



horizontal line. Chin and upper throat, belly, inside of limbs, and lower surface of the tail white. Head brownish unspotted, the face darker. Ears brown outside, white within. A melanoid variety indistinctly spotted occasionally occurs (*C. nudipalpebra*).

Dimensions. Height of males at shoulder 36 to 38 inches in Central and Northern India, length $4\frac{1}{2}$ to 5 feet. A female measured 30 inches high, 53 long; tail with hair $12\frac{1}{2}$, without 10. In Southern India the height is considerably less, 30 to 34 inches according to Jerdon. But an Anaimalai male measured by Hornaday was nearly 36 inches high, 62 long, and weighed 145 lb. Basal length of a large male skull 9.75, orbital breadth 4.7. Horns of the larger variety have been measured 38 and 38.75 inches long round the curve, with a girth of 4 at mid-beam and 5.75 at the base above the burr. Ordinary horns measure about 30 in length, but heads from Bengal and Southern India are generally smaller.

Distribution. The spotted deer is found nearly throughout India and Ceylon. It occurs at the base of the Himalayas, not, however, ascending the mountains beyond the lower spurs, from the neighbourhood of the Sutlej to Nepal, but not in Sikhim. It is not found in the Punjab plains, nor in Sind, and only to the eastward in Rajputana; it is wanting also in Assam and to the east of the Bay of Bengal, but common in the Sundarbans, apparently as far east as Mymensing (J. A. S. B. xxii, p. 415), throughout Bengal and Orissa, the N.W. Provinces, Central India, Mysore, Malabar, and Ceylon, in all suitable localities. It ascends the hills of S. India in places to about 3500 or 4000 feet.

Varieties. With the exception of the rare melanoid form already mentioned, the only variation, so far as I know, is in size. The spotted deer of Lower Bengal, Malabar, Southern India, and Ceylon are considerably smaller than those of the North-west and Central Provinces, and of the hills of Orissa and Vizagapatam. Hodgson proposed the name of *Axis minor* for the smaller race, and Jerdon was inclined to regard it as distinct, but there is now a general agreement that the two forms are merely local varieties.

Habits. The especial habitat of this deer, perhaps the most beautiful in form and coloration of the whole family, is amongst bushes and trees near water, and in bamboo-jungle. The spotted deer is found both in hilly ground and on alluvial plains. It never goes far from its drinking-places. So long as it has a wild tract of bush or ravines for shelter, it appears to care little for the neighbourhood of man. Many of its favourite haunts are in some of the most beautiful wild scenery of the Indian plains and lower hills, on the margins of rippling streams with their banks overgrown by lofty trees, or in the grassy glades that open out amidst the exquisite foliage of bamboo clumps. Spotted deer are thoroughly gregarious and associate at all times of the year in herds, sometimes of several hundreds. They are less nocturnal than sambar, and may be found feeding for three or four hours after sunrise, and again in the afternoon for an hour or two before



sunset. They generally drink between 8 and 10 o'clock in the morning, the time varying with the season of year, and repose during the day in deep shade. They swim well, and take readily to water. They both graze and browse.

There is, I believe, much variation in the rutting-season, which, according to Hodgson, begins in September. It is generally in the cold season in Northern India, but I am under the impression that young fawns are born almost throughout the year. Certainly there is great irregularity as to the period of dropping the horns, and bucks with perfect antlers may be found at all seasons. The call of the spotted deer is a peculiar, loud, hoarse barking sound, easily recognized but difficult to describe. This deer also utters a shrill alarm cry. The period of gestation is 8 months (P. Z. S. 1863, p. 230), or 6 according to Hodgson (J. A. S. B. xvi, p. 691). The flesh is dry as a rule, but if kept till tender is excellent.

369. *Cervus porcinus*. The Hog-deer.

Cervus porcinus, Zimm. *Spec. Zool. Geog. Quad.* p. 532 (1777); McClelland, P. Z. S. 1839, p. 150; Hutton, J. A. S. B. xv, p. 150; Brooke, P. Z. S. 1878, p. 902; W. Sclater, p. 178.

Hyelaphus porcinus, Sundevall, Kong. Vet. Ak. Handl. 1844, p. 181; Adams, P. Z. S. 1858, p. 530; Blyth, Cat. p. 153; *id.* Mam. Birds Burma, p. 45.

Axis oryzus, Kelaart, Prodr. p. 83 (1852); Blyth, J. A. S. B. xxiii, p. 217.

Axis porcinus, Jerdon, Mam. p. 262.

Pára, H. (also Sindhi and Punjâbi); *Dodar*, Rohilkund; *Khâr laguna*, Nepal Terai; *Nutrinî haran*, Beng.; *Wil-muhu*, Cing.; *Darai* or *Dayai*, Burmese.

Size small. Legs shorter in proportion. Tail rather long. Frontal region of skull narrow. No upper canines. Horns small, on longish pedicels. Each horn with 3 tines, the brow-antler meeting the beam at an acute angle, outer upper tine exceeding the inner.

Colour. Brown, more or less rufous or yellowish, the hairs with pale tips, producing a minutely speckled appearance. Lower parts paler. Ears white inside, and tail white beneath. In summer the fur is paler, more rufous and more or less spotted with pale brown or white. The spots are probably not always developed, and they soon disappear: they are sometimes limited to one or two rows on each side of a dark dorsal stripe. Some doubt has been expressed as to whether adults are ever spotted, but I watched the assumption of the spotted summer garb for 2 or 3 years in several adults kept in the Calcutta Zoological Gardens. The young up to about six months old are spotted throughout the body.

Dimensions. Height at shoulder about 24 inches; length from muzzle to root of tail 42 to 44, tail with hair 8. A male skull measures 8.6 in basal length by 4.1 in orbital breadth. The horns are generally small, and do not often exceed 10 or 12 inches in

length. The longest recorded are a little over 20 inches long with a girth at mid-beam of 3·5.

Distribution. In the Indo-Gangetic plain everywhere from Sind and the Punjab to Assam. The hog-deer is common in the Terai, but never ascends the hills. It is found also in Sylhet and throughout Burma to Tenasserim in alluvial flats. It may range some distance into the Peninsula along the course of the Gangetic tributaries like the Soane; but although it is said by Forsyth to be found in the Central Highlands east of Mandla, and by Ball to

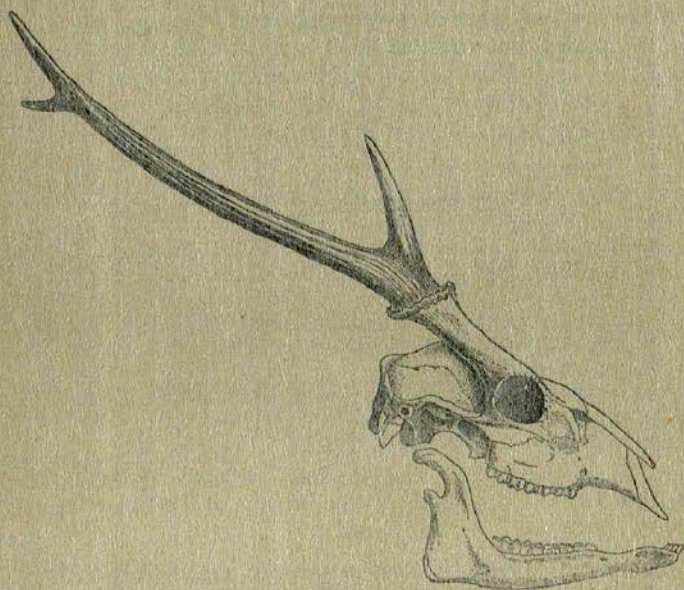


Fig. 179.—Skull and horn of *Cervus porcinus*.

have been seen by him distinctly in Jeypore near Vizagapatam, I think the existence of the animal in both localities needs confirmation. As a rule, it is certainly not found in the Peninsula of India; reports of its occurrence in parts of the Bombay and Madras Presidency being due to the use of the term Hog-deer for *Tragulus meminna* and perhaps for *Cervulus muntjac*, on account of their bearing tusks. Some true hog-deer occur in Ceylon, but are confined, as I learn from Mr. Hugh Nevill, to a small area between Matura and the Kaltura River, and have almost certainly been introduced.

Habits. The hog-deer is an inhabitant of alluvial plains, and is almost if not quite restricted to them. It abounds in some of the grass-jungles, keeping as a rule to grass of moderate height, mixed with tamarisk and other bush, rather than to the masses of grass 12 to 30 feet in height that form the favourite haunt of the buffalo and rhinoceros. It is sometimes found amongst high trees, but not so often as on grassy plains. Hog-deer are not



gregarious, it being rare to find more than two or three together, though several may be met with in the same small tract. As a rule, however, individuals of both sexes are solitary. These animals are somewhat ungainly in their movements; they run awkwardly, with the head low. As already stated, they have frequently been speared, but generally give a good run before being caught; they are naturally more often found on ground suitable for riding than other Indian deer. Generally they are shot off elephants. The rutting-season is in September and October according to Jerdon. The period of gestation is 8 months (P. Z. S. 1863, p. 230). The bucks drop their horns generally in April.

Subfamily MOSCHINÆ.

No horns in either sex. A gall-bladder present, as in the *Bovidae*. A simple orifice to the lachrymal canal, situated just within the anterior margin of the orbit. Hemispheres of brain but slightly convoluted. Cotyledons of placenta arranged in a peculiar linear order. A single genus.

Genus MOSCHUS, L. (1766).

Upper canines in both sexes, greatly developed in males and projecting considerably beyond the mouth. Skull very similar in

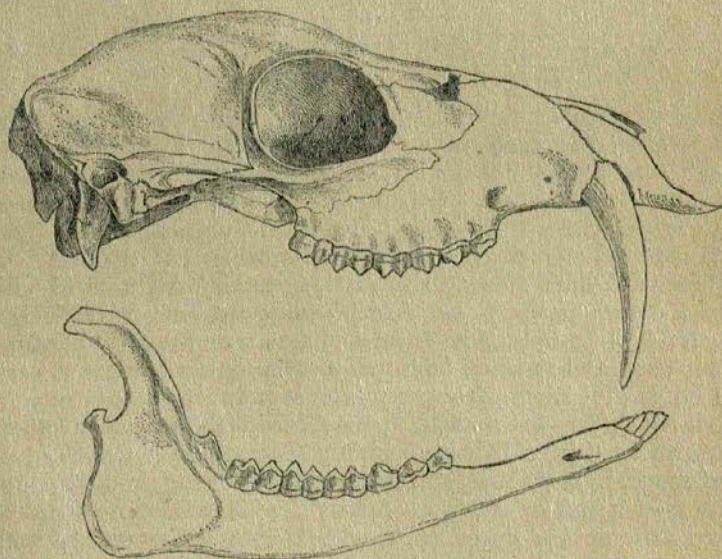


Fig. 180.—Skull of *Moschus moschiferus*.

form to that of *Cervus*. Outer metatarsals wanting; the distal extremities of the outer metacarpals present; all the outer toes



have well-developed phalanges. No infraorbital or interdigital glands. A peculiar sac-like gland in the male, situated beneath the skin of the abdomen, immediately in front of the preputial aperture. This is the musk-gland. Campbell (J. A. S. B. vi, p. 118) and Hodgson (*op. cit.* x, p. 795) have described another gland with an elliptical orifice on each side beneath the tail, also peculiar to the male. Vertebrae: C. 7, D. 14, L. 5, S. 5, C. 6.

The anatomy has been described by several writers, especially Pallas (*Spic. Zool.* xiii, 1779), Campbell and Hodgson *ll. c.*, Flower (P. Z. S. 1875, p. 159), and Garrod (P. Z. S. 1877, p. 287).

Several species have been proposed on account of differences in coloration, but these distinctions appear due to individual variation. Recently Büchner has described an additional species from Kansu, east of Tibet, as *M. sifanicus*.

370. *Moschus moschiferus*. *The Musk-deer*.

Moschus moschiferus, *L. Syst. Nat.* i, p. 91 (1766); *Hutton, J. A. S. B.* vi, p. 935; *Hodgson, J. A. S. B.* xvi, p. 693, xvii, pt. 2, p. 486; *Adams, P. Z. S.* 1858, p. 528; *Blyth, Cat.* p. 157; *Jerdon, Mam.* p. 266; *A. Milne-Edw. Ann. Sc. Nat.* (5) ii, p. 154, pl. iv, fig. 1; *id. Rech. Mam.* p. 176, pls. xix, xx; *Blanford, J. A. S. B.* xli, pt. 2, p. 39; *Lydekker, J. A. S. B.* xlii, pt. 2, pp. 286, 287, xlix, pt. 2, p. 4; *Scully, P. Z. S.* 1881, p. 209; *W. Selater, Cat.* p. 172.

Musk-deer, *Hodgson, Gleanings Sc.* iii, p. 320, pl. xxi (young).

Moschus chrysogaster, *leucogaster*, and *saturatus*, *Hodgson, J. A. S. B.* viii, p. 203, xi, p. 285.

Kastura, *Múshk*, H.; *Râos*, *Rons*, Kashmir; *Lá*, *Láwa*, Tibetan; *Riljo*, Ladak; *Bena*, *Masak nába*, Garhwál and Kumaun.

