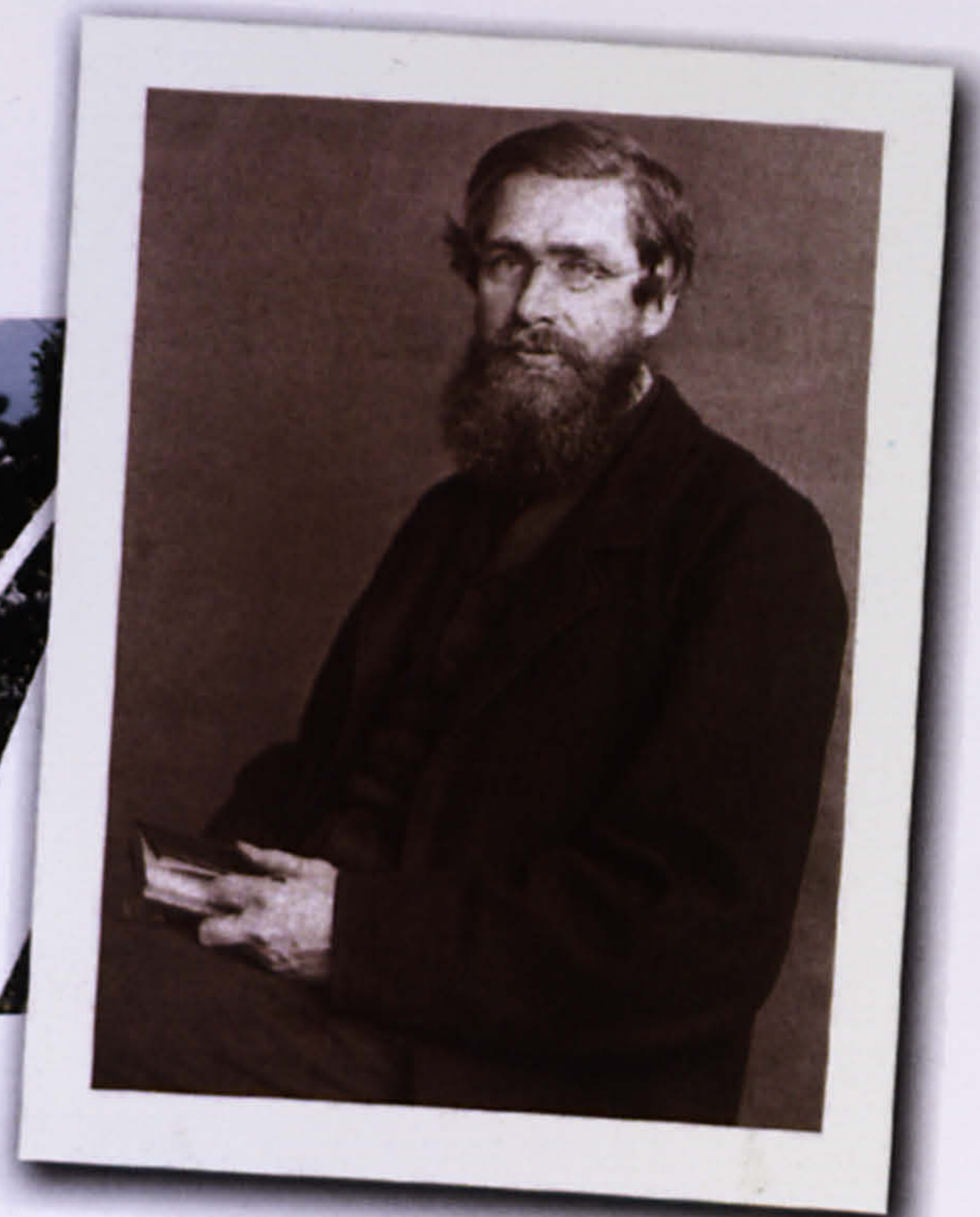


*'Every species has come into existence both in time  
and space with a pre-existing closely allied species'*  
Wallace, Santubong 1855



## **WALLACE IN SARAWAK – 150 YEARS LATER**

**Proceedings of an International Conference  
on Biogeography and Biodiversity**

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# **Wallace in Sarawak– 150 Years Later**

## **An International Conference on Biogeography and Biodiversity**

**Andrew Alek Tuen and Indraneil Das**  
*Editors*

**Institute of Biodiversity and Environmental Conservation  
Universiti Malaysia Sarawak**

2005

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**Front cover:** Alfred Russel Wallace (from a portrait dated 1869), and Rajah Brooke's Birdwing Butterfly (*Trogonoptera brookiana*) and the site of Rajah Brooke's Bungalow at the base of Gunung Santubong, Sarawak. During his time here, he most famously wrote the "Sarawak Law" paper. Cover design: Azwan Abidin, Faculty of Applied and Creative Art, Universiti Malaysia Sarawak.

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## INTRODUCTION

### A CONFERENCE TO HONOUR ALFRED RUSSEL WALLACE

Among the first Western naturalist to acknowledge the richness of the fauna of south-east Asia was Alfred Russel Wallace. Benefiting from Rajah James Brooke's hospitality, Wallace visited Sarawak between November 1854 and January 1856. And, sampling along the Sarawak River valley from the foothills of Mount Santubong to the limestone hills of Bau and from Sarawak River basin to the peat swamps of Simunjan, Wallace collected and shipped back to England, thousands of biological specimens ranging from insects to orang-utans. Indeed, Wallace described his insect collection from the state as the most productive in his 12 years of collecting in the tropics. Wallace's own exploits in Sarawak are told in his hugely popular autobiographical work, 'The Malay Archipelago'.

From his travels throughout the Indo-Australian Archipelago, Wallace noted the contrasting characters of island fauna, some which are allied to Australia, others with south-east Asia. Inspired by the richness of his natural surroundings while residing at Rajah Brooke's bungalow in the base of Gunung Santubong, Wallace realized the evolutionary significance of distribution patterns of animals and wrote, in 1855, his theory on the geographical distribution of species. He later articulated and expanded his views on natural speciation in the famous essay "On the tendency of varieties to depart indefinitely from the original type" which was presented together with Charles Darwin, at a special meeting of the Linnean Society of London on 1 July 1858. This joint paper was to radically change our thinking of the origin of species, and indeed, of biology itself.

This year, we celebrate 150 years of Wallace's exploits in Sarawak. The Institute of Biodiversity and Environmental Conservation and the Faculty of Resource Science and Technology, Universiti Malaysia Sarawak, in partnership with Sarawak Development Institute, is jointly organizing the **International Conference on Biogeography and Biodiversity**, with the theme "**Wallace in Sarawak– 150 years later**". This conference sees a gathering of scientist, managers, academics and historians in the field of history of biology, evolution, speciation, biogeography, ecology, biodiversity and conservation, in a picturesque setting of Sarawak's capital city of Kuching, not far from Gunung Santubong where Wallace wrote his thesis on speciation and biogeography. The meetings will take place in the old Courthouse, built during Rajah Brooke's time.

The major themes of the Conference are:

- a) Wallace in Context
- b) Biogeography
- c) Biodiversity

We acknowledge the support of Universiti Malaysia Sarawak, our partner institution, the Sarawak Development Institute and our sponsors.

