HERPETOLOGICAL HISTORY

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A Guide to the Field Guides to the Herpetofauna of Borneo

The 10th World Congress of Herpetology was held in Kuching, Sarawak, Borneo, from 5–9 August 2024. Located within one of the world's biodiversity hotspots, statistics for the island's herpetofauna are staggering, with over 500 species of amphibians and reptiles recorded. Borneo, the second largest tropical island in the world (after New Guinea), covers a land area of 743,380 km^2, larger than the combined sizes of Germany and Italy, or Texas. To facilitate interest in Bornean herpetofauna, we review current herpetological literature and list resources for identification of the island's herpetofauna, including in-print books and websites.

Amphibians

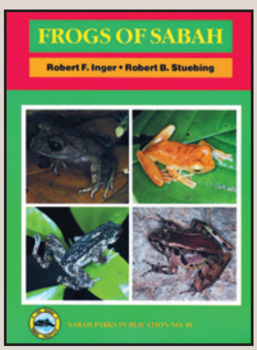

Fig. 1. Front cover of Inger and Stuebing (1989).

Inger and Stuebing (1989) produced a guide to the common amphibians of Sabah (Fig. 1), comprising the northeastern portion of Borneo. This is a handy field guide, depicting 56 species, or roughly half those then known, with an identification key and color photos. This work was the precursor to the larger 'A Field Guide to the Frogs of Borneo', the first edition appearing in 1997, the second in 2005, the third (Inger et al. 2017), being the most recent (Fig. 2). The current work describes 184 members of the Bornean Anura, each species account comprising brief descriptions and natural history notes, and for over 95% of the species, an image of the species in life.

A near contemporary field guide to the amphibians (Fig. 3), in Malay language, 'Amfibia Sabah', was prepared by Imbun (2014), renowned naturalist attached to Sabah Parks. The work describes 116 species of anuran amphibians and two caecilians and includes an extensive introduction on the biology and paleohistory of amphibians as well as species accounts, each with a color portrait photo.

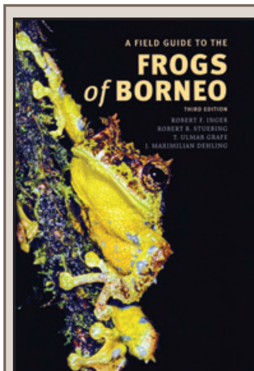

Fig. 2. Front cover of Inger et al. (2017).

The larval stages of the amphibians of Borneo have been subject of a recent monograph, 'A Guide to the Tadpoles of Borneo' (Haas et al. 2022), that includes descriptions of the tadpoles of 99 species (Fig. 4). This is a significant portion of the amphibian fauna considering that a quarter of the species lack free-swimming larval stages. Descriptions include tadpoles in life as well as scanning electronic micrographs, and those of the corresponding adults. Online resources for Bornean amphibians include the 'Frogs of Borneo' website (https://www.frogsofborneo.org), associated with the aforementioned work, that will update herpetologists as new information becomes available. The second frog-related website site is 'Frog Voices of Borneo' (https://soundcloud.com/frogvoicesofborneo), an excellent resource for studies on ecology and ethology, compiled by Ulmar Grafe and Maximilian Dehling. It includes the calls of more than 65 species as well as soundscapes from particular localities. Another local resource covers frogs of Sarawak of the genus *Hylarana* (and related genera) by Ramlah et al. (2011). It is a printed book with an audio compact disk (Fig. 5).

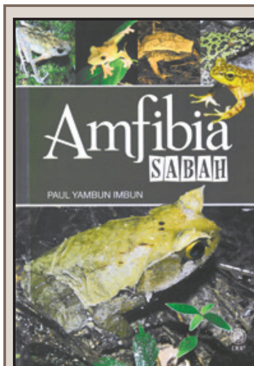

Fig. 3. Front cover of Imbun (2014).

For the identification of caecilians, one has to turn to Taylor's (1968), now dated 'Caecilians of the World' and more recent research papers (e.g., Nishikawa et al. 2013). Finally, mention must be made of the field

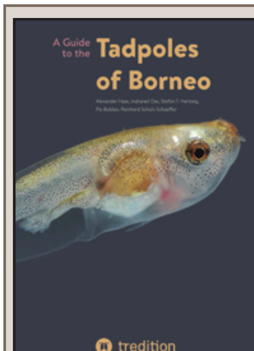

Fig. 4. Front cover of Haas et al. (2022).

