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Natural History Photographs by Michael Willmer Forbes Tweedie: A Discovery of Original Glass Lantern Slides

Seventeen glass slides (or ‘magic lantern’ slides) were discovered in the Lee Kong Chian Natural History Museum (LKCNHM) at the National University of Singapore (NUS) in 2015. The slides depict 14 images of various snakes, and three images of the arboreal gecko *Ptychozoon kuhli*. These slides were examined and found to be those taken and owned by Singapore’s Raffles Museum Director Michael Willmer Forbes Tweedie, determined by his use of them as photographs in his publications where they are captioned to himself or noted as such in the front of his books. All or part of every image was determined to have appeared in at least one of his many publications in a period spanning over three decades, from 1950 to the third edition of *The Snakes of Malaya* in 1983.

These historic slides are important in preserving an era of natural history photography. The versatility of Tweedie’s slides within his publications shows that in an age without digital technology, photographs had to be carefully planned. Processing costs and limited post-photographic adjustments all weighed heavily on the importance of a single image being sufficient, and Tweedie did indeed make effective use of his photographs.

Today, our photographs come in multitudes, we are able to choose the ‘best’ in batches of hundreds. Technology allows us more time, it allows images to be disposable but also places an emphasis on the ‘perfect image’ where post-capture platforms are deployed to ensure all details are to perfection. In Tweedie’s era, there were no methods of digital enhancement, no program to edit a defect on an image and so, these images bound as they are between sheets of thin glass, are unique and as objects themselves. They indicate precision, intention, and longevity. The importance of this small collection is one that has retained historical value.

TWEEDIE IN SINGAPORE

In 1932, Michael Willmer Forbes Tweedie began working as Curator of the then Raffles Museum at Stamford Road, Singapore, now the National Museum of Singapore. As the war approached, according to Malayan Volunteers Group (2016), Tweedie was

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assigned as Camouflage Officer where he used his knowledge of nature to camouflage aircraft, particularly that of disruptive coloration as seen with moths and stick insects. He later became Pilot Officer and in 1942 was evacuated with the Royal Air Forces Headquarters to Bandung, Java, Indonesia. After the Allied Forces surrendered to the Japanese in March 1942, Tweedie was captured and taken as Prisoner of War at the local Boei Glodok Camp in Java.

His labor force group ‘Java Party 5A’ was transferred back to Singapore, arriving on 17 October 1942 where the party of 1352 men appeared to have been split. Tweedie was sent on 28 November 1942 (The National Archives Website 2018) with 2212 other POWs on a Japanese ‘Hell Ship,’ *Kamakura Maru*, to Yahata POW Camp in Nagasaki, Japan, arriving on 7 December 1942 (Taylor 1999).

After several years he was transferred on 29 April 1945 to Hoten POW Camp in Mukden, Manchuria (now Shenyang,

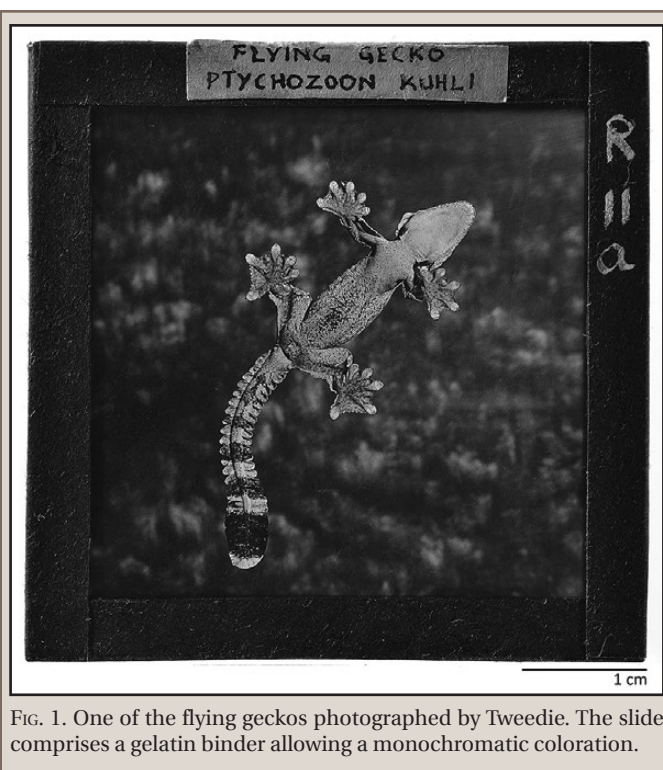


FIG. 1. One of the flying geckos photographed by Tweedie. The slide comprises a gelatin binder allowing a monochromatic coloration.