In bringing the proceedings volume out in print in time for the launch of the Conference, we are indebted to the authors for the timely submission of manuscripts, and to Lee Miing Press, Kuching, for printing it. We are also indebted to the following colleagues for reviewing manuscripts: Douglas Brandon-Jones, Rafe Marion Brown, The Earl of Cranbrook, Geoffrey Davison, Genevieve V. A. Gee, Robert Frederick Inger, Ruth Kiew, Tzi-Ming Leong, Lim Boo Liat, Lim Chan Koon, Kelvin Kok Peng Lim, Navjot Sodhi, Robert Butler Stuebing, Benito Tan and John Wilson. Sendie Tangan helped coordinate reviews. Finally, we are grateful to Azwan Abidin, Faculty of Applied and Creative Art, Universiti Malaysia Sarawak, for designing the front cover of this volume.

We welcome you to the Conference, and wish you a pleasant stay in Sarawak.

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4 July 2005.

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## **ALFRED RUSSEL WALLACE: THE FORGOTTEN NATURALIST**

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(with eight text-figures)

**ABSTRACT.**– Alfred Russel Wallace is best known for his discovery of the Geographical Divisions of the Wallace Line. However his greatest contribution to science was begun here in Sarawak with the writing of “The Law Paper” (the so-called Sarawak Law). He wrote it in a bungalow belonging to Rajah Brooke at the foot of Mount Santubong in February 1855. He was of humble birth and came to Sarawak to collect natural history specimens to send back to England for sale. His collections were enormous as was his contribution to the description of the biodiversity of Sarawak and the Malay Archipelago. His geographical divisions have now been confirmed with the theory of the Tectonic Plates. His concern for the future of the orang-utan was also prophetic. His ideas on evolution by the survival of the fittest, the question of female choice and much else, are still being debated. It is, therefore, fitting that we honour this great man here in Sarawak, 150 years later.

**KEY WORDS.**– A. R. Wallace, Sarawak, Law Paper, collections, Wallace's Line, evolution by natural selection, biogeography.

### **INTRODUCTION**

For many years, I have had in my bookcase a set of green leather-bound books, entitled *The Malay Archipelago*, *Natural Selection*, *Darwinism*, *Island Life*, *The World of Life*, and two large volumes entitled *Geographical Distribution of Animals*. These were given to me by my great-uncle, Dr C. E. G. Wilson, a few years before he died. He had written inside the books that the author, Alfred Russel Wallace, was a cousin of his father. These books led me to investigate the life and works of Wallace and, in 2000, to publish my own book, entitled *The Forgotten Naturalist: in search of Alfred Russel Wallace*. My researches put me in a good position to introduce you to the hero of this Conference.

*Who was Alfred Russel Wallace? Why did he come to Sarawak and why are we here celebrating him now, 150 years later?*

He was an English naturalist who had been invited by Rajah James Brooke to come to Sarawak to collect natural history specimens. Wallace wanted to see the orang-utans and knew that Brooke had already made a study of them.

Wallace arrived in Sarawak on 1st November 1854, and, although he spent only 15 months in Sarawak he achieved a great deal. While there, he laid the foundation for the still much-debated Theory of Evolution by Natural Selection.

Alfred Russel Wallace was born in South Wales in 1823. His family were desperately poor and Alfred had to leave school at the age of 14 years. He was a great reader and had an insatiable desire for learning all he could of the sciences of botany, mathematics, zoology, astronomy and geology. Fortunately, he was not busy and had free time when he was working as a surveyor in Wales. He used to wander off into the countryside collecting botanical specimens. After several different occupations, he decided to earn his living collecting and selling natural history specimens, and so at the age of 25 years, with his friend Walter Bates, he set off for the Amazon by ship.

He spent four years there exploring and collecting specimens, many of which were new to science at that time. He travelled to the headwaters of the Rio Negro River, and nearly died of tropical fever while travelling

up the Uaupés River. It was here that Wallace first began to question the origin of species. He was observing the geographical distribution of the animals, and noted that certain species of monkey were confined to specific areas of Brazil. He also noted that a lovely blue butterfly he found at Santarem on the Amazon to be only slightly different from the butterfly on the opposite side of the river. Why was this? This was the first inkling of his Sarawak Law paper, which I will come to shortly. Finally, after collecting all his specimens and being in poor health, he decided to return home. Unfortunately, the ship caught fire in the mid-Atlantic and sank. He lost all his hard-earned specimens. After 10 days in an open boat he was picked up and returned home vowing never to go to sea again.

It was not long before he was (Fig. 1) off again, this time, with help of money from the Royal Geographical Society, to The Malay Archipelago and Singapore where he met Rajah James Brooke, and so came to Sarawak.

## WALLACE IN SARAWAK

He arrived in the wet season and at first did a little collecting along the Sarawak River. He was able to live with the Rajah at his home. "The Grove", (Fig. 2) and spent time discussing and arguing with him on all sorts of subjects. The Rajah would not believe that we humans descended from the apes, like the orang-utan. The Rajah obviously enjoyed these discussions, and it is likely they helped Wallace in his thinking about the question of the origin of species.

