

Article IV.—WALLACE'S LINE AND THE DISTRIBUTION OF INDO-AUSTRALIAN MAMMALS

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With an Introduction by

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TEN MAPS

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## INTRODUCTION

In 1909 Dr. P. N. Van Kampen published a paper on the zoö-geography of the East Indian Archipelago in which he gave expression to the following opinion regarding the zoögeographic significance of Wallace's Line: "According to the researches of more recent times, among which should be mentioned especially those of Von Martens, Max Weber, and the Sarasins, it becomes evident that such a sharp boundary as Wallace drew does not exist. Not only is there none where he drew it, but no such line exists anywhere in the archipelago. Of course it is possible to draw such a line which apparently bounds the distribution of some single group; . . . But taking the fauna as a whole it is quite certain that no line may be drawn; but, rather, we may lay out a transition zone in which the fauna of India and that of Australia are mingled, and wherein from the west to the east the Australian components increase more and more in number; and on the other hand, the Indian tend to die out. All of this region belongs to the eastern half of the archipelago from Celebes to New Guinea, and included in it we find a part of the Polynesian Islands; but it is necessary to keep in mind that even the boundaries of this transition region are not sharply defined."

W. D. Matthew (1915), in his famous paper on Climate and Evolution, included Celebes, the Moluccas, Timor and smaller islands east of Wallace's Line in a new subregion which he called Australo-malaya. He referred to this region as "the debatable ground between the Oriental and the very distinct Australian region" and said that "the consensus of opinion classes it by preference with the Australian".

In the present paper Mr. Raven will present evidence tending to show: (1) that so far as the distribution of the mammals indicates, Van Kampen greatly underestimated the value and significance of "Wallace's Line", as a zoögeographic boundary, at least in its lower two-thirds; (2) that the upper end of Wallace's Line where it runs between Celebes and the Philippines is of less significance and geologic antiquity; (3) that Matthew's "Australo-malaya" is an artificial complex, since the mammalian fauna of Celebes is primarily Indo-Malayan in origin with only a few Australian immigrants, and since the Moluccas are another artificial complex, some of them belonging with

Celebes, others being on the other side of Weber's Line and definitely within the Australian region.

Mr. Raven spent the years 1912 to 1918 collecting mammals and other vertebrates for the United States National Museum in the Dutch East Indies and the years 1921 to 1923 collecting similar material in Australia for the American Museum of Natural History; he thus became interested in the zoogeographical problems of the Indo-Australian region. In order to test the validity of Dr. Van Kampen's conclusion as expressed in the above mentioned article, he therefore began in 1927 a systematic tabulation of all the known forms of mammals from this region. The literature was searched and a series of maps was made, showing the distribution of 2240 species and subspecies of mammals.

In considering the problems raised by the distribution of the mammals in the Indo-Australian region, he has had constantly before him the basic physiographic map of Molengraaff (1921), the standard work of Lydekker (1896) on the geographic history of mammals and the palaeogeographic treatises and maps of W. D. Matthew (1915) and A. W. Grabau (1927). Nor has he neglected the evidence supplied by the fossil mammals of India, Java, Japan and the Philippines, when considered in the light of the general distribution and sequence of fossil mammals in North America, Europe and Asia. After the first draft of his manuscript was finished, he was naturally delighted to find that his results were so thoroughly in accord with those of Roy E. Dickerson and his collaborators in their excellent work on the Distribution of Life in the Philippines (1928). Indeed it seems noteworthy that the results of such a large number of field and museum workers on the geology, palaeontology, physiography, and botany, on the birds, mammals, reptiles, fishes, molluscs, insects, etc., from so many parts of the vast Indo-Australian region, should so perfectly fit together and confirm the general conclusions of Wallace, Lydekker, Matthew, Weber and other great students of zoogeography.

In this connection, it may be noted that quite recently Bailey Willis (1932) has developed the hypothesis that the East Indies, like the West Indies, consist in part of long curving or festooned mountain chains and volcanic peaks which have been thrust up by the pressure of great ocean depths in deep geosynclines, bordering or between continental land masses and great ocean depths; that these isthmian lands have been more or less unstable, forming contacts with the main land in periods of elevation, giving rise to scattered archi-

pelagos and new volcanic islands in periods of depression. We may here generalize the results of Brouwer, Molengraaff, Weber and others by stating that Borneo, along with the Malay Peninsula, Sumatra, Java and Bali forms the remnants of the southeastern corner of the Asiatic continent, called Cathaysia by Grabau, while the Lesser Sunda Islands, Celebes and the Philippines form part of the great north and south festoon of isthmian lands to which Dickerson (1928, p. 27) and his collaborators have recently given the name of Wallacea.

W. K. G.

## Viverridae (cont'd)

- 070 *Paradoxurus leucomystax* Gray, 1836'. Malacca; Sumatra; Java; Borneo.  
 " " *refulgens* Rosenberg, 1867'. Aru Is.  
 071 " *lignicolor* Miller, 1903. Sumatra.  
 072 " *macrodon* Gray, 1864'. Malacca.  
 073 " *minax* Thomas, 1909. S. Mindanao, P. I.  
 074 " *minor* Bonhote, 1903. Celebes.  
 075 " *minax* Thomas, 1909. Mindanao, P. I.  
 076 " *musschenbroecki* Schlegel, 1879'. Menado, Gorontalo, Celebes.  
 077 " *puadongus* Lyon, 1908. E. Coast Sumatra.  
 078 " *pareus* Miller, 1913. Simalur I.  
 079 " *philippinensis* Jourdan, 1837'. Borneo; Palawan, P. I.  
 " " *baritensis* Lönnberg, 1924. Borneo.  
 080 " *sabanus* Thomas, 1909. N. Borneo.  
 081 " *sumbanus* Schwarz, 1910. Sumba I.  
 082 " *torvus* Thomas, 1909. Tawi Tawi Group.  
 083 " *tytleri* Tytler, 1864'. Andaman I.  
 084 *Viverra megaspila* Blyth, 1862. Malacca, Sumatra.  
 085 " *tangalunga* Gray, 1832'. Malacca; Sumatra; Borneo; Celebes; Amboina, Philippine Is.; Bintang I.; Linga Is.  
 " " *lancaensis* Robinson & Kloss, 1920. Langkawa I.  
 086 " *zibetha* Linnaeus, 1766'. Malacca.  
 087 *Viverricula malaccensis* Gmel., 1788'. Malacca; Java.  
 088 " *rasse* Horsfield, 1821'. Java.

## Hyaenidae

- 089 *Hyaena bathygnatha* Dubois, 1908. Pleistocene, Trinil, Java.

## Felidae

- 090 *Felis badia* Gray, 1874'. Sarawak, N. Borneo.  
 091 " *bengulensis* Kerr, 1792'. Malacca; Borneo.  
 " " *javensis* Desmarest, 1820'. Java.  
 " " *minuta* Temminck, 1827'. Malacca; Philippine Is.  
 " " *sumatrana* Horsfield, 1824'. Sumatra.  
 " " *undata* Desmarest, 1820'. Java.  
 092 " *catus* Linnaeus, 1758. Luzon, P. I.  
 093 " *chaus affinis* Gray, 1832'. Malacca; Andaman I.  
 094 " *delinis* Hilzheimer, 1906. Sumatra.  
 095 " *marmorata* Martin, 1836'. Malacca; Sumatra; Java; Borneo.  
 096 " *megalotis* Miller, 1893'. Timor I.  
 097 " *microgale* Dubois, 1908. Java.  
 098 " *minuta* Temminck, 1827. Java.  
 099 " *nebulosa* Griffith, 1821'. Malacca; Sumatra; Sarawak, Mt. Dulit, Borneo; Java.  
 100 " *oxygnatha* Dubois, 1908. Java.

## Felidae (cont'd)

- 101 *Felis palaeojavanica* Stremme, 1911. Pleistocene; Java.  
 102 " *pardus variegatus* Wagner, 1841'. Java; Sumatra.  
 103 " *planiceps* Vigors & Horsfield, 1828'. Malacca; Sumatra; Sarawak, Mt. Dulit, N. Borneo.  
 104 " *temmincki* Vigors & Horsfield, 1828'. Malacca; Sumatra; Borneo.  
 105 " *tigris balica* Pocock, 1930. Bali I.  
 " " *sondaica* Pocock, 1930. Java.  
 " " *sumatrae* Pocock, 1930. Deli, Sumatra.  
 " " *tigris* Pocock, 1930. Malacca.  
 106 " *tingia* Lyon, 1908. W. Coast Sumatra.  
 107 " *trinilensis* Dubois, 1908. Trinil, Java.

## PROBOSCIDEA

## Elephantidae

- 01 *Elephas hysudricus* Dubois, 1908. Java.  
 02 " *antiquus* (Stremme), 1911. Pleistocene; Java.  
 03 " *indicus* (Linnaeus), 1754'. Borneo.  
 " " *sumatranus* Temminck, 1847'. Sumatra.  
 04 " *maximus hirsutus* Lydekker, 1914. Malay Peninsula.  
 05 *Mastodon latidens* Clift, 1829'. Pliocene; Java; Borneo.  
 " " *sp.*, Martin, 1888'. Pliocene; Java.  
 06 *Stegodon airavata* Martin, 1890'. Pliocene; Java.  
 07 " *bombifrons* Falconer & Cautley, 1846'. Pliocene; Java.  
 08 " *gunesa javanica* Dubois, 1908. Pleistocene; Java.  
 09 " *insignis* Falconer & Cautley, 1846'. Pliocene; Java.  
 " " *sp.*, Neumann, 1887'. Pliocene; Banka; P. I.  
 10 " *mindanensis* Neumann, 1890'. Pliocene; P. I.  
 11 " *trigonecephalus* Martin, 1887'. Pliocene; Java; Mindanao, P. I.

## PERISSODACTYLA

## Tapiridae

- 001 *Tapirus indicus* F. Cuvier, 1798'. Malacca; Sumatra.  
 " " *brevitanus* Kuiper, 1926. Palembang, S.E. Sumatra.  
 " " *foss.*, Dubois, 1891'. Pleistocene; Java; Sumatra.  
 002 " *pandanicus* Dubois, 1908. Java.

## Rhinocerotidae

- 003 *Rhinoceros kendengenticus* Dubois, 1908. Java.  
 004 " *sivasondaicus* Dubois, 1908. Java.  
 005 " *sondaicus* Desmarest, 1822'. Malacca; Java; Sumatra; Borneo.  
 006 " *sumatrensis* Cuvier, 1817'. Malacca; Sumatra; Borneo.