

Major Fossil Groups. The superfamily Tapiroidea Gill, 1872, in addition to Tapiridae, contains three extinct families (^oIsectolophidae Peterson, 1919; ^oHelaletidae Osborn, 1892; ^oLophodontidae Gill, 1872). The family Tapiridae includes five extinct genera in addition to *Tapirus* (Simpson, 1945a: 140).

Remarks. The four species of tapirs are *T. bairdii*, *T. indicus*, *T. pinchaque*, and *T. terrestris* (see Hershkovitz, 1954: 465).

FAMILY RHINOCEROTIDAE Owen, 1845

Rhinoceroses

Diagnosis. Manus with three or four digits, pes with three, each digit with small basal hoof; ulna and fibula complete and unfused; femur with strongly marked third trochanter; nasal bones standing out freely, often heavy and projecting beyond and above premaxillae, with a rugose cushion for one or two horns; skull low, elongate, with occiput surmounted by sharp occipital crest; orbits open posteriorly, temporal fossa unusually large; incisors and canines sometimes absent; premolars generally molariform; upper molars with thick ectoloph, with median fold and with two oblique, gently-curved transverse ridges intimately connected with ectoloph; lower cheek-teeth partly bicrescentic; third molar lacking talon; dental formula, 0-2/0-1, 0/0-1, 3-4/3-4, 3/3 = 24-34 (Lydekker, 1894: 463-465; Romer, 1945: 435-441; Zittel, 1925: 134-135).

General Characters. Size large and ponderous; legs short and stout; tail thin, short and terminating in stiff bristles; neck short and thick; head large, elongate, and concave in profile, with erect, oval, slightly-tufted ears that are posteriorly placed; horns solid, of dermal origin without bony horn-core and made up of agglutinated fibers, attached on median line of nasals, second horn (when present) directly behind the first, on frontals; eyes small; upper lip often prehensile and extending beyond the extremity of the lower lip; skin thick, coarse, and often folded in certain areas; color drab brown, gray, or black; hair sparse or generally absent over most of body; height at shoulder, 122 to 198 cm.; weight up to 2800 kg.; no scrotum.

Habits. Rhinoceroses are chiefly nocturnal, generally solitary (except possibly for *Diceros bicornis* and *Ceratotherium simum*) and somewhat timorous beasts, generally moving away at the approach of man. At other times, an animal may charge without hesitation "... often with a clumsy rush which he usually advertises with a sharp steam whistle" (Smith, 1935: 218). Rhinoceroses feed on vegetable matter; species inhabiting plains and savannas eat principally grasses; species inhabiting forests eat principally browse (leaves and twigs of woody plants) and fruit. *Didermocerus sumatrensis* also eats bark and lichens (Hubback,

1939: 13). The animals occur in both lowlands and mountainous areas but never far from water. Wallowing places are frequented; salt licks also attract them. According to Lydekker (1894: 472), *Didermocerus* has been reported swimming in the sea in the Merqui Archipelago.

Rhinoceroses are territorial, the different species having characteristic types of territorial behavior (Hutchinson and Ripley, 1954: 179). *Diceros*, at least, uses as retreats clearings 4.5 to 6 m. in diameter in thick brush (Lydekker, 1894: 475). Regular beaten paths are followed from resting grounds to wallows and feeding areas. According to Hutchinson and Ripley (1954: 178) and Ripley (1952: 570-573), *Rhinoceros unicornis* lives solitarily in definite territories during most of the year. Wandering occurs, at least during the breeding season. Each territory consists of a small pond surrounded by open grassland and is marked by a central dunghill with smaller hills at peripheral positions. At least one other species, *Ceratotherium simum*, also may use dunghills in a similar manner. The territory covered by *Didermocerus* may be much larger than that used by *R. unicornis* (Ansell, 1947; Hubback, 1939: 6-8). Even though heavy-bodied and clumsy, rhinoceroses are capable of moving rapidly. *Diceros* can move as fast as a horse carrying a rider (Lydekker, 1894: 478).

