

Bonner zoologische Beiträge	Band 52 (2003)	Heft 3/4	Seiten 231–243	Bonn, November 2004
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Collecting in the “Land Below the Wind”, Herpetological Explorations of Borneo

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Abstract. Herpetological explorations and collections from Borneo, including the East Malaysian States of Sarawak and Sabah, as well as the Indonesian Province of Kalimantan, are described. Borneo was far off the commercial trade route of Europe, and consequently, biological explorations of this large tropical island were to commence much later than in other adjacent regions, such as Java and Sumatra. Some of the earliest collectors include James MOTLEY, Alfred Russel WALLACE, Odoardo BECCARI and William Temple HORNADAY. The Sarawak Museum at Kuching has historically played an important role in the exploration of Borneo, and many leading naturalists of the day were based here – Eric MJÖBERG, Robert SHELFORD and Tom HARRISSON. Dutch explorations of their former colony – Kalimantan, commencing from the establishment of the Natuurkundige Commissie voor Nederlanse Indies in 1820, have been important, and significant collections from this southern portion of Borneo were reported on by Hermann SCHLEGEL, Salomon MÜLLER, Pieter BLEEKER, Theodorus Willem VAN LIDTH DE JEUDE, Jan Komelis DE JONG and Leo BRONGERSMA. The continuing new discoveries of amphibians and reptiles in recent years indicate that much remains to be learned about the herpetofauna of Borneo.

Key words. Sarawak, Sabah, Kalimantan, Sarawak Museum, Zoölogisch Museum te Buitenzorg, history of herpetology.

1. INTRODUCTION

The second largest (after New Guinea) tropical island (area ca. 575,000 km²) in the world, Borneo straddles the equator, and thereby receives rainfall spread throughout the year. Mountain ranges extend in a north-east to south-west direction, separating (the once Dutch-held) Kalimantan from the northern former British protectorates of Sarawak, Brunei and British North Borneo (now Sabah). Because of the location of the island south of the area prone to cyclones and hurricanes, Borneo and adjacent regions have been referred to as “Land below the Wind” by seafarers and travellers.

Being far from trade routes to either India or China, Borneo featured poorly in ancient maps of south-east Asia (SUÁREZ 1999) and remained isolated from the western world. Early trading links did exist between coastal regions of northern Borneo and both India and China, as archeological evidence indicates (SAID 1999). In the Sixteenth Century, emissaries of Spain and Portugal reached the shores of the island, and in 1609, there was a brief British interest in the island (HARLOW 1955). However, it was to be the Dutch and the British who were to control the island from the Seventeenth Century till the end of World War II, when Indonesia (in 1949) and Malaysian Borneo (in 1962) gained independence from colonial rule. British interests in the Far East grew primarily to protect commerce (primarily tea, but also silk and ivory) in China in the late 1700s (WRIGHT 1970). The major shipping lanes in the South

China Sea, particularly along south-western Borneo, were prone to piracy, leading to the establishment of Singapore. Independent of the British Crown Government, the English adventurer, James BROOKE arrived in Sarawak in 1839, and for helping the Sultan of Brunei in quelling a local rebellion in 1840, was awarded the territory. Self-proclaimed Rajah, BROOKE started to rule north-western Borneo in 1842. The political stability of Sarawak, as a result of the rule of the BROOKES and the support given to visiting European intellectuals soon began to attract, among others, natural historians and collectors curious about the natural production of this great island.

Because the history of herpetology, and indeed biological research in general, of Borneo started relatively recently compared to other parts of the Indo-Malayan region, such as Java (RAFFLES 1817; HORSFIELD 1821–1824) or Sumatra (MARSDEN 1811; RAFFLES 1822; see also GALLOP 1995), natural history drawings have not played an important part in the advancement of scientific knowledge on Borneo. As recently as 1832–1834, English traveller G. W. EARL (1837) remarked that the north-west coast of Borneo, from Tanjung Datu to Brunei “is scarcely known even to the native trader”. The first checklist of the amphibians and reptiles of Borneo appeared in an appendix of a book published in 1848 by the Scottish botanist, Hugh LOW (1824–1905), who was described as an admirer and disciple of James BROOKE (1803–1868), the First Rajah of Sarawak. The work listed 19 species of reptiles and three of amphibians

(although several more were mentioned in the text itself, including unspecified "land tortoises" of two species, flying lizards, *Draco volans* Linnaeus, 1758, etc.). For some, only generic identities were provided, the list evidently prepared on the basis of specimens existing at the time in the British Museum, London (COWAN 1968).

In this essay, the history of herpetological explorations of Borneo is traced from around the middle of the 1800s, with the establishment of the rule of the BROOKES in Sarawak, to around the end of the colonial period, with the independence of Malaysia and Indonesia.

