armed against attacks of pirates etc." Shortly thereafter, when abandoned by his locally-hired crew, these muskets were fired as signals of distress, and later as ship-to-shore warning signals (*Journal* #214, 215, 222). Finally, in 1862, ARW's two double-barrelled guns (probably the original pair) became a parting gift to his most loyal assistant, Ali (Wallace 1905).

A passage in *MA* (Wallace 1869, i: 248) not presaged in the *Journal*, shows ARW using a bird-hunter's technique to get "the beautiful ground thrushes (*Pitta concinna*)" on Lombok in 1856: "They were so shy that it was very difficult to get a shot at them, and it was only after a good deal of practice that I discovered how to

[27] On Kaioa again: "When I sat down to work the house was surrounded with men women & children lost in amazement at my extraordinary & inexplicable operations, & when I proceeded to write the name of the place on small circular tickets & attach one to each insect, even the comparatively civilised old Kapala, the Mohamedan priest & some Malay traders could not repress signs of their astonishment" (*Journal* #155).

[28] When in Sarawak, hunting orang-utans, "I got a shot at it, and the second barrel caused it to fall down almost dead, the two balls having entered the body" (*MA*).

do it. The habit of these birds was to hop about on the ground, picking up insects, and on the least alarm to run into the densest thicket or take flight close along the ground. At intervals they utter a peculiar cry of two notes which once heard is easily recognised … My practice was, therefore to walk cautiously along the narrow pathways with which the country abounded, and on detecting any sign of the Pitta's vicinity to stand motionless and give a gentle whistle continually, imitating the notes as near as possible....having my gun raised and ready for a shot, a second glimpse would enable me to secure my prize, and admire its soft fluffy plumage and lovely colours."

While ARW might go out in the morning carrying a gun himself, more often he concentrated on insects and delegated the bird hunt to assistants. In 1857 on Aru Is, "On the second day after my arrival, my boys[29] returned from the jungle with a most beautiful specimen of that superb little creature the King Bird of Paradise *Paradisea regia* of Linnaeus. Thus one of the great objects of my coming so far was accomplished! My admiration and delight over this exquisite winged form quite amused my Aru hosts who saw nothing more in the 'Burong rajah' than we do in the Robin or the Chaffinch" (*Journal* #70). There was greater excitement when, on Batchian in October 1858, he recorded the first specimen of Wallace's Standardwing: "In the first few days my men did not bring many birds, but there was one which greatly surprised & delighted me. This was a quite new species allied to the birds of Paradise which though of general sombre plumage was remarkable for its throat and breast & lateral shield of plumes of an intense & brilliant metallic green, & for two white feathers springing from each shoulder and capable of being erected vertically on each side of the body. These give the bird a most extraordinary appearance & are altogether unlike any thing yet known" (*Journal* #159).[30]

In Sarawak, as the subtitle of *MA* indicates, one of ARW's chief objects "was to see the Orang-utan (or great man-like ape of Borneo) in his native haunts, to study his habits, and obtain good specimens". The stories of orang-utan hunts that occupy much of *MA* chapter An Inordinate Fondness for Beetles. The Hero's Journey of Alfred Russel Wallace in Southeast Asia are not easy to stomach, but were written for a readership that expected savage encounters. When hunting orang-utans he normally carried the larger gun but on his third, unexpected encounter, he was armed only with the small gun. This he fired none the less, but succeeded only in enraging the ape which escaped, wounded. Altogether, ARW obtained 17 freshly killed orang-utans, of which he himself shot 16 (Cranbrook et al. 2005), and the skeletons of two others. Of necessity, the carcasses were processed very promptly. Charley [Allen]

[29] In *MA* this story appears in a more florid version, naming "my boy Baderoon" (Wallace 1869 ii:221–222).

[30] The account in *MA* ii: 40, gives credit to Ali for bringing in this new bird, and is elegiac by comparison with this first version. However, writing to Stevens shortly afterwards (29th Oct. 1858) ARW was exultant:"..a new Bird of Paradise! of a new genus!! quite unlike anything yet known, very curious and very handsome !!! When I get a couple of pairs I will send them overland to see what a new Bird of Paradise will really fetch. I expect £25 each ! … I consider it the greatest discovery I have yet made "(Raby 2001:143).

assisted in skinning and preparation of the skeleton of the largest male, finally felled after six shots of solid ball.[31] ARW had "a great iron pan, in which I boiled the bones to make skeletons" while skins were preserved in a cask of alcohol.

The bird and mammal collections were also listed in the *Species Registry*. For these groups, however, ARW was more ready to make a provisional identification, at least to genus level. Orang-utans were numbered and listed separately, with anatomical measurements, mostly one individual per page scattered among the pages of other collections. For remaining mammals, and for birds, each 'species' was allotted a serial number. This number was written (with the genus or species name, if known or conjectured) on the distinctive pre-printed label or, in a few cases, on a temporary tag from other materials. Subsequent catches of the same kind at the same location received the same number. Lists in the *Species Registry* therefore recorded the number of species from each locality, not the number of specimens. Some misidentifications occurred. Thus, of three Greater racquet-tailed drongos *Dicrurus paradiseus* taken in Sarawak, ARW gave one field number to two skins with one or two racquets present and, not recognising the similarity, another number to a third bird that had lost both racquets. The records of Sarawak mammals in the *Species Registry* begin with #1 *Cynomolgus*, accompanied by a fulsome note on the appearance and habits of this common monkey, the long-tailed macaque, but such field observations soon declined and ultimately ceased (Cranbrook et al. 2005).

Like most collectors, ARW did not fail to make use of the carcasses! Again at Batchian – "On the last day of my stay one of my hunters succeeded in finding & shooting the rare and beautiful Nicobar pigeon which I have been so long in search of. None of the people here had ever seen it which shows it is very rare. My specimen was a female in very fine plumage, I skinned it myself and had the meat for supper" (*Journal* #172).

3 The Collections

3.1 Vertebrates

Conforming with his policy of building up a personal collection, ARW divided the specimens between those for his "Private" use and duplicates available for sale. "The groups thus reserved were the birds, butterflies, beetles and land shells" (Wallace 1905, i: 385). General instructions to Stevens were to reserve a superior set of specimens for ARW's private collection and raise funds by the sale of others (Bastin 1989). It appears that Stevens exercised a degree of discretion in following these rules. Among birds from the shipments of skins from Malacca, Singapore and

[31] "On examination, we found he had been dreadfully wounded. Both legs were broken, one hip joint and the root of the spine completely shattered, and two bullets were found in his neck and jaws. … I was occupied with Charley the whole of the next day, preparing the skin and boiling the bones to make a perfect skeleton."(*MA*).