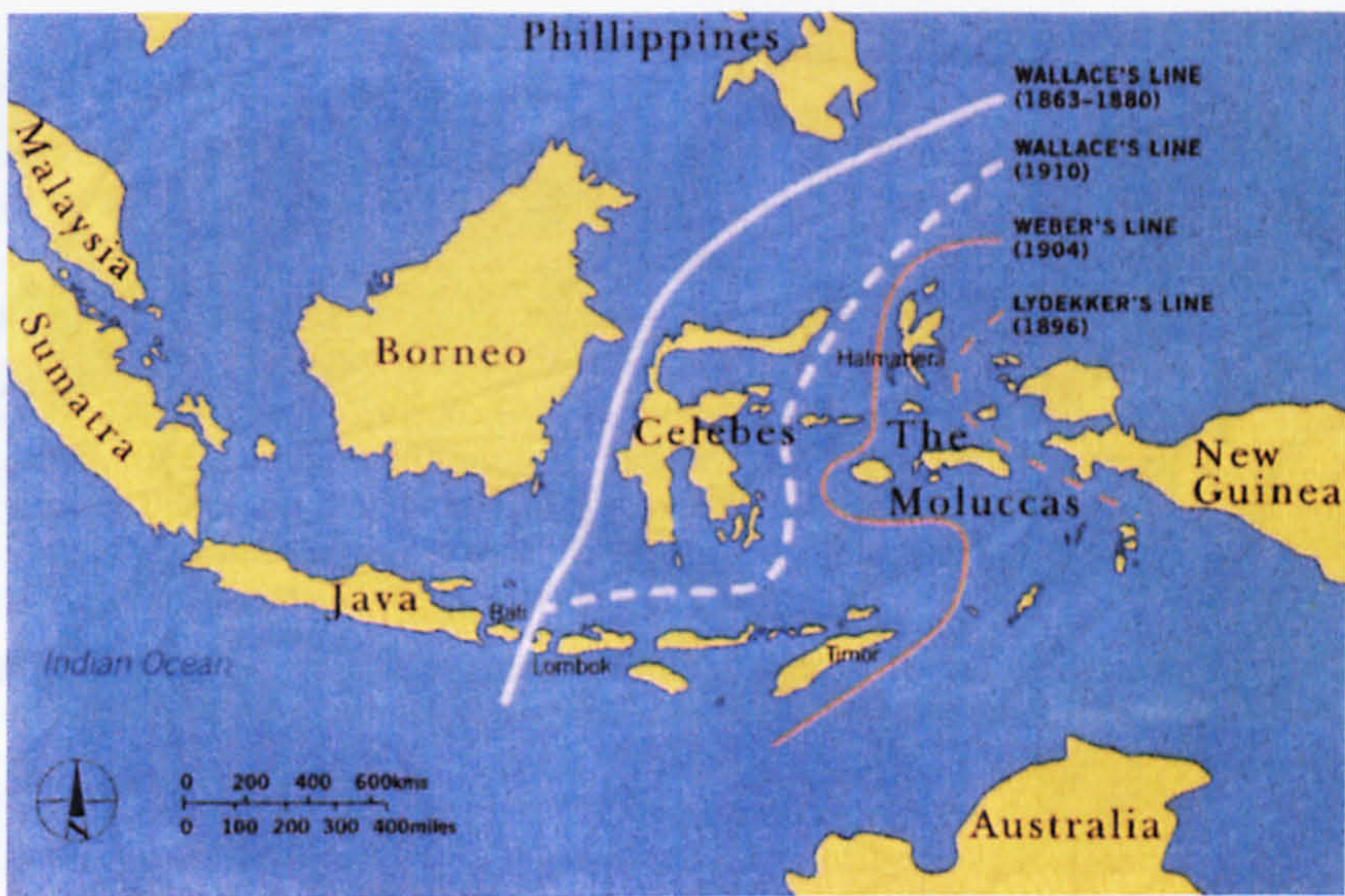
Wallace spent his first Christmas with the Rajah and his secretary Spenser St. John in the Rajah's bungalow at the base of the Gunung Santubong. This bungalow no longer exists, unfortunately. After Christmas the Rajah went back to Sarawak (now Kuching) and Wallace was left with a Malay cook to recuperate from a probable attack of malaria. He could not collect and had time to think and write. It was here he wrote his famous "Law Paper", or as he called it "my paper on the succession of species". In this paper, he concluded that "every species has come into existence coincident both in time and space with a pre-existing closely allied species". Other writers at this time had stated that each geological period was marked by the introduction of forms totally different from those that had come before, or would come after. In Sarawak, Wallace was surrounded by many new species of beetles, moths, butterflies and birds. He could see that different species were not nearly so different from one another as previous naturalists had supposed, and that often the differences were quite minimal. He felt there must be some connection. A species, more often than not, is restricted to an area, often quite a small area, and closely allied species are found geographically near to each other. This paper clearly pointed to some kind of evolution, but did not answer the question of how it occurred. Species, he argued had arisen not by separate acts of Divine Creation, as postulated by many theologians, but by natural variability. It was this variability that most impressed Wallace as he saw all about him. This "Sarawak Law" paper was an astonishing paper for a 32-year-old "self educated drifter" who had no regular employment. It was written in Wallace's clear direct style and is an historic paper. It was published in the *Annals and Magazine of Natural History* in September 1855.

The significance of the paper was not immediately appreciated by its readers in the U. K., but when it was, it caused a stir, as it was realised how close to the truth Wallace was getting. At this time Charles Darwin had published nothing on this subject, and his friends were alarmed that he was likely to be usurped in his claim to priority by this "unknown flycatcher from Sarawak in Borneo".

After the rains eased, Wallace went to Simunjan on the Sadong River, hoping to see the orang-utans. He also found it a great spot to collect beetles, because a great number of trees had been cut down and lay rotting on the ground. This was ideal for wood-feeding beetles, such as the longicorns. In a period of nine months he collected 10,000 in all with 2000 different species, and this included a period of six weeks when he could not collect because of a badly ulcerated ankle. He wrote that he averaged 24 new species every day and some days, he would collect up to 50 or 60 different kinds. This is an extraordinary feat and I doubt if any other naturalist before or since has equalled this record.

From Simunjan, Wallace set off up the Sadong River to its headwaters, and lived with the Dyak people. He described how he slept in their huts "with half a dozen smoke-dried human skulls suspended over my head". He loved the Dyaks and admired their customs and way of life. His white skin was of great interest to them, and while he ate his evening meal he often had to raise his trouser leg to show he was white all over. He would meet the Orang Kaya (head man) of the village and often sat around with them drinking their rice wine and watching their dances, as I also have done. He enjoyed this break from collecting insects and began to compare their way of life with the so-called more civilised races. Crimes of violence were unheard of and he slept with open doors and constantly went about unarmed.

He was well ahead of his time when he wrote, "the more I see of uncivilized people, the better I think of



**FIGURE 1:** Map of south-east Asia, showing the Wallace's (and others) lines.



**FIGURE 2:** Rajah Brooke's bungalow, where A.R. Wallace resided.



**FIGURE 3:** Rajah Brooke's birdwing butterfly.



**FIGURE 4:** Beetles collected by Wallace at Simunjon.



**FIGURE 5:** Wallace's route in Sarawak.



**FIGURE 6:** Ali, Wallace's field assistant.



**FIGURE 7:** Rajah James Brooke.



**FIGURE 8:** A. R. Wallace, Singapore, 1862.

human nature on the whole, and the essential differences between so-called civilized and savage man seem to disappear.”

The other collection he made at Simunjan was that of the orang-utan. He shot 16 and preserved the skins in spirit. He kept as many of the skulls and skeletons as he could for study and sent them back to London to be distributed by his agent.

When one reads about Wallace shooting these magnificent animals, one wonders how this gentle, humble man who once cared so tenderly for an infant mias could do this. He was driven, of course, by scientific enquiry and so it would have then seemed justified. This argument is still on today, and I wonder how valid it is when we see animals, such as the orang-utan, are fast disappearing. Even Wallace predicted that with the loss of habitat, the survival of the orang-utan would be threatened. It is hoped, both here in south-east Asia, and the Amazon, where life is so abundant, this loss of habitat can be controlled to allow such animals as “the man of the forest” to survive man’s intrusion on their territory.

Another of Wallace’s extraordinary collections was of moths. It was made at Rajah Brooke’s cottage in Peninjau, high up on Bukit Serambu, near Bau, about 30 km up the Sarawak River. Wallace made two visits, interrupted by the Christmas holiday (1855), which he spent in Kuching. While enjoying the evenings, moths would be attracted to his lamp on the verandah. He collected 1386 moths on 26 nights, but 800 of these were collected on four very wet dark nights when the moths literally came in their thousands. What a collection!

In September 1889, the Sarawak Museum sent an expedition to Peninjau. After much searching, they found the remains of the hut, which unfortunately had been destroyed by fire. The stream under the overhanging rock where Wallace and the Rajah used to shower has now no flowing water and the area has changed with surrounding development. When I visited the mountain some years ago, I was surprised that anyone could climb it at all, as it is so steep, let alone erect a hut on the top.