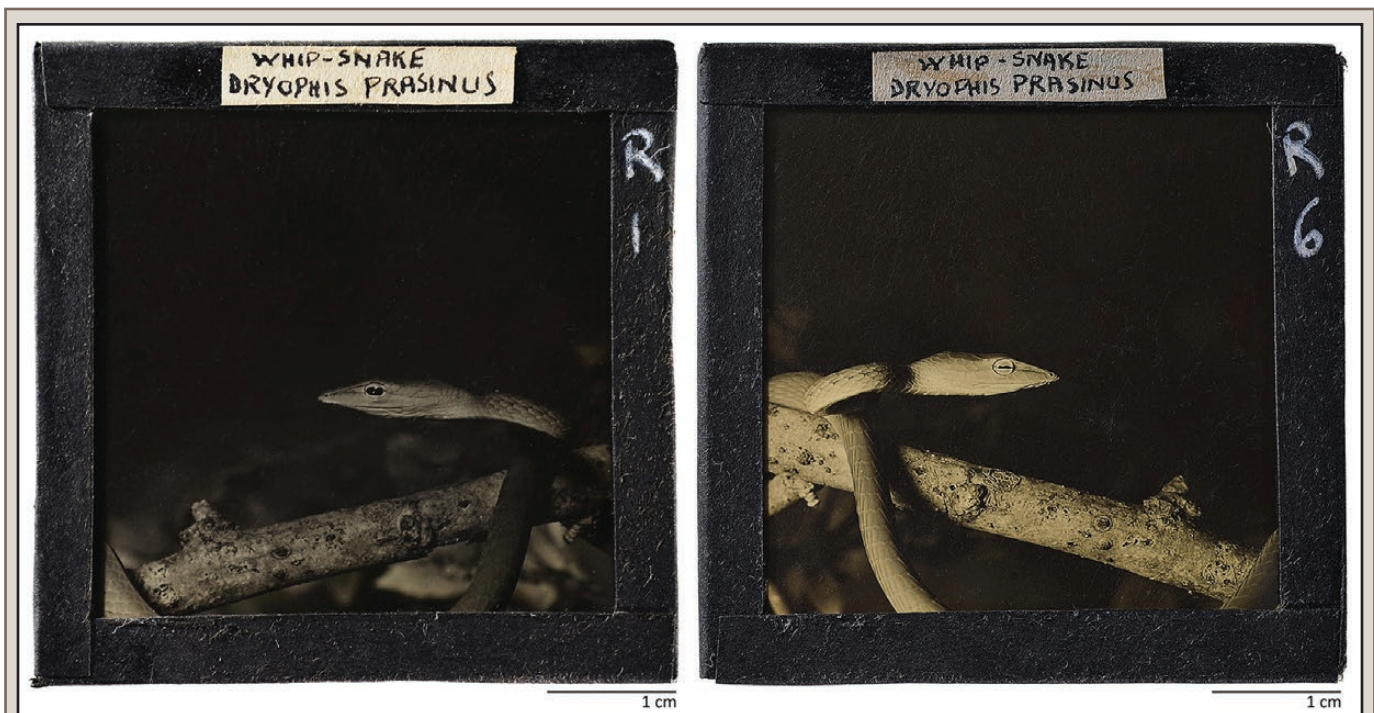


FIG. 2. A specimen of *Ahaetulla prasina* (donated to Tweedie in 1957, photographed to observe pupil dilation in a darkened room (left) and in 'photo-flood illumination' (right).

China), working in the MKK Machine and Tool Factory which was liberated by the Russian army a few months later in August 1945, followed by the American Recovery team where he was repatriated by train on evacuation roster TFR2-59. It is said that upon walking outside the camp for the first time after liberation, Tweedie recorded all the butterflies and moths he saw (Malayan Volunteers Group 2016).