Sarawak, he retained the first set and disposed of duplicates to private collectors. However, the BM was close at hand to Stevens' premises and, starting with the receipt of specimens from Lombok, it was arranged that staff of the Zoology Department should be first to see ARW's latest consignments. "The understanding between the traveller and George Robert Gray[32] was, that the latter should describe the collections in their entirety, which was done. The first set Dr. Wallace retained, and the second set was to go to the British Museum. These separate series were selected by the traveller, and the types of the new species remained in the care of Mr. Samuel Stevens, until the return of Dr. Wallace" (Sharpe 1906: 489).[33] However, in an era before the formulation of the Code of Zoological Nomenclature in 1895 (Melville 1995) these arrangements caused later difficulties in the recognition of type specimens. The decision was ultimately made that the duplicates of new species retained by the Museum had status as syntypes with Wallace's personal specimens but, if no duplicate was accessioned, the sole type was returned to Stevens to hold for ARW. If later acquired by BM on the purchase of ARW's private collection, this was recognised as holotype (Warren 1966).[34]

In 1857, when the first consignment of birds from Lombok arrived, John Gould[35] was a frequent habitué of the British Museum and, presumably because he was working on his glorious monographs of kingfishers and pittas, he was given the opportunity to describe two new species: *Halcyon fulgidus* and *Pitta concinna* (Gould 1857a). In this instance, the types were retained by Gould. After being exhibited at a meeting of the Zoological Society on 10 November 1857, Gould (1857b) described *Spilornis rufipectus*, collected at Macassar by ARW; he also saw and commented on the two birds of paradise (*Paradisea apoda* and *P. regia*) from Aru Island (Gould 1858).

When ARW discovered his Standardwing Bird of Paradise on Batchian (Bacan) Island, he wrote at once to Stevens, with a sketch. This was read and displayed at a meeting of the Zoological Society of London in March 1859 (Wallace 1859), and Gray (1859a) proposed the name *Paradisea wallacii* based on ARW's sketch. When specimens arrived, the bird was described and illustrated by Gould (1859: plate 52), who proposed the new genus *Semioptera*. Gray was considered to have precedence by a couple of months (Warren and Harrison 1971) and, after BM bought ARW's retained collection in 1873, Sharpe (1877: 179) designated a male (reg. no. 1873.5.12.14) as type of Gray's species name, while accepting Gould's subsequent genus name.

The system worked more smoothly with other consignments. Thus, G.R. Gray (1858a) rapidly cataloged successive collections from Aru and Ké (Kei) Islands,

[32] Assistant in the Zoological Department of the British Museum.

[33] Sharpe was appointed Assistant in the Zoological Department of the British Museum in 1872, in charge of the ornithological collection, in succession to G. R. Gray (who died in May of that year).

[34] For instance, *Habroptila wallacii* from East Gilolo (Gould 1860) was not immediately accessioned, and the Museum had to wait until the type was acquired in 1873 with ARW's personal collection.

[35] Among other distinctions, Gould was a Vice-President of the Zoological Society of London.

followed by those from New Guinea (Gray 1859b), the Moluccas (Gray 1860), and Waigiou, Mysol and Gagie (Gray 1861),[36] in each case describing hitherto unknown species. By 1865, when the final consignment was dealt with under this arrangement, 1,018 skins had been bought by the BM, adding many species to the bird collection (Table 1). Stevens also sold duplicates to prominent British private collectors, several of whom ultimately gave, sold or bequeathed to BM their collections, among which were ARW's bird skins. Further trade by Stevens with other dealers and intermediaries resulted in a wide distribution of ARW specimens which can be found, in small numbers, in museums throughout the world. For instance, Yamashina Institute for Ornithology, Tokyo, holds two skins,[37] Morotai friarbird *Philemon fuscicapillus* (Y10.50381) and Rusty pitohui *Pitohui fuscicapillus* (Y10.39588), of which the first bears an original ARW label of the form *Collected by A. R. Wallace 186*. The specimen was collected by Charles Allen, acting for ARW, who did not himself visit the Moluccan island of Morotai (which he spelled 'Morty'), while both have labels indicating Museum Boucard[38] as their source. More complicated transactions are exemplified by the history of the Asian brown flycatcher skin now in the Raffles Museum of Biodiversity Research, Singapore (van Wyhe and Rookmaaker 2013). By varied but similar means, birds collected by ARW have become distributed among many museums, including the US National Museum (Smithsonian) which holds ten such skins.[39]

ARW's mammal specimens were much less numerous than birds, and procedures for their disposal were less orderly. There were fewer private collectors interested in mammals. Notable was Robert F. Tomes, who specialised in bats and purchased ARW's collection, including specimens from Sarawak. Stevens exhibited new arrivals at meetings of the Zoological Society, some of which were subsequently sold to the BM, where J. E. Gray[40] took charge of mammals. In the history of the collections, for 1856, the "first consignment from Mr. A.R. Wallace" was among "the principal additions of the year" (Thomas 1906: 8). Wallace (1856a) claimed to have collected 35 mammal species in Sarawak, among them several interesting rarities such as the otter-civet "*Potamophilus*" (now *Cynogale bennettii*) and wild cats. The *Species Registry*, however, numbers only 32 species (excluding orang-utans). Of these, 22 were provisionally identified by systematic or vernacular name but the remainder were unspecified, being bulked as: *About 10 species more*

[36] Specimens from this consignment were exhibited by S. Stevens at the meeting of the Zoological Society held on 12th November, 1861.

[37] http://decochan.net/index.php?p=5

[38] Adolphe Boucard, a Frenchman, was more a trader than collector. His large collection went to the Museum National d'Histoire Naturelle, Paris. His labels are easy to recognise, as they are written in violet ink and bear a large, red, stemless "B". They are not very informative, since many of his skins came through the feather trade. Boucard used to write "type" on the labels of specimens which he considered as being typical of the species, possibly a trick to enhance their value. As he also described a few taxa, mostly hummingbirds, this led to considerable confusion (J-F. Voisin, *in litt*. 13th Jan 2014).

[39] http://collections.mnh.si.edu/search/birds

[40] Keeper of Zoology at the British Museum, 1840–1875.

Table 1 Direct purchase by the British Museum of Wallace's bird specimens from the Malay Archipelago; data from Sharpe (1906)

Year	Locality	Vendor	No.	Reg. nos.	Notes
1857	Lombok	S. Stevens	50[a]	57.6.13, 1–50	"This was the first collection sent from the Malay Archipelago by Dr. A. R. Wallace"
1857–1858	Makassar	S. Stevens	74	57.8.3,4–19, 58.12.2,38–96	New to the [BM] collection: *Gazzola typica*, *Macropteryx wallacei*, *Hypothymis puella*, *Geocichla erythronota*, *Lalage leucopygialia*, *Penelopedes exarrhatus*
1858	Aru Islands and Key Islands	S. Stevens	150	58.3.10, 1.150	
1859	Amboina	S. Stevens	16	59.3.25,1–5 59.3.30, 1–11	Including *Cyanalcyon lazuli* new to the collection
1859	Dorey, New Guinea	S. Stevens	74	59.4.5, 1–7[4]	New to the collection *Corone orru*, *Gymnocorax senex*, *Pseudorrhectes ferrugineus*, *Chalcophaps stephani* and *Mino dumonti*
1859	Batchian	S. Stevens	4	59.6.13, 1–4	4 specimens of *Semioptera wallacei*
1860	Batchian	S. Stevens	103	60.2.4, 1–103	Added: *Ceyx uropygialis*, *Alcyone affinis*, *Hermotimia auriceps*, *Dicaeum schistaceiceps*, *Lalage aurea*, *Melitograis giloloensis*, *Carpophaga basilica*, *Grauculus papuensis*, *Piezorhynchus nigrimentum*, *Pitta cyanota* and *P. rufiventris*
1860	Timor, E.Gilolo, Ternate	S. Stevens	79	60.9.5, 1–79	New: *Oreicola melanoleuca*, *Megaloprepia formosa*, *Eulipoa wallacei*, *Aprosmictus hypophonius*, *Pitta maxima*,*Rhipidura rufiventris*, *Philemon timorensis*
1860	Celebes	S. Stevens	46	60.9.6, 1–46	New: *Ptilopus gularis*, *P. formosus*, *Carpophaps radiata*, *Myristicivora luctuosa*, *Macropygia albicapilla*, *Chalcophaps stephani*, *Coracias temmincki*, *Pelargopsis melanorhyncha*, *Lyncornis macropterus*, *Scissirostrum dubium*, *Prionochilus platurus* and *Hypotaenidia celebensis*
1860	Ceram	S. Stevens	27	60.12.6, 1–27	New: *Baza reinwardti*, *Philemon subcorniculatus*, *Ceyx lepida*, *Eclectus cardinalis*

