

Patterns and progress of Malaysia's amphibian research in the 21st century

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Abstract. We review the status, patterns, and progress of Malaysia's amphibian research in the 21st century (2000–2021) with the main goal of identifying areas for improvement that can help focus and prioritise future research initiatives. Between the period of January 2000–September 2021, we found 280 publications that can be broadly grouped into five categories: 1) Checklists and Biodiversity; 2) New Species, Taxonomy, and Identification; 3) Ecology and Natural History; 4) Evolution and Phylogenetics; 5) Conservation. An average of 12.7 papers were published per year and although the number of papers fluctuated, there was an overall positive trend towards higher research output. The majority of research was from the Checklists and Biodiversity (34%; 95 papers) and New Species, Taxonomy, and Identification (35%; 97 papers) categories, followed by Ecology and Natural History (21%; 59 papers), Evolution and Phylogenetics (9%; 25 papers), and Conservation (1%; four papers). Amphibian research was conducted most frequently in the Bornean states of Sarawak (45 papers) and Sabah (34 papers) and most infrequently in the states of Malacca (one paper), Negeri Sembilan (two papers), Selangor/Kuala Lumpur (two papers), Perlis (two papers), and Kelantan (three papers). Despite being a megadiverse country and a biodiversity hotspot, only four conservation studies were published over the last two decades, highlighting the urgent need for more conservation-focused research.

Key words. biodiversity, conservation, systematics, taxonomy, evolution, natural history, phylogenetics, ecology

INTRODUCTION

Herpetological research in Malaysia dates back to the 19th century. The earliest published work relevant to the region is that of Theodore Edward Cantor (1809–1860), a Danish surgeon-naturalist with the English East India Company. Between 1842–1845, he was based at Prince of Wales Island (now Pulau Pinang or Penang Island) as Superintendent of six hospitals. His 1847 monograph used names of Indian and Javan species (Cantor, 1847). Otherwise impressive for its coverage of reptiles, it listed just eight species of amphibians, including a caecilian. The only amphibian species described as new in this work was *Hylaedactylus bivittatus* Cantor,

1847, which is now considered synonymous with *Kaloula pulchra* Gray, 1831. Subsequent notable herpetological collections in the Malay Peninsula were made by Ferdinand Stoliczka (1838–1874), which focused on former centres of European trade, including Penang, Malacca, and Singapore; Stanley Smyth Flower (1871–1946) who sent specimens to London that were described by George Albert Boulenger (1858–1937) at the British Museum, London; and Arthur Lennox Butler (1873–1939), Curator of the Selangor State Museum, in 1902 and 1904, who compiled the first amphibian checklists for the Malay Peninsula listing 58 species (Butler, 1902, 1904). Additions and emendations to the list were made by Herbert Christopher Robinson (1874–1929) in 1905, by which time 63 nominal species, plus the genus "*Ixalus*", were added to the fauna. In 1848, the Scottish botanist, Hugh Low (1824–1905) compiled the first checklist of the herpetofauna of Borneo, which listed just three species of amphibians. Significant systematic research on the island started with the arrival of professional biologists from Europe, chiefly, the Italian botanist Odoardo Beccari (1843–1920); Alfred Russel Wallace (1823–1913), famously associated with the Flying Frog (*Rhacophorus nigropalmatus*); and a lineage of museum curators and associates of the Sarawak Museum, Kuching, including Edward Bartlett (ca. 1836–1908), Charles Hose (1863–1929), Alfred Hart Everett (1849–1898), Robert Walter Campbell Shelford (1872–1912), and Eric Georg Mjöberg (1882–1938). On the eastern side of Borneo, the island's tallest mountain, Gunung (=Mount) Kinabalu, received its first explorers between 1887 and 1888, when John Whitehead (1860–1899), an ornithologist, organised

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