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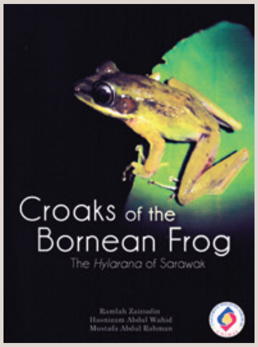

Fig. 5. Front cover of Ramlah et al. (2011).

Fig. 6. Front cover of Das et al. (2019a).

guides specific to sites in Sarawak for amphibians that are near-annually produced for the International Bornean Frog Race (Pang 2022). These are multiauthored, illustrated guides to the faunas of the most popular protected areas, including Lambir Hills National Park (Das et al. 2016a; 2016b); Gunung Gading National Park (Das et al. 2017a; 2017b); and Kubah and the Matang Range (Das et al. 2014; 2015; 2018; Wahab et al. 2014). The most recent in the series covers all amphibians known from western Sarawak (Das et al. 2019a; Fig. 6).

The Institute of Biodiversity and Environmental Conservation, in collaboration with other State agencies, such as Sarawak Forestry Corporation, the Sarawak Oil Palm Berhad, and the Ministry of Tourism Sarawak, have also produced field guides and checklists for the herpetofauna of the High Conservation Value Forests of the Tinbarap Estate (Das et al. 2019b), Bako National Park (Pui et al. 2016; 2017), and Gunung Mulu National Park (Das et al. 2017c).

Turtles

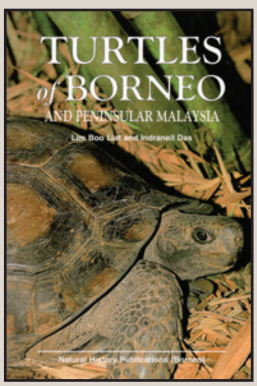

Fig. 7. Front cover of Lim and Das ("1999", 2000).

'Turtles of Borneo and Peninsular Malaysia' by Lim and Das ("1999" 2000) (Fig. 7), is the most current for the terrestrial, freshwater, and marine turtles of Borneo (and of Peninsular Malaysia). All 20 species are covered via descriptions, natural history accounts, and for most, multiple images, including of the sexes and ontogenetic stages, if relevant. Included in the species accounts and identification key are (*Trachemys scripta* and *Pelodiscus sinensis*). Nomenclatural changes that have occurred since the publication of this work, over two decades ago, include the transfer of *Callagur borneoensis* to the genus *Batagur*, and *Hieremys annandalii* to *Heosemys*. While out of print from the publisher, this work is available online and occasionally, in local "brick-and-mortar" stores.

Crocodiles

While no 'field guides' may be necessary for the regional crocodilian fauna, the fact that herpetologists cannot agree whether there are three of four species of crocodiles on the island raises issues (the status of *Crocodylus raninus* remaims controversial). Not a field guide, but an account of crocodilian attack stories as pursued by the media, with general accounts of the natural history of the group as relevant to Borneo, is the book 'Man-eating Crocodiles of Borneo,' now in its third edition (Fig. 8). It is authored by James Ritchie and Johnson Jong (2025), and also contains sections on natural history, crocodilian philately, and a scientific bibliography to the crocodilian literature of the island. Jong is the proprietor of the eponymous Jong's Crocodile Farm, situated on the outskirts of Kuching, and is one of few to regularly breed the Malayan False Gharial, *Tomistoma schlegelii*.

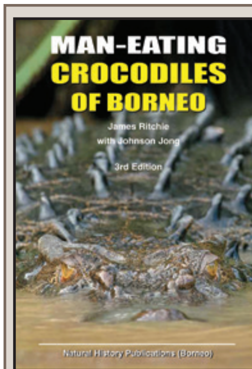

Fig. 8. Front cover of Ritchie and Jong (2025).

Lizards

A total of 131 species of lizards are now known from Borneo, with the annual description of multiple species (particularly, geckos and skinks). One or two extralimital species have now gained a foothold and appear to be spreading. The last published guide specific to the fauna is 'Lizards of Borneo' by Das (2004a), listing 109 species (Fig. 9). It was in the 'Pocket Guide' series by Natural History Publications (Borneo), a publisher of fine natural history works. As can be expected, generic name changes have been quite a few. These include the synonymy of *Apterygodon* and *Lamprolepis* with *Dasia*, and *Cosymbotus* and *Ptychozoon* with *Hemidactylus* and *Gekko*, respectively. Further, the intervening period has witnessed the revival of the generic names *Eutropis, Subdoluceps,* and *Pelturagonia* for Bornean species formerly in *Mabuya*, *Lygosoma*, and *Phoxophrys*, respectively. Species accounts are one page long and include 1–2 images, a short writeup containing a brief description and maximum length reached. Once described as the 'Holy Grail of Herpetology', the Bornean Earless Monitor, *Lanthanotus borneensis*, is far better known now than a decade earlier, and a revision of this work can replace the museum images with those obtained more recently from the field.