Hair of peculiar texture—long, coarse, brittle, minutely wavy, and composed of a substance resembling pith. Limbs long, the hinder considerably the longer. Hoofs narrow, pointed; lateral hoofs greatly developed. Ears large. Tail very small, glandular, and marked with a terminal tuft in males, hairy in females. The canines in the male are frequently 2 to 3 inches in length.

Colour rich dark brown, more or less speckled and mottled with grey, the hairs having a subterminal white ring and blackish tips. The basal three-fourths or more of the hair on the body is white. Lower parts and inside of limbs paler; chin, inner borders of ears, and inside of thighs whitish; a white spot in some (the young?) on each side of the throat. Some individuals are paler, others yellowish in tint. Hodgson's variety *chrysogaster* is described as bright sepia-brown above, sprinkled with golden red, and the lower parts golden red or orange. Adams describes another form as "very dark on the upper parts with black splashes on the back and hips, underparts white or a dirty white." This corresponds to Hodgson's *leucogaster*. Others, he says, "are of a yellowish white all over the upper parts, with the belly and inner sides of the thighs white." Jerdon mentions a Kashmir variety with



grizzled grey spots in lines on the back. The young are spotted with white, or yellowish white; those from Kashmir are much paler in colour than Eastern Himalayan individuals.

Dimensions. Height of male at shoulder about 20 inches, at croup about 22; length, nose to rump, 36; tail without hair $1\frac{1}{2}$ to 2; ear 4; weight of a female about 20 lbs. A male skull measures 5.15 in basal length, 2.7 in breadth across the orbits.

Distribution. Throughout the Himalayas as far west as Gilgit, at elevations exceeding 8000 feet (in Sikkim in the summer above 12,000), in forest and brushwood. Also in Tibet and other parts of Central Asia as far north as Siberia.

Habits. The musk-deer is a solitary animal, more than two being seldom if ever seen together. It frequents wooded slopes, often very steep, and, as Kinloch says, resembles a hare in its habits, making a "form" in which it remains throughout the day, and moving about to feed in the mornings and evenings. It is very active and surefooted, its large lateral hoofs apparently giving it the means of holding on to slippery and precipitous rocks, and it progresses by a series of bounds, sometimes of great extent. It is by no means shy where it has not been much hunted.

The food of the musk-deer is, by Adams, said to consist of grass and lichens, by Kinloch of leaves and flowers. This animal's fur is admirably adapted as a defence against cold. According to Adams, no cry has been observed, even in the rutting-season; the only sound this animal has been known to make is a series of harsh screams that it utters when captured.

The breeding-habits were observed by Hodgson in a pair kept in captivity at Katmandu. The rutting-season was in January, the period of gestation about 160 days, and a single young one was born in June. Two are sometimes, but not usually, produced; the young procreate before they are a year old.

The musk, the contents of the abdominal gland, is only developed at the rutting-season, and is a brown soft mass with a peculiar well-known odour. An ounce is about the average produce of one animal. Many musk-deer are snared in nooses, others shot to secure the "musk-pod," which is an article of commerce. The flesh of the animal is excellent, and free from any musky flavour.

TRAGULINA.

Family TRAGULIDÆ.

This being the only family of the present section, the characters may be given under one heading. The dentition is i. $\frac{0}{3}$, c. $\frac{1-1}{1-1}$, pm. $\frac{3-3}{3-3}$, m. $\frac{3-3}{3-3}$, as in most *Cervidæ*. The fibula is complete. There are four toes, with fully developed phalanges and metapodials on all feet, the middle metapodials generally confluent. Navicular, cuboid, and ecto-cuneiform bones of tarsus united. The members of this section are true ruminants, but the stomach is composed of only three distinct compartments, the manyplies or third cavity of the Pecora being rudimentary. Placenta diffused.

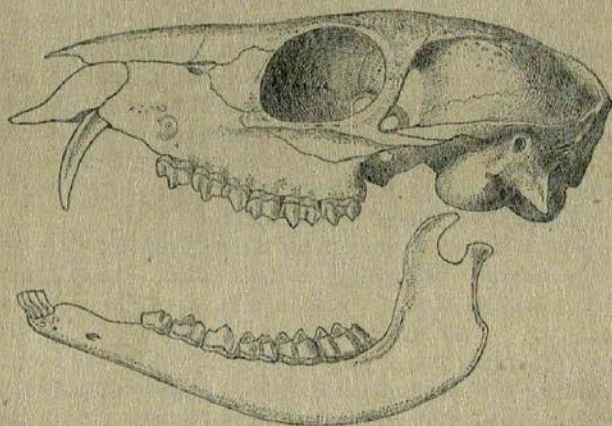


Fig. 181.—Skull of *Tragulus meminna* ♂, $\times 3$.

The *Tragulidæ* are small animals with very slender limbs and high hind-quarters, inhabiting forests. Of the only two living genera one, *Dorcatherium* (*Hyomoschus*), is West-African, the other, *Tragulus*, is Oriental. The type is less specialized than that of the *Pecora*, and it is not surprising to find many extinct forms of *Tragulina* in the Upper Eocene and Miocene of Europe and America, whilst in India two species of *Dorcatherium* (now peculiar to Africa) and one of *Tragulus* have been described from the Pliocene Siwaliks.

Genus **TRAGULUS**, Brisson (1756), partim.

Syn. *Meminna*, Gray.

Size small or very small. Metapodials confluent. A large muffle occupying the terminal portion of the muzzle. No infraorbital,



Interdigital, or inguinal glands. Skull elongate and compressed anteriorly; occiput narrow. Brachydont and selenodont; premolars with a pointed triangular crown, the profile becoming almost tricuspid with age; upper canines in males long, exerted, short in females. Mammae 4. Hair in all species fine and close.

Synopsis of Indian, Ceylonese, and Burmese Species.

- a. Body spotted; chin and throat hairy *T. meminna*, p. 555.
b. Body not spotted; skin between rami of
mandible naked.
a'. Larger; hind foot and tarsus 5·6 to 6
inches *T. napu*, p. 557.
b'. Smaller; hind foot and tarsus 4·4 to 5
inches *T. javanicus*, p. 556.

371. *Tragulus meminna*. *The Indian Chevrotain or Mouse Deer.*

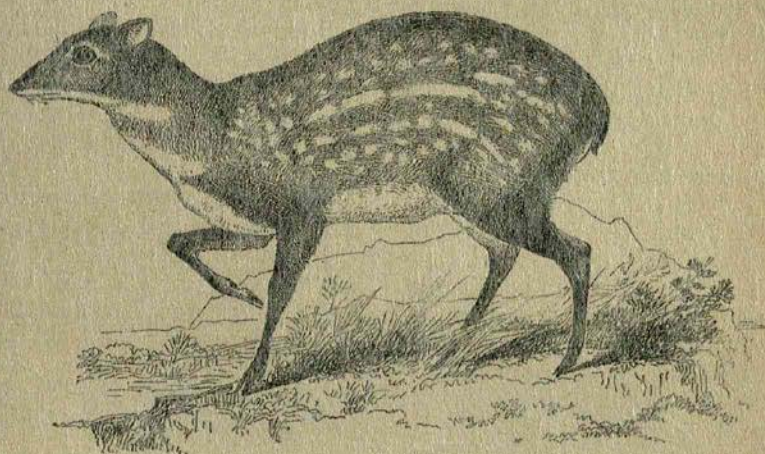


Fig. 182.—*Tragulus meminna*.

Moschus meminna, *Ercl. Syst. Regn. An.* p. 322 (1777); [*Sykes*, *P. Z. S.* 1831, p. 104; *Elliot, Mad. Jour. L. S.* x, p. 220; *Tickell, Calc. Jour. N. H.* i, p. 420; *Blyth, J. A. S. B.* xi, p. 96.

Meminna indica, *Gray, List Mam. B. M.* 1843, p. 172; *Kelaart, Prod.* p. 81; *Blyth, Cat.* p. 155; *id. P. Z. S.* 1864, p. 483; *Jerdon, Mam.* p. 269.

Tragulus meminna, *A. Milne-Edwards, Ann. Sci. Nat.* (5) ii, p. 160, pl. iii, fig. 2, pl. x; *W. Selater, Cat.* p. 189; *Thomas, P. Z. S.* 1891, p. 385.

Pisura, *Pisora*, *Pisai*, H., Mahr.; *Jitrai haran*, Beng.; *Gandwa*, Uria; *Yar*, Ho-Kol; *Kuru-pandi*, Tel.; *Kuram-pani*, Tam.; *Kur-pandi*, Can.; *Walmucha*, Cing.

No naked glandular area on throat. Tarsus hairy all round, except behind close to the hock. Tail short.

Colour. Upper parts brown, darker or paler, minutely speckled with yellow; the hairs brown at the base, black towards the end,



with a yellow ring a short distance from the tip. Sides spotted with white or buff on a brown ground, the spots elongate and passing into longitudinal bands. Lower parts white; throat with 3 white stripes, one in the middle pointed in front, and an oblique one on each side.

Dimensions. Height at shoulder 10 to 12 inches, length from nose to base of tail 18 to 22 inches, tarsus and hind foot about 5·3, tail 1 to 1·5; weight 5 to 6 lb. A good-sized male skull from the Shevroy hills measures 4·5 in extreme, and 3·85 in basal length, and 2 in zygomatic breadth.

Distribution. Ceylon and Southern India in forest at elevations below 2000 feet, extending northwards to Orissa, Chutia Nágpur, and the Eastern Central Provinces; also along the Western Gháts to north of Bombay. I have never heard of this animal in Bengal proper, Behar, the North-west Provinces, Rajputana, the Bombay Deccan away from the Western Gháts, Berar, nor the Central Provinces west of Jubbulpore, Seoni, and Nágpur (Sterndale has recorded its occurrence near Seoni). Hodgson included it in his list of Nepal mammals, but appears never to have obtained a specimen, though Blyth refers to a Nepalese specimen in his Catalogue. I think the occurrence of this species in Northern India requires confirmation. If it occurs, it must be very rare. Jerdon also questioned its existence to the northward.

Habits. A good account is given by Tickell. He says this species "is found throughout the jungly districts of Central India (*i. e.* Chutia Nágpur), but from its retired habits is not often seen. It never ventures into open country, but keeps among rocks, in the crevices of which it passes the heat of the day, and into which it retires on the approach of an enemy. In these the female brings forth her young, generally two in number, at the close of the rains or the commencement of the cold season. The male keeps with the female during the rutting-season (about June or July), at other times they live solitary."

Like all the *Tragulidæ* this animal has a peculiar walk on the tips of its hoofs, which gives the legs a rigid appearance, and there is a common idea that it has no knee-joints. It is timid, but gentle and easily domesticated, and has bred in confinement. The only sound it has been observed to utter is a feeble bleat. It is crepuscular in its habits.

372. *Tragulus javanicus*. *The little Malay Chevrotain.*

Moschus javanicus, *Gmelin, Syst. Nat.* i, p. 174 (1788).

Moschus kanchil, *Raffles, Tr. L. S.* xiii, p. 262; *Gray, P. Z. S.* 1836, p. 64.

Tragulus kanchil, *Gray, List Mam. B. M.* p. 173; *Cantor, J. A. S. B.* xv, p. 268; *Blyth, J. A. S. B.* xxvii, p. 276; *id. Cat.* p. 156; *A. Milne-Edw. Ann. Sci. Nat.* (5) ii, pp. 111, 159, pl. ii, fig. 3, pl. ix; *Blyth, P. Z. S.* 1864, p. 483; *id. Mam. Birds Burma*, p. 44; *Thomas, P. Z. S.* 1886, pp. 72, 79; *W. Selater, Cat.* p. 189.



Tragulus javanicus, A. Milne-Edw. t. c. pp. 103, 157, pl. ii, fig. 1; Blyth, P. Z. S. 1864, p. 483; Thomas, P. Z. S. 1891, p. 385.

Tragulus pelandoc, Blyth, J. A. S. B. xxvii, p. 277; id. Cat. p. 156.

Yun, Burmese; Kanchil, Pelandoc, Malay.

A naked glandular area beneath the chin, between the rami of the mandible; tarsus naked behind throughout, carpus almost naked behind. Tail long.

Colour. Above brown, more or less rufous. Back in old individuals nearly black, but always more or less mixed with rufous or yellow, from some of the hairs having a yellow ring near the end. Hair at base light brown. Sides paler; nape and upper surface of neck almost or quite black, contrasting with the light brown of the sides. Lower parts white, variously mixed with light rufous and usually with a median narrow brown or rufous line throughout the breast, in front of this is a brown cross band and on the fore neck an arrowhead-like brown mark, sometimes imperfect, with three white stripes, one median, within the arrow-head, the other two diverging, one on each side, outside of it; the last two joining on the throat. Rump rufous, inside of thighs and intermediate space always white; tail rufous-brown above, white below.

Dimensions. The largest adults measure: nose to root of tail 18.5 inches, tail 3 (Cantor), tarsus and hind foot 4.4 to 5. Basal length of a male skull 3.4, extreme length 3.95; zygomatic breadth 1.9.

Distribution. Malay Peninsula and Islands, extending as far north as Yai in Tenasserim, also to Cambodia and Cochin China. This species is common in Sumatra and Java.

Habits. Very similar to those of *T. meminna*. This chevrotain inhabits dense thickets and is said to be very abundant in the mangrove-jungle along the coast of Tenasserim and the Malay Peninsula. It is timid and very delicate, though it is easily tamed, and occasionally has been known to breed in confinement. It produces one or two young at a time. Except the Royal Antelope, *Nanotragus pygmaeus*, the present is the smallest living Ungulate.