2. EXPLORATIONS OF BRITISH BORNEO IN THE 1800S

The earliest specimens in western museums came from collections made by European residents of Sarawak and from the Dutch settlements of what is now Kalimantan, or by explorers in search of botanical or zoological specimens. For instance, in 1864, the British Museum (Natural History), London (now, the Natural History Museum, London), received from Borneo a collection made by Lewis Llewellyn DILLWYN (?-?), from "Labuan and Borneo", some of the collections made with the assistance of James MOTLEY (1814–1892), a civil engineer with the Eastern Archipelago Company at the Labuan coal mines (1851–1854), and later at Banjarmasin (1854–1859). It was the intention of the duo to publish an illustrated work on the natural history of Borneo, along the lines of their 1855 work on the natural history of Labuan and adjacent areas of northern Borneo, which was abandoned after MOTLEY's untimely death (SMYTHIES 1957). The British Museum, in 1872 and 1893–1894, purchased a collection made by Alfred Hart EVERETT (GÜNTHER 1872; BOULENGER 1906).

At about the same time, Italian nobleman Marquis Giacomo DORIA of Genoa (1840–1913) and botanist Odoardo BECCARI (1843–1920) were collecting on the island as well, landing on the shores of Borneo in June 1865. DORIA returned to Europe early, on account of ill health, while BECCARI, who was later to become famous for his botanical collections (see biographies in CRANBROOK 1986; SAINT 1987), remained till 1868. BECCARI made some significant collections of amphibians and reptiles (see SHELFORD 1905b, for BECCARI's route and activities) that were worked on by Wilhelm Carl Hartwig PETERS (1815–1883), who wrote two papers in 1871 and 1872, and by PETERS & DORIA (1878), who described numerous herpetological novelties collected by the expedition of DORIA and BECCARI to Borneo. The types of these species are at present extant either in the Zoologisches Museum für Naturkunde, in Berlin (BAUER et al. 1995) or Museo Civico di Storia Naturale

di Genova, Genova (CAPOCACCIA 1957; 1961). Unfortunately, the localities of collection were not precise, although DORIA and BECCARI concentrated their collecting activities in Sarawak (see BECCARI 1902, English translation, 1904, for an account of the expedition). From the Kanowit River, in the interior of Borneo, BECCARI reported a palustrine crocodile, possibly the enigmatic *Crocodylus raninus* Müller & Schlegel, 1844 ("Boaya katak" or frog crocodile), although it was not mentioned if a specimen was actually secured. In all, the Italian expedition collected 88 species, of which 19 were reported as new to science.

Perhaps the most celebrated collector of all to visit Borneo was Alfred Russel WALLACE (1823–1913), co-founder with Charles Robert DARWIN (1809–1882) of the theory of evolution through natural selection. Already well travelled in Amazonia, WALLACE's collecting activities on Borneo were on the Simunjon and Sandong Rivers of Sarawak, and his material is at present in The Natural History Museum, London (field sites in Borneo visited listed in BAKER 2001). Wallace arrived in Sarawak from Singapore on 1 November 1854; he left Sarawak on 25 January 1856 (BASTIN 1986). Although insects were his primary target, he also collected herpetological specimens. In his now famous work, *The Malay Archipelago*, WALLACE (1896: 49–50) described the discovery of *Rhacophorus nigropalmatus* BOULENGER, 1895 thus:

"One of the most curious and interesting reptiles which I met with in Borneo was a large tree-frog, which was brought me by one of the Chinese workmen. He assured me that he had seen it come down, in a slanting direction, from a high tree, as if it flew. On examining it, I found the toes very long and fully webbed to their very extremity, so that when expanded they offered a surface much larger than the body. The fore legs were also bordered by a membrane, and the body was capable of considerable inflation. The back and limbs were of a very deep shining green color, the under surface and the inner toes yellow, while the webs were black, rayed with yellow. The body was about four inches long, while the webs of each hind foot, when fully expanded, covered a surface of twelve square inches. As the extremities of the toes have dilated discs for adhesion, showing the creature to be a true tree-frog, it is difficult to imagine that this immense membrane of the toes can be for the purpose of swimming only, and the account of the Chinaman that it flew down the tree becomes more credible. This is, I believe, the first instance known of a "flying frog". And it is very interesting to Darwinians, as showing that the variability of the toes, which have been already modified for purposes of swimming and adhesive climbing, have been taken advantage of to enable an allied species to pass through the air like the flying lizard".

WALLACE is known to have influenced James BROOKE (1803–1868) to establish the Sarawak Museum (BANKS 1983; LEH 1993). The temporary building opened to the public in 1886, the present building in 1891. The museum was further developed through the encouragement of his successors, Charles BROOKE (1829–1917) and Charles Vyner BROOKE (1874–1963), along the lines of western museums of the time (MAITLAND 1998). Thus, with the solid support of the government, the hiring of professional curators and the publication of scientific results in the museum's official organ, the *Sarawak Museum Journal*, the Museum was to flourish in the century to follow. The first Curator of the Museum was John E. A. LEWIS (?–?), appointed in 1888 (HARRISON 1961). He was succeeded by George Darby HAVILAND (1857–1901) who served 1893–1895 and was primarily interested in botany and ornithology. There are no records of herpetological researches (apart from HAVILAND's collections from Sarawak, and also, during a trip to Gunung Kinabalu – see JENKINS 1996), carried out by the first two Curators of the Museum.