Other collections that Wallace made in Sarawak included birds, butterflies, shells, a flying lemur and a strange flying frog. He listed 50 species of ferns, the pitcher plants (*Nepenthes*), and of course an enormous number of insects, 25,000 specimens of 5,000 species, and most of them new. What an amazing number! He not only collected the specimens, but also sorted them, labelled and pinned the insects and packed them for transport back to his agent in London to sell. As well as the specimens themselves, he found time to write letters to his family back in England and produce papers entitled: *Observations on the Zoology of Borneo* and *On the Orang-Utan or Mias of Borneo*.

He did not collect a large number of butterflies, but one, in particular, he found at Simunjan. It was as Wallace described it, “a beautiful creature with long pointed wings-- deep velvety black with a curved band of spots of a brilliant green colour extending across the wings”. This of course is the birdwing butterfly *Ornithoptera brookeana* (now *Trogonoptera brookeana*), that Wallace named after his friend Rajah Brooke (Fig. 3). The butterfly is rare and it took some time before the female was finally identified.

Wallace left Sarawak in late January 1856. Although his time here had been relatively short, it was, nevertheless, one of the most productive periods of his life.

## THROUGH THE ARCHIPELAGO AND AFTERWARDS

After returning to Singapore, he decided to travel further east in the Malay Archipelago, where he spent the next five years. Over this period, Wallace achieved many things. He wrote his famous paper outlining the evolution of species by means of natural selection, or the survival of the fittest. He wrote this while recovering from an attack of malaria in his house in Ternate in the Moluccas. This paper he sent to Charles Darwin in London where it caused great anxiety. It was, in fact, similar to Darwin’s theory of evolution, and written before Darwin had published anything on the subject. It led to a special meeting of The Linnean Society, where Wallace’s letter and a paper by Darwin were jointly read, announcing the Theory of Evolution for the first time. Wallace of course was away in the Moluccas at the time and knew nothing of it. Although his name has often been overlooked in connection with this, he always remained pleased that his name had been linked with that of Charles Darwin at this important meeting.

His other great contribution was the realisation of the geographical division of the animals in the area. He first became aware of this by chance. He wished to travel from Singapore to Makassar (Ujung Pandang), but when he found he could not go direct, he decided to go via Bali and Lombok. When he arrived in Lombok, he noticed that the birds were not those he had been used to seeing. There were noisy parrots, honeyeaters and mound-building birds. This was new to him. Although the distance between Bali and Lombok is only 25 kilometres, the faunal change was clear. Throughout Wallace’s subsequent travels in the area, he continued to

notice a difference in the animals of Asia from those of the Australian region. This division has now been labelled "The Wallace Line" and begins between Bali and Lombok and travels north between Borneo and Sulawesi before turning north-east to the Pacific south of the Philippines. Perhaps this was Wallace's greatest discovery as it has led to the understanding of the idea of continental drift and the theory of plate tectonics, which has revolutionised our understanding of such things as volcanoes and tsunamis. This, of course, is very relevant at the present time. Over the years there has been some difference of opinion over the actual position of this line but Wallace's Line has stood the test of time.

Charles Darwin has been given the credit for the Theory of Evolution, and Wallace's contribution has always been under-rated. The two men were friends and communicated a great deal. However, they differed on several issues. One was the question of female choice. The reason for the extraordinary display of feathers in the birds of paradise has always been a problem. Wallace felt it was a survival strategy by the duller female, who was less obvious to predators being of a dull colour. It appears now that Darwin was right and that sexual choice by the female for the best display of feathers is the driving force. Wallace could never believe that the human brain was subject to the same laws of evolutionary descent as the rest of the body. Our human brain has so many other attributes, such as the appreciation of beauty and music, all of which to Wallace seemed to be on a higher plane. This led him to believe that a higher power was at work in lifting man above the ape. He postulated an over-riding force or spirit in nature. Darwin would have none of this. It is likely that Wallace's time living with the Dyak people may have influenced him.

Wallace wrote many books including, *Geographical Distribution of Animals*, *Darwinism*, *Natural Selection and Tropical Nature*. His best-known book is the classic *The Malay Archipelago: The Land of the Orang-utan, and the Bird of Paradise*. In his later years, Wallace became interested in many other things. They were about such things as socialism, spiritualism, the anti-vaccination crusade, land nationalism, women's rights and anti-militarism. He was never afraid to speak out, which often got him into trouble. He argued well and wrote all his life. His works are still very readable. Many of the things that Wallace wrote about both scientific and social, are still very much debated today.

Since Wallace made his discoveries, the science of genetics has made tremendous advances, confirming in many cases how natural selection works. As time has gone by, these concepts have been better understood and have assumed great importance in many fields. In medicine, for instance, the problem of the resistance of bacteria to one antibiotic after another is an example of evolution at work. We are losing the race here and running out of new effective antibiotics for such infections as tuberculosis and the HIV virus. We need to understand more about this, and base further research on the evolutionary principles first announced by Wallace.

## CONCLUSION

I have labelled him the Forgotten Naturalist, but I wonder how true this is now. For many years, he has been overshadowed by Charles Darwin, but recently there has been several books written about Wallace. His grave in the south of England has been upgraded and there are Wallace lecture theatres all over the country. There is even a large aviary named after him in Bristol. The Linnean Society of London, who were slow to admit Wallace as a member all those years ago, have had both a 50th and a centenary celebration of the famous July meeting when the Theory of Evolution was first announced to the world. So perhaps he is at last getting the acclaim that he so rightly deserves.

Wallace is known as the father of biogeography, but his contributions to other sciences are also significant. In zoology, he was the first to see the birds of paradise in their natural state. He studied the orang-utan. He made an enormous contribution to entomology with the collection and naming of thousands of insects. Even in anthropology, he made a study of the different races of humans in the Moluccas and New Guinea. His contribution to botany was perhaps less. In all nature including the trees and plants, he saw the idea of survival of the fittest all around him. He noticed the differing geology and how it relates to natural history. He was in fact, in his later years known as the "Grand Old Man of Science."

It is fitting, therefore, to so honour this great man here in Sarawak where I believe it all began.



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**A. R. WALLACE, COLLECTOR:  
TRACING HIS VERTEBRATE SPECIMENS. PART I**

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**ABSTRACT.**– Wallace spent longer in Sarawak than at any other destination during his travels in the Malay Archipelago. By his own account, his insect collecting was extremely productive, but his vertebrate collections were disappointing. This paper matches details of his vertebrate specimens published in *The Malay Archipelago* with surviving contemporary records. These comprise Wallace’s field collection lists, his notes on shipments to his London agent, Samuel Stevens, and other entries in two of several notebooks held in the libraries of the Natural History Museum and the Linnean Society, London. This information is compared with entries in the registers of the British Museum (now the Natural History Museum, London). It is shown that, over more than 50 years, this institution progressively enlarged its acquisitions of Wallace’s specimens, ultimately becoming the largest single repository of his vertebrate collections in the world.

**KEY WORDS.**– A. R. Wallace, Sarawak, mammal, orangutan, bird, reptile, museum.

## **INTRODUCTION**

To finance his travels and collecting in Sarawak, and subsequently elsewhere in the Malay Archipelago, Alfred Russel Wallace depended on the proceeds of the sale of specimens. For this, he relied on a London agent, Samuel Stevens, who had previously acted for him during the Amazon expedition with Bates. Stevens operated his agency at 24 Bloomsbury Street in from 1848 until 1867 (when he sold out to E. T. Higgins), and was well known in scientific circles of the time. From each destination, as he progressed around the Archipelago, Wallace shipped specimens in mixed lots. In dealing with Wallace’s consignments, Stevens was “commendably prompt and efficient in handling the sale of what Wallace regarded as duplicates” (Baker, 2001). Stevens also undertook responsibility for the distribution of material reserved by Wallace for other specified recipients, and the storage of those specimens intended for Wallace’s private collection.