During the war, the museum underwent temporary leadership by several people, but Tweedie's return in 1946 meant he automatically succeeded the pre-war Director, Frederick Nutter Chasen, who had died in 1942 while attempting to flee Singapore upon the imminent invasion of the Japanese.

In an archived correspondence held at LKCNHM, Tweedie wrote to Dr. A. W. Herre of Stanford University in December 1946, stating "I have been very lucky" and describes how he had thought of the safety of the collections during his imprisonment. In his new role at the museum, Tweedie worked to instigate an international emphasis on the significance of the region's rich biodiversity and natural history collections. Previous scientists at the museum had a tendency to 'safeguard' specimens by sending those of scientific importance to the British Museum in London (now the Natural History Museum, London) (NUS 2018). Of course, sending these important specimens overseas was indeed more of a risk than housing them in Singapore itself. There was no guarantee the specimens would arrive at their intended destination and, historically, not all of them did. While attempting to escape Singapore, it is speculated that Chasen may have been carrying type material with him (Tan 2015), with intent to deposit it in the British Museum. His attempted escape on-board *HMS Giang Bee* failed when the ship was bombed, shelled, and sunk by a Japanese destroyer on 13 February 1942 (Malayan Volunteers Group 2017).

Tweedie had studied fossil ostracods at Cambridge University (Adler 2007), and his continued interest in the natural world led him to cover many aspects of zoology throughout his

career: ichthyology, herpetology, and carcinology (crustaceans). His enthusiasm extended to the Southeast Asia's historical framework and Tweedie motivated explorations of the 'prehistory' of Malaya, where from 1936 to 1953 he organized and/or participated in excavations across Malaya. These included those in Bukit Chintamani (Pahang), Tui (Padang, Tengku), Kelantan, and Gua Bungoh (Sarawak). Tweedie subsequently published several manuscripts: *The Stone Age in Malaya* (1941), *Pre-history of Malaya* (1942), and *The Malayan Neolithic* (1949).

He differed from other scientists previously directing the museum. Not only did he keep scientifically valuable specimens, such as type specimens, in Singapore, he also shared his findings and sent duplicates of specimens worldwide to scientists and authorities, which subsequently ensured recognition of their scientific value (Ng and Yang 1989) and that of the region.

Tweedie was an advocate for actively instilling a passion for nature in the general public. His publications of *Popular Pamphlets* educated the layman on collecting methods of butterflies (Tweedie 1957b) and shells (Tweedie 1957c), his books gave simple definitions and many illustrations to enable identification techniques of animals in the wild, while also including scientific systems such as keys to species. *The Snakes of Malaya* (Tweedie 1953) and *Malayan Animal Life* (Tweedie and Harrison 1954) were widely popular, having three editions each, and at nearly 70 years old are still used today by local herpetologists. Within the gallery of the museum, he made room for additional, comprehensible specimen information to be added and displayed for a wider range of audience (Tan 2015). It seems he wanted the diverse nature of the region to be understood by anyone, whether or not they were an inhabitant of Singapore, then a part of Malaya. Anyone reading his work will see that it is imbued with his amicable nature and anecdotes throughout his professional narrative.