Edward BARTLETT (ca. 1836–1908) was Curator of the Sarawak Museum from 1895 to 1897, and it was during his time that the zoological collections of the Museum started to grow. His most important herpetological contribution was a 24 page account of the crocodiles and lizards of Borneo that were represented in the Sarawak Museum, including the description of eight new species of lizards (BARTLETT 1895e). Bartlett also wrote a series of papers in *The Sarawak Gazette*, the monthly official gazette for the staff of the Civil Service (many of whom generously donated specimens to the Museum), on turtles and tortoises (1894a, 1895a, 1895b, 1896b), amphibians (1894b) and snakes (1895c, 1895d, 1896a, 1896c). These were essentially checklists, annotated with locality records and, occasionally, brief descriptions and natural history tidbits, and were reprinted in a book edited by BARTLETT (1896d). A biography of this early naturalist is in DAS (2000).

Two prominent Englishmen, both civil servants in the employ of the Sarawak Civil Service and the British North Borneo Company, were to become famous as collectors of amphibians and reptiles of Borneo in the late 19th Century – Charles HOSE and Alfred EVERETT. Although neither published specifically on herpetology, they made collections available (usually through sale) to various museums in Europe and the United States, where they were worked on by museum-based systematists.

Alfred Hart EVERETT (1849–1898) came to Sarawak to study cave deposits at the recommendation of the famous British geologist, Charles LYELL (1797–1875), and also to collect natural history specimens for sale to museums and private collectors (CRANBROOK & LEH

1983). EVERETT (see ANONYMOUS 1898, for an obituary notice) was, at various times, in the employ of the Sarawak Civil Service (between 1872–1876 and 1885–90) and the British North Borneo Company (1876–1883), and collected amphibians and reptiles from both areas which were described by GÜNTHER (1872) and BOULENGER (1893, 1895a, 1896) at the British Museum, London.

EVERETT's collecting zeal and commercial skill is thought to have inspired Charles HOSE (1863–1929), who joined the Sarawak Civil Service under EVERETT in 1884. HOSE is best known as an amateur ethnographer, but surpassed his mentor in the business of collecting and selling botanical and zoological specimens, which reached many museums around the world (DAVIES & HULL 1976). This undoubtedly supplemented his income, stretched during his working life by his generous hospitality to scholars from overseas (DURRANS 1993), and perhaps also supported him after an early retirement from the Service. HOSE's herpetological collections, from Mt. Dulit, and other then inaccessible localities in Sarawak, were reported on by BOULENGER (1893, 1895b). HOSE's scientific contributions, including publications, have been enumerated by NUTTALL (1927). Among numerous visitors HOSE worked with, or provided specimens to, were the HARRISON-HILLER Expedition in 1897–1898, lead by Alfred Craven HARRISON, Jr. (1869–1925) and Hiram Milliken HILLER (1867–1921), and the Furness Expedition lead by William Henry FURNESS, III (1868–1920) from the University of Pennsylvania (FURNESS 1897; STONE 1900; MEDWAY 1965). The routes taken by these expeditions have been depicted in KATZ (1988), and herpetological specimens collected were deposited in the Wistar Institute and are at present in The Academy of Natural Sciences, Philadelphia (BROWN 1902).

Among early American collectors in Borneo was William Temple HORNADAY (1854–1937), whose expedition to Asia was sponsored by Henry Augustus WARD (1834–1906), Professor of Natural Science at the University of Rochester. HORNADAY's collecting activities were restricted to Sarawak (HORNADAY 1885), and concentrated on large species of commercial interest, including orang utans (*Pongo pygmaeus* [Linnaeus, 1760]), and crocodiles, and also various species of amphibians and reptiles. An examination of the lists of HORNADAY's material at the Museum of Comparative Zoology, Harvard College, indicate that he must have collected primarily from lowland sites. Other specimens were presumably retained by the University of Rochester's Natural Sciences Establishment that WARD founded (GULLICK 1993). This early Bornean material included several novelties: *Draco gracilis* BARBOUR (1904a), at present synonymized under *D. cornutus* Günther, 1864 and *Nectes obscurus* Barbour, 1904b,

now *Pseudobufo subasper* Tschudi, 1839. HORNADAY's great interest in crocodylians is expressed several times in his writings, and his specimen of *Crocodylus raninus*, now in the Museum of Comparative Zoology (MCZ 6727), from an unknown Bornean locality (presumably in Sarawak) is still one of few specimens known of this enigmatic freshwater crocodylian (see ROSS 1990). At the time of HORNADAY's visit to Sarawak, crocodiles were caught for the government reward of 35 cents per foot, and in 1878 alone, 266 crocodiles were brought to Kuching for destruction, and an amount of \$738.28 paid in rewards. At present, crocodylians are protected by legislation in Sarawak, and at places, such as the Batang Lupar, continue to take human lives (see RITCHIE & JONG 2002; STUEBING 1985; STUEBING et al. 1985). A biography of HORNADAY is in GULLICK (1993).