(continued)

Table 1 (continued)

Year	Locality	Vendor	No.	Reg. nos.	Notes
1861	Ceram, Waigiou, Mysol, etc	S. Stevens	116	61.12.11, 1–116	New: *Philemon novaeguineae*, *Rhectes uropygialis*, *R. cerviniventris*, *Pseudorhectes leucorhymchus*, *P. ferrugineus*, *Machaerorhynchus albifrons*, *Monarcha nigrimentum*, *Piezorhynchus aruensis*, *P. guttulatus*, *Todopsis wallacei*, *Microeca flavovirescens*, *Edoliisoma schistaceiceps*, *Pachycephala griseonota*, *Collocalia esculenta*, *Paradisea sanguineum*, *Geoffroyus rhodops*
1862	East Timor	S. Stevens	114	62.3.20, 1–114	New: *Ptilotis maculate*, *Philemon inornatus*, *Myzomela vulnerata*, *Dicaeum mackloti*, *Halcyon australasiae*, *Rhipidura semicollaris*, *R. rufiventris*, *Ptistes jonquilaceus*, *Artamides personatus*, *Pachycephala calliope*, *Lalage timoriensis*, *Turacoena modesta*, *Geopilia maugeri*
1862	Morotai, Gilolo, Ternate, New Guinea, Salawati	S. Stevens	35	62.2.11, 1–35	New: *Tanisptera doris*, *Aeluroedus buccoides*, *Locustella fasciolata*,*Todopsis cyanocephala*, *Erythrura trichroa*, *Piezorhynchus bimaculatus*, *Oriolus phaeochromus*, *Criniger chloris*, *Philemon fuscicapillus*, *Lycocorax pyrrhopterus Cyclopsittacus desmaresti*, *Ptilopus monachus*, *Henicophaps albifrons*, *Habroptila wallacei*, *Eutrygon terrestris*
1862	Sula Islands	S. Stevens	30	62.12.21, 1–30	New: *Loriculus sclateri*, *Psitteuteles flavoviridis*, *Oriolus frontalis*, *Criniger longirostris*, *Pitta crassirostris*, *Pelargopsis melanorhynchus*, *Chibia pectoralis*, *Artamus monachus*, *Hypotaenidia sulcirostris*, *Rallina minahassa*
1863	Bouru	S. Stevens	15	63.2.16, 29–43	New: *Pitta rubrinucha*, *Rhipidura bouruensis*, *Philemon moluccensis*, *Oriolus bouruensis*, *Edoliisoma marginaturm*, *Criniger mystacalis*, *Athene hantu*, *Myristicivora melanura*, *Tanygnathus affinis*, *Ninox squamipila*

1863	Flores	S. Stevens	25	63.12.16, 1–25	New: *Rhipidura diluta*, *Pachycephala fulvotincta*, *Taeniopygia insularis*, *Sporaeginthus flavidiventris*, *Zosterops aureifrons*, *Dicaeum ignifer*, *Osmotreron floris*, *Accipiter sylvestris*
1865	Various Molucca islands	S. Stevens	29	65.9.7, 1–29	
1873	Malay Peninsula and Archipelago	A.R. Wallace	2,474	73.5.12, 1–2,474	"This was Dr. Wallace's celebrated collection from the Malay Peninsula and Archipelago, Celebes and the Molucca Islands, and New Guinea" (Sharpe 1906: 505). 44 type specimens included

[a]66 skins mentioned under the year 1857 (Sharpe 1906: 252) but later 50 under S. Stevens (Sharpe 1906: 488), the latter number matching the registered series
Actually already in the collection, see 1860 from Timor, above

from '*Peter*' (Cranbrook et al. 2005, Table 2a). A note at the end of the *Species Registry* entry ("2 Cats & *Potamophilus barbatus* from Simunjan 3 sculls private") suggests that these were specimens chosen by ARW to be held in his personal collection.

In September 1856, Stevens sold to the BM a small, mixed lot of vertebrates from Sarawak, including 17 mammal skins, comprising five typical squirrels,[41] one flying squirrel, three murine rodents and a cat. Compared with the *Species Registry* list, however, there were several absentees, including some noted by Wallace (1856a) for their particular interest. The BM did not receive: '*Macacus cynomolgus*' = long-tailed macaque *Macaca fascicularis*; '*Sciurus ephippium*' = giant squirrel *Ratufa affinis*; two '*Gymnurus* (*Rafflesii*)' = moonrat *Echinosorex gymnurus*; '*Potamophilus barbatus*' = otter-civet *Cynogale bennettii*; mouse deer, *Tragulus* sp., nor '*Galeopithecus volans*' = colugo or flying lemur *Galeopithecus variegatus*, and only one of four felids listed. It must be assumed that these attractive specimens were reserved by Stevens for ARW's private collection. One was subsequently acquired by the BM: a black-eared pigmy squirrel *Nannosciurus melanotis*, bought from Stevens in 1864. The fate of others remains unknown.

Also received by BM in September 1856 was the skull of a sun bear *Ursus* (*Helarctos*) *malayanus* shipped from Sadong on 21 July 1855 (Cranbrook et al. 2005, Table 4), possibly the "scull" marked private in the *Species Registry*. A couple of months later the BM obtained the first of ARW's orang-utan specimens. His notebooks show that the pickled skins of orang-utans, together with the dried skeletons, were shipped from Sarawak to Samuel Stevens in several consignments, as expeditiously as possible, and promptly sold. The BM register records five specimens bought from Stevens as two lots: in November 1856, a stuffed adult[42] and skull, identified as '*Simia morio*', and a stuffed young '*Simia satyrus*', followed in January 1857 by a skeleton and a stuffed specimen of '*Simia morio*' (Cranbrook et al. 2005, Table 5).[43] The two mounted specimens of 1856 both have a visible seam down the front. The stuffing material is mostly straw, with a small amount of a more fibrous, finer (almost wool-like) substance in the hands and fingers. No bones remain in the hands, and apparently none in the arms.