While collecting in the Malay Archipelago, Wallace concentrated his effort on insects and birds, for both of which ready markets existed. His insect collecting in Sarawak was hugely successful, exceeding 25 000 specimens, by his own provisional estimation belonging to about 5000 species: 2000 beetles, 1500 moths and 1500 other insect Orders (Wallace, 1856c). Stevens was prompt in selling several hundred mixed species to the British Museum; other selections went to private collectors (Baker, 2001). From these collections, within a comparatively short time, more than 1000 new species were described (Polaszek and Cranbrook, in press). Even concentrating on the types alone, it would be a formidable, if not impossible, task to track down such a prodigious number of specimens.

In contrast, by virtue of their larger size and fewer numbers, it is more practicable to trace individual specimens of vertebrates. The trail starts with Wallace’s published work: the passages describing Sarawak experiences in his two books of an autobiographical nature (Wallace, 1869, 1905) and his scientific papers written about Sarawak wildlife (Wallace, 1855c, d, e, 1956a, b, c, d). Supplementing these publications is a significant manuscript archive, much of which was consulted by the authors of recent biographies including

McKinney (1972), Wilson (2000) and Raby (2001), and some of which has been transcribed or reproduced in facsimile (Baker, 2001; Pearson, 2002).

Wallace's customers for vertebrate specimens (i.e., mammals, birds, reptiles and amphibians) included private collectors and national institutions. Foremost among institutions was the British Museum (BM). At this period of its development, the BM acquired many specimens for its rapidly enlarging collection from Stevens, whose premises were situated conveniently near at hand in Bloomsbury. Entries in the BM registers for year 1856 listed a first batch of Wallace's vertebrate specimens from Sarawak, purchased from Stevens soon after their arrival in England; additions followed in the same year. Search through the pages of the register shows that further Wallace specimens collected in Sarawak, 1854–1856, were obtained later years, often among other material from the Malay Archipelago in large, general collections. The register indicates that these were acquired by a variety of means, including purchase from Stevens or, later, from Wallace himself, or by gift or purchase from private collectors (or their legatees).

As a consequence, at its two sites in London and (birds only) at Tring, the Natural History Museum (NHM), successor to the British Museum (Natural History), now undoubtedly holds the most important representative collection of Wallace's vertebrate specimens obtained in Sarawak during 1854–1856. While most vertebrate groups in the Museum have been listed at various times in the past, and Wallace specimens have been noted, there is still no comprehensive and up-to-date catalogue of the present enormous collections of terrestrial vertebrates in NHM. The final testimony is therefore that of the specimens themselves. Attached to many of these we have found the confirmatory evidence of special printed labels designed by Wallace for this purpose, many of which are inscribed with provisional identifications and (rather limited) collection details..

As a contribution to the Conference theme 'Wallace in context', and as a companion to the report on Wallace's insect collections from Sarawak (Polaszek and Cranbrook, in press), the present paper draws on this mix of sources to illustrate Wallace's working methods in action. In Part I, for the first time, we match the variety of published and unpublished documentary sources ending with the registers of the NHM. In some cases, the original point of capture of identified vertebrate specimens is pin-pointed. At the forthcoming conference, Part II will complete the link between register entries and specimens. Brief reports, backed by photographs, will be presented on the identity and condition of specimens still securely preserved in the storage cabinets of the Natural History Museum.

It has been a pleasure to revisit Wallace's published works and to read for the first time the extensive manuscript archive in his own hand. We are particularly grateful for their ready help to the Archivist, Polly Tucker, and Rachel Perkins and other staff of the Zoology and General Libraries at NHM, and the Librarian, Gina Douglas, and Lynda Brooks at the Linnean Society, London.

## WALLACE IN SARAWAK

Having decided that the Malay Archipelago should be his destination, Wallace spent some months in preparation for his future expedition. He found the available literature on insects inadequate and accordingly, for the families of butterflies and some of the beetles, he "made notes and sketches at the British Museum, which enabled me to recognize some of the larger and best known species; but I soon found that so many of the species I collected were new or very rare, that in the less well known groups I could safely collect all as of equal importance" (Wallace, 1905: 329).

To identify birds, he invested in Prince Lucien Bonapartes's *Conspectus generum avium*, "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", in the margins of which he added notes on the distinguishing characters of the species he expected to find in the Malay Archipelago. As a result, "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).

While in London, he made the acquaintance of Rajah James Brooke who, on the point of leaving England in April 1853, wrote to assure Wallace that he would be welcomed in Sarawak (Raby, 2001). Accordingly, in June 1853, in his request to the Royal Geographical Society (RGS) to recommend him for a free passage in a government vessel "to any convenient port in the Archipelago", Wallace proposed to make Singapore his headquarters and to visit Borneo first among the principal islands eastward to New Guinea. He cited the support of "[RGS Gold] Medallist, Sir James Brooke, who has kindly promised him every assistance", and thereby had "little doubt of success in exploring the great Island of Borneo" (McKinney, 1972, Appendix 1).

In September 1854, the two men met again in Singapore, and the Rajah reiterated his offer of “every assistance in exploring territories under his rule”. Wallace’s decision to make Borneo his first island destination was thereby confirmed; he might otherwise have gone to Cambodia (Raby, 2001). In the event, he spent longer in Sarawak than at any other place on his later travels, arriving at Kuching from Singapore on 1<sup>st</sup> November 1854, and returning to Singapore once more on 25<sup>th</sup> January 1856. As planned, his principal targets were insects and birds, but he also collected mammals, reptiles and amphibians, marine and freshwater shells, and a few plants.

As the guest of the Rajah, Wallace’s base in Kuching was James Brooke’s bungalow. For the first four months of his stay, he collected in the Sarawak river basin, “from Santubong at its mouth up to the picturesque limestone Mountains and Chinese gold-fields of Bow [Bau] and Bedé [Bidi]” (Wallace, 1869). Thanks to Brooke’s personal interest in natural history, and through the explorations and collecting he had encouraged, there was already a fair general knowledge of the vertebrate fauna of Sarawak (Keppel, 1847; Low, 1848; Mundy, 1848). Wallace was disappointed that his collections from this well frequented tract of the country were “comparatively poor and insignificant”, attributing his lack of success to the fact that these months were at the height of the wet season (Wallace, 1869). Hoping to improve his success, in March 1855 he moved to Simunjan, where a route was being cleared to take a rail line through swamp forest from the river to newly opened coal mines. Here, Wallace and his young assistant Charles Allen built their own small house, adjoining that of the supervising engineer [Robert] Coulson<sup>1</sup>.