The most spectacular novelty to come out of Borneo at that time is the so-called Bornean earless monitor, *Lanthanotus borneensis* Steindachner, 1877, described as a new family, genus and species by Franz STEINDACHNER (1834–1919), Curator of Naturhistorisches Museum Wien (STEINDACHNER 1877). The second specimen to be seen in Europe, one on loan from the Rajah of Sarawak, was exhibited at a meeting of the Zoological Society of London in 1899 (Anonymous 1899). Although a precise locality was not provided in the original description, this species is now known from lowland sites in eastern and central Sarawak (MANTHEY & GROSSMANN 1997). The Rajah of Sarawak, as well as his staff were also important donors of herpetological specimens to the British Museum, which were described by a succession of curators in London.

The most successful scientific expedition of the time was one by John WHITEHEAD (1860–1899), an ornithologist who visited Mount Kinabalu in 1887–1888 (JENKINS 1996; WONG 1995). WHITEHEAD's herpetological material was reported on by both BOULENGER (1887) at the British Museum (Natural History) and MOCQUARD (1890) at the Musée National d'Histoire Naturelle, Paris, although no consensus was reached on the validity of some of the species described by the latter (see BOULENGER 1891). MOCQUARD's list shows 204 species for Borneo – 49 amphibians and 155 reptiles. WHITEHEAD's (1893) massive monograph on the mountain and its plant and animals life include reprints of papers by others that were based on his collections. On the heels of WHITEHEAD was the 1899 expedition lead by Karl Richard HANITSCH (1860–1940), of the Raffles Museum, Singapore, primarily to add to the collections of that museum. A large number of zoological specimens was collected (HANITSCH 1900); the amphibians and reptiles, included three new species of squamates and a new genus of snake (*Oreocalamus* Boulenger, 1899).

Towards the end of the century, around the early 1890s, Jan Christiaan PRAKKE (1860–?), who became an elected member of the Koninklijke Natuurkundige Vereeniging in Nederlandsch Indië in 1887 (biography in FRANSEN et al. 1997), collected amphibians and reptiles from the neighbourhood of Sandakan Bay, in the then British North Borneo. The collection is extant in Naturalis, the Nationaal Natuurhistorisch Museum, Leiden, and was reported on by Theodorus Willem VAN LIDTH DE JEUDE (1893). It contained one new species – *Japahwa ornata* van Lidth de Jeude, 1893 (at present *Aphaniotis ornata*) of lizard and two snakes – *Calamaria prakkei* van Lidth de Jeude, 1893 (considered valid at present) and *Bothrops sandakanensis* van Lidth de Jeude, 1893 (a synonym of *Trimeresurus borneensis* [Peters, 1871]).

3. EXPLORATIONS OF DUTCH BORNEO IN THE 1800S

There was little interest in the natural history of the Dutch territories of Borneo during the administration of the Dutch East India Company, which came to an end in 1796. In 1820, with the establishment of the Natuurkundige Commissie voor Nederlandse Indies, naturalists were appointed to explore and collect in the Netherlands East Indies (HUSSON & HOLTHIUS 1955; MOULTON 1914), this predating explorations that were to be supported in the British-held Borneo to the north. Collections for the Dutch museums were made by the German taxidermist, Salomon MÜLLER (1804–1864) of Heidelberg in 1836 from Banjarmasin and the lower reaches of Sungei Barito, from where he described *Tomistoma schlegelii* (Müller, 1838), the Malayan or Sunda gharial. These areas were visited earlier by the French natural historian and Correspondent of the Museum in Paris, Pierre Médard DIARD (1794–1863) in 1826, when he toured Banjarmasin, Pontianak and the Sungei Barito as Inspector of Agriculture under the Dutch East Indies Government (FRANSEN et al. 1997; GÜNTHER 1872; ROSS 1990). MÜLLER & SCHLEGEL (1844) later published the description of an endemic Bornean freshwater crocodile, *Crocodylus raninus*, based on these collections, and Hermann SCHLEGEL (1804–1884) described several new species of snakes in two volumes (SCHLEGEL 1837a, 1837b). Diard, who travelled with Alfred DUVAUCEL (1793–1824) to India, Sumatra and Borneo, joined the Natural History Commission of the Dutch Indies in 1829, becoming its head in 1832. Between 1820 and 1825, he sent specimens to the Musée National d'Histoire Naturelle, Paris, but thereafter, his collections were sent to Leiden (KINNEAR 1953).