Other than the BM, Wallace's marginal notes name the Derby Museum (City of Liverpool) as the purchaser of five skins and skulls, and two skeletons, for the large sum of £150, as follows: ♀, dry skeleton and skin in 'arrack', the term for commercially produced ethanol for human consumption; ♀, skeleton and skin in arrack; ♂,

[41] One of which was promptly named as a new species, *Sciurus macrotis*, by J.E. Gray (1856).

[42] The attached label identifies this dramatic standing mount as: "The spm from which Wallace's description was taken". It has now been restored and is exhibited as part of the 2013 Wallace Trail in the Natural History Museum.

[43] In marginal annotations to the summary tabulation of his collection of orang-utans in the *Species Registry*, Wallace noted two purchases by the BM: firstly, for £46 altogether, a female and infant, probably the subjects of the sad tale repeated in several places: in a letter home (NHM WP1/3/34), Wallace (1856b, *MA*, 1905: 343–345); and, secondly, for £50, a 'small' male from Semabang (Cranbrook et al. 2005: Table 3). The last of these has not been rediscovered in the Natural History Museum.

dry skeleton and skin in arrack; ♂, 'small, Simunjan'; and ♀, evidently juvenile, skin in arrack (Cranbrook et al. 2005, Table 3). Of these, only a skull and a skin remain in the present Liverpool Museum collections, recorded as having been acquired through S. Stevens in March 1857.[44] The skin, now dry, remains folded as originally received and thereby demonstrates Wallace's procedure for preservation in alcohol and subsequent despatch. It can be assumed that the BM skins, shipped in liquid preservation, were also folded in this manner. The delay of 1 or more months between arrival of the specimens and their receipt at the Museum, as 'stuffed' mounts, implies that Stevens was responsible for the taxidermy before sale.[45]

At the meeting of the Zoological Society of London on 23 February 1858, two phalangers of the genus *Cuscus* sent by ARW from the Aru Islands were exhibited, and described as new species *C. ornatus* and *C. celebensis* by J. E. Gray (1858a). Further collections from the Aru Islands were reported by J. E. Gray (1858b), and from Batchian and other Moluccan islands by J. E. Gray (1860). These, and a later collection (Gray 1863), were retained by BM.

The skin of the huge python pulled from ARW's house on Amboyna (*MA*) was preserved, and is now owned by the Linnean Society of London, but he paid limited attention to the collection of reptiles and amphibians. Fifteen assorted specimens from Sarawak were bought from Stevens by BM in 1856. New species were noted by J.E. Gray (1862), and ARW's specimens were later mentioned by Günther (1872) in his account of the reptiles of Borneo. There was no other specialised report, but ARW's specimens from the Malay Archipelago were noted in the BM catalogs of Günther (1858a, b, 1865) and Boulenger (1889, 1893, 1894).

3.2 Invertebrates

Land shells were among ARW's declared special interests and he collected widely around the Archipelago, accumulating 7,500 specimens (*MA*: Preface). An early shipment from Sarawak included a consignment which Stevens was instructed to sell promptly. Charles Allen also collected land shells for ARW in the Moluccas in 1860–1861 (Rookmaaker and van Wyhe 2012). The main private enthusiast of that time was Hugh Cuming. There are citations of ARW specimens, many of them types of new species, in a succession of papers cataloguing Cuming's huge collection, produced during the 1860s by authors including Adams, Pfeiffer (1862a, b), Deshayes, and others. After his return, ARW himself listed 125 species by then in the ownership of W.W. Saunders, presumably having been 'private' specimens retained by Stevens. The description of 14 new species among this collection was

[44] Reg. no. F.P.M.31a, a skull only, taken from a lost mounted specimen 85a, and 18.3.57.5, ♂, skin and skull. The skull of the latter specimen, which is a juvenile, has been halved by a longitudinal cut.

[45] Among the mammals, the flying squirrel is still mounted, and the condition of some other skins suggest that they have been dismounted. Further research is needed to clarify the matter.

Table 2 Entomological specimens collected by A.R. Wallace bought directly by the British Museum (1855–1863), summarised from Baker (1995: Table 2)

Lepidopt	Coleopt	Hymenopt	Diptera	Orthopt	Neuropt	Hemipt	Apterigo	Total
1204	3,847	920	678	158	62	845	15	7,758

entrusted to the specialist, H. Adams, and these shells were illustrated in a single plate engraved by Sowerby (Wallace 1865a).

Throughout his travels in the Archipelago, ARW's personal attention was closely directed towards the curation of his insect specimens. Promptly shipped to Stevens, important new examples were displayed at meetings of the Entomological Society (e.g. Wallace 1855b) or the Zoological Society, and the name of Mr. A.R. Wallace rapidly became familiar among members of the naturalist community.[46] Baker (1995) has shown that, from the first consignments from Singapore and Malacca, to the last from New Guinea, Salwatty and Bouru, in every case the BM received entomological specimens across the range of orders, ultimately amounting to 7,758 specimens (Table 2).

The BM may have been forced to bid against private collectors of considerable means. Baker (1995) reported the minimum payment for mixed insect collections at 1 shilling[47] per specimen, for beetles 2s. 6d per specimen (with exceptions such as stag beetles *Lucanus* at 10s. each).[48] Butterflies were costly at 4s.6d. each, again with exceptional prices for new rarities, such as £6 per pair paid in October–November 1860 for the huge golden birdwing caught on Batchian that roused physical reactions in ARW, named *Papilio* (*Ornithoptera*) *Croesus* by G.R. Gray (1859c).

Stevens continued to reserve prime specimens for ARW's personal collection, but specialist collectors were encouraged to inspect new arrivals and to buy duplicates. A considerable collection of ARW's butterflies was obtained directly from Stevens by W.C. Hewitson, who described those in his personal holding combined with the retained private collection (Hewitson 1859, 1862). Among prominent private collectors who obtained major portions of his beetle specimens was Francis Polkinghorne Pascoe, one-time President of the Entomological Society of London, who specialised in Longicorn beetles. Pascoe bought much, if not all ARW's specimens of this group. His monumental catalog of ARW's Longicornia occupied an entire volume of the *Transactions of the Entomological Society* (Pascoe 1864–1869), treating more than a thousand species, of which at least 900 were previously undescribed and new to European cabinets (*MA*: Preface). The foremost expert on phytophagous beetles (= Chrysomeloidea), Joseph S. Baly, published companion papers cataloguing ARW's specimens of this superfamily in various entomological outlets, culminating in a 300-page revision of the 'Phytophaga' of the Malay

[46] After his return, in 1864 ARW was elected a Vice President of the Entomological Society.

[47] One shilling (s.) = 12 pence (d.). 20s. = one pound sterling (£1) = approx. 5 Straits dollars at that time.

[48] By comparison, each number of the *Journal of the Linnean Society*: *Zoology*, in which many of these collections were listed, cost 2s., for approximately 50 pages.

Archipelago (Baly 1865). Between them, Pascoe and Baly described more than 300 new species from Sarawak collections (Polaszek and Cranbrook 2006). Edwin Brown bought ARW's Cetoniidae. Other coleopteran groups, notably jewel beetles Buprestidae and click beetles Elateridae, reached continental entomologists including E. Fleutiaux and R. Oberthuer (Polaszek and Cranbrook 2006).