After eight months active and successful work in this neighbourhood, on 27<sup>th</sup> November 1855, having sent Charles with the collections by sea, Wallace himself set off (with a locally recruited Malay guide, ‘Bujon’) up the Sadong river and thence by an overland route across to the headwaters of the Sarawak river, thus returning to Kuching (6<sup>th</sup> December). For a week in December and again, after Christmas in Kuching, from 31<sup>st</sup> December until 19<sup>th</sup> January, 1856, Wallace made his final collections staying with Charles and a ‘Malay boy named Ali’ at Rajah James Brooke’s bungalow, ‘Peninjau’, situated on the summit ridge of Serambu hill. On leaving for Singapore at the end of January Wallace took Ali<sup>2</sup> with him, and the two remained together during subsequent travels in the Archipelago; Charles Allen preferred to stay in Kuching for the time being (Wallace, 1869).

## THE PUBLISHED RECORD

Wallace’s chief testament is the enduringly popular account of his travels published in 1869 under the long title: *The Malay Archipelago: the land of the Orang-utan and the Bird of Paradise. A narrative of travel, with studies of man and nature*, in which chapters IV – VI cover his experiences Sarawak. This book was reprinted 15 times in his lifetime, and remains available in a variety of imprints; for page references, we have used the 1883 reprint by Macmillan. Later, in his autobiography *My life*, Wallace published abstracts from his letters home from Sarawak, which had been saved by the family (Wallace, 1905: 341–348).

While preparing for his journey to the Malay Archipelago, Wallace had attended meetings of the Zoological and Entomological Societies in London, becoming acquainted with prominent members of the scientific community including Huxley (Wallace, 1905). During his subsequent travels, these contacts, and the help of Samuel Stevens, ensured the prompt publication of his communications. His first submission from Sarawak, dated November 25, 1854 - a resumé of his entomological observations in Malacca – appeared in *The Zoologist: a popular miscellany of Natural History* (Wallace, 1855a). The famous paper written at Santubong in February 1855, “On the law which has regulated the introduction of new species”, was published in *The Annals and Magazine of Natural History* (Wallace, 1855b). These two scientific periodicals published his subsequent communications from Sarawak: a letter dated 8<sup>th</sup> April 1855, from “Si Munjon Coal Works”, reporting enthusiastically on the surroundings and the variety of insects collected (Wallace, 1855c); the description of Rajah Brooke’s birdwing (Wallace, 1855d,e) and two notes on the orangutan (Wallace, 1856a,b).

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<sup>1</sup> Referred to only as (Mr.) Coulson by Wallace in *The Malay Archipelago*, his first name is known from a later publication (Wallace, 1873).

<sup>2</sup> Ali became a useful shot and good preparator of specimens. Charles Allen was less satisfactory as an assistant and in his letters from Sarawak Wallace dwelt on his failings: ‘At present, I cannot trust him to do the smallest thing without watching that he does it properly, so that I might generally do it myself. And again . . . Every other day an hour is lost looking for knife, scissors, pliers, hammer, pins, or something he has mislaid’ (Wilson, 2000:90). In a letter to his sister Fanny Sims, in June 1855, Wallace wrote that: ‘Charles is a very nice boy, but I could not be troubled by another like him for any consideration whatever’. Charles – the son of a carpenter – was hopeless at carpentry, setting butterflies or putting up a bird – and this ‘after twelve months’ constant practice and constant teaching!’ (Raby, 2001:106).

After his return to Singapore, while waiting for the remittance from London of funds needed to continue his travels, he wrote a summary of his zoological observations in Sarawak (Wallace, 1856c), more on the orangutan, elaborating his theory on the geological succession of species (Wallace, 1856d), and a substantial paper on avian systematics (Wallace, 1856e).

Not long after his return to Singapore, over the dateline March 10, 1856, Wallace dispatched a report of his recent activities and future plans, in which he wrote disparagingly of his vertebrate collections from Sarawak: "With a very few exceptions, the Mammalia and birds are not very interesting or numerous. Of the former I obtained about thirty-five species, among which are two species of orang-utan, five other *Quadrumania*, the rare and curious otter, *Potamophilus barbatus*, the no less interesting *Gymnurus Rafflesii*, and several curious Rodentia and Insectivora. To the great orang-utans I devoted particular attention, and have probably seen more of these animals in a state of Nature than any other European: I resided for eight months in the district they frequent, and in that time succeeded in shooting fifteen specimens, male and female, old and young, and among them two males of the smaller species, hitherto known only by the female skeleton. ...

"The birds I found remarkably scarce and uninteresting, almost all being common Malacca species. Out of about a hundred I do not think more than one or two are new. ... Birds of brilliant plumage are remarkably rare, and the Psittacidae, so beautiful and numerous further eastward, are here represented only by four common Malacca species. It is clear, therefore, that, from what is known of it, Borneo does not offer a very tempting field for the researches of the ornithologist" (Wallace, 1856e).

Looking back somewhat later, in his account in *The Malay Archipelago*, he blamed the lack of assistance for the comparative paucity of his collection of vertebrates in Sarawak: "During my stay in Borneo I had no hunter to shoot for me regularly, and, being myself fully occupied with insects, I did not succeed in obtaining a very good collection of the birds or Mammalia, many of which, however, are well known, being identical with species found in Malacca. Among the Mammalia were five squirrels, two tiger-cats, the *Gymnura Rafflesii*, which looks like a cross between a pig and a polecat, and the *Cynogale Bennetti* a rare, otter-like animal, with very broad muzzle clothed with long bristles."

However, again he mentioned the exception. One of his chief objects in going to stay at Simunjan 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 of the different varieties and species of both sexes, and of the adult and young animals. In all these objects I succeeded beyond my expectations..." (Wallace, 1883). Summarising his observations in a submission dated "Sarawak Dec. 1855", and incidentally accepting the prevailing view that two species were represented, Wallace (1856b) claimed to have "examined the bodies of seventeen freshly killed Orangs, all but one shot by myself. Of eleven of these I have preserved the skins either in spirits or dried. Of seven I have perfect skeletons, and of the remainder the skulls; and of all, the sex, colour and other external peculiarities were accurately noted at the time, as well as the principal dimensions. I have besides two other skeletons and two skulls, the sex and external characters of which were determined on the authority of Europeans or natives who saw them freshly killed" (cf., Wallace 1883: 62) This summary appears to account for 21 specimens represented by 11 skins, 9 skeletons and 12 skulls but, as shown below, the total is confused by discrepancies between different sources.

Other notes on animals collected occur elsewhere in the narrative of *The Malay Archipelago*. Thus, on 16<sup>th</sup> May 1855, on an excursion from Simunjan he shot his fifth 'mias' (orangutan), a full-grown female found to be nursing a recently born (still toothless) infant which survived the death and fall of its parent (Wallace, 1883: 41-46). Wallace took this juvenile into his care. In his next letter home he wrote about "the addition to my household of an orphan baby" (Wallace, 1905: 343-345). As a companion for his pet, he obtained "a young hare-lip monkey (*Macacus cynomolgus*), which, though small, was very active and could feed itself" (Wallace, 1883: 44). After three months the orangutan died of malnutrition, diarrhoea and fever (Wallace, 1856a; 1883: 42-46).

After a period of sickness, in August 1855, with a cask of medicated arrack to preserve his specimens and a Chinese boy as a servant, Wallace set off up a branch of the Simunjan river, to Semabang where he stayed in a fine longhouse 250 feet long. On the way he saw "an abundance of monkeys – the common *Macacus cynomolgus*, a black *Semnopithecus*, and the extraordinary long-nosed monkey (*Nasalis larvatus*)" (Wallace, 1883: 52-53). During a week at this place, he shot "a deer and several monkeys" (Wallace, 1883: 53).