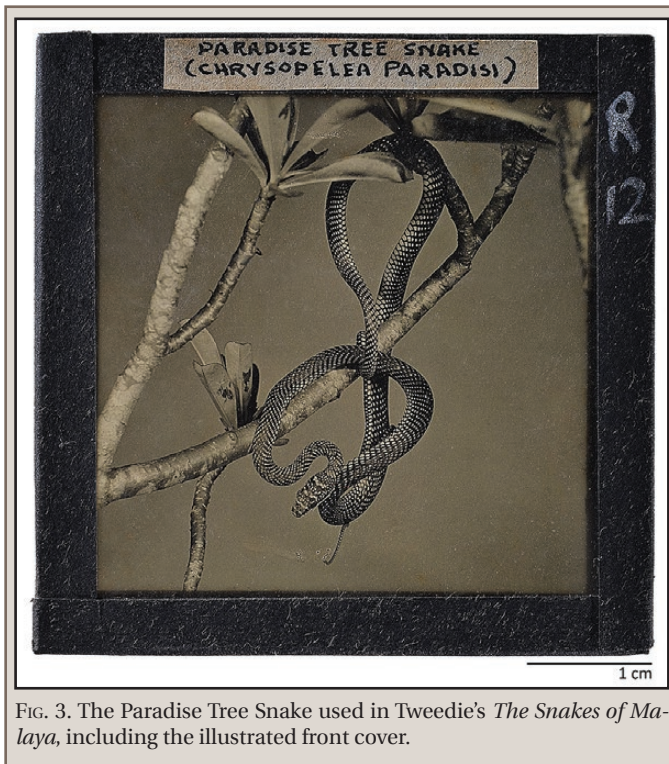


FIG. 3. The Paradise Tree Snake used in Tweedie's *The Snakes of Malaya*, including the illustrated front cover.

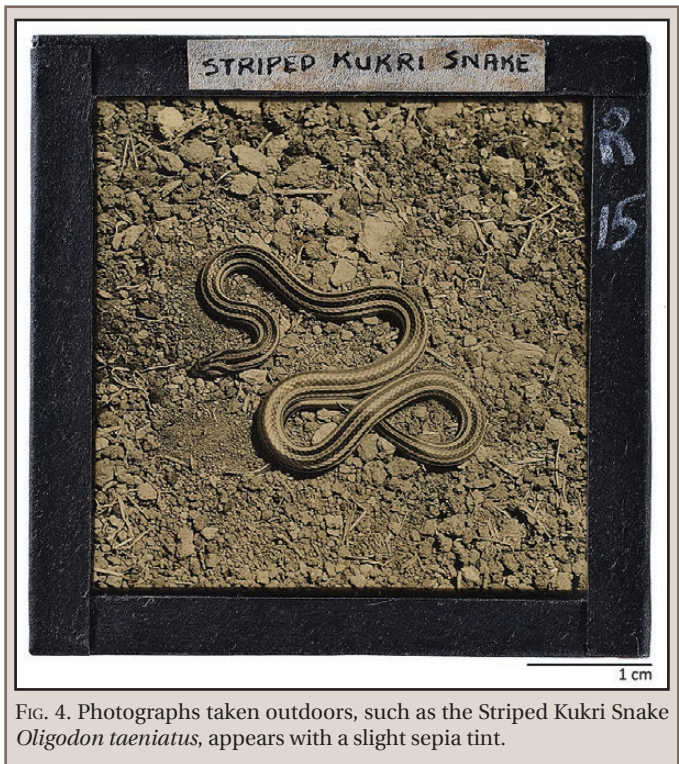


FIG. 4. Photographs taken outdoors, such as the Striped Kukri Snake *Oligodon taeniatus*, appears with a slight sepia tint.

TWEEDIE'S SLIDES

In this collection of photographic glass slides, most images were found as figures in multiple publications, whether scientific or speculative anecdotes. In the publications listed here, many other photographs were present and attributed to Tweedie, suggesting his collection of slides would have been much larger than what remains today. All slides were affixed with a paper label with India ink text and white ink labelling on the edge. The annotations on the black tape propose a sequence of slides, all labelled "R" (presumably for Reptile), followed by a number. The additional labelling of 'a', 'b', and 'c' on slides of *Ptychozoon kuhli* (Fig. 1) does not suggest any form of species categorization as the other slides do not follow suit.

Composition and other elements such as acquisition factors, date of publication, and foliage present in the images have helped the recognition of multiple slides of the same subject. For example, living specimens donated to Tweedie, such as the Oriental Whip Snake *Ahaetulla prasina* from a Mr. Dennis Dias (occupation unstated) in 1957, appear twice (Fig. 2) and possibly three times in Tweedie's publications. When viewing the angle of the snake and notch on the branch in which the snake is coiled, it is clear these photographs were taken in succession (one image labelled on the reverse and so appears here as mirror images).

It is likely that some of the specimens were photographed in a studio against a white cloth such as the iconic image of the Paradise Tree Snake *Chrysopelea paradisi* (Fig. 3), while others appear as 'snapshots' in natural habitats such as the Striped Kukri Snake *Oligodon taeniatus* seen in Fig. 4. In his books, Tweedie gave examples of how to identify species and thus used several of the photographs as a basis for his illustrations, the most prominent being the Paradise Tree Snake, which Tweedie also used more artistically on the dust jacket of *The Snakes of Malaya*.