F. Moore (1859) included ARW's early collections in his catalog of silk-producing moths, but a major proportion of ARW's moth collection was acquired by William Wilson Saunders[49] who contracted to buy insects other than beetles and butterflies. Saunders (1861) produced a paper on the curious horned flies (Glaubrechta and Kotrbab 2001), but mainly "caused the larger proportion of [the specimens] to be described by good entomologists" (*MA*: Preface). Some Diptera were sent by Stevens to the French specialist Jacques M.F. Bigot (1818–1893), and others to the German C.E.A. Gerstäcker[50] (Baker 2001). Other Diptera, Heterocerous Lepidoptera (i.e., moths) and Homoptera, were passed by Saunders to Francis Walker, who was paid by result: £1 for each new genus and 1s. for each new species described (Baker 1995:180). Unsurprisingly, Walker rapidly produced a succession of catalogs of ARW's collections published in the *Journal of Proceedings of the Linnean Society of London* from 1859 to 1865, describing many new taxa. His catalog of the famously vast series of moths lamp-lighted at Rajah James Brooke's hilltop bungalow, Peninjau, in Sarawak, described more than 100 new genera and nearly 400 new species, occupying over 160 pages (Walker 1862–1864). Simultaneously, in a serious of papers in the same journal, Walker also cataloged ARW's large collections of Diptera (Walker 1861, 1864a, b) and, separately, Homoptera (Walker 1858). His final synoptic list of ARW's Diptera collected in the Archipelago occupied 23 pages, showing the occurrence, by location, of more than 950 species (Walker 1866). The quality of Walker's work was challenged, to the extent that an obituary notice charged him with doing "an amount of injury to entomology almost inconceivable in its immensity" (Baker 1995: 180). A broader view of his life has since mollified this assessment, and most of his Sarawak moth taxa have stood the test of rigorous investigation (J. Holloway, quoted by Polaszek and Cranbrook 2006).

Frederick Smith[51] was chosen by Saunders to catalog ARW's Hymenoptera. Commencing promptly in November 1857 with a report on those collected in Singapore, Malacca and Sarawak (Smith 1857–1858), and ending with the descriptions of new species from Sumatra, Sula, Gilolo, Salwatty and New Guinea, Smith duly produced a succession of papers alongside those of Walker in the *Journal of the Proceedings of the Linnean Society of London* from vol. 2, no. 6, with a catalog

[49] W. Wilson Saunders was an underwriter at Lloyd's of London. President of the Entomological Society from 1841–1842 to 1856–1857; Treasurer of the Linnean Society of London 1861–1873; Fellow of the Royal Society from 1853.

[50] Carl Eduard Adolph Gerstäcker (1828–1895) was Curator of the Zoological Museum of Humboldt University, Berlin, from 1857 to 1876.

[51] Frederick Smith. Born 1805. Curator of the Collections and Library of the Entomological Society of London 1841–1850; Assistant in the Zoological Department, BM 1850–1875; Assistant Keeper of Zoology 1875 until his death in 1879.

of Sarawak specimens (Smith 1857–1858) to vol. 8, no. 30 (Smith 1865). A concluding catalog, with a foreword by ARW, was published in 1873 (Smith 1873).

4 The Returned Traveller

On his return from the Malay Archipelago in 1862, ARW found himself "surrounded by a room full of packing-cases, containing the collections that I had from time to time sent home for my private use. These comprised nearly 3,000 bird skins, of about a thousand species; and at least 20,000 beetles and butterflies, of about 7,000 species; besides some quadrupeds and land shells" (*MA*: Preface). He also found that, through the efforts of Samuel Stevens and based on this very considerable volume of published reports, catalogs and descriptions of his collections, he was well known as an industrious and effective provider of new and valuable specimens from an under-explored region of the world.

More than this, as a result of his published works, he had gained a reputation as an innovative theorist in biology. Written during his travels, his paper on avian systematics (Wallace 1856c) had emphasised the importance of morphological features. His review of the distributions of birds of the Archipelago (Wallace 1859) had built on the pioneering work of Sclater (1858) and established biogeography as a discipline. Drawing on his reserved private collections, he now embarked on extended studies of systematics and zoogeography of birds (Wallace 1864a, b, 1865b, c), butterflies and beetles. His review of the Eastern members of the butterfly family Pieridae (Wallace 1867a) included the description of 45 new species, by no means all his own additions, confirming that he was working in the BM with full access to the collections. The treatment of this family was geographical, and picked up the challenge by Pascoe who had asserted that the division of the Malay Archipelago into Indian and Australian zoogeographical regions did not hold good for invertebrates as it does for 'higher' animals, i.e., birds and mammals. ARW also took a zoogeographical viewpoint in his catalog of the beetle family Cetoniidae of the Archipelago (Wallace 1868), again making it clear that, in addition to his own specimens, he was incorporating material in the BM and in the collection of Major Parry.[52] ARW argued that, despite large overlap in species composition, for the beetle faunas east and west, respectively of "a line drawn on the east side of the Philippines, curving to the west of Celebes, and passing between the islands of Baly and Lombock, will divide the Indian from the Australian region" (Wallace 1867a: 304). In placing the boundary here, at the deep water divide, ARW did not assert that the line marked an impermeable barrier. Rather, his figures emphasised the gradual nature of the faunal transition, with the Line representing an averaged point at which source of the majority of species turned from the west to the east. His own name was not yet attached to this famous Line.

[52] Major Frederick J.S. Parry specialised in the stag beetles, Lucanidae.

By 1869, ARW had published 30 scientific papers based on his collections,[53] which he considered sufficient groundwork to justify a book for general readership, *The Malay Archipelago* (Wallace 1869: Preface). During the 1870s, his reputation was confirmed by a succession of books published by Macmillan, drawing on his experiences in Amazonia and the Malay Archipelago but also reflecting, and responding to the writings of other authors who were engaged in the great debate on natural selection, including Charles Darwin. These Macmillan publications demonstrate his contribution to contemporary thought on natural selection (Wallace 1870), zoogeography (Wallace 1876), especially reflecting the selective influence of the tropical environment (Wallace 1878)[54] and the consequences of isolation (Wallace 1880). He also added to the literature on animal coloration and mimicry (Wallace 1867b, 1879). Remarkably, ARW's division of the world into six zoogeographical regions has only recently been amended by analysis based on advanced computing power, combined with modern concepts of phylogeny (Holt et al. 2013).

During this time, other specialists made use of his specimens in broader zoological reviews. For instance, prominent among the private buyer of duplicates sold by Stevens was Viscount Walden (later Marquess of Tweeddale). Among other new species described from his collection, he named *Mulleripicus wallacei* (Tweeddale 1877). The Keeper of Zoology at BM, in a review of Asiatic squirrels, described ARW's specimens from Sarawak as a new genus (*Rheithrosciurus*) and new species (*Macroxus sarawakensis*) (Gray 1867) and, lacking further examples, finally described a Sarawak cat as *Felis badia* (Gray 1874). Later still, the distinctness of two small rodents from Sadong, registered simply as *Mus*, was recognised by Thomas (1893), and they became type and paratype of *Chiropodomys major*.