Fig. 9. Front cover of Das (2004a).

Snakes

The rich (163 of the 168 currently known species) snake fauna known for Borneo has been given a contemporary treatment by Stuebing et al. (2014) in 'A Field Guide to the Snakes of Borneo'. The book describes all species and illustrates > 90% of the fauna. This is the second edition of the work (Fig. 10), the first issued in 1999, and improvements in the dichotomous keys and imagery make the work a 'must-have'.

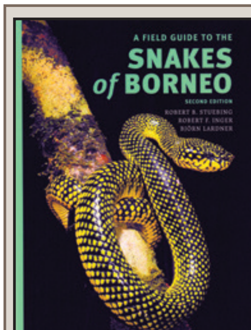

Fig. 10. Front cover of Stuebing et al. (2014).

Regional Herpetofauna

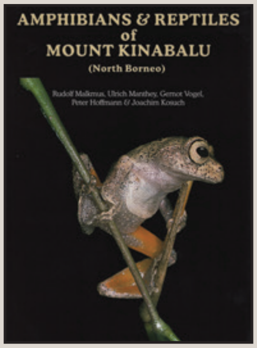

Fig. 11. Front cover of Malkmus et al. (2002).

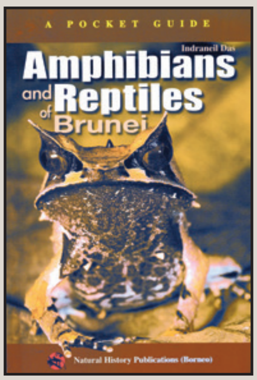

Fig. 12. Front cover of Das (2007).

The towering (4,094 m asl) Gunung Kinabalu, the tallest mountain in Borneo, with its various geological features and vegetation, is a reservoir of rich biodiversity. Arguably, more research papers have been written on its herpetofauna than any other site on the island. Information on Kinabalu has been collated into a well-illustrated work by Malkmus et al. (2002), entitled 'Amphibians & Reptiles of Mount Kinabalu (North Borneo)'. This is a hardcover volume with dust jacket (Fig. 11) detailing a total of 77 species of amphibians and 112 reptiles. Most Kinabalu (including adjacent lowland) species are illustrated, along with dichotomous identification keys, habitat images, and where applicable, sonograms and oscillograms, as well as larval stages. A second regional guide covers the herpetofauna of Negara Brunei Darussalam, an independent Sultanate situated on the north coast of Borneo. In 'Amphibians and Reptiles of Brunei', Das (2007) describes 61 amphibians and 100 reptiles, species depicted by photographs and a short text (Fig. 12). We are unaware of field guides specific to the vast portion of Borneo, referred to as Kalimantan, and politically organised under different provinces of the Republic of Indonesia. Finally, modern herpetological checklists of protected areas appear in a series of books published by the Institute of Biodiversity and Environmental Conservation, published since 2015 (see Mohd-Azlan et al. 2023, 2024 for examples).

General Faunal Accounts

The most up-to-date field guide for Bornean reptiles as a whole is 'A Field Guide to the Reptiles of Borneo' (Das 2025; Fig. 13), which covers 321 species. The work includes species descriptions, identification keys, range maps and photographs of nearly every species. The reptiles of Borneo can also be identified using two regional works- one for the entire fauna of the region ('A Field Guide to the Reptiles of South-east Asia', Das 2010; Fig. 14), the other specific to snakes ('A Naturalists' Guide to the Snakes of South-east Asia', Das 2021; Fig. 15). Information contained in these works need to be updated with more recent resources, as relevant, given the intense research now underway and the rapid accumulation of knowledge relevant to species level taxonomy and higher level classification, in addition to other aspects of natural history, including venom. A recent work by Janssen and Sy (2022) permits users to identify 225 species of lizards of southeast Asia, from Myanmar to Timor Leste and the Philippines (Fig. 16).