Shortly afterwards, on another excursion, this time accompanied by Charles Allen, he went up another branch of the Sadong river, "to a place called Menyille, where there were several small Dyak houses and one large one. Here the landing place was a bridge of rickety poles, over a considerable distance of water; and I thought it safer to leave my cask of arrack securely placed in the fork of a tree. To prevent the natives from drinking it, I let several of them see me put in a number of snakes and lizards" (Wallace, 1883: 54).

At Simunjan, Wallace was also famously presented with a specimen of “flying” frog, described and illustrated in his book (Wallace, 1883: 38–39). This he conjectured would prove to be a new species of the genus *Rhacophorus*, but apparently failed to preserve it in his cask of arrack. In describing *Rhacophorus nigropalmatus*, the species to which is attached the vernacular name Wallace’s Flying Frog, Boulenger (1895) mentioned no Wallace specimen.

It is difficult to derive a single, consistent list from these several accounts but, assuming that all animals killed were potential specimens, the indicated totals are summarised in Table 1.

## THE MANUSCRIPT ARCHIVE: 1. COLLECTING

This published information can be checked against an extensive manuscript archive. From April 1854, when he arrived in Singapore, Wallace kept a variety of written records in small, cardboard-covered notebooks. For the purpose of tracing his Sarawak collections, the first notable item among these is one of two notebooks in the Zoology library of the Natural History Museum, London, measuring 18.5 cm x 11 cm, bound in cardboard faced with marbled paper, now rather tattered (Z MSS 89 O WAL). The library also holds a bound photocopy of the contents (Wallace, 1855–58).

The front of this notebook bears an adhesive label, headed:

### *Insect Notes 3*

below which, in column, are listed the collecting localities *Borneo, Lombok, Macassar, Aru, Ternate, Dorey, Amboyna, Ceram, Waigiou*. Miscellaneous entries on unnumbered prelim pages were obviously made on different occasions. The opening page (i, recto) is headed, “Madeira contains 482 species of Coleoptera of which ....etc.” (doubtless a note made on reading the recently published paper by Woollaston, 1854). There follows a list of materials: pins of three sizes, boxes, etc. - perhaps equipment for the trip to Simunjan; then a further note, “Madeira contains under 700 flowering plants of which ... etc.”. On p. iv, below the heading “Dec. 1855 at Peninjauh” is a tabulation of the catch of moths (A.W.) and [other] insects (C.A.), evidently the raw material of the figures given in Wallace (1883: 86), and a list of beetles in spirits, in wine bottles, part of a “private collection sent home July 1855 Si Munjon”. The main text starts on page 1; headed “Dragonflies Nos. continued from 72, Singapore”, this implies a preceding notebook, now lost. Pages 4–81 are occupied by an annotated list of “Coleoptera from Borneo”, illustrated by careful anatomical drawings.

Like Wallace’s other small notebooks, this book was used simultaneously from both ends. The back cover is labelled externally:

### *Birds & mammals*

3

### **Borneo**

This end of the notebook contains key information on the original collection data of vertebrate specimens taken in Sarawak. The organisation of entries is erratic, and not chronological. Varying densities of ink and different writing utensils (pen and pencil) confirm that Wallace reverted to many of the pages on different occasions, making additions or interpolations in the original text. On (unnumbered) prelim p. iii there is “Saml Stevens’ address”, and other miscellaneous notes. Borneo interest begins on p. iv, with a list of the number of bones in the ‘Mias’ (orangutan) skeleton.

The entries for each Order (Mammalia, Birds and Tortoises) are numbered separately, and sequentially, apparently in order of collection. For some numbers, more than one specimen is indicated; evidently when additional members of the same species were collected, the specimens were given the same number. Although not specifically stated, citations of ‘Sarawak’ as a location, following contemporary usage, would have distinguished collections at Kuching or along the Sarawak river valley -- as opposed to the Sadong/Simunjan, which then lay outside the area known as ‘Sarawak Proper’. The details of these vertebrate collections are transcribed in Tables 2, a, b, c.

The general mammal list begins on the page spread 3–4 (odd numbers, unusually, falling on the left-hand page = verso), continues on p. 32 and concludes on p. 37. Evidently lacking a comprehensive work of reference, the identifications of mammals are generalised and tentative. Early enthusiasm led him to describe individuals in detail, with notes on habitat. Descriptions falter as the list lengthens, with the exception of the strange colugo or flying lemur, until the final entry casually aggregates “about 10 species” (unnamed) collected by “Peter”, presumably a local assistant. Only the first mammal is dated, but the date and location are of interest, showing that Wallace made a visit to Serambo hill (and presumably the Rajah’s bungalow) soon after his arrival, in November 1854.

In addition, a summary list of “Mias skeletons skins &c.” is given on page spread 9–10 (reproduced as Table 3). Again, it is notable that the early entries are more detailed and complete than the later, which are tantamount to summary jottings. Fuller listings of orangutan specimens are erratically interspersed among the pages of other mammal specimens, birds and tortoises. These provide detailed measurements of individuals, as follows: p. 4 (recto) *Mias kassir* ♂; p. 11, No. 5; p. 12 contains tabulations of “Skulls” of #3 and #5 (both “young”), and skeletal measurements of # 1 adult ♂ and # 4 adult ♀, followed by a summary note:

“Skeletons .. 4 male adult 3 female adult  
 7 1 “ young  
 Skins (in arrack) .. 2 large adult ♂  
 10 2 small “ “  
 4 females .. ♀  
arrived in England. 2 young ... ..”

The next page, p. 13, contains body measurements of No. 6 *Mias Kassir?* ♀ Full grown old; opposite this, p. 14, No 7. ♀ with young skin in spirits; p. 15 running on to p. 16, No. 8 - ♀ Young of No. 7 probably 4 weeks old, measured on May 19<sup>th</sup>, with additions on June 17<sup>th</sup>; p. 17, No. 9; opposite page numbered 20, # 10 - Old *Mias Chappan* ♂, with a note: “This specimen was killed by the Dyaks, & severely wounded one of them who attempting to spear the animal was seized by him and dreadfully bit in the arms and legs, the teeth passing completely through & tearing out large pieces of flesh. The mias was brought to me the next day much decomposed - so I cut off the head & took it to clean the skull, having the rest of the body placed in an inclosure in the jungle to decompose and form a skeleton - apparently in the prime of life, the teeth very fine and large. The sagittal crest [illeg.] very much developed. [Sketch of] canine tooth. June 4<sup>th</sup> Monday”. These notes can be compared with the account of the event published later in *The Malay Archipelago* (Wallace, 1883: 49–50, and frontispiece).

Further body measurements of orangutan are found on p. 27, No. 11 *Mias Pappan* - ♂, shot June 18<sup>th</sup>; p. 28, No. 12 *Mias (pappan ? Dyak)* ♀, shot June 21<sup>st</sup>; p. 40 (opposite p. 37, No. 16 ♀ adult (*Rambi*) Dyaks; p. 41, *Mias* 17, ♀ young of last; Without measurements, p.42, *Mias* No. 18, ♀ adult (*Kassir* Dyak), “skull only kept”, young shot at same time ♂, “skull much broken by bullet, not kept”. Finally, p. 43, *Mias* No. 19 ♂ *M. Chappan*; the last entry of Sarawak interest.