Females of *R. unicornis* come into heat between February and June whereas in *Didermocerus* mating is thought to occur between July and October; in captivity males of *R. unicornis* are sexually active for a short period during the first half of the year (Hutchinson and Ripley, 1954: 178-179). After a gestation period of approximately 19 months (in *Diceros*, 16 to 18 months according to Roberts, 1951: 243; 540 days, according to Talbot *et al.*, 1965: 13), one precocial young is born. The calf remains with the female for a considerable length of time; lactation lasts for several months. At least in *Diceros*, adulthood is reached in 5 years (Roberts, 1951: 243). In captivity, rhinoceroses are long-lived; *R. unicornis* is known to live more than 33 years (Manville, 1957: 279), while Lydekker (1894: 468) cites Blanford as saying that captive specimens may live for 50 or 60 years; *Diceros* is known to live for at least 23 years (Lydekker, 1894: 479, and Roberts, 1951: 213).

Rhinoceroses have keen senses of smell and hearing, but vision is thought to be poorly developed. Various sounds are uttered. An alarm call or snort resembles that of a steam whistle. Hunters report that animals make a grunting noise when disturbed. Hubback (1939: 11-12) writes that *Didermocerus*, when alarmed, makes a noise "... something between the bark of a dog and the quack of a duck." While feeding and undisturbed, this species may make continual squeaking noises; while wallowing, a low plaintive sound is made, resembling, according to Hubback, that of a gibbon. Rhinoceroses defend themselves with their mas-

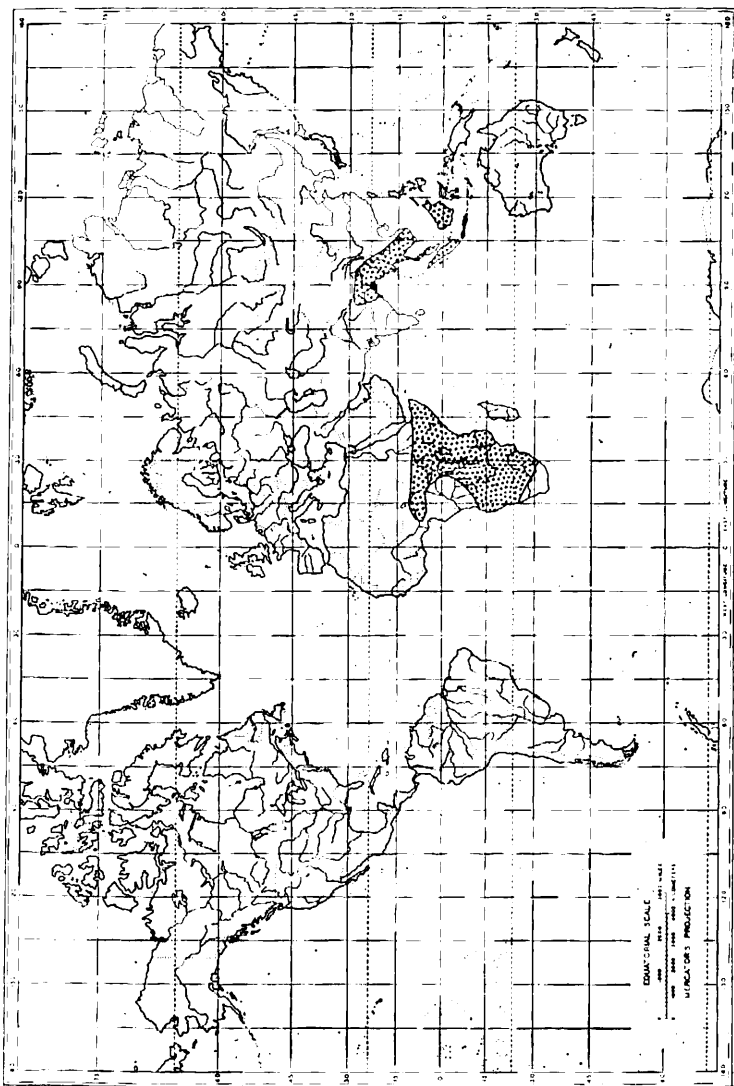


Fig. 64. Distribution of Rhinocerotidae.