5 Dispersal and Reassembly

5.1 Vertebrates

Ultimately, ARW had worked his way through his collections, and his interests moved away from systematics and biogeography. In 1873 he sold to BM most of his retained bird collection from the Malay Archipelago, amounting to 2474 skins, "containing the types of all the new species described by Mr. G. R. Gray and Dr. A. R. Wallace himself" (Sharpe 1906).[55] These, however, were not the final items of ARW's birds to reach this museum. Several of the great private collectors of the period who had acquired skins from Stevens subsequently passed their collections to BM, by gift, bequest or sale. The types of *Halcyon fulgidus* and *Pitta concinna* (Gould 1857b), retained by Gould, passed to BM after his death when Gould's large

[53] See http://wallace-online.org

[54] ARW (1878) *Tropical nature and other essays*. London, Macmillan and Co.

[55] ARW also chose this occasion to let the Museum have 27 hawks and owls from his Amazonian collection (Sharpe 1906).

private collection of 6,315 specimens was purchased in 1881 (Sharpe 1906: 375; Warren 1966: 104; Warren and Harrison 1971: 126). After his death, the Marquess of Tweeddale's huge collection of 20,186 Asiatic birds, including ARW specimens, was donated to BM in 1888 by his nephew, Col. R.G. Wardlaw Ramsay (Sharpe 1906: 445). Other private collectors who bought ARW bird skins that ultimately came to BM by gift or bequest included Henry Seebohm[56] and R. B. Sharpe.[57]

Some of Wallace's birds from the Malay Archipelago were acquired by Canon H. B. Tristram,[58] whose collection was ultimately sold to the Derby Museum, Liverpool. A few skins and skeletal preparations were also sold to Professor Alfred Newton[59] and are now in the University Museum of Zoology, Cambridge. In the 1890s, the BM gave duplicates, including skins from ARW's personal collection, to the Burslem Art Museum, and to Princeton Museum, USA. The former institution no longer exists, and the fate of its collections is obscure. Princeton has been able to locate ARW's specimens in its remaining holding, but also disposed of a portion of its collections to the Field Museum of Natural History, Chicago. The Field Museum now holds 13 ARW skins, mostly from Princeton but also obtained by exchange with the American Museum of Natural History (Appendix A). Still at the American Museum of Natural History are 35 skins collected in the Archipelago between 1859 and 1862 (several from the Moluccas attributable to Charles Allen), almost all of which were part of the purchase of the Rothschild collection in the early 1930s (Cracraft, personal communication, 2014). The National Museum of Natural History, Paris, holds some bird skins collected by ARW but there is no list of them, "and the accession catalogues are most of the time not very explicit about the origins of our specimens" (Voisin, personal communication, 2014). Most poignant is a group of bird skins, the residue of ARW's private collection that he saved for his own pleasure, obtained after his death by Mr Parkinson Curtis by whom, in turn, they were bequeathed to the Dorset County Museum (Appendix B).

After the death of Tomes in 1904, among the 500 mammal specimens purchased by BM from his executors there was a large number of bats collected by ARW (Thomas 1906), and also one treeshrew from Sarawak (Cranbrook et al. 2005). According to Thomas (1906) the BM held a final total of 123 mammal specimens from ARW's collections in the Malay Archipelago of which, before his return, J. E. Gray had described new species (including *Mus xanthurus*, *Mus celebensis*,

[56] Henry Seebohm (1832–1895) was a member of a prominent Quaker family involved in a variety of businesses, including banking, steel-making, and the wool trade. A respected amateur ornithologist, his publications included *A History of British Birds* (1883), *The Geographical Distribution of the family Charadriidae* (1887), *The Birds of the Japanese Empire* (1890), and (posthumously) *A Monograph of the Turdidae* (1898) and *The birds of Siberia* (1901).

[57] When Sharpe was appointed to succeed G.R. Gray in 1872, obeying "the rule of the Civil Service, which very properly prohibits the keeping of private collections of any group to the custody of which an officer is appointed" (Sharpe 1906: 481), he added his existing bird collection to the British Museum.

[58] Among other distinctions, the co-founder of the British Ornithologists' Union, publishers of the periodical *Ibis*.

[59] Among other posts, Newton held a travelling fellowship of Magdalene College, Cambridge.

Phalanger celebensis, *Phalanger ornatus* and *Phascogale wallacei*). The present BM holding is 205 specimens (Daphne M. Hills, 2013 unpublished), i.e., two thirds (66 %) of ARW's total collection of mammals. The flying squirrel and a cuscus are still mounted, and the condition of several other skins indicates that they have been dismounted. It is also apparent that, in some cases at least, ARW left the skulls in situ (as is still conventional for birds), cutting the occipital region to extract brain tissue. Further research is needed to evaluate the condition of these and other vertebrate specimens, and to trace items missing from the BM collection.

5.2 Invertebrates

The BM progressively acquired many of ARW's invertebrate specimens, as whole or part of large holdings originally the property of private collectors. Thus, Cuming's collection of 82,992 shells was acquired by BM in 1866 (Smith 1906).[60] Given time, ARW's specimens could in theory be found by diligent search among that huge acquisition.

After ARW returned to England, Hewitson completed the purchase of his butterflies, and compiled a catalog. He wrote, "The very valuable collection of Satyridae, Ericinidae, Lycaenidae and Hesperidae amassed by the indefatigable industry of Mr. Wallace having been transferred to my keeping, I am happy to comply with his wishes by compiling a list of species, with notice of all their varieties and localities" (Hewitson 1865). Hewitson died in 1878 and bequeathed to the BM his entire collection of exotic butterflies, consisting of 24,625 specimens, including most of the types collected by ARW (Waterhouse 1906: 569).

Other large private holdings of ARW's insect specimens also passed to BM as their owners, or their heirs, decided to part with their collections. On the death of F.P. Pascoe in 1893, BM purchased his entire collection of some 48,500 beetles, of which 3,191 were types of Pascoe's named species (Waterhouse 1906: 594). J.S Baly's collection of 28,000 phytophagous beetles was also obtained by BM through progressive purchases between 1880 and 1905 (Waterhouse 1906: 580). W.W. Saunders was a generous benefactor, in 1865 presenting his collections of 3207 Hemiptera and, in 1868, 2000 Neuroptera and 5000 Diptera, among which were series collected by ARW in the Malay Archipelago (Waterhouse 1906: 565, 595). Brown's collections were auctioned in Stevens's rooms in 1877 when the BM bought lots of Cetoniidae, including all Wallace's types (Waterhouse 1906: 582).

[60] "The actual number of species and types was never estimated, but when we regard the twenty volumes of Reeve's 'Conchologia Iconica', the five volumes of Sowerby's 'Thesaurus Conchyliorum', and the numerous papers by Pfeiffer, Broderip, H. and A. Adams, Dehayes and others, all descriptive of this collection, we get some idea of the interest attaching to it. This collection of shells was the main object of Mr. Cuming's life. He not only devoted several years of personal collecting to its formation, but he purchased largely, and obtained very many species by exchange with foreign museums and private collectors in all parts of the world" (Smith 1906:710)

An important private collector who bought ARW specimens direct from Stevens was Frederick William Hope FLS, FRS (1797–1862). In 1849 Hope endowed a chair of Zoology at Oxford University, nominating as the first Hope Professor John Obadiah Westwood (1805–1893), who also curated Hope's collection. Westwood himself bought more of ARW's insects[61] and thus, in Oxford University Museum, began the second most important British collection of ARW specimens (Appendix B).