Fourteen of the seventeen slides were used recurrently in *The Snakes of Malaya* and *Malayan Animal Life*. Other slides in addition to some of these were found in other publications including the *Malayan Nature Journal* and the *Raffles Bulletin*.

GLASS LANTERN SLIDES

Glass lantern, or 'magic' lantern slides originated in 17th Century Europe from hand-painted glass images and developed to incorporate the techniques used in creating negative images on both paper and glass. During the height of photographic technique and development in the 1800s, a variety of binders such as albumen and collodion were tested, among others. Ultimately the use of gelatin became a preferred method for glass lantern slides, such as is used in this collection. Formed using a silver positive image on a gelatin binder, this standard technique was developed and commonly used between 1850 and 1960.

Slides were frequently used for home entertainment and as educational tools and were displayed with an early form of light projection through a 'magic lantern.' Several companies such as the British 'Flatters and Garnett' created topic-specific slide series (e.g., zoology, subcategory plankton; religion, subcategory churches) which could be bought off-the-shelf or through their catalogue. These were often used in universities to support lectures. The choice of the binding agent resulted in subtle color variations on the final slide.

In Tweedie's slide collection, most images appear monochromatic, positive silver images likely formed on a gelatin binder (Fig. 1), some are tinted towards sepia; this may be due to a variation of the binder, ageing, or chemical re-use. Sepia images seem to be those taken with flooded light or outdoors (Fig. 4). Each of the slides measures 50 x 50 mm and are bound with black passe-partout tape.

For several years the collection was stored in unstable conditions until the recent, permanent housing now in the

recently opened LKCNHM (previously the Raffles Museum of Biodiversity Research [RMBR]). These slides have stood the test of time, particularly in a country with consistently high temperatures and unrelenting humidity where the mean annual relative humidity is 83.9%. These intense conditions are known to accelerate physical and chemical damage to photographic materials. Despite this, the methods of producing glass lantern slides ensured their longevity whereby the components of the photographs are sealed from external factors and only minor signs of degradation are visible.

It is likely that exposure to fluctuations in temperature have occurred, particularly while stored in buildings where air-conditioning is used infrequently, or buildings exposed to external humidity especially in months of high rainfall. These fluctuations are the likely cause of surprisingly minor structural damage; one crack along one surface of Slide 12, Paradise Tree Snake, *Chrysopelea paradisi* (Fig. 2). There is mild delamination and silvering on others. Conservation methods were used to prevent further degradation to the slides; the crack was stabilized by maintaining the original structural integrity, an extra layer of glass was added and bound to the existing slide with archival tape. Surface grime from years of handling was present, this was removed with an initial swab of deionized water. The surfaces also had a film of surface mold, typically present in hot and humid climates such as Singapore. Laboratory grade 75% ethanol (EtOH) was applied to the surfaces and immediately buffed with cotton swabs to break down fungal chitin—a carbohydrate polymer that adds structural rigidity to the cell walls of fungi (mold). Microscopic observation was used to confirm cleanliness of the slides to allowing for optimal digitization. Future storage in adequate and stable conditions of 4–20°C (\pm 5°C over 24 hours) and a relative humidity (RH) of 30–40% will also prevent further strain on the glass.

CONCLUSION

Tweedie played a vital role in regenerating the Raffles Museum after World War II, but his biggest impact was establishing an international network among zoologists, leading to a worldwide acknowledgment of Southeast Asia's rich biodiversity. He understood the importance of developing the museum's collections and his enthusiasm was not only in the scientific context, but for the public, too.

Tweedie retired in 1957 and eventually travelled back to the United Kingdom where he continued to publish. However, in Singapore, the natural history collections of the Raffles Museum (now the National Museum of Singapore) were 'evicted' due to governmental redirection of the museum's vision. In 1972, thousands of scientifically valuable specimens began a tumultuous journey through several institutions until finally being adopted within the National University of Singapore. During this time, Tweedie had maintained contact with the museum and returned for the opening of the Zoological Reference Collection at NUS in 1988.