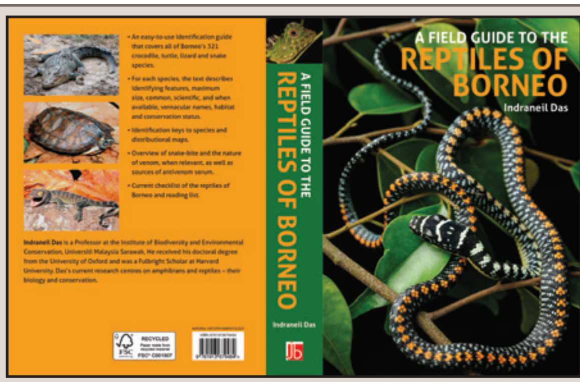

Fig. 13. Front and back covers of Das (2025).

Not a field guide *per se*, but no work on the modern herpetology of Borneo can be complete without mention of the book by Inger and Tan (1996), 'The Natural History of Amphibians and Reptiles in Sabah' that emphasizes the ecology of the local herpetofauna. In the words of the authors, the work described "..how these animals fit into the complex workings of Borneo's ecosystems" (Fig. 17). Individual chapters are classified into representative landscapes, from coastal zones, through lowland forests to submontane and montane forests. Each of these are described along with the herpetofauna therein, their diversity and ecological adaptations. One chapter is devoted to habitats created by humans, and on the commensal species of frogs and reptiles that have invaded them.

Further, historically important papers on the herpetology of Borneo can be found in the century-old Sarawak Museum Journal. The Museum itself, inspired by Alfred Russel Wallace (1823–1913), is worth a visit for its natural history and cultural artifacts relevant to the island. Finally, no account of the herpetological literature can be complete without mention of the first checklists of the fauna, in a series of articles in the Sarawak Gazette, a government-issued

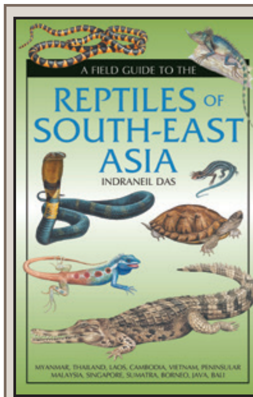

Fig. 14. Front cover of Das (2010).

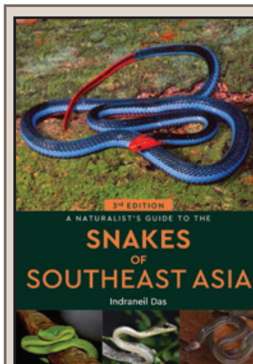

Fig. 15. Front cover of Das (2021).

Fig. 16. Front cover of Janssen and Sy (2022).

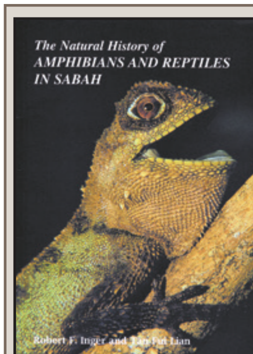

Fig. 17. Front cover of Inger and Tan (1996).

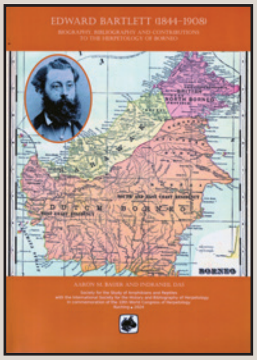

Fig. 18. Front cover of Bauer and Das (2024).

monthly periodical that otherwise covered administrative matters. The author is Edward Bartlett (1844–1908), a Sarawak Museum curator, whose collections were made or received from different parts of Sarawak. Das (2004b) reviewed herpetological studies till the turn of the century for Borneo, and the reading list contained therein can be consulted for taxon specific works. A facsimile of Bartlett's herpetological papers, along with his biography and a modern checklist of the herpetofauna of Borneo (Bauer and Das 2024; Fig. 18), was published by SSAR and distributed to delegates to the Kuching Congress, and is now available through the SSAR online bookstore.

Many of the 1485 delegates who attended the 10th World Congress of Herpetology in Sarawak had the opportunity to see some of the incredible Bornean herpetofauna in the wild. For those who did not attend, the literature reviewed here will provide an introduction and perhaps impetus to visit in the future.

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- Preference will be given to images that depict poorly known species. These could include recently described taxa or species for which a color illustration has never been published.
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