373. *Tragulus napu*. The larger Malay Chevrotain.

Moschus javanicus, Raffles, Tr. L. S. xiii, p. 262; Gray, P. Z. S. 1836, p. 64; nec Gmelin.

Moschus napu, F. Cuv. Hist. Nat. Mam. pl. 329 (1822).

Tragulus javanicus, Gray, List Mam. B. M. 1843, p. 173; Cantor, J. A. S. B. xv, p. 269; Blyth, J. A. S. B. xxvii, p. 277; id. Cat. p. 155.

Tragulus fuscatus, Blyth, J. A. S. B. xxvii, p. 278.

Tragulus napu, A. Milne-Edw. An. Sci. Nat. (5) ii, pp. 106, 158, pl. ii, fig. 2, pl. viii; Blyth, P. Z. S. 1864, p. 483; Blanford, J. A. S. B. xlvii, pt. 2, p. 166; Thomas, P. Z. S. 1886, p. 71, 1891, p. 385; W. Selater, Cat. p. 190.

Napu, Malay.

A naked tract on the throat, the tarsus naked behind, and the tail long as in *T. javanicus*. Size larger.



Colour. Upper parts yellowish or rufous-brown, sides greyer. Hair on back light brownish orange with black tips, no subterminal pale ring. On the sides the basal portion of the hair is whitish. Forehead and nape blacker, but the borders of the black area ill-defined. Lower parts white, generally a brown median line on the breast, the chest and lower abdomen white and an intermediate tract brownish. Throat and fore neck brown, with 5 white bands, more or less distinct, a median band on the chest and two oblique lines on each side in front on the throat. The white lines often become blended together. Rump rufous; tail brown above, white below.

Dimensions. Height 13 inches, nose to root of tail 28, tarsus and hind foot 5·6 to 6, tail 5. I have been unable to obtain the measurements of an adult skull; those of the figure in Milne-Edwards's paper are: extreme length 4·5 inches, basal length 4, breadth 1·9, but these are probably small.

Distribution. The Malay Peninsula, extending north into Southern Tenasserim, and south to Sumatra, Java, and Borneo. This species was obtained at Bankasun in S. Tenasserim by Mr. W. Davison.

Habits. So far as is known similar to those of the other species, but the larger chevrotain is much less common in the Malay Peninsula than *T. javanicus*.

The *Tylopoda*, or Camels and Llamas, form a separate section of the ruminant Artiodactyle Ungulates. They differ from other ruminants in dentition, the full number of upper incisors being present in the young and the outermost being persistent throughout life. The canines are present in both jaws, and the lower canines are distinct from the long procumbent and spatulate incisors. The molars are selenodont and hypsodont, but one or more of the anterior premolars is usually detached from the series and pointed. Only two digits, the third and fourth, are present in each foot, and there are no true hoofs, the ungual phalanges bearing nails and the sole of the foot consisting of a broad fleshy pad. There are no horns. There is no distinct third compartment of the stomach or manyplies, the interior of the rumen or paunch has no villi on the surface, and both it and the second compartment have within their walls large pouches or cells in which water can be retained. The placenta is diffuse.

There are two living genera, *Camelus* and *Lama* (*Auchenia*), the latter South American. Only two species of camel exist—*Camelus bactrianus*, the two-humped camel, found tame in Central Asia; and *C. dromedarius*, the single-humped camel, so extensively employed in South-western Asia and Northern Africa. This is the animal of which large herds are kept in North-western India. It is unknown in the wild state, and although Bactrian Camels have been found wild by Prejvalski and others in the deserts east of Yarkand, there is but little doubt that these wild individuals are descended from tame ancestors. Fossil remains of camels belonging to two extinct species are found in the Pliocene Siwaliks of Northern India.



SUINA.

Molars bunodont, bearing, when unworn, cone-like tubercles, and exhibiting when worn a pattern not arranged in crescents. Not ruminant. Third and fourth metapodials not completely united to form a cannon-bone (fig. 157 c, p. 480). Upper incisors present.

Only one family is represented in India.

Family SUIDÆ.

An elongate snout, terminating in an expanded, truncated, nearly naked, flat disk containing the nostrils. Feet narrow; four completely developed toes in each, the hoofs of the outer two not reaching the ground in the ordinary walking position. Teeth variable in number. Incisors rooted. Upper canines curving more or less outwards and upwards. Stomach simple. A cæcum present.

The family of the pigs is distributed throughout the greater part of Europe, Asia, and Africa. These animals are amongst the least specialized of living Ungulates and are represented by a great number of extinct species, extending back to the Miocene and Upper Eocene. In Indian Pliocene and Pleistocene beds six or seven species of *Sus* alone are found, one of them the largest of known pigs, besides species of *Hyotherium*, *Hippohyus*, &c. In addition to members of the *Suidæ*, numerous forms are met with that tend to unite the non-ruminant *Suina* with the ruminant *Pecora*, especially pigs with selenodont molars (*Anthracotherium* &c.). Amongst the most remarkable pig-like forms is *Tetraconodon*, an animal about the size of a tapir with enormous conical premolars.

The Indian living species belong to the typical genus.

Genus *SUS*, L. (1766).

Syn. *Porcula*, Hodgson (1847).

The complete dentition of the Eutheria is present:—i. $\frac{6}{6}$, c. $\frac{1-1}{1-1}$, pm. $\frac{4-4}{4-4}$, m. $\frac{3-3}{3-3}$. Upper incisors diminishing rapidly in size from the median pair to the outer. Lower incisors long, narrow, projecting almost horizontally. Canines (tusks) greatly developed in males, rootless, both upper and lower curved outwards and projecting from the mouth in males, the upper turned upwards. Teeth of molar series increasing in size and complexity from the

first to the last, first lower premolar separated from the second by an interval. Last molar nearly or quite as long as the two preceding it together. Vertebrae: C. 7, D. 13-14, L. 6, S. 4, C. 20-24.

Skull elongate, the occipital crest greatly elevated, so that in the profile the occiput makes an acute angle with the line of the face. Nasals very long and narrow; a peculiar prenasal bone.

True pigs are found throughout the Oriental region and the temperate portion of the Palearctic, and are represented by the subgeneric form *Potamochoerus* in Africa and Madagascar. Three species occur within Indian limits.

Synopsis of Indian, Ceylonese, and Burmese Species.

Large; height at shoulder 30 to 40 inches. . . . *S. cristatus*, p. 560.
Small; height about 20 inches *S. andamanensis*, p. 562.
Very small; height about 10 inches. *S. salvanius*, p. 563.

374. *Sus cristatus*. The Indian wild Boar.

Sus cristatus, Wagner, Münch. gel. Anz. ix, p. 535 (1839); Blyth, Mam. Birds Burma, p. 43; W. Sclater, Cat. p. 193.

Sus scrofa, Sykes, P. Z. S. 1831, p. 104; Elliot, Mad. Journ. L. S. x, p. 219; Blyth, Cat. p. 139; Blanford, J. A. S. B. xxxvi, p. 197 (nec Linn.).

Sus indicus, Gray, List Sp. Mam. B. M. p. 185 (1843); Cantor, J. A. S. B. xv, p. 261; Kelaart, Prod. p. 78; Jerdon, Mam. p. 241.

Sus affinis, Gray, List Ost. Sp. B. M. (1847), p. 71 (no description).

Sus zeylonensis, Blyth, J. A. S. B. xx, p. 173; xxi, p. 351.

Sus bengalensis, S. indicus, and *S. zeylanensis*, Blyth, J. A. S. B. xxix, p. 105.

Suar, Barha, Bad or Bura jānwar, H.; Dūkār, Mahr., Guz., Sind.; Hikk, Baluch; Gūráz, Kuk, P.; Pandi, Tam., Tel., &c.; Kātu-pam, Tam.; Paddi, Gond; Bir Sukri, Ho-Kol; Kis, Rājmeḥāl hill tribes; Handi, Mikka, Jevadi, Kari-jāti, Can.; Sukaram, Mal.; Watūra, Cing.; Banel, Nepal.; Ripha, Phāk, Bhotia; Sarao, Daphla; Bali, Techim, Mishmi; Sniang, Khāsi; Vāk, Gāro; Omar, Hono, Kachāri.; Kubak, Tharo, Kashag, Mengi, Vāk, Nāga; Eyeg, Abor; Mu, Khāmti; Ok, Manipur; Vu, Kuki; Vhu, Aka; Wa, Singpho; Tau wet, Burm.; Kalet, Talain; Hto, Karen; Mu, Shan; Bābi ūtan, Malay.

A crest of lengthened black bristles from the nape along the back. Hair coarse and bristly throughout, thin on the sides, and still thinner below. No woolly underfur. Tail extending nearly to hocks, scantily haired except at the tip, which is compressed and fringed on each side. Ears thinly clad externally, more thickly within. The last lower molar always, and the last upper molar generally, longer than the two preceding molars together. Mammæ 6 pairs.

Colour. Black, more or less mixed with rusty brown or whitish; young animals browner, old animals greyish. The young, when first born, are light fulvous brown, with longitudinal stripes of dark brown.

Dimensions. Adult animals measure about 5 feet from nose to vent; tail 8 to 11.5 in., with hair a foot or more; ear 5.5 in.



Height 28 to 36 inches at the shoulder; according to Simson, one of the largest boars he ever killed (in Bengal, where some are of great size) was just under 38 inches high. Males are larger than females.

Basal length of a large boar's skull 13.75 inches, zygomatic breadth 7.3. Weight of adults from about 200 to considerably over 300 lb. (4 maunds). The lower tusks in a large hog are said to have measured 12 inches in length, including the portion imbedded in the jaw, but they rarely exceed 9.

Distribution. Throughout India, Ceylon, and Burma; on the Himalayas to a considerable elevation. Capt. Baldwin says he has seen their tracks at 15,000 feet.

Varieties. Blyth at one time divided the wild pigs of India into 3 species, distinguished by the form of the skull, and especially by the breadth and convexity of the frontal plane in the parietal region, the skull of the large Bengal type being broadest and most convex, and a Ceylonese skull narrowest. There appears, however, to be no constant distinction, although large skulls from the Gangetic plain exhibit the peculiarities noticed by Blyth. The other characters mentioned by him are not, I believe, peculiar to the Bengal race. Some years ago I called attention (J. A. S. B. xxxvi, p. 197) to the occurrence in forest and bush-jungle of whole herds of brown pigs, and to my having seen a large solitary hog of the same colour, a dull brown, quite different from the usual blackish tint. This was on the Nerbudda, south-east of Indore; but I have seen pigs of the same colour in various parts of India, including, I think, Western Bengal. The same variation has been noticed by Forsyth.

Sus cristatus is distinguished from the European wild boar, *S. scrofa*, by its much more developed crest or mane, and by the proportionally greater size and complexity of the last molar in each jaw. The Indian pig is higher, and much more thinly covered with hair. According to Jerdon the tail is more tufted and the malar beard more marked, perhaps owing to the hair in general being less shaggy. The wild pigs of Baluchistan and Afghanistan may be *S. scrofa*, as are, I think, those of Persia and Mesopotamia.

The tame pig of India is doubtless derived from the wild animal and probably breeds with the latter in places. I have more than once seen a litter of tame young pigs striped; and as this peculiarity is wanting in tame animals generally, such litters may have been the produce of tame sows by wild boars.

According to Blyth the Tenasserim wild pig is a much smaller form, adult skulls being one-fifth less in linear dimensions.

Habits. The Indian wild boar is found during the day in high grass or bushes, sometimes in forest and often in high crops—the females and young as a rule associating in herds or “sounders” usually of ten or a dozen, and rarely exceeding about twenty individuals, whilst the adult males keep apart. They roam about and feed on various vegetable substances in the morning and evening. They are partial to marsh, and feed largely on the roots of plants growing in swampy places—especially, according to



Jerdon, on those of a sedge that is found on the edges of tanks. They turn up the soft ground with their snouts when rooting about for food, and leave marks easily recognized. No animals are more destructive to crops. The food of wild pigs is, however, not absolutely restricted to vegetables; they have several times been observed to feed on dead animals, and Mr. Peal states that in Assam they dig out and eat the fish that bury themselves in mud during the dry season. Wild pigs feed much at night, but they are less nocturnal in tracts where they can feed without disturbance after sunrise.

The speed of a wild pig is considerable, but not for a long distance; on any practicable ground either boar or sow may be caught by a fair horse within a moderate distance. Spearing hogs, or "pigsticking" as it is commonly called in India, is unquestionably the finest sport in the country, and owes its excitement to the circumstance that, as Sterndale justly remarks, a boar is perhaps the most courageous of all wild animals, and generally fights to the death, receiving spear after spear and charging horseman after horseman with reckless gallantry. Several instances are on record of desperate fights between a large boar and a tiger, and in not a few the tiger has been killed. Sterndale mentions two cases within his own knowledge. McMaster relates an instance of a boar charging, knocking over, and ripping a camel, and occasionally even elephants are attacked. Yet a boar seldom makes an attack without provocation. There is much difference in both the endurance and courage of hogs in different parts of India, the large heavy pig of Bengal having less taste for running and more for fighting than the more lightly built animal of the Deccan or the Punjab.

Wild pigs have a habit of cutting grass and making a kind of shelter in which they are said to leave the young. Old boars may sometimes be found in these lairs, as Simson states in his 'Letters on Sport in Eastern Bengal.'

Pigs are much more prolific than most of the Ungulata. The period of gestation is about 4 months, and they, sometimes at all events, breed twice in the year; the number of young is usually 4 to 6 in *S. scrofa* and probably the same in *S. cristatus*. The European wild pigs breed in the second year and live from 20 to 25 years.

375. *Sus andamanensis*. *The Andaman Pig*.

Sus andamanensis, Blyth, *J. A. S. B.* xxvii, p. 267 (1858); xxviii, p. 271; xxix, p. 103; *id. Cat.* p. 141; *W. Selater, Cat.* p. 195.

Tail very short. Animal covered with somewhat shaggy and long bristles; no distinct crest on the neck or back in the only skin examined. Molars much less complex than in *S. cristatus*. The hinder molar, above and below, shorter than the two preceding molars together.



Colour. Black, tips of some dorsal bristles brownish grey.
Dimensions. Height at shoulder about 20 inches; basal length of an adult male skull 9, zygomatic breadth 4·5.
Distribution. Forests of the Andaman Islands.

376. *Sus salvanius.* *The pigmy Hog.*

Porcula salvania, Hodgson, *J. A. S. B.* xvi, pp. 423, 593, pls. xii, xiii; xvii, pt. 2, p. 480, pl. xxvii; *Horsfield*, *P. Z. S.* 1853, p. 192, pl. xxxvii; *Jerdon*, *Mam.* p. 244; *Sclater*, *P. Z. S.* 1882, p. 546, pl. xxxvii; 1883, p. 388, pl. xliii, *juv.*; *W. Sclater*, *Cat.* p. 195.
Sus salvanius, *Garson*, *P. Z. S.* 1883, p. 413.

Sano banel, Nepal.

No distinct crest, but hair on hind neck and middle of back rather longer. Ears small, naked. Tail very short. No woolly underfur. Three pairs of mammae. The last molar, either upper or lower, is considerably shorter than the two preceding molars together.

Colour. Brown or blackish brown, black and brown bristly hairs being mixed. The young are dark brown, with longitudinal rufous bands, above and on the sides, white beneath.

Dimensions. An old male measured by Hodgson was 26 inches from snout to rump, 11·25 high at the shoulder, ear 2·75, tail 1·25. Weight 17 lb. The skull measures 5·9 in basal length, and 3·2 in zygomatic breadth.

Distribution. The forest at the base of the Himalayas in Nepal, Sikhim and Bhutan.

Habits. Apparently very similar to those of *S. cristatus*. The pigmy hog is chiefly found in high grass-jungle, and is said to live in herds of from 5 to 20, the adult boars keeping with the females. These small pigs are very rarely seen, as, like other swine, they only leave the forest at night.

The *Hippopotamidae*, now confined to Africa, were, in Pliocene and Pleistocene times, represented in India by several species, some of which probably were contemporaries of man, a worked flint having been found in the Nerbudda gravels that contain bones of *Hippopotamus*. Falconer thought that these animals might have lived until the Arian immigration, and that they might have been the *Jald-hasti*, or water-elephant, of Sanscrit writers, but it appears more probable that the animal thus named was *Platanista*.



Order CETACEA.

Whales, dolphins, and porpoises constitute an order differing widely, both in form and structure, from all land-mammals. They were at one time supposed to have some affinity with the Carnivora, but Flower has shown that the relationship is doubtful, and that Cetaceans are probably more nearly allied to some of the primitive Ungulates than to any other Mammalia.

The Cetacea are modified for a purely aquatic life and their external form much resembles that of Fishes. There are no external hind limbs, whilst the tail is flattened and expanded into lobes, known as flukes, so as to resemble that of a fish in outline, though the expansion is horizontal instead of vertical. The anterior limbs are converted into paddles, termed flippers or pectoral fins, the digits being completely united together by skin and destitute of nails. There is in most genera a dorsal fin composed of integument. The skin is smooth and hairless, with the exception of a few bristles round the mouth, generally confined to young animals; but the body is surrounded, immediately beneath the skin, by a thick layer of fat or "blubber," which, like the hair or wool of land-animals, serves to retain the heat of the body.

The eye is small and the ear-orifice minute; there is no trace of an external ear. The nostrils open either separately or by a single, generally crescentic, orifice or "blow-hole" much above the extremity of the snout, and in most forms on the top of the head. The mammae, two in number, discharge each by a teat lying in a groove, one on each side of the genital orifice. The testes are abdominal, the uterus is bicornuate, the placenta non-deciduate and diffuse.

The peculiarities of the skeleton are too numerous for any except the most important to be here mentioned. The bones generally are spongy in texture, the cavities being filled with oil. The skull is greatly modified and consists of a short, almost round brain-case, and of a more or less elongate rostrum. The cervical vertebrae are often partially or wholly anchylosed. There is no sacrum. The mode of attachment of the ribs to the vertebrae is more or less peculiar, and presents modifications characteristic of the different families. There are no clavicles. The radius and ulna are distinct, and are flattened, as are all the bones of the wrist and hand. The digits are 4 or 5 in number, more often the latter, and the phalanges of the second and third digits greatly exceed in number those found in other mammals. A pair of styliform bones represent the pelvis.



In one large group no teeth occur, except in the foetus; when teeth are present after birth, all are similar in form, and are not preceded by milk-teeth.

By far the majority of Cetacea are marine, but many enter large rivers, and a few are restricted to them. All are carnivorous and live on fish, crustacea, or mollusca; one genus, *Orca*, preying on seals and whales. Like other mammals, cetaceans are air-breathers and come to the surface of the water to breathe or "blow." The old idea, represented in many pictures, that whales "spout" or eject by the blow-holes water taken in by the mouth, is erroneous, the supposed jet being merely the expired air with watery and mucous particles forming spray. The "spouting" is naturally much more conspicuous in cold regions. The acts of expiration and inspiration are very quickly performed, especially by dolphins.

The order is divided into two suborders thus defined:—

No teeth after birth; baleen present. Breathing-orifice double	MYSTACOCÆTI.
Teeth present throughout life; no baleen. Breathing-orifice single	ODONTOCÆTI.

In the preparation of the following account of Indian cetaceans, I have generally followed Prof. W. H. Flower, to whom I am indebted for much personal aid, in addition to the information published in his papers on various genera of the order.

Suborder *MYSTACOCÆTI*.

Teeth never present after birth. The palate is furnished with numerous plates of baleen or whalebone, serving to strain the water from the fish, crustacea, or mollusca, mostly of small size, on which whales feed. Skull symmetrical. Rami of mandible arched outwards, not uniting in a true symphysis at the distal extremities. Ribs very loosely connected with the vertebræ, and articulating only with their transverse processes; the first rib alone connected with the sternum. External openings of the two nostrils separate, longitudinal. A cæcum present.

Family BALÆNIDÆ.

Characters of the suborder, of which this is the only family. The principal genera are the Right Whales (*Balæna*), with enormous heads, long baleen, no dorsal fin, and united cervical vertebræ, and the Humpbacks (*Megaptera*) and Fin-whales or Rorquals (*Balenoptera*), with smaller heads, shorter baleen, a dorsal fin, and free cervicals. Only the last-named genus has been as yet clearly recorded from Indian seas.

Genus **BALÆNOPTERA**, Lacépède, 1804.Syn. *Physalus*, Cuvierius, Sibbaldius, &c., Gray.

Form slender; head flat, pointed, measuring $\frac{1}{4}$ to $\frac{1}{5}$ of the total length. Skin of the throat with deep longitudinal furrows. A small falcate dorsal fin, placed far back about two thirds of the distance from head to tail. Pectoral limbs or flippers small, narrow and pointed, $\frac{1}{4}$ to $\frac{1}{11}$ of total length, tetradactylous. Baleen short and coarse. Cervical vertebræ free.

The members of this genus, known to whalers as Finners, Fin-whales, Fin-backs, Razor-backs, or Rorquals, are found in all seas. Formerly, when Right-whales (*Balæna*) were more common, other whales, and especially Finners and Humpbacks, were not attacked by whalers, as these whales, owing to their greater speed, are more difficult to kill, and they yield far less oil and whalebone. Of late years, however, Finners have been pursued by means of steam-vessels and attacked with improved forms of harpoon-guns, and large numbers have been captured.

Four species of the genus *Balenoptera* have long been known to whalers in the northern seas, but have only recently been clearly identified by naturalists, chiefly through the work of Profs. Flower and Van Beneden. It has been ascertained that all, unlike the Greenland whale (*Balæna mysticetus*), are migratory, and visit the seas of Norway, Iceland, and even of Greenland in summer, returning to warmer seas in winter. It has been satisfactorily shown that some of the Fin-whales of the southern hemisphere (New Zealand, &c.) are identical with those of northern seas; and in his last work ('Hist. Nat. des Cétacés des Mers d'Europe') Prof. Van Beneden has identified all species of *Balenoptera* hitherto described, including those of the Indian seas, with these four species. To facilitate the comparison of Indian whales, the following leading characters of the four are given, chiefly from Mr. R. Collett's descriptions (P. Z. S. 1886, p. 264):—

1. *Balenoptera rostrata*.—Length 25 to 30 feet, seldom exceeding 33 feet. Height of body to total length 1:5. Greyish black above, white below, including lower side of tail; a broad band of white across outer side of each flipper, inner side all white. Flippers $\frac{1}{4}$ total length, jaws $\frac{1}{11}$. Vertebræ about 48, ribs 11 pairs.

2. *B. borealis*.—Length 40 to 48 feet, rarely as much as 52. Height to total length 1:5 $\frac{1}{2}$. Bluish black above, with oblong white spots

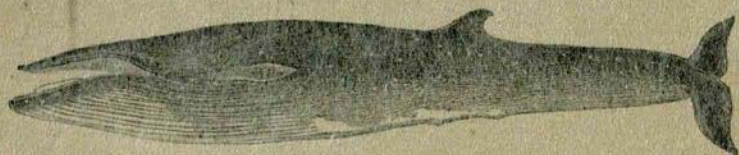


Fig. 183.—*Balænoptera borealis* (from P. Z. S. 1836, pl. xxv).

more or less white below; tail and flippers black on both sides. Flippers very small, $\frac{1}{11}$ total length, jaws $\frac{1}{4}$. Vertebræ 55 to 56, ribs 13 pairs.



3. *B. musculus*.—Length 60 to 65 feet, rarely exceeding 70. Very elongate. Height to total length 1: $6\frac{1}{2}$ or $6\frac{3}{4}$. Greyish slate above and on left lower jaw; below, with right lower jaw, inside of flippers, and lower side of tail-flukes, white. Flippers $\frac{2}{3}$ total length, jaws $\frac{1}{2}$. Vertebrae about 62, ribs 15 pairs.

4. *B. sibbaldi*.—Length 70 to 80 feet, rarely exceeding 85. Height to total length 1: $5\frac{1}{2}$. Dark bluish grey, with small whitish spots on breast; lower edges and inner sides of flippers white. Flippers $\frac{1}{2}$ total length, jaws $\frac{2}{3}$. Vertebrae about 63, ribs 15–16 pairs.

Curiously enough, four species have been indicated more or less distinctly in the Indian Ocean, viz.: *B. indica* by Blyth, *B. schlegeli*, from Java, by Flower, *B. blythi* and *B. edeni* by Anderson. The first is of the same size as the great *B. sibbaldi*; the second has been clearly identified by its describer with *B. borealis*; *B. blythi* corresponds in size with *B. musculus*; and the published figures representing bones of *B. edeni* are referred by Van Beneden without doubt (*op. cit.* p. 186) to *B. rostrata*. It should, however, be added that Van Beneden, in another part of the same work (p. 155), appears to refer the same *B. edeni* to *B. borealis*, and that there is no evidence as to the locality whence came the few vertebrae to which Anderson (*An. Zool. Res.* p. 564) gave the name of *B. blythi*; it is uncertain whether these bones are of Indian or even of Asiatic origin. The identifications of *B. indica* and *B. edeni* are probable, but both have been found in Indian seas in the summer, when, according to the theory of migration, they should be in colder regions; and *B. edeni*, although agreeing in most characters with *B. rostrata*, is larger. For the present, therefore, I leave the two undoubted Indian species under the names by which they were described.

The Fin-whales feed on fish and crustacea, and are found sometimes solitary, sometimes in shoals.

Synopsis of Indian Species.

Adults 80 feet or more in length *B. indica*, p. 567.
Adults about 40 feet long *B. edeni*, p. 568.

377. *Balænoptera indica*. The great Indian Fin-whale.

Balænoptera indica, Blyth, *J. A. S. B.* xxviii, p. 488 (1859) (*conf. op. cit.* xxi, p. 358, xxii, p. 414, xxix, p. 451); *id. Cat.* p. 95; *id. Mam. Birds Burma*, p. 34; Jerdon, *Mam.* p. 161; Anderson, *An. Zool. Res.* p. 551; Murray, *Vert. Zool. Sind*, p. 41, pl. vi (skull); W. Sclater, *Cat.* p. 313.

External characters unknown. Described from two mandibular rami, a rib, the right radius, and 5 vertebrae preserved in the Indian Museum, Calcutta. The character by which the species is especially distinguished, according to Blyth, is the slenderness of the mandible.

Dimensions. Total length of adult 80 to 90 feet. The lower jaw of a specimen said to be 84 feet long measured nearly 21 feet



length, 18 inches in vertical diameter at a spot 3 feet in advance of the coronoid process, and nearly 27 inches at the coronoid. The radius was 39 inches long; a rib (probably the third) 8 feet 2 inches.

Distribution. Bay of Bengal and Arabian Sea. A large whale, probably this species, is not rare on the coast of Baluchistan. The animal from which the typical bones were procured was stranded on Amherst Island, Arrakan, in the rainy season of 1851. Another came ashore alive, Sept. 15, 1842, near Chittagong. Other individuals have been stranded on the coast of Sind; of one the skull, 17 feet 8 inches long, is preserved in the Karáchi Museum, and this large whale has also been recorded on the coasts of Malabar and Ceylon.

As already pointed out, this species is probably the same as the great northern Fin-whale (*B. sibbaldi*). It is the largest of all known animals, living or extinct.

378. *Balænoptera edeni*. *The smaller Indian Fin-whale.*

Balænoptera edeni, Anderson, *An. Zool. Res.* p. 551, pl. xlv (skull and vertebræ); *W. Selater, Cat.* p. 314.

Of this whale, also, no details of the external characters are known, but a skull, the vertebræ, and some other bones of an adolescent individual are preserved in the Indian Museum, Calcutta. The vertebral formula is believed to be C. 7, D. 10, L. 14, C. 21, = 52. The skull is very long, the maxillary portion especially.

Dimensions. Total length of adult probably 40 feet. In an adolescent individual 37 feet long the skull was 9 feet 11 inches long, 4 feet 5 inches broad (a larger skull 10 feet 4 inches by 4 feet 10 inches), lower jaw 9 feet 5 inches; humerus 12.25 inches, radius 22; height of mandible at coronoid process 14, length of baleen about 12. Additional measurements of various bones are given by Anderson.

Distribution. Bay of Bengal. The type was stranded in the Sittoung Estuary, June 18, 1871.

As already pointed out, this whale is referred by Van Beneden to *B. rostrata*.

Although no specimen has yet been procured from the Indian seas, there can be little if any doubt that a species of *Megaptera* exists there. In this genus the head is of moderate size, the body much less slender than in *Balænoptera*, and there is a protuberance or hump forming the base of a low dorsal fin. Throat plicated; baleen-plates short and broad; cervical vertebræ free. The pectoral limb is very long and narrow, being one-fourth the total length of the animal. This whale grows to a length of 50 or 60 feet or even more.

The common Atlantic form, *M. boops*, is said to occur in almost all seas; but another species, *M. indica* (Gervais, *Comptes Rendus*, xcvi, p. 1566), has been described from the Persian



Gulf, and Van Beneden is inclined to regard this form as distinct. A skull of *M. boops* from Java is, however, in the Leyden Museum. A whale some years since (July 1873) was entangled in the telegraph-cable off the Baluchistan coast and drowned. The tail was covered with barnacles (Cirripeds), and this, as Van Beneden points out, is characteristic of *Megaptera*. I myself once saw a whale of much stouter form than *Balaenoptera*, under favourable circumstances, a great part of the body being above the sea at times, off the mouth of the Indus. Gray (Cat. Seals and Whales

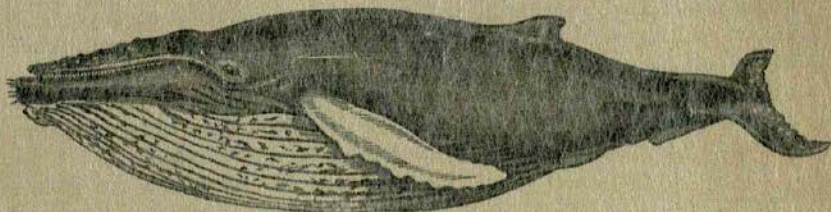


Fig. 184.—Humpbacked Whale, *Megaptera boops*. (Flower, art. "Whale," 'Encyclopædia Britannica'.)

B. M. 1866, p. 131) refers an imperfect skeleton in the Asiatic Society's collection at Calcutta to this genus, but on evidence that is scarcely convincing.

The accompanying figure of *M. boops* may assist in the recognition of the genus.

Suborder ODONTOCETI.

Teeth always present in one or both jaws after birth. No baleen. Upper surface of skull asymmetrical. Rami of mandible nearly straight, meeting distally in a true symphysis. Several of the anterior ribs articulate with the bodies of the vertebræ, and several pairs are connected with the sternum by sternal ribs. Manus always pentadactylous. Nostrils united into a single external orifice. No cæcum, except in *Platanista*.

Three families compose this suborder; all are found in Indian seas or rivers. They are distinguished as follows:—

- | | |
|--|----------------------|
| A. Functional teeth in the lower jaw only..... | Physeteridæ. |
| B. Functional teeth in both jaws (upper teeth deciduous in <i>Grampus</i>). | |
| a. Ribs abnormally articulated. Symphysis of mandible never exceeding $\frac{1}{3}$ length of ramus..... | Delphinidæ. |
| b. Ribs normally articulated. Mandibular symphysis $\frac{1}{2}$ length of ramus | Platanistidæ. |



Family PHYSETERIDÆ.

No functional teeth in the upper jaw. Teeth in lower jaw varying in number, sometimes only one or two on each side. Bones of cranium rising into a crest behind the nares. Pterygoid bones thick, produced backwards, and not involuted to form the outer wall of the post-palatal air-sinuses. Transverse processes of the arches of the dorsal vertebræ, to which the tubercles of the ribs are attached, ceasing abruptly near the posterior end of the series, and replaced by other processes at a lower level from the bodies of the vertebræ, the latter processes homologous anteriorly with the heads of the ribs, and posteriorly with the transverse processes of the lumbar vertebræ. (In *Physeter* both processes are found in the same vertebra in the region of transition.)

All the members of this family are oceanic, and all, so far as is known, subsist mainly on Cephalopoda (cuttle-fishes). Besides the sperm-whales, which form the subfamily *Physeterinae*, and have, in each mandibular ramus, several teeth set, not in distinct alveoli, but in a long groove imperfectly divided by partial septa, the present family contains the ziphioid whales, or subfamily *Ziphiinae*, in which only one or two teeth are functionally developed in each ramus of the mandible. Members of the first subfamily alone are known from the Indian seas, though there can be little if any doubt that some representatives of the *Ziphiinae*, several of which inhabit the Indian Ocean, occur near the coasts of British India.

Only two genera of sperm-whales are known; both are Indian, and they are easily distinguished thus:—

Head very large; lower teeth 20 to 25 on each side..... PHYSETER.

Head moderate; lower teeth 9 to 13 on each side..... COGIA.

Genus PHYSETER, Linn. (1766).

Syn. *Catodon*, Artedi.

Teeth of the upper jaw rudimentary, simply imbedded in the gum. Lower teeth 20–25 on each side, stout, conical, recurved, pointed until worn, and without enamel. Upper surface of the skull formed of a high semicircular crest, with a deep hollow in front; from the bottom of this hollow the elongate rostrum protrudes. Lower jaw very long, the symphysis half as long as the jaw itself.

Vertebræ: C. 7, D. 11, L. 8, C. 24. Atlas free, the other cervicals united.

Head about one third the length of the body ($\frac{1}{4}$ total length), high, subcylindrical, ending abruptly in front, as if truncated. Blowhole single, longitudinal, and at the left side of the upper anterior extremity of the huge muzzle. The mouth opens beneath the muzzle, and some distance short of the end. Pectoral limbs



short, broad, and truncated. Dorsal fin replaced by a low protuberance.

The upper part of the huge head is filled with the substance known as spermaceti. The same substance is found, though in smaller quantities, in other *Physeteridae*, probably in all.

Only one species is known with certainty.

379. *Physeter macrocephalus*. The Sperm-whale or Cachalot.

Physeter macrocephalus, *L. Syst. Nat.* i, p. 107 (1766); *W. Selater, Cat.* p. 314.

Catodon macrocephalus, *Blyth, Cat.* p. 93.

Colour black or blackish throughout, or whitish below.

Dimensions. Males grow to about 60 feet; females are said not to attain more than half that length.

Distribution. Pelagic; found in nearly all tropical and sub-tropical seas, occasionally visiting colder regions. Formerly this whale is said to have been much hunted in the Bay of Bengal and off Ceylon. The only recorded case of an individual being stranded on the Indian coast, so far as I am aware, took place in January 1890 at Madras, and was noticed by Mr. Thurston, Superintendent, Government Central Museum. The animal was about 24 feet long.



Fig. 185.—Sperm-whale (*Physeter macrocephalus*). (Flower, Art. "Whale," 'Encyclopædia Britannica.')

Habits. The Sperm-whale is found in the open sea, generally in herds or "schools" varying from ten or fifteen to a very large number, sometimes, it is said, as many as two hundred animals. The old males live apart. All wander much, sperm-whales having been killed in the Atlantic with harpoons that had been left in them in the Pacific Ocean. These animals can dive for a long time and to great depths. Their movements are more rapid than those of other whales.

The Cachalot, like other *Physeteridae*, appears to feed entirely on Cephalopoda (cuttle-fishes). Besides the spermaceti from the head and sperm-oil from the blubber, this whale yields ambergris, which is a concretion formed in the intestine and found sometimes floating on the sea.

Genus **COGIA**, Gray, 1846.

Syn. *Kogia*, auct.; *Euphysetes*, MacLeay (1851).

Upper teeth absent, or represented by a rudimentary anterior pair embedded in the gum; 9 to 13 lower teeth on each side, long, slender, pointed, curved backwards, and coated with enamel. Upper surface of cranium slightly concave, rostrum not longer than cranial portion of skull. Mandibular symphysis less than half the entire length of the rami.

Vertebrae: C. 7, D. 13-14, L. & C. 30. All cervical vertebrae united.

External form not unlike that of a porpoise. Head about one sixth of the total length, obtusely pointed in front. Mouth small, inferior, and considerably short of the end of the snout. Blowhole crescentic, on top of head, but to the left of the median line and anterior to the eyes. Pectoral fins obtusely falcate. A well-developed dorsal fin.

Several nominal species have been described, but all are probably varieties of one.

380. *Cogia breviceps*. *The small Sperm-whale*.

Physeter breviceps, *Blainv. Ann. Anat. Phys.* ii, p. 337 (1838).

Kogia breviceps, *Gray, Zool. Erebus & Terror*, p. 22 (1846).

Euphysetes grayii, *Wall, Hist. New Sperm Whale, Sydney*, p. 37 (1851).

Euphysetes macleayi, *Krefft, P. Z. S.* 1865, p. 708, figs.

Physeter (Euphysetes) simus, *Owen, Tr. Z. S.* vi, p. 30, pls. x-xiv (1866); *Elliot, ib.* p. 171.

Wongu, Telugu.

Colour. Above shining black, growing paler below.

Dimensions. An immature female, captured at Vizagapatam, was

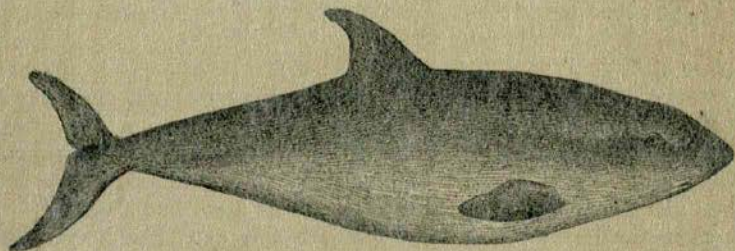


Fig. 186.—*Cogia breviceps*. (From Elliot's figure.)

7 ft. 2 in. long, from muzzle to dorsal fin 3 ft. 4 in., snout to pectoral limb 17 inches, length of pectoral 14, breadth of tail-flukes 22. The dorsal fin was 11 inches high and 1 foot long, the girth in front of the dorsal 4 ft. 4 in. (*Elliot, Tr. Z. S.* vi, p. 172). The



dimensions given by Owen were incorrect. Australian individuals have been measured exceeding 10 feet in length.

Distribution. Indian and Australian seas; Cape of Good Hope; North Pacific. Probably widely distributed. Habits quite unknown. The specimen obtained at Vizagapatam by Sir W. Elliot was the type of *P. sinus*, Owen.

It has already been pointed out, that some members of the *Ziphiinae* are in all probability found in the Indian seas. They are small whales, generally from 10 to 25 feet long, the best known being the "Bottle-nose" (*Hyperoodon rostratus*) of the North Atlantic. Amongst the forms probably inhabiting the seas around India are *Ziphius cavirostris*, with a single tooth near the anterior end of each mandibular ramus; and *Mesoplodon densirostris* (*Dioplodon sechellensis*, Gray), with a large tooth on each side in the middle of the lower jaw.

Family DELPHINIDÆ.

The present family comprises all porpoises and true dolphins*, with the exception of a few fluviatile types. The species are much more numerous than those of any other family of Cetacea.

The size in general is moderate or small. The teeth (except in the genus *Grampus*) are numerous in both jaws. The pterygoid bones are short, thin, each involuted to form, with a process of the palate-bone, the outer wall of the post-palatine air-sinus. Symphysis never much exceeding one third of the mandible in length and generally much shorter. Transverse processes of the dorsal vertebræ gradually transferred from the arches to the bodies of the vertebræ without any sudden break; each anterior rib attached to the transverse process by the tubercle and to the body of the vertebra by the head, the latter attachment lost in the posterior ribs. Sternal ribs firmly ossified. Cervical vertebræ varying, the first two to four generally united.

The genera of this family tend to pass into each other, and with a few exceptions are very difficult to distinguish. Professor Flower (P. Z. S. 1883, p. 466) has, however, reduced the numerous genera of Gray into order; and recently, in 1889, Mr. F. W. True has published a review of the family *Delphinidae* (Bulletin no. 36 of the United States National Museum, Washington), and has done much towards distinguishing the various species and eliminating unnecessary synonyms. The following descriptions are in great measure taken from the two works just quoted.

Our knowledge of the Indian porpoises and dolphins is still extremely imperfect. For the little we know, we are chiefly

* The Dolphin of sailors, celebrated for the changes of colour it undergoes when dying, is a fish (*Coryphæna hippurus*).



indebted to Blyth*, Elliot, and Anderson. In all probability several species have still to be recognized, whilst of some of those known only single occurrences have hitherto been recorded. Skins are difficult to preserve, and of no great use in identification; a good sketch to scale and a skeleton are better.

Synopsis of Indian Genera.

- | | |
|--|-----------------|
| A. Teeth small, spade-like, with flat crowns | PHOCÆNA. |
| B. Teeth very large, an inch in diameter or more. | ORCA. |
| C. Teeth moderate or small, conical. | |
| a. Head globose, no trace of a beak. | |
| a'. Teeth confined to anterior half of rostrum. | GLOBICEPHALUS. |
| b'. Teeth occupying greater part of rostrum.. | ORCELLA. |
| b. Head with a short, not very distinct beak .. | LAGENORHYNCHUS. |
| c. Head with a distinct compressed beak. | |
| a'. Teeth not less than $\frac{1}{2}$ inch in diameter, and round in section. | |
| a''. Symphysis much shorter than $\frac{1}{2}$ mandible | TURSIOPS. |
| b''. Symphysis longer than $\frac{1}{2}$ mandible. . . . | STENO. |
| b'. Teeth less than $\frac{1}{2}$ inch in diameter, oval in section, and exceeding 35 on each side of each jaw | DELPHINUS. |

Genus **PHOCÆNA**, Cuvier (1817).

Syn. *Neomeris*, Gray (1846) (*nec* Lamouroux).

Size small. Head without a beak, snout rounded. Dorsal fin variable, wanting in the only Indian species.

Teeth 16 to 26 on each side of each jaw, small, spade-shaped, the crown being much broader than the root, and compressed in the direction of the jaw, the upper border either entire or divided into two or three lobes. Rostrum short and broad, palate very broad. Pterygoid bones small, widely separated. Mandibular symphysis short. Vertebrae 57 to 67.

This genus, the type of which is the common porpoise of the British Islands, is widely distributed on sea-coasts and in estuaries. One species is found in India.

381. *Phocæna phocænoides*. *The little Indian Porpoise.*

Delphinapterus phocænoides, Cuv. *Règne An.* éd. 2, i, p. 291 (1829).
Neomeris phocænoides, Gray, *Zool. Ereb. & Terror*, p. 30 (1846);
Blyth, *J. A. S. B.* xxix, p. 449; *id.* *Cat.* p. 89; *Flower*, *P. Z. S.* 1883, p. 506; *True*, *Delphinidæ*, pp. 114, 178, pl. xxxiv, figs. 1, 2;
W. Sclater, *Cat.* p. 318.

* I am indebted to Mr. W. L. Sclater, who has kindly made notes and measurements of the specimens preserved in the Calcutta Museum, for much assistance in identifying the species mentioned by Blyth.



Delphinus melas, Temm. *Faun. Jap., Mam. Mar.* p. 14, pls. xxv, xxvi, 1847 (*nec* Traill, 1809).

Delphinapterus molagan, Owen, *Tr. Z. S.* vi, p. 24 (1866).

Neomeris kurrachiensis, Murray, *A. M. N. H.* (5) xiii, p. 351 (1884); *id.* *Jour. Bombay N. H. Soc.* i, p. 159, plate.

Molagan, Tamil (Elliot); *Bhulga*, Mahr. (Sinclair).

Snout rounded; head very convex. No dorsal fin; pectorals sub-ovate. A band of tubercles on the back, broad in front, narrow behind, from above the insertion of the pectorals to above the vent. Teeth about $\frac{18}{18}$ (18 on each side of each jaw). Vertebrae; C. 7, D. 12-13, L. & C. 38-43.

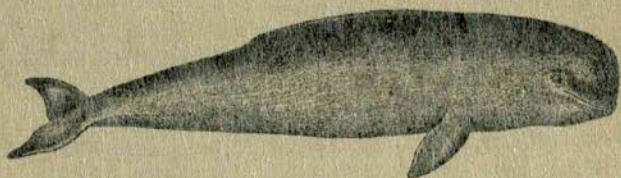


Fig. 187.—*Phocæna phocænoides*. (From a drawing by R. A. Sterndale.)

Colour. Black throughout; a purplish-red patch on the upper lip and one on the throat were observed by Murray.

Dimensions. Length 45 inches, snout to pectoral fin 10, expanse of tail 9 (Murray). A Bombay female was 50 inches long, 31 in girth, with a tail 15 wide and pectoral fin 9 long; weight 60 lbs. Basal length of skull 7.75, length of rostrum 3, breadth of skull between orbits 4.75.

Distribution. The shores of the Indian Ocean, from the Cape of Good Hope to Japan. Recorded in India from tidal rivers near Calcutta; also from Madras, Malabar, Bombay, and Karachi.

Habits. For the following details I am indebted to Professor Flower, to whom they were sent by Mr. W. F. Sinclair of Bombay. This porpoise "frequents the tidal creeks, not ascending very far, and the sounds among the reefs and islands. It feeds chiefly on prawns, also on small cephalopods and fish. It does not appear to herd in 'schools'; more than four or five are rarely, if ever, seen together. Usually it is solitary; the pairs seem to consist of female and calf, more often than male and female. The young (one in number) are born, apparently, about October. The roll of this porpoise is like that of *Phocæna communis*. It does not jump or turn summersaults like *Platanista* and the *Delphini*, and is, on the whole, a sluggish little porpoise."

According to Mr. Sinclair's observations, this species is only found in shallow water.

This porpoise has generally been placed in the genus *Neomeris*, distinguished from *Phocæna* by wanting a dorsal fin. As there is no other distinction, and the species are in other respects nearly allied, it appears unnecessary to maintain the generic distinction.

Genus *ORCA*, Wagler (1830).

Size very large. No beak; head conical and depressed. Dorsal fin erect, very high, especially in the male. Pectoral fins large, broadly ovate.

Teeth few, 10 to 13 on each side above and below, very large, often an inch or more in diameter, oval in section, the longer diameter across the jaw. Rostrum broad. Pterygoids separate. Vertebrae: C. 7, D. 11-12, L. 9-10, C. 24=51 or 52.

The animals of this genus are highly predatory, living on seals, whales, and other cetaceans, besides fish. They associate in small herds, and are said to attack and kill even the largest whales. Many species have been described, but it is quite uncertain how far they can be distinguished.

382. *Orca*, sp. (*O. gladiator*?—*The Grampus or Killer*).

? *Delphinus orca*, *L. Syst. Nat.* i, p. 108 (1766).

? *Delphinus gladiator*, *Bonnaterre, Cét.* p. 22 (1789).

? *Orea gladiator*, *Gray, Zool. Ereb. & Terror*, p. 33; *Flower, P. Z. S.* 1883, p. 507; *True, Delphinida*, p. 187, pl. xlv, figs. 1, 2.

Cetacean, Holdsworth, P. Z. S. 1872, p. 583 (figs. p. 584).

A cetacean was seen by Mr. E. W. H. Holdsworth in April 1868 off the west coast of Ceylon, and briefly described by him, the description being illustrated by sketches. The animal appeared to be about 25 feet long, and was furnished with a remarkable straight, erect, narrow dorsal fin about 5 feet high. As figured the fin appears scarcely a foot broad, with the anterior and posterior margins nearly parallel.

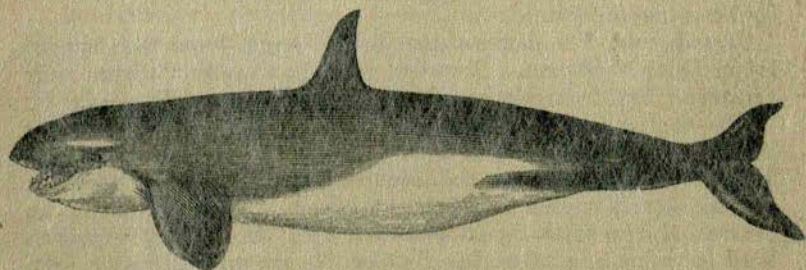


Fig. 188.—*Grampus or Killer, Orca gladiator*. (Flower, art. "Mammalia," 'Encyclopædia Britannica.')

The only cetacean with a fin of this kind is *Orca*, but generally the dorsal fin, though very high, especially in the male, is represented as triangular. There is a skull of *O. gladiator* from the Seychelle Islands in the British Museum, so this species is an inhabitant of the Indian Ocean. *O. gladiator* grows to about 20 feet in length, the teeth are 10-13 in number on each side above and below, and the coloration is peculiar—the upper parts generally, with the fins, black; the lower to the vent white, but the white



forms a trident posteriorly and there are white patches on each side of the head. The accompanying figure may enable the species, if seen in Indian seas, to be recognized.

Genus **GLOBICEPHALUS**, Lesson (1842).

Head globular, no beak. Dorsal fin long, low and thick. Pectoral fins narrow and long.

Teeth few and confined to the anterior half of the rostrum and to the corresponding part of the mandible. Skull broad and depressed, rostrum broad and flat; premaxillæ very broad, nearly or quite covering the maxillæ anteriorly. Symphysis of mandible short. Pterygoids large, prominently keeled and in contact. Vertebrae: C. 7, D. 11, L. 12-14, C. 26-29=56-59.

The members of this genus, known as 'Ca'ing Whales,' 'Pilot Whales,' and 'Blackfish,' are found in all seas and grow to a considerable size.

383. **Globicephalus indicus.** *The Indian Pilot Whale.*

Globicephalus indicus, Blyth, *J. A. S. B.* xxi, p. 358, xxviii, p. 490; *id.* *Cat.* p. 89; Jerdon, *Mam.* p. 160; True, *Delphinida*, p. 137; W. Sclater, *Cat.* p. 319.

Nearly allied to *G. melas* of the European seas, but the colour is different, there are fewer and stouter teeth, 6-7 above and 7-8 below on each side, and the premaxillaries are much broader and completely cover the maxillaries in the rostrum. Vertebrae: C. 7, D. 11, L. 12, C. 26=56.

Colour uniform leaden black, slightly paler beneath.

Dimensions of an adult male:—Length 14 ft. 2 in., pectoral fin 24 inches long and 6 broad, dorsal fin 27 long and 11 high, expanse of tail 3 ft. Total length of a skull 65 inches, length of rostrum 33, breadth of skull between orbits 47, breadth of beak at the middle of its length 25, breadth of premaxillæ at same place 22.

Distribution. This large porpoise has hitherto only been observed on one occasion in the salt or brackish water of the Gangetic delta.

Habits. The typical examples, two in number, were from a shoal that were found stranded by Blyth on the shallows of Salt-water Lake, near Calcutta, in July 1852. The shoal was said to have consisted originally of several dozens. The animals when observed were floundering about in the shallow water and groaning painfully. Other specimens, which Mr. Blyth regarded as the young of this cetacean, have been shown by Dr. J. Anderson (*An. Zool. Res.* p. 369) to be *Orcella brevirostris*.

A genus somewhat allied to *Globicephalus*, and resembling it in external form, is *Grampus*, a pelagic type, of which a representative is very likely to be found in Indian seas. There are no teeth in

the upper jaw in adults, and 2 to 7 on each side of the lower jaw near the symphysis. The common species, *G. griseus*, which has a very wide range, is about 10 feet long, and grey in colour, the back and fins black and belly white; the sides with numerous irregular pale streaks.

Genus **ORCELLA**, Gray (1866).

Head globose, no beak. Dorsal fin small, falcate. Pectoral fins of moderate size, broad at the base, subovate.

Teeth 13 to 17 on each side of the upper jaw, 12-15 in the lower; small, conical, pointed, closely set, occupying nearly the whole length of the rostrum, the posterior teeth disappearing with age. Generally (perhaps in all adults) the anterior teeth in both jaws are directed outwards, becoming at the anterior extremity of each jaw almost horizontal. Rostrum short, tapering, broad at the base; premaxillaries broad. Pterygoids widely separated from each other, and very bluntly keeled. Mandibular symphysis short. Vertebrae: C. 7, D. 12-13, L. 14-15, C. 29-30 = 62-63.

Two species have been described, one marine, the other fluviatile, both Indian or Burmese. A full account of the anatomy of both is given by Anderson in his 'Anatomical and Zoological Researches.'

Synopsis of Indian and Burmese Species.

- Colour blackish, without streaks..... *O. brevirostris*, p. 578.
Colour pale slaty, with streaks..... *O. fluminalis*, p. 579.

384. *Orcella brevirostris*. *The larger Indian Porpoise.*

Phocaena (*Orca*) *brevirostris*, *Owen*, *Tr. Z. S.* vi, p. 24, pl. ix, figs. 1, 2, 3 (1866).

Orcella brevirostris, *Anderson*, *P. Z. S.* 1871, p. 143, fig. 1; *id.* *An. Zool. Res.* p. 369, pl. xxv, figs. 4, 5, pl. xliii, figs. 6-10; *True*, *Delphinidæ*, p. 182, pl. xxxviii, figs. 1, 2; *W. Sclater*, *Cat.* p. 318.

Lomba-lomba, Malay.

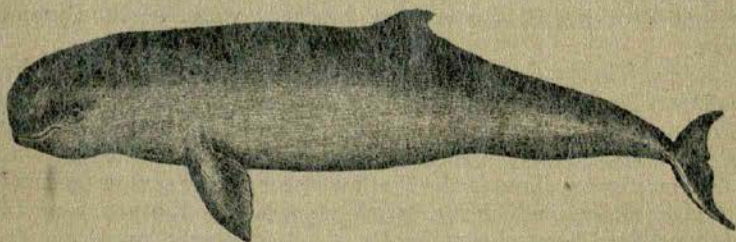


Fig. 189.—*Orcella brevirostris*. (From Anderson's figure.)

Anterior profile of head very convex. Dorsal fin commencing about middle of length, small, falcate, obtusely pointed. Pectoral fins subtriangular, pointed. Teeth about $\frac{1}{3}$.



Colour. Dark slaty blue, nearly black, above, and but little paler below.

Dimensions. Total length about 7 feet. Snout to dorsal fin 46 inches, height of dorsal 3.75, snout to pectoral 16.5, anterior margin of pectoral 17, breadth of pectoral 6.20, expanse of caudal fin 21.5. A skull measures 10.6 in basal length, 7.4 broad across orbits, length of rostrum 5.1.

Distribution. Bay of Bengal, ascending rivers as far as the tide extends; also found at Singapore and in North Borneo.

385. *Orcella fluminalis*. *The Irrawaddy Porpoise*.

Orcella fluminalis, Anderson, *P. Z. S.* 1871, p. 143, fig. 2; *id. An. Zool. Res.* p. 358, pls. xxv a, xxvii, &c.; *Blyth, Mam. Birds Burma*, p. 34; *True, Delphinidae*, p. 182; *W. Schläter, Cat.* p. 319.

Form very similar to that of *O. brevirostris*. The dorsal fin is situated somewhat farther back, and is smaller, lower, and less falcate, and the pectorals are rather shorter and broader. The head is less globose. Teeth about $\frac{15}{14}$.

Colour. Pale slaty above, whitish below, numerous narrow streaks irregularly dispersed on the sides.

Dimensions. Length of a male $7\frac{1}{2}$ feet, snout to dorsal fin 55 inches, to pectoral 17, length of pectoral along anterior margin 17. Basal length of a skull 10.3 inches, breadth between orbits 7, length of rostrum 4.6. In another male 86 inches long, the dorsal fin was a little over 2 high.

Distribution. The deeper channels of the Irrawaddy from below Prome to above Bhámo. This porpoise has not been observed in the tidal waters of the river delta.

Habits. The Irrawaddy porpoise is gregarious, solitary individuals being rare, and it keeps to deep water, rising to breathe every minute or two as a rule, and emitting "the short blowing sound, which ends in the more feeble one of inspiration" (*Anderson*). The food, so far as known, is exclusively fish.

Mr. Thomas has recently united this species with *O. brevirostris*, but the absence of that form in other Indian rivers renders it probable that *O. fluminalis* is really distinct.

Genus **LAGENORHYNCHUS**, Gray (1846).

Head with a short, not very distinct beak, or pointed, without a beak. Dorsal and pectoral fins moderate. Caudal ridges very prominent.

Teeth variable in size. Rostrum flat, not greatly exceeding the remainder of the skull in length. Premaxillæ flat or slightly convex above. Pterygoids usually in contact. Mandibular symphysis short. Vertebrae very numerous, 73 to 92 (generally over 80).



Several species are known; of these two have been obtained in India.

Synopsis of Indian Species.

- Teeth about $\frac{22}{23}$; breadth of skull more than half its length *L. electra*, p. 580.
Teeth about $\frac{30}{30}$; breadth of skull less than half its length *L. obscurum*, p. 580.

386. *Lagenorhynchus electra*. The Indian broad-beaked Dolphin.

Lagenorhynchus electra, Gray, *Zool. Ereb. & Terror*, p. 35, pl. xiii (1846); Flower, *P. Z. S.* 1883, p. 490; True, *Delphinidæ*, pp. 100, 173, pl. xxviii, figs. 1, 2; W. Selater, *Cat.* p. 321.
Delphinus (*Lagenorhynchus*) *fusiformis*, Owen, *Tr. Z. S.* vi, p. 22, pl. v, fig. 1, pl. vii.

A short and broad beak. Dorsal and pectoral fins falcate. Snout broad. Teeth about $\frac{22}{23}$, conical, curved inwards, about $\frac{1}{5}$ inch in diameter, confined to the anterior two thirds of the rostrum and less than half the mandible. Rami of mandible deep in the posterior half and slender in front.

Colour. Dark above, darkest on the dorsal fin, the fore part of the pectoral and caudal fin, and the snout; ashy grey unspotted below (Owen). But a specimen of the same species from the Pacific is described as blue-black, with a white spot in front of each pectoral fin, a frontal band of light slate-colour, vent and abdomen reddish white.

Dimensions. An adult female measured 6 feet long, snout to pectoral fin $19\frac{1}{2}$ inches, to dorsal 31, length of pectoral fin along front margin 12, of dorsal 10. Basal length of skull 17, breadth across orbits 9.5, length of rostrum 9.75, breadth of same at base 5.4.

Distribution. Indian and Tropical Pacific Oceans. Obtained at Vizagapatam by Sir W. Elliot.

387. *Lagenorhynchus obscurum*. The beakless Dolphin.

Delphinus obscurus, Gray, *Spic. Zool.* p. 2 (1828); *id.* *Zool. Ereb. & Terror*, p. 37, pl. xvi; Blyth, *Cat.* p. 90.
Lagenorhynchus obscurus, True, *Delphinidæ*, pp. 104, 174, pl. xxix, figs. 1, 2.
Prodelphinus obscurus, Flower, *List Cetacea B. M.* p. 28 (1885); W. Selater, *Cat.* p. 324.

No distinct beak, the head sloping gradually down to the upper lip. Fins falcate. Teeth about $\frac{30}{30}$, small, less than $\frac{1}{6}$ inch in diameter, curved inwards, those in the upper jaw occupying about $\frac{7}{8}$ of the rostrum. Skull and rostrum much narrower than in *L. electra*, and intermediate in form between those of that species and those of *Delphinus*.



Colour. Black, neck and belly white, a black band from the angle of the mouth to the pectoral fins; lateral oblique streaks of white (Gray).

Dimensions. Length (of type skin) 65 inches, length of pectoral fin 11; of a skull 14, breadth across orbits 6·7, length of rostrum 8, breadth of same at base 3·75.

Distribution. Indian and Pacific Oceans. A skull from Palk Straits, Ceylon, is in the Museum, Calcutta.

Genus **TURSIOPS**, Gervais (1855).

General form stout. Beak moderate, tapering, separated by a groove from the forehead; dorsal and pectoral fins falcate.

Skull and rostrum much broader than those of *Steno* or *Delphinus*. Rostrum moderately long, very convex above, tapering. Pterygoids in contact. Mandibular symphysis short. Teeth stout (about $\frac{1}{4}$ inch in diameter), occupying nearly the whole jaw. Vertebrae in *T. tursio*: C. 7, D. 13, L. 17, C. 27=64.

It is probable that two species of *Tursiops* occur around India, but only one has hitherto been recognized.

338. *Tursiops tursio*. *The common bottle-nose Porpoise.*

Delphinus tursio, Fabricius, *Fauna Greenland.* p. 49 (1780); Flower, *Tr. Z. S.* xi, p. 3, pl. i.

Delphinus eurynome, Gray, *Zool. Erebus & Terror*, p. 38, pl. xvii (1846); Blyth, *Cat.* p. 90.

Tursiops tursio, Flower, *P. Z. S.* 1883, p. 478; True, *Delphinidae*, pp. 32, 158, pl. viii, figs. 1, 2; W. Slater, *Cat.* p. 323.

Teeth about $\frac{22}{25}$. Rostrum broad, depressed, forming more than half the length of the skull, its breadth in the middle $\frac{1}{3}$ to $\frac{1}{4}$ its length.

Colour of Eastern animals not known. Atlantic specimens are clear plumbeous grey, more or less tinged with purple, above, including the dorsal, pectoral, and caudal fins, and passing gradually into pure white on the belly. The limits of the two colours vary. Some individuals are black above, pale grey below, some all grey.

Dimensions. Total length of an adult male 9 ft. 6 in., snout to dorsal fin 50 inches, length of pectoral fin 15·5, vertical height of dorsal 9, breadth of flukes 24. Some individuals exceed 10 ft. in length. Skull 22 inches long, 11 broad between orbits, rostrum 12·5 long.

Distribution. Probably throughout temperate and tropical seas. Blyth records a skull of an animal captured in the Bay of Bengal. In the British Museum are specimens from Muscat and the Seychelle Islands.

It is highly probable that either *Tursiops catalania* described from N.W. Australia, or the closely allied *T. abusalam*, inhabiting the Red Sea, is also found in the neighbourhood of India. The



Two may be identical. Both are smaller than *T. tursio* and have dark spots on the lower surface. The skull of *T. catalania* is 16.75 inches long by 7.5 broad between the orbits, rostrum 9.75 long. *Delphinus* (*Steno*?) *maculiventer* (p. 585) of Owen may be *Tursiops catalania*.

Genus **STENO**, Gray (1846).

Head prolonged into a distinct narrow snout, which is separated by a groove from the forehead. Dorsal and pectoral fins falcate.

Rostrum of skull long, narrow and compressed. Symphysis of mandible long, one fourth to one third the length of the ramus. Teeth of moderate size, about one fifth (4-6 millim.) of an inch in diameter; 20 to 35 on each side of each jaw. Vertebrae of *S. frontatus*: C. 7, D. 12, L. 15, C. 32=66.

The species found on the coast of India are in part referred to *Sotalia* by Flower and True; but the differences between the Indian types here brought together appear to me scarcely to justify generic distinction, until the skeletons are known. The typical *Sotalia* are estuarine or fluviatile dolphins with 51 to 55 vertebrae.

Synopsis of Indian Species.

- A. Teeth very rugose, $\frac{20}{20}$ to $\frac{25}{27}$ *S. frontatus*, p. 582.
B. Teeth nearly smooth.
a. Rostrum more than $\frac{1}{2}$ length of skull;
teeth about $\frac{37}{34}$ *S. plumbeus*, p. 583.
b. Rostrum less than $\frac{1}{2}$ of skull.
a'. Dark grey above; teeth about $\frac{28}{26}$ *S. perniger*, p. 583.
b'. Speckled throughout; teeth about $\frac{34}{35}$ *S. lentiginosus*, p. 584.
c'. Black above; teeth $\frac{27}{30}$ *S.?* *maculiventer*, p. 585.

389. *Steno frontatus*. *The rough-toothed Dolphin*.

Delphinus rostratus, Shaw, *apud* Cuv. *Ann. Mus.* xix, p. 10 (1812);
Desmarest, Nouv. Dict. H. N. ix, p. 160, *nee* Shaw.

Delphinus frontatus, Cuv. *Oss. Foss.* éd. 2, v, pp. 278, 400, partim (1823).

Delphinorhynchus rostratus, Blyth, *J. A. S. B.* xv, p. 368.

Steno rostratus, Blyth, *J. A. S. B.* xxviii, p. 491; Flower, *P. Z. S.* 1883, p. 483; True, *Delphinidæ*, pp. 24, 157, pl. vi, figs. 1, 2;
W. Selater, Cat. p. 324.

Steno frontatus, Blyth, *Cat.* p. 91.

Snout long. Teeth $\frac{20}{20}$ to $\frac{25}{27}$, distinctly rugose, the enamel closely pitted with irregular very wavy furrows. Rostrum long and compressed, its breadth in the middle varying from $\frac{1}{2}$ to more than



of its length. Pterygoids in contact along the median line. Mandible with its inferior border very convex at the symphysis, which is very long, fully $\frac{1}{3}$ the ramus.

Colour. In an Atlantic specimen the upper parts and fins were purplish sooty black; sides marked with rather large stellate white spots. Snout and under surface of body white, more or less tinged with purple and rose-colour and marked with prominent purple spots (*Lütken*). The colour of Eastern specimens has not been recorded, and there may be much variation.

Dimensions. Total length 8 ft. 6 in.; snout to dorsal fin 44 inches, to pectoral 25. Length of a large skull 19.5, of rostrum 11.5; breadth of skull between orbits 7, greatest breadth 8.5.

Distribution. Indian and Atlantic Oceans. Found in the Bay of Bengal; a specimen having been captured near the Nicobar Islands.

390. *Steno plumbeus*. *The plumbeous Dolphin.*

Delphinus plumbeus, *Dussumier*, *Cuv. Règne An.* éd. 2, i, p. 283 (1829); *Pucheran*, *Rev. Mag. Zool.* (2) viii, 1856, pp. 146, 315, 362, 449; *Jerdon*, *Mam.* p. 157.

Sotalia plumbea, *Flower*, *P. Z. S.* 1883, pp. 489, 513; *True*, *Delphinidæ*, pp. 21, 153, pl. i, figs. 1, 2; *W. Sclater*, *Cat.* p. 325.

La-maing, Burmese.

Snout very long; dorsal fin long and but little elevated; pectoral limbs short, about $\frac{1}{4}$ total length; caudal ridges prominent.

Teeth about $\frac{37}{34}$ (37 on each side of upper jaw, 34 on each side of lower). Rostrum more than $\frac{3}{8}$ length of skull; its breadth at the middle $\frac{1}{6}$ its length. Pterygoids not in contact. Symphysis of mandible one third length of jaw.

Colour. Uniform plumbeous grey, except on the extremity and underside of the lower jaw, where it is white.

Dimensions. Total length 7 ft. 9 in.; tip of snout to dorsal fin 34 in., to pectoral 23; length of anterior margin of dorsal fin 17, of pectoral 14; expanse of tail-flukes 22. Skull 22 inches long, beak 13.75, breadth of skull between orbits 7.5.

Distribution. Indian Ocean. Recorded from Madras, Ceylon, the Malabar coast, and Karáchi, and said to be common in tidal estuaries in Burma.

391. *Steno perniger*. *Elliot's Dolphin.*

Delphinus perniger, *Elliot*, *Blyth*, *J. A. S. B.* xvii, pt. 1, p. 250; *Blyth*, *Cat.* p. 91; *Jerdon*, *Mam.* p. 157.

Delphinus (*Steno*) *gadamu*, *Owen*, *Tr. Z. S.* vi, p. 17, pls. iii, iv (1866).

Sotalia gadamu, *Flower*, *P. Z. S.* 1883, pp. 489, 513; *True*, *Delphinidæ* pp. 13, 154, pl. ii, figs. 1, 2; *W. Sclater*, *Cat.* p. 325.

Tursiops perniger, *W. Sclater*, *Cat.* p. 323.

Gadamu, Telugu.



Snout long and compressed; pectoral and dorsal fins falcate and of similar size, the pectorals long, nearly $\frac{1}{3}$ of the total length; caudal ridges prominent.

Teeth about $\frac{26}{28}$ (varying from 23 to 28). Rostrum less than $\frac{3}{8}$ length of skull; its breadth at the middle about $\frac{1}{6}$ its length. Pterygoids close together on median line, but not in contact. Symphysis less than $\frac{1}{3}$ length of mandible.

Colour. Upper parts dark plumbeous grey, almost black upon the fins, becoming paler on the sides and passing into pinky ashy grey, with a few small irregular darker blotches, on the breast and abdomen.

Dimensions. Total length of an adult female 6 ft. 10 in.*; tip of snout to dorsal fin 36 inches; length of base of dorsal 13, length of anterior margin of dorsal 16, of pectoral 18; expanse of tail-flukes 22 (Owen). Skull 17 inches long, rostrum 10, breadth of skull between orbits 6.75.

Distribution. Indian Ocean. Recorded from Vizagapatam and Karachi in India, and from Australia.

Mr. W. L. Sclater has sent to me the rostrum of *D. perniger* from the type skin preserved in the Museum, Calcutta (the rest of the skull is not preserved). I have compared this rostrum with that of the typical skull of *S. gadamu* in the British Museum, and find the two identical.

392. *Steno lentiginosus*. *The speckled Dolphin*.

Delphinus (*Steno*) *lentiginosus*, Owen, Tr. Z. S. vi, p. 20, pl. v, figs. 2, 3.

Sotalia lentiginosa, Flower, P. Z. S. 1883, pp. 489, 513; True, *Delphinida*, pp. 15, 155, pl. ii, fig. 3; W. Sclater, Cat. p. 325.

Delphinus lentiginosus, Sterndale, Jour. Bombay N. H. Soc. ii, p. 51.

Bolla gadimi, Tel.

General form similar to that of *S. perniger*, but with smaller and less falcate pectoral and dorsal fins and the tail-flukes wider from front to back. The dorsal fin is longer at its base, being about $\frac{2}{3}$ of the total length. Length of pectoral about $\frac{1}{3}$ of total. Caudal ridges prominent.

Teeth about $\frac{34}{35}$. Breadth of rostrum at the middle $\frac{1}{6}$ its length.

Colour. "Pretty uniformly bluish cinereous or slaty, freckled with irregular small spots of brown or plumbeous pigment, the streaks longitudinal and flecked with white (Owen, probably from

* Unfortunately it is not stated whether the measurements were made on the animals by Sir W. Elliot, or merely calculated from the drawings by Sir R. Owen. The same remark applies to the dimensions of *S. lentiginosus* and *S. maculiventer*. I have been unable to trace the original drawings.

the drawing). Sinclair, quoted by Sterndale, describes the colour as "Above (and below behind the anus) rather pale leaden grey, with numerous long drop-shaped spots. Of these the majority, especially on the rostrum, limbs, dorsal fin, and flukes, are pure white, the rest dark slate-colour or black. Below, from the anus forward, the general ground-colour is white, much mottled on the belly with the dorsal ground-colour, less so on the breast, and the mental (chin) region almost pure white; but there are a few black spots." There is probably some variation.

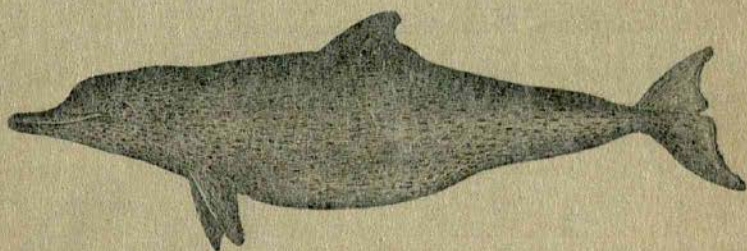


Fig. 190.—*Steno lentiginosus*. (From Elliot's figure.)

Dimensions. Total length of an adult female (Vizagapatam) 7 ft. 10 in.; tip of snout to dorsal fin 40 inches, to pectoral 24; length of dorsal along front 13, of pectoral along anterior curve 12; breadth of tail-flukes 21 (Owen). An adult male (Bombay) was 10 ft. 6 in. long, the pectoral 15 in. long, base of dorsal 27, expanse of flukes 27. Skull of female 18 in. long, rostrum 11, breadth of skull between orbits nearly 7.

Distribution. Indian seas. The species has been obtained at Vizagapatam and at Alibág near Bombay. I also refer to it a skull now in the Museum of the College of Surgeons, that was obtained by Mr. Holdsworth at Aripo in Ceylon, and noticed by Prof. Flower (P. Z. S. 1883, p. 488) as closely resembling *Sotalia sinensis*. There are 31-32 teeth on each side of the upper jaw. The skull is 18.75 inches long (basal length) and 8 broad.

393. *Steno? maculiventer*. *The spot-bellied Dolphin.*

Delphinus (*Steno?*) *maculiventer*, Owen, *Tr. Z. S.* vi, p. 21, pl. vi, figs. 1, 2.

Suvva, Telegu.

Teeth $\frac{27}{30}$. Pectoral and dorsal fins falcate, pectoral apparently about $\frac{1}{6}$ of total length.

Colour. Above deep shining plumbeous black, becoming paler below; from the chin to the anus ashy grey, with irregular dark spots or blotches.

Dimensions. Length of an adult female 6 ft. 11 inches, of rostrum externally 5 in., from snout to dorsal fin 40, to pectoral 21, length of pectoral along anterior curve 15; vertical height of dorsal fin 8, length of its base 18; expanse of tail-flukes 20 (*Owen*).

Distribution. Vizagapatam.

This is a doubtful species, founded on drawings, no skull having been preserved. As already suggested, it requires comparison with *Tursiops catalania*.

Genus **DELPHINUS**, Linn. (1766).

Syn. *Eudelphinus*, *Prodelphinus*, Gervais (1880).

Snout long, separated by a groove from the forehead. Dorsal and pectoral fins falcate.

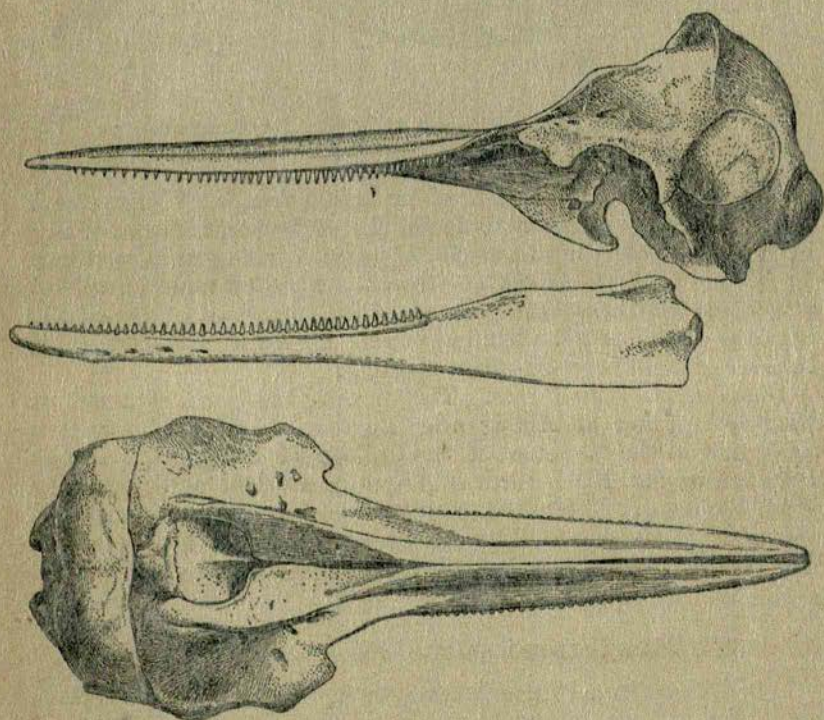


Fig. 191.—Skull of *Delphinus delphis*; from the side and above.

Rostrum long and narrow, generally about twice as long as the cranial portion of the skull. Pterygoids narrow, compressed, sharply keeled, in contact. Mandibular symphysis short. Teeth small ($\frac{1}{10}$ to $\frac{1}{8}$ inch in major diameter), acutely pointed, and numerous (41 to 65 on each side of each jaw), oval in section towards the



base, the longer diameter across the jaw. Vertebrae 73 to 76; in *D. delphis* C. 7, D. 14-15, L. 21-22, C. 30-32.

I include *Prodelphinus*, which only differs in having a flatter palate.

Synopsis of Indian Species.

A. Palate with deep and broad lateral grooves proximally.

a. Teeth $\frac{47}{46}$ to $\frac{50}{51}$ *D. delphis*, p. 587.

b. Teeth $\frac{65}{58}$ *D. dussumieri*, p. 588.

B. Palate nearly flat; teeth $\frac{40}{40}$ *D. malayanus*, p. 588.

394. *Delphinus delphis*. *The common Dolphin.*

Delphinus delphis, *L. Syst. Nat.* i, p. 108 (1766); *Flower, Tr. Z. S.* xi, p. 1, pl. i; *id. P. Z. S.* 1883, p. 500; *True, Delphinidae*, pp. 45, 160, pl. xi, figs. 1-3; *W. Selater, Cat.* p. 321.

Delphinus pomeagra, *Owen, Tr. Z. S.* vi, p. 23, pl. vi, fig. 3, pl. viii, figs. 1-4.

Pomigra, Tamul (Madras.)

Body slender, head small. Beak long and narrow; pectoral fins three times as long as broad, narrow in the distal half and acutely pointed.

Teeth $\frac{41}{45}$ to $\frac{50}{51}$, small. Bony palate deeply excavated on each side proximally, the median portion convex.



Fig. 192.—Common Dolphin, *Delphinus delphis*. (Flower, *Art. Mammalia*, 'Encyclopædia Britannica'.)

Colour very variable. The Indian *D. pomeagra* is said to be almost black, with a rather lighter shade on the belly. In Atlantic specimens the back is usually dark grey, the underparts white or whitish, and the sides occupied by various bands of grey or fulvous.

Dimensions. Total length 7 ft. 6 in., snout to dorsal fin 39.3 inches, to pectoral 20, length of pectoral 14, breadth of flukes 20.5. Length of skull 18.4 inches, breadth between orbits 6.75, length of rostrum 11.

Distribution. Probably all tropical and temperate seas. In India only recorded from the Madras coast.

395. *Delphinus dussumieri*. *The Indian long-nosed Dolphin.*

Delphinus longirostris, *Dussumier*, *Cuv. Règne An.* éd. 2, i, p. 288 (1829); *Flower*, *P. Z. S.* 1883, p. 503; *True*, *Delphinidæ*, pp. 58, 161, pl. xii, fig. 2; *W. Sclater*, *Cat.* p. 322 [nec *Gray*, *Spic. Zool.* p. 1 (1828)].

Colour and other external characters unknown.

Teeth $\frac{65}{58}$. Rostrum greatly elongate. Symphysis of mandible one fifth the length of the skull. Palatal grooves as in *D. delphis*.

Dimensions. Length of skull 19·5 inches, breadth between orbits 5·