In 2015, the Lee Kong Chian Natural History Museum opened as a hub for scientific research, and to permanently house the expanding Zoological Reference Collection. In memory of Tweedie, these slides remain ever important to preserving significant information of the history of nature and the naturalist, photography, the museum, and Tweedie himself through the historical changes, advances in technology, and expansion of scientific knowledge. Tweedie passed away in 1993 after a long

battle with bone cancer (Ng and Yang 1989); in his lifetime he authored at least 124 publications and named at least 40 species (Goater 1993).

Acknowledgments.—I thank Richard Crangle of Lucerna, the Magic Lantern web resource, for his valuable inputs as to the history of 20th century glass slides. Kelvin Lim Kok Peng and Martyn Low provided reference materials, and Tan Siong Kiat and Chan Kin Onn offered guidance. I also thank Kraig Adler and Aaron Bauer for reviewing this manuscript, and their comments led me to further discoveries of Tweedie's inspirational life.

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APPENDIX COLLECTION LIST

The following is a list of the collection contents with acquisition of photographed specimens when necessary and additional notes. Associated literature is listed with plate numbers. This list is ordered by the annotations of 'R' numbers written on the top of the slides, written here verbatim followed by '=' with updated scientific and/or vernacular names as of December 2017.

- SLIDE R1. "WHIP-SNAKE *DRYOPHIS PRASINUS*" = ORIENTAL WHIP SNAKE *AHAETULLA PRASINA* (BOIE, 1827). Received and photographed in January 1957 as a pet of Mr. Dennis Dias, Johore Bahru, Malaysia. Photograph was taken in a darkened room while observing pupil dilation. This image is paired with Slide R6. Associated literature: Tweedie 1957a, pl. 10: left; Tweedie 1957d, pl. 58: top; Tweedie 1983, pl. 7: left.
- SLIDE R2. "WAGLER'S PIT VIPER *TRIMERESURUS WAGLERI*" = WAGLER'S PIT VIPER *TROPIDOLAEMUS WAGLERI* (BOIE, 1827). Photographed ca. 1953. Associated literature: Tweedie 1953, pl. 11b; Tweedie 1957a, pl. 15: bottom; Tweedie 1983, pl. 11b.
- SLIDE R3. "WHIP-SNAKE (*DRACOPHIS* [sic] *PRASINUS*)" = ORIENTAL WHIP SNAKE *AHAETULLA PRASINA* (BOIE, 1827). Photographed c. 1957. Associated literature: Tweedie 1957a, pl. 10: top; Tweedie 1983, pl. 7: top.
- SLIDE R4. "RED-TAILED RACER *ELAPHE OXYCEPHOLA* [sic]" = RED-TAILED RACER *GONYOSOMA OXYCEPHALUM* (BOIE, 1827). Photographed c. 1953. Associated literature: Tweedie 1953, pl. 2; Tweedie 1957a, pl. 4; Tweedie 1983, pl. 2.
- SLIDE R5. "WAGLER'S PIT-VIPER (ADULT)" = WAGLER'S PIT VIPER *TROPIDOLAEMUS WAGLERI* (BOIE, 1827). Photographed c. 1953. Adult. Associated literature: Tweedie 1953, pl. 12; Tweedie 1957a, pl. 16; Tweedie and Harrison 1970, pl. 11; Tweedie 1983, pl. 12.
- SLIDE R6. "WHIP-SNAKE *DRYOPHIS PRASINUS*" = ORIENTAL WHIP SNAKE *AHAETULLA PRASINA* (BOIE, 1827). Received and photographed in January 1957 as pet of Mr. Dennis Dias, Johore Bahru, Malaysia. Photograph taken with powerful 'photo-flood illumination' when observing pupil dilation. This image is paired with Slide 1. Associated literature: Tweedie 1957a, pl. 10: right; Tweedie 1957d, pl. 58: top; Tweedie 1983, pl. 7: right.