Other Europeans also collected and/or described material from Borneo contemporaneously with DIARD. The French civil engineer and explorer, Maurice Armand CHAPER (1834–1896) travelled in western Borneo be-

tween November 1890 and January 1891 (described in CHAPER 1894a; 1894b). CHAPER's Bornean collections of amphibians and reptiles from what is now Kalimantan (including Pontianak, Sintang, Sebruang and the drainage of the Kapuas), went to the Muséum National d'Histoire Naturelle, Paris, resulting in a paper by MOCQUARD (1892), which dealt with 25 species of reptiles and eight species of amphibians. Two new genera, one each of reptile (*Idiopholis* Mocquard, 1892, a subjective synonym of *Pseudorabdion* Jan, 1862) and amphibian (*Chaperina* Mocquard, 1892, at present valid, named for the collector) were described. A Prussian ornithologist, Friedrich GRABOWSKY (1857–1929), of the museum at Braunschweig, Germany, visited south-eastern Borneo, mainly around Banjarmasin and the western Borneo, mainly in the Kapuas area, in 1881–84. GRABOWSKY's collections were reported on by FISCHER (1885), who described, among other species, the colubrid *Calamaria grabowskii* Fischer, 1885.

One of the most significant herpetological collections were made during the three expeditions by the Dutch Scientific Expedition to Central Borneo, organised by the "Maatschappij tot bevordering van het natuurkundig onderzoek der Nederlandsche Kolonien", between 1893–1900 (see FRANSEN et al. 1997, for an account). Their objectives were to explore the headwaters of the Kapuas River in south-western Borneo in order to collect geological, botanical, zoological and ethnographical material for museums in the Netherlands. The First Expedition was led by Gustaaf Adolf Frederik MOLENGRAAF (1868–1942) and Johann BÜTTIKOFER (1850–1927). BÜTTIKOFER, the official zoologist, collected much valuable material by travelling up river, to the Mandai and Sibau Rivers, besides ascending Mount Kenepai and Liang Koebeng (see FRANSEN et al. 1997, for a biography). Also a member of the Expedition as doctor-ethnologist-quartermaster was Anton Willem NIEUWENHUIS (1864–1953), later (1898–99) to become the first European to cross Borneo at its widest part, from Pontianak to Samarinda (SMYTHIES 1955; VAN GOOR 1995). NIEUWENHUIS conducted three expeditions to Borneo, and his name is associated with a mountain range at the source of the Baleh, as well as the remarkable scincid lizard, *Lamprolepis nieuwenhuisii*. The plant specimens collected were sent to the Botanical Gardens at Buitenzorg (at present Bogor), the preserved animals to the Rijksmuseum (at present Nationaal Natuurhistorisch Museum) in Leiden. The herpetological collections from the Expedition made by BÜTTIKOFER, and later by NIEUWENHUIS during his travels in central Borneo, were reported by VAN LIDTH DE JEUDE (1905), and are significant in containing several new species that are considered valid today: *Ophisaurus buettikoferi* van Lidth de Jeude, 1905, *Lygosoma buettikoferi* van Lidth de Jeude, 1905 (at present in *Spheno-*

morphus Fitzinger, 1843), *Lygosoma nieuwenhuisii* van Lidth de Jeude, 1905 (at present in *Lamprolepis* Fitzinger, 1843), *Lygosoma hallieri* van Lidth de Jeude, 1905 (at present in *Sphenomorphus*), *Tropidophorus iniquus* van Lidth de Jeude, 1905 and *T. micropus* van Lidth de Jeude, 1905. Many of the species reported are rare in collections, and some have not been collected since their original description.

Pieter BLEEKER (1819–1878), an army surgeon with the Dutch East Indian Army, based in Batavia, published extensively on both ichthyology and herpetology (see FRANSEN et al. 1997, for a biography). During his time in the East Indies (1842–1860), he reported on collections made by others from various parts of Dutch East Indies. For instance, he reported on herpetological (and ichthyological) collections made from the west coast of Dutch Borneo and on new species of snakes from Sintang and Sinkawang (BLEEKER 1857, 1859a, 1859b). Bleeker also did some travelling, including two years at Samarang, Surabaya and Ambarawa, as well as a voyage to the Celebes (Sulawesi) and Moluccas (Maluku) in 1856 and founded the Natuurkundige Vereeniging in Nederlandsch Indië. BLEEKER (1859c) published a checklist of the herpetofauna of Borneo, which shows 82 reptile and eight amphibian species. Although his herpetological work is substantial, BLEEKER was primarily an ichthyologist, and of his 730 publications, 520 were on fishes (ROBERTS 1989). A herpetological contemporary of BLEEKER was Lieutenant A. C. J. EDELING (?–1895) of the Dutch Navy, who also reported on collections made by others (EDELING 1864a; 1864b). His 1864a paper described a number of new records, and some new species (including *Apterygodou vittatum* Edeling, 1864, a new genus and species of scincid lizard), based on collections from Banjarmasin made by M. BENJAMINS (?–?), an army physician of the Dutch East Indian Army.