Saunders' collection of 'exotic' Hymenoptera, amounting to 12,415 specimens arranged by Frederick Smith, was sold through E.W. Janson and acquired by Oxford University Museum in 1875 (Baker 1995). Smith's personal collection of about 25,000 non-British specimens (including ARW material) was dispersed after his death in 1879. The BM purchased a first selection of 3445 of his Hymenoptera, including all his types. The remainder passed in to the hands of the Rev. Farren White, whose collection of 17,451 Hymenoptera, chiefly aculeate, was ultimately presented to BM by his widow in 1899 (Waterhouse 1906: 577). Some specimens, after a variety of intermediate owners, also reached the Oxford University Museum (Baker 1995).

As time has passed, others of ARW's specimens have been transferred by exchange, gift or sale, and incorporated into the collections of museums in Europe, USA, Australia and Singapore. Among British institutions, the Hunterian, University of Glasgow, holds several labelled cerambycids from the Malay Archipelago, including *Chaeromorpha wallacei* from Borneo (i.e. Sarawak) still pinned to an original circular white label (Breitling and Hancock 2014: pl. 4). A list of institutions known to hold ARW specimens has been put online by George Beccaloni.[62] Despite these dispersals, the BM undoubtedly now holds the major proportion of ARW's vertebrate and invertebrate specimens from the Malay Archipelago, with Oxford a close second in entomology.

6 Epitome

The period from 1854 to 1862, while ARW was collecting in the Malay Archipelago, marked a revolution in human understanding of nature and natural processes regulating the evolution and distribution of species. Through his experiences in the Malay Peninsula, Singapore and the islands that extend to New Guinea, supplemented and strengthened by the information contained in his varied collections of vertebrate and invertebrate animals of that region, Wallace himself contributed powerfully to this intellectual watershed. His collections still provide potentially unmatched base-line information on the biodiversity resource, and are thus vitally

[61] "Westwood, having but a small amount for purchases, used to buy damaged specimens at a low price & patch them up. He did this very cleverly, but you must have come across some." ARW, Letter to Poulton, 26 March 1896 (Oxford Museum archive).

[62] http://wallacefund.info/wallace-specimens

important in the region for systematics and taxonomy. The information provided by these specimens is also valuable for regional and national policy-making in matters such as nature conservation and species protection, and useful for practical applications, e.g. in integrated pest management.

As shown above, a large proportion of ARW's collections ultimately ended up at BM. Moreover, when the opportunity arose, BM Trustees made special efforts to obtain the type specimens, which are of special importance in all these fields of research and policy. Of 310 specimens of mammals that ARW claimed to have collected (*MA*: Preface), 205 (66 %) are in the BM (Hills unpublished). Of c. 8050 birds, direct purchases by G.R. Gray (1,018 skins) combined with the acquisition of ARW's private collection (2474 skins) indicates a minimum of 3492 (43 %), undoubtedly raised by subsequent gifts and purchases from individual collectors. No figure for the number of 'herptiles' is yet obtainable but, for this group, the comparatively small numbers make it an exacting but not insurmountable task to discover and recognise ARW's surviving specimens.

Among invertebrates, the immense numbers involved (7500 shells, 13,100 Lepidoptera, 83,200 Coleoptera and 13,400 other insects), make the reassembly of ARW's collections a much more demanding aspiration. Moreover, the recognition of individual specimens has been hampered by changes in labelling and mounting as collections passed from hand to hand among private collectors, before ultimately reaching BM (Baker 1995). Some large collections in BM, such as Cuming's land shells, remain only partially registered. A UK Parliamentary inquiry in 1990–1992 highlighted concerns among the scientific community that the standards of curation at BM had declined as a result of financial constraints (House of Lords 1992 1: 33). The deposition from the BM itself admitted that there were serious storage and curatorial problems, that the condition of biological specimens can deteriorate, and that retarding this process is expensive (House of Lords 1992 *Written evidence* 1: 155–156).

7 A New Initiative in Sarawak

In the course of the House of Lords inquiry, the Director of Australian National Parks and Wildlife Service emphasised the special concerns among former colonial countries about the state of type specimens collected in their territories, and aired proposals for joint curatorial care (P. Bridgewater in House of Lords 1992). The listing by Polaszek and Cranbrook (2006) of insect species described from ARW's Sarawak collections has provided a start for an exercise to locate, redescribe and create digital images of types collected in Sarawak. A bolder initiative, in conjunction with BM and Oxford University Museum, could provide a model for further collective action by the national governments of Indonesia, Malaysia, Singapore and Timor-Leste, perhaps through ASEAN scientific cooperation. An exercise to compile and disseminate a comprehensive catalog of ARW's Archipelago collections, with emphasis on the irreplaceable type specimens, would be a fitting

centennial memorial for the indefatigable enterprise of Alfred Russel Wallace and also an invaluable asset for regional biologists, zoogeographers, conservationists and wildlife managers in all nation states of the region.

Acknowledgments Cranbrook is grateful to the Natural History Museum authorities who have given him access to the magnificent library where the duty officer has invariably been helpful. For assistance in examining the collections, much help was also received from George Beccaloni, leading scholar and protector of Wallace's legacy, from Roberto Portelo-Miguez (mammals) and Robert Prŷs-Jones (birds). Daphne Hills has kindly made available her full list of Wallace's mammal specimens in the Natural History Museum. Successive Librarians of the Linnean Society of London, Gina Douglas and Lynda Brooks, have provided ready help. At the Liverpool Museum, Clemency Fisher kindly made available Wallace specimens in this collection, notably orang-utans. Jenny Cripps kindly provided the full list of ARW's bird skins in the Dorset County Museum, and Ben Marks kindly abstracted a list of bird skins in the Field Museum of Natural History, Chicago.

Appendix A: ARW Skins in the Field Museum of Natural History, Chicago. Information Provided by Ben Marks, Curator of Ornithology

FMNH 98708 – *Megalaima henricii henricii* – A R Wallace – 1859 – skin
FMNH 98995 – *Dicrurus hottentottus bimaensis* – A R Wallace – skin
FMNH 304574 – *Pycnonotus finlaysoni finlaysoni* – A R Wallace – 1862 – skin
FMNH 304584 – *Pycnonotus plumosus plumosus* – A R Wallace – 1854 – skin
FMNH 304585 – *Pycnonotus plumosus plumosus* – A R Wallace – 1854 – skin
FMNH 304613 – *Hypsipetes malaccensis* – A R Wallace – 186? – skin
FMNH 304647 – *Chloropsis sonnerati zosterops* – A R Wallace – skin
FMNH 304651 – *Chloropsis sonnerati zosterops* – A R Wallace – 1854 – skin
FMNH 305166 – *Copsychus pyrropygus* – A R Wallace – skin
FMNH 409589 – *Ptilinopus perlatus zonurus* – A R Wallace – skin
FMNH 303452 – *Dinopium javanense javanense* – A R Wallace – skin
FMNH 280815 – *Paradisaea apoda apoda* – A R Wallace – skin
FMNH 310220 – *Semioptera wallacei wallacei* – A R Wallace – skin