- SLIDE R7. "IRIDESCENT EARTH SNAKE" = SUNBEAM SNAKE *XENOPELTIS UNICOLOR* REINWARDT, 1827. Photographed c. 1953. Associated literature: Tweedie 1953, pl. 1; Tweedie 1957a, pl. 2.
- SLIDE R8. "ELEGANT BRANZEBACK [sic] *AHAETULLA FORMOSA*" = ELEGANT BRANZEBACK *DENDRELAPHIS FORMOSUS* (BOIE, 1927). Photographed c. 1953. Associated literature: Tweedie 1953, pl. 3: top; Tweedie 1957a, pl. 5: top; Tweedie 1983, pl. 3: top.
- SLIDE R9. "AMPHIBIOUS SEA-SNAKE *LATICAUDA COLUBRINA*" = BANDED SEA KRAIT *LATICAUDA COLUBRINA* (SCHNEIDER, 1799). Photographed c. 1953. Associated literature: Tweedie 1953, pl. 9; Tweedie 1957a, pl. 13; Tweedie 1983, pl. 9.
- SLIDE R10. "MALAYAN PIT-RIPER [sic] *ANCISTRODAN* [sic] *RHODOSTOMA*" = MALAYAN PIT VIPER *CALLOSELASMA RHODOSTOMA* (KUHIL, 1824). Photographed c. 1953. Associated literature: Tweedie 1953, pl. 10; Tweedie 1957a, pl. 14; Tweedie 1983, pl. 10.
- SLIDE R11A. FLYING GECKO *PTYCHOZOOON KUHIL* STEJNEGER, 1902. Photographed c. 1950s. Associated literature: Tweedie and Harrison 1970, pl. 12 and adapted to drawing for Fig. 53.
- SLIDE R11B. FLYING GECKO *PTYCHOZOOON KUHIL* STEJNEGER, 1902. Received as eggs in December 1951, from Mr. C. S. Ogilvie. Photographed c. February 1952. They were found on a tree (*Lagerstroemia* sp.) about 20 ft from the ground under a mass of epiphytic orchids, growing at Jenut Kumbang, a salt-lick near Kuala Tahan in Pahang, Malaysia. Eggs hatched on 28th and 29th of the month [January 1952]. One escaped and the other lived for about two weeks, sickened and died. Tweedie notes it as very shy, fed freely on small moths and flies, and was always pleased to lick water from a "cautiously proffered fingertip." Associated literature: Tweedie 1954, pl. 1: bottom.
- SLIDE R11C. FLYING GECKO *PTYCHOZOOON KUHIL* STEJNEGER, 1902. Received and photographed in June 1949, from Mr. J. Le Doux of Kota Tinggi, Johore, Malaysia. "In June 1949, I received a living specimen of this lizard about 15 centimetres in length" ... "I am convinced also that the webbed feet and frilled tail enhance the procryptic effect, which is remarkably perfect as shown in Pl.1." (Tweedie 1950). "The hinder part of the tail has been lost and has grown again without the scalloped edges" (Tweedie and Harrison 1970). Associated literature: Tweedie 1950, pl. 1; Tweedie and Harrison 1965, 1970, adapted to drawing for Fig. 54.
- SLIDE R12. PARADISE TREE SNAKE *CHRYSOPELEA PARADISI* BOIE, 1827. Photographed c. 1952. "The photo of *paradisi* reproduced here, was taken by the writer in Singapore, of a specimen from Selangor" (Tweedie, 1952). Associated literature: Tweedie 1952, pl. 16; Tweedie 1953, pl. 4; Tweedie 1957a, pl. 6; Tweedie and Harrison 1970, pl. 10; Tweedie 1983, pl. 4 and illustrated version on front cover.
- SLIDE R13. "HOUSE SNAKE *LYCODON AULICUS*" = INDIAN WOLF SNAKE *LYCODON AULICUS* (LINNAEUS, 1758). Photographed c. 1953. Associated literature: Tweedie 1953, pl. 5: bottom; Tweedie 1957a, pl. 7: bottom; Tweedie 1983, pl. 5: bottom.
- SLIDE R14. BANDED KRAIT *BUNGARUS FASCIATUS* (SCHNEIDER, 1801). Photographed c. 1953. Associated literature: Tweedie 1953, pl. 8; Tweedie 1957a, pl. 11; Tweedie 1983, pl. 8.
- SLIDE R15. STRIPED KUKRI SNAKE *OLIGODON TAENIATUS* (GÜNTHER, 1861). Photographed c. 1953. Associated literature: Tweedie 1953, pl. 3: bottom; Tweedie 1957a, pl. 5: bottom; Tweedie 1983, pl. 3: bottom.