4. EXPLORATIONS OF BRITISH BORNEO IN THE 1900S

Also collecting in British Borneo at the turn of the century was Harrison Willard SMITH (1872–?), a professor of Physics at Harvard College, USA. SMITH collected in Borneo during two visits (1909 and 1911–1912) and donated a large collection of vertebrates as well as insects to the Museum of Comparative Zoology at Harvard. BARBOUR (1921) and BARBOUR & NOBLE (1916) worked on the herpetological collection from Sarawak, which included four new species of amphibians and reptiles (two of which, the frog, *Calliglutus smithi* Barbour & Noble, 1916, now *Calluella smithi*, and the lizard, *Tropidophorus perplexus* Barbour, 1921, are still valid). SMITH collected from the then zoologically unknown regions of Limbang, the Madalam River districts,

Mt. Lundu, the Tinjar River districts and near Gunung Mulu.

Perhaps apprehensive of huge bands of overenthusiastic foreign collectors descending on Sarawak, Charles BROOKE (1906) issued an order (No. IV, 1906), directing collectors or exporters of plants and animals to apply for permits for "a limited quantity only of birds, animals or plants", which was to be issued by the Resident's Office in Kuching.

Meanwhile, the Sarawak Museum continued to flourish. Successive curators added much to its collections and wrote numerous papers describing new species and natural history notes. Equally important, several of them published memoirs of their time in Sarawak. Between 1898 and 1905, the Curator of the Museum was Robert Walter Campbell SHELFORD (1872–1912), who, besides writing a couple of taxonomic papers of herpetological interest, prepared a checklist of the reptiles of Borneo in 1901 (an addenda and corrigenda appeared in 1902). A total of 212 species was listed as occurring (deleting erroneous records and including new reports in SHELFORD's 1902 note), and localities were provided for the species listed. Doubtful specimens, including those Shelford thought were new to science, were sent on to BOULENGER at the British Museum to identify or verify, and the types of several new species described by BOULENGER (1900) were eventually donated to the British Museum. An account of the life of SHELFORD, including the history of his incomplete manuscript that was subsequently published as *A naturalist in Borneo* (1916), is in POULTON (1916).

John Coney MOULTON (1886–1926), during whose time (1908–1915) the Museum building was enlarged, made herpetological collections, but wrote no major papers specific to the subject. He was succeeded by Eric Georg MJÖBERG (1882–1938, born Hallands IAN) who served in this capacity 1922–1924. Although not a herpetologist, remarkable observations on the behaviour of reptiles were penned by MJÖBERG. Ever the adventurer and explorer, in his 1928 work, originally published in Swedish (translated into English in 1930), he wrote "Snakes and other reptiles find a paradise in Borneo, and there develop a beauty of form and splendour of colour which they seldom achieve elsewhere". MJÖBERG went on to describe and provide anecdotal information on many of Sarawak's local snakes and crocodiles. MJÖBERG's herpetological collections, particularly from montane regions (such as Gunung Murud, Gunung Gading, Gunung Penrissen and Gunung Pueh, including the adjacent Gunung Beremput) were studied by the British physician-herpetologist, Malcolm Arthur SMITH (1875–1958), who wrote a couple of long papers (1925a; 1925b), describing new species. He was to later (SMITH 1931) write an account of the herpetofauna of Gunung

Kinabalu, based on a collection of some 600 specimens (now mostly in the Raffles Museum of Biodiversity Research, National University of Singapore) made by Frederick Nutter CHASEN (1897–1942) and H. M. PENDLEBURY (?–?) to this mountains between April and May 1929 (PENDLEBURY & CHASEN 1932). Six new herpetological species were recognised based on this collection.

Edward BANKS (?–?) succeeded MJÖBERG in 1925, remaining during the war years (when he was interned by the Japanese Army) till 1947. BANKS' zoological emphasis was on mammals, and apart from a 1931 paper on crocodiles and a 1937 paper on sea turtles, did not publish on herpetology.

After the devastation of World War II, Tom Harnett HARRISSON (1911–1976) was hired as Government Ethnologist and Curator of the Museum in 1947. HARRISSON studied the nesting of sea turtles on the coast of Sarawak, reporting the laying of over 2 million eggs. Those harvested were sold at 2 cents apiece, the proceeds going to various religious and charitable purposes (ANONYMOUS 1949). HARRISSON wrote a series of papers on sea turtle biology in the *Sarawak Museum Journal* in 18 parts, becoming a prominent spokesperson for their conservation (CHIN 1976). He, his wife, Barbara Brünig HARRISSON née GUTTLER (1922–) and a colleague, the geologist Neville Seymour HAILE (1928–), also reported the rediscovery of *Lanthanotus borneensis*, till then known in Europe only from the holotype in Vienna and a specimen that was briefly viewed in London in 1899 (B. HARRISSON 1961, 1962; T. HARRISSON 1963; HARRISSON & HAILE 1961), and made specimens available to others, such as Robert Friedrich Wilhelm MERTENS (1894–1975) at the Senckenberg Museum in Frankfurt am Main, Germany, who wrote papers on its morphology and behaviour (MERTENS 1961, 1962, 1966, 1970), the Museum of Comparative Zoology at Harvard, the Field Museum of Natural History, in Chicago and the Rijksmuseum van Natuurlijke Historie, in Leiden. At the end of World War II, in 1948, HARRISSON visited the Kelabit Highlands, primarily to collect large mammals for exhibition in his museum (ANONYMOUS 1950), the incidentally collected herpetological material was worked on by Michael Willmer Forbes TWEEDIE (1907–1993) and reported in a paper published in 1949. Obituaries of HARRISSON have been written by SMYTHIES (1975) and MEDWAY (1976).