Appendix B: Birds from the Malay Archipelago in the Alfred Russel Wallace Bird Collection at the Dorset County Museum

Date	Name		Place	Acc no
0	Black-headed Pitta	*Pitta novae-guineae/? Pitta soldida*	Celebes (Sulawesi)	V1055
0	Blue-faced Parrot-finch	*Erythrura trichora*	Ternate	V1054
0	Vernal Hanging Parrot	*Coriculus vernalis*	Sula Is.?	V1070
1854	Many-coloured Barbet	*Megalaima rafflesii*	Malacca	V1075
1854	Red-breasted Bee-eater	*Nyctiornis amicta*	Malacca	V1074
1856	Blue-winged Pitta	*Pitta brachyura/ Pitta moluccensis*	Lombok	V1067
1856	Rainbow Bee-eater	*Merops ornatus*	Lombok	V1063
1858	Beautiful Paradise Kingfisher	*Tanysiptera galeata*	Gilolo (Halmahera)	V1082
1858	Pied Butcherbird	*Cracticus nigrogularis*	Dorey, New Guinea	V1053
1859	Great Pitta	*Pitta maxima*	East Gilolo	V1065
186?	Oriole	*Oriolus frontalis*	Soella (Sula Is.)	V1069
1860	Crinkle-coloured Manucode	*Manucodia chalybatus*	Misool (Mysol)	V1080
1861	? Starling	*Gracula pectoralis*	New Guinea	V1060
1861	Blue-capped Dove	*Ptilinopus monacha*	Gilolo (Halmahera)	V1083
1861	Crested Jay	*Platylophus galericulatus*	Sumatra	V1079
1861	Fairy Bluebird	*Irena puella*	Malacca	V1076
1861	Grey-headed Fruit Dove	*Ptilinopus hyogastra*	Gilolo (Halmahera)	V1084
1861	Little Friarbird	*Philemon citreogularis*	Gilolo (Halmahera)	V1062
1861	Little Green Pigeon	*Treron olax*	Sumatra	V1077
1861	White-collared Kingfisher	*Halcyon chloris*	Sula	V1071
1861	Perfect Lorikeet	*Trichoglossus euteles*	E.Timor	V1087
1861	Racquet-tailed Treepie	*Crypsirina temia*	E. Java	V1068
1861	Rail Babbler	*Eupetes macrocerus*	Malacca	V1073
1861	Trumpet Bird	*Phonygammus keraudrenii*	New Guinea	V1059
1862	Black and Red Broadbill	*Cymbirhynchus macrorhynchos*	Sumatra	V1078
1862	Black and Yellow Broadbill	*Eurylaimus ochromalus*	Malacca	V1072
1862	Olive-backed Sunbird	*Nectarinia jugularis*	Flores	V1066
1862	Timor Sunbird	*Nectarinia solaris*	Flores	V1056

Appendix C: ARW Specimens in the Oxford University Museum of Natural History. Compiled by Darren Mann, Head of Life Collections

1858 20 diurnal Lepidoptera from Celebes. Purchased from Stevens by F.W. Hope
1858 Insects from Sarawak and the Aru Islands. Purchased from Stevens by F. W. Hope
1859. Insects from Borneo, Amboyna, Dorey, Batchian, Ternate, and Gilolo. Purchased from Stevens by F. W. Hope
1860. Insects from Sarawak. Purchased from Stevens by F. W. Hope
1862. Insects from Mysol and Waigiou. Purchased from Stevens
1863. Two larvae and one pupa of *Mormolyce phyllodes.* Presented by J.O. Westwood
1863. Insects from Sumatra, New Guinea, and Mysol. Purchased from S. Stevens
1865. Entire private collection of Melolonthidae, Rutelidae, Trogidae, Aphodiidae, and genus *Valgus* (514 specimens) from the Malayan Archipelago, also his private collection of Eumorphidae (201 specimens), Pselaphidae, and Scydmaenidae (29 specimens), from the same islands (£28. 16s)
1866. Private collection of Clavicorn Coleoptera made in the Malayan Archipelago (£10)
1866. Three specimens of *Iridotania* from Kaisa, Ternate, and New Guinea (through W. W. Saunders)
1866. Entire private collection of Cleridae formed in the Malayan Archipelago containing 697 specimens, also Staphylinidae containing 523 specimens, purchased £35
1867. Purchased from Mr. Walker (on acct of W. W. Saunders) 73 Diptera, 29 Homoptera from the Malayan Archipelago collected by A. R. Wallace and described by Messrs. Walker and Stil, from Mr. Saunders Collection and 15 Cercopidae from ditto (at 10d each)
1868. Various insects from Wallace collection. Purchased from Mr Higgins, purchased £2 7s, 7s, 12s, £1, 12s, 3s, 4s
1869. Private collection of Heteromerous Coleoptera, purchased £32 10s
1871. 271 butterflies. Purchased from Mr Hewitson from collection of A. R. Wallace, £26 14s
1871. Assorted insects selected from Wallace collection. Purchased from Mr. Higgins, £8 19s 9d
1874. Malay collection: three *Sospita*, two *Mycalesis*, and 40 small butterflies chiefly *Polyommatus*. Purchased from Mr Hewitson, £1.4s
1874. A few Coleoptera amongst specimens purchased from W. W. Saunders
1876. His private Collection of the following families of Malayan Coleoptera. Price £40.0.0. Anthribidae 1,080 specimens, Brenthidae 605, Malacodermata 909+ 35 half eaten individuals, Hydrophilidae &c. 107, Passalidae 86, Coprides 199, Dynastidae 19 Oryctes-68 other genera. Total 3,073
1877. 104 Carabidae from Malay Archipelago, included in lot 345 purchased at sale of Edwin Brown's collection
1896. Butterflies from Malay Archipelago in Godman-Salvin collection

Appendix D: Bird Skins Collected by A. R. Wallace in the Collection of the Oxford Museum of Natural History, Compiled by Darren Mann

Ref no	Name	Sex	Age	Locality	Collector	Method of acquisition	Acquisition
06385	*Aplonis panayensis strigata*	♀	Adult	Sarawak	Wallace	Pascoe collection	1909
14731	*Coracina papuensis melanolora*[a]	?	Adult	Gilolo (Halmahera, Moluccas)	Wallace	British Trust for Ornithology Collections, Tring, obtained for O.U.M. and presented by Dr. C.M. Perrins, Edward Grey Institute, Oxford	09 Dec 1969
11525	*Pitohui ferrugineus ferrugineus*	?	Adult	Misol Isl.	Wallace	C.M.N. White collection	1950
12362	*Nectarina solaris*[b]	♂	Adult	Flores	Wallace	Pascoe collection	1909

[a]*Campephaga melanolora* G.R. Gray

[b]Wallace AR (1863) A list of birds inhabiting the Islands of Timor, Flores and Lombok with descriptions of the new species p 486. Most likely collected by Charles Allen, as Wallace did not visit Flores

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