The list of “Birds collected in Borneo” begins on the open spread of (numbered) pages 1–2, continues on pp. 5–6 (with p. 6, recto, filled by two sketches of the bills of hornbills and, below, a note, “In a small trogon I found a grasshopper which was exactly the length of the body of the bird”), and p. 31, and concludes on pp. 33–34. On p. 16 a note is interpolated on *Sus papuensis* at Dorey, and on pp. 25–26, undated notes made in Lombok, including a sketch of the head of jungle fowl.

For the identification of birds, Wallace referred to Bonaparte’s compendium; in some instances he evidently changed his first opinion. As with the mammals, his entries became progressively sparser as time passed. It appears that the final 15 items were collected and prepared hurriedly, around Kuching (# 95, the hawk “at Rajah’s house, Sarawak”) or the Sarawak estuary, where he would have had access to open wetlands (collecting snipe, duck, water rail, sandpiper). The bird list closes with three lines of summary, probably added later:

“3 Pigeons in Borneo 3 owls 3 hawks  
 91 Land - 7 Water birds  
 abt 20 Java sp.”

Of other vertebrates, Wallace collected “tortoises”, listed on p. 24, and evidently was equipped with a source work for identifications (Table 2, c). No mention is made in these lists of snakes, lizards or frogs which, as noted above, were pickled in arrack at Menyille as a deterrent, rather than as part of a planned collection!

Holdings in the library of the Linnean Society, London, include four notebooks 22 cm x 14 cm, cardboard covered, which contain chronologically sequential narrative entries. These have been designated the ‘Journals’ (McKinney, 1972). The opening date of the first of these is 13 June, 1856, “Arrived at Bileling on the N. side of Baly 20 days from Singapore”. No ‘Journal’ is known covering the earlier period spent in Sarawak, but an untitled notebook (MS no. 180), 18 cm x 11 cm, contains miscellaneous jottings on pages 1–178 from the front, including passages written in Sarawak, starting: “March 12<sup>th</sup>, 1855 I arrived at the landing place in the Si Munjon river.”. These passages and the four ‘Journals’ have been transcribed by Pearson (2002). The Sarawak pages contain dated notes of the kills of nine orangutans, and probably the first versions of “A mias hunt” and “Habits of a young Mias”, but no additional information on collection totals.

## THE MANUSCRIPT ARCHIVE: 2. CONSIGNMENTS TO STEVENS

The next notebook of interest is also in the Linnean Society library (MS no. 179). Chronologically earlier, this is small, 15.5 cm x 10 cm, also bound in cardboard but with metal (?copper) corners and hasp. There is a printed Almanack for 1853 inside the front cover. Again, entries, mixed in subject, date and time are made on pages numbered both from the front and from the back. The front of this notebook contains a 5-page list of moths of Singapore, an annotated and partly illustrated list of "Birds collected at Singapore Malacca etc. by Alfred R. Wallace", dated June to September 1854, detailed notes on "Coleoptera, Malacca & Singapore" (with many sketches), a summary table of Diptera from "Sing. Mal." and "Sar." and three pages on "Ferns in Borneo" (52 numbers listed).

Starting on the back end-paper, the pages from the other end of this notebook contain summary lists of shipments to Stevens consigned by Wallace during his travels in the Malay Archipelago, amounting eventually to 36 pages. The lay-out is irregular, and the many additions and later interpolations make it hard to interpret these entries. The pages have been reproduced photographically, with annotations, by Baker (2001). Vertebrate specimens from Sarawak were shipped in three consignments. The first was sent from Sadong in July 1855, containing the skeletal remains of 10 orangutans, a bear skull and 12 dry chelonian specimens, all of which must therefore have been collected in that locality. The second comprised a cask containing the pickled skins of five orangutans. The last, and largest, sent from Kuching or Santubong in January 1856, just before Wallace himself departed, contained the balance of his collections including dried and pickled skins, and skeletal and cranial remains of orangutans, other osteological specimens, and the full collection of skins of other mammals (26 + 30 = 56 - ? species or specimens) and of birds - 96 species for Wallace's private purposes, representing the full collection, with 60, presumably duplicates, for sale; four bird skins were also specifically addressed to his friend (Table 4).

## THE BRITISH MUSEUM REGISTERS

Wallace's final consignment from Sarawak, by the *Water Lily* (Table 4), reached London on 21 June (Baker, 2001: 263). The first lot of Wallace's vertebrates from Sarawak was bought from Stevens by the BM in September 1856 (Thomas, 1906). At that time the BM maintained a common zoological register for vertebrate specimens. This collection, comprising the skins of 16 mammals along with five dried specimens of chelonians, was therefore registered sequentially according to the BM system as 1856 [year]. 9 [month]. 19 [collection number]. 1-22 (Table 5). The price was £12, as Stevens evidently reported by letter of October 3rd to Wallace, who made a note of it (Table 4). Compared with Wallace's *Notebook* list (Table 2a) the mammals amounted to only a partial selection, excluding highlights such as '*Potamophilus*' and '*Gymnurus*', neither of which ever came to this museum. These were perhaps among the selection sold to 'Franks', for £16 (Table 4) - whereabouts yet to be discovered! The squirrels did however include a striking example, Wallace's # 3 (Table 2, a), promptly described as new species by the Museum's Keeper of Zoology, J. E. Gray (1856). Although Wallace had observed the carriage of the tail by the living animal, his MS note was apparently not available to the artist whose colourful picture showed it in an un-lifelike posture.

In September 1856, the BM registered a second purchase from Stevens, consisting of the bear skull, noted in the first shipment by *Cornubia*, and nine reptiles and amphibians in spirit, shipped in the third consignment (Table 4). In November 1856, a skull and mounted skins of a male and a female orangutan were acquired. Stevens must have worked hard and fast to prepare these specimens, which were probably # 7, 8 and 14, together raising £76 (Table 3). In January 1857, two more orangutans were bought as osteological specimens. Two such were listed in J. E. Gray's catalogue (1862) of bones in the British Museum: the skull of a male and skeleton of a female, both identified as the 'Kasser Orang' *Simia morio*.

At the same time, Stevens was selling to private collectors. Prominent among these was Robert F. Tomes, who worked actively on mammals during 1845-63. Not until Tomes' death in 1904 did the Museum purchase from his executors "a large number of bats collected by Mr A. R. Wallace in the Malay archipelago" (Thomas, 1906), of which eight were taken in Sarawak (Table 5).

For bird specimens, which were a key interest of Wallace himself, special arrangements were made. According to Sharpe (1906: 252, 489-490), the full collections were submitted in their entirety to George Robert Gray (the middle brother of J. E. Gray and Assistant Keeper of Zoology at the British Museum) for description. Then, by agreement, all types and the first set of specimens were returned to Stevens to be held on behalf of Wallace, until his return; only the second set was allocated to the Museum. The first acquisitions by the Museum under this arrangement were 66 birds from Lombok, received in 1857. Thereafter, each year until 1865, the Museum obtained additional lots of specimens collected by Wallace, marking his progression round