John Augustus GRISWOLD, Jr. (1912–?), an American collector, visited northern Borneo in 1937 as a member of the Asiatic Primate Expedition. Among other places, GRISWOLD worked at Mount Kinabalu in 1937 (SMYTHIES 1957). GRISWOLD's collection resulted in the description of *Calamaria griswoldi* Loveridge (1938), as well as several other new herpetofaunal spe-

cies (LOVERIDGE 1938, 1944) from this mountain range.

5. EXPLORATIONS OF DUTCH BORNEO IN THE 1900S

Although material, plants and animals, collected from its colony in the East Indies were taken back to Europe, and most of these deposited in either the collections at Amsterdam or Leiden, the need was felt for a zoological museum in Java. J. C. KONINGSBERGER (?-?), appointed as a government entomologist between 1898–1917, conceived the idea of a zoological museum which was established in Buitenzorg (Bogor). Zoölogisch Museum te Buitenzorg (at present, Muzium Zoologicum Bogoriense) was established in 1901, and the first herpetological collection received was that gathered by NIEUWENHUIS in Borneo (LIEFTINCK & BEMMEL 1941, 1945). The Museum's first periodical was *Contributions à la Faune des Indes Néerlandaises* (1915), which was replaced by *Trenbia* in 1919. The collection was moved in 1999 to a modern building in the nearby town of Cibeinong.

Carl Sofus LUMHOLTZ (1851–1922), the celebrated Norwegian explorer and ethnographer, collected zoological specimens incidental to his anthropological studies in central, southern and eastern parts of Dutch Borneo, between 1914–15. He died tragically of an insect sting before his ethnographic and other reports could be published, and the only writing left of his Bornean expedition is the 1920 account of his journey (KING 1991). LUMHOLTZ's zoological collections were dispersed, and were worked on by curators of different museums (see VOOUS 1961, for a list). The lizards and amphibians from LUMHOLTZ's collection were deposited in the Zoological Museum in Kristiania and reported on by ANDERSSON (1923), who described two new species—*Aeluroscolabotes longicandatus* Andersson, 1924 (now treated as synonymous with *A. felinus* (Günther, 1864) and *Rana macrodon* var. *leporina* (Andersson, 1923) (at present *Limnodynastes leporinus*, the familiar Bornean giant river frog). The snake collection from the LUMHOLTZ expedition was deposited in the United States National Museum, Washington, D.C., and worked on by STEJNEGER (1922).

A collection of snakes and lizards was made in 1910 by a German collector, BRUEGEL, for the Staatliches Museum für Naturkunde, Stuttgart and the Zoologische Staatssammlung des Bayerischen Staates, Munich, from unspecified localities in "Central-Borneo". BRUEGEL's material was worked on by MERTENS (1924), who described a new genus, *Hylagama* Mertens, 1924 (at present synonymous with *Harpesaurus* Boulenger, 1885) and a new species, *H. borneensis* (Mertens, 1924) of lizard, and a new species of snake, *Calamaria bruegeli*

Mertens, 1924 (at present a synonym of *C. lumbricoidea* H. Boie in F. Boie, 1827).

A small collection of amphibians and reptiles was made from eastern Borneo in 1925 by the Dutch ornithologist, Hendrik Cornelis SIEBERS (1890–1949) of the "Uitgave van het Indisch Comité voor wetenschappelijke onderzoekingen", and staff of the Zoölogisch Museum te Buitenzorg in charge of vertebrates during the "Midden-Oost-Borneo Expeditie, 1925" (BUIS et al. 1927). The collections made were from localities in Kalimantan, including Long Petah, Long Hoek, Narak and Marah, and were presented to the Dutch Zoological Museum, Amsterdam and the Nationaal Natuurhistorisch Museum, Leiden. The reptile specimens were reported on by Jan Kornelis DE JONG (1928), who replaced SIEBERS at the Zoölogisch Museum te Buitenzorg and BRONGERSMA (1928), and the amphibians by BRONGERSMA (1937). They included five lizard, 17 snake and 10 amphibian species, none of which was considered new to science, but provide new localities and range extensions of several poorly known species. DE JONG (1930) later reported on a smaller collection of reptiles in the Museum collection, including the description of a new species—*Japalura nasuta* de Jong, 1930 (at present synonymous with *Aphanotis ornata*) and *Elapoidis fusca* Boie, 1827 (a new record for the island, to be reported again by VOGEL & KÖHLER, 1996), both from unspecified localities in North Borneo. Americans who collected in Dutch Borneo include William Louis ABBOTT (1860–1936), who visited Borneo and Sumatra in his own vessel manned by Malay and Chinese crew. ABBOTT's collection was deposited in the United States National Museum, and was worked on by COCHRAN (1923, 1926), resulting in the description, among others, of a new megalophryid, *Leptobrachium abbotii* (Cochran, 1926), from Balikpapan.

6. THE POST-COLONIAL PERIOD

Following independence of the countries within Borneo (Sarawak, Sabah and Brunei from British rule and Kalimantan from Dutch rule), herpetological research and explorations increased in Sarawak and Sabah, due, in no small measure, to the efforts of a single man—Robert Frederick INGER (1920–) of the Field Museum of Natural History, Chicago. Within the larger portion of Borneo (the Indonesian Kalimantan Province), herpetological research almost ceased, apart for a few concentrated collecting efforts made recently.

The story of discoveries of remarkable new amphibians and reptiles from Borneo is far from over—virtually every sampling continues to yield new species and even new genera and family for the island. BACON (1967); DAS & BAUER (1998); DAS & HAAS (2003), DAS & LIM (2003), DRING (1983a, 1983b, 1987); DE GRIJS (1937);

GÜNTHER & MANTHEY (1995); HAILE & INGER (1959); HIKIDA (1982; 1990); INGER (1957, 1958a, 1958b, 1966, 1967, 1989); INGER et al. (1995, 1996); INGER & FROGNER (1980); INGER & GRITIS (1983); INGER & LEVITON (1961); INGER & STUEBING (1991, 1994, 1996); ISKANDAR (1978); KIEW (1984a, 1984b); MALKMUS (1992; 1996); MALKMUS & MATSUI (1997); MALKMUS & REIDE (1996); MANTHEY & STEIOF (1998); MATSUI (1986); OTA & HIKIDA (1988, 1991); OTA et al. (1996); STUEBING (1994); STEUBING & WONG (2000) and WALLACH & GÜNTHER (1998), all reported on new taxa in the last few decades. Although illustrated field guides to most of the herpetofauna are now available – INGER & STUEBING (1996) for anuran amphibians, STUEBING & INGER (1999) for snakes, DAS (2004) for lizards, and LIM & DAS (1999) for turtles, there remains much to be learned of the amphibians and reptiles of this large island.

Acknowledgements. Curators, other research staff and librarians of many institutions permitted me to examine historical specimens, refer to literature, and were most generous with their time and attention. These include: Ned Gilmore, The Academy of Natural Sciences, Philadelphia; Charles Myers, American Museum of Natural History, New York; Colin John McCarthy, Natural History Museum, London; Robert Frederick Inger, Alan Resetar and Harold Knight Voris, Field Museum of Natural History, Chicago; Adria Katz, Oceanic Collection, University Museum, University of Pennsylvania, Philadelphia; José Rosado and Van Wallach, Museum of Comparative Zoology, Cambridge, MA; Edouard-Raoul Brygoo and Patrick David, Muséum National d'Histoire Naturelle, Paris; Marinus Charles Hoogmoed, Nationaal Natuurhistorisch Museum, Leiden; Ulrich Manthey, Society for Southeast Asian Herpetology, Berlin; Charles Leh, Sarawak Museum, Kuching; Kelvin Kok Peng Lim, Peter Kee Lin Ng and Chang Man Yang, Raffles Museum of Biodiversity Research, National University of Singapore; Ronald Ian Crombie and George Robert Zug, National Museum of Natural History, Smithsonian Institution, Washington, D.C.; and Leobertus van Tuijl, Zoological Museum, Amsterdam. Kraig Adler, Aaron M. Bauer, Patrick David, Siegfried Eck, Uwe Fritz, Robert Frederick Inger, Ulrich Manthey, Tyson Roberts, Robert Butler Stuebing and Van Wallach provided information and/or comments on the manuscript.

Manuscript preparation was supported by UNIMAS, and I thank Prof. Ghazally Ismail, Fatimah Abang, Andrew Alek Tuen and my other colleagues at the Institute of Biodiversity and Environmental Conservation, for their support.

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Zeitschrift/Journal: [Bonn zoological Bulletin - früher Bonner Zoologische Beiträge.](#)

Jahr/Year: 2004

Band/Volume: [52](#)

Autor(en)/Author(s): Das Indraneil

Artikel/Article: [Collecting in the "Land Below the Wind", Herpetological Explorations of Borneo 231-243](#)