sive horns (chiefly African species) or with their sharp lower front teeth (chiefly Asiatic species). The young may be preyed upon by the large carnivores, but except for man adults have few enemies. The animals are infested with numerous parasites; birds remove many external ones from the backs and sides of the animals. Man has seriously reduced all species of rhinoceroses by overhunting as well as by reducing their natural range through agriculture and settlement. The animals have been sought for their meat, hides, bones, blood, and especially their horns. The horns have been used for centuries as drinking cups and for Oriental medicine. Even under government protection the animals continue to decline as the result of poaching. Asiatic species are in much greater danger than African species (Barbour and Allen, 1932: 144-149; Carter *et al.*, 1945: 151-153; Gee, 1958: 353, 1959: 59-85; Harper, 1945: 375-414; Hubback, 1939: 18-20; Hutchinson and Ripley, 1951: 178-179; Jeanin, 1951: 118-131; Lydekker, 1894: 463-483; Milton and Estes, 1963: 69; Roberts, 1951: 242-243; Shebbeare, 1953; Shortridge, 1934: 412-437; Ulmer, 1941: 2-10). Natural history information and recent distributional information on the Asiatic and Indonesian species is presented by Talbot (1960: 169-215).

Habitat. Grassy plains, savannas, swamps, dense brush, heavy tropical jungle, from sea level to mountain slopes as high as 2135 m. in elevation.

Recent Distribution. Tropical areas of Africa and southeastern Asia, including Malaya, Sumatra, Java, and Borneo. Range reduced considerably in all species as a result of the activities of man (see maps in Ulmer, 1941: 2-10, and in Talbot, 1960: 171, 189, 207, for *Rhinoceros* and *Didermocerus*).

Recent Genera. (4, 5 Recent species)

Ceratotherium Gray, 1867 (1)

Diceros Gray, 1821 (1)

Didermocerus Brookes, 1828 (1) [= *Dicerorhinus* Gloger, 1841]

Rhinoceros Linnaeus, 1758 (2)

Geologic Range. Middle Eocene to Pleistocene in Europe; late Eocene to Recent in Asia; late Eocene to late Pliocene in North America; Miocene to Recent in Africa (Simpson, 1945a: 142-143).

Major Fossil Groups. The superfamily Rhinocerotoidae Gill, 1872, in addition to Rhinocerotidae, contains three extinct families (°Hyrachyidae Wood, 1927; °Hyracodontidae Cope, 1879; °Amynodontidae Scott and Osborn, 1883). The family Rhinocerotidae includes 30 extinct genera as well as the four living genera (Simpson, 1945a: 141-143).

Remarks. The evolution of rhinoceroses has paralleled that of horses, but emphasis has been on bulk rather than cursorial gait. Like horses, rhinoceroses were abundant and diverse in late Tertiary and Pleistocene

times but are now restricted to a few, rapidly declining species. Strict protection is now needed for most species to save these slow-breeding, ponderous beasts from extinction. *Ceratotherium* is regarded as a subgenus of *Diceros* by Ellerman *et al.* (1953: 163).

20

Artiodactyls

Karl F. Koopman

The American Museum of Natural History, New York

ORDER ARTIODACTYLA

Diagnosis. Teeth bunodont to selenodont, brachydont to hypsodont; premolars simpler than molars; frontal appendages (horns or antlers) may be present; nasal bones usually not expanded posteriorly; no alisphenoid canal (Flower and Lydekker, 1891: 276-277); parietals usually reduced; frontals usually enlarged; clavicle rarely present; typically 19 thoracic and lumbar vertebrae, but sometimes 18 or 20; third trochanter absent; ulna usually reduced or more or less fused with radius; fibula articulates with calcaneum, and is usually slender or incomplete, in some cases fused with tibia (Romer, 1945: 442-444); foot paraxonic, main axis between third and fourth digits; second and fifth digits usually reduced, lost in advanced forms; ungual phalanges usually flattened on inner and ventral surfaces, equally developed on third and fourth toes (Flower and Lydekker, 1891: 276-277); two or four toes on each foot except in some extinct forms and in recent Tayassuidae, where inner digit is suppressed on pes (Hall and Kelson, 1959: 994); four toes in Suidae and Hippopotamidae, "dew claws" (with vestigial lateral metapodials) present in most others; two-toed or "cloven hoofed" forms have principal metapodials fused to form cannon bone, lateral metapodials absent; carpus with three proximal elements separate, in distal row magnum and trapezoid may fuse to support third metacarpal, unciform supports fourth metacarpal; astragalus with rolling surface above, pulley surface below, gives free ankle motion, and rests on navicular and cuboid, which may be fused (Romer, 1945: 445); stomach simple to complex ruminating or non-ruminating; caecum small; colon convoluted; placenta diffuse or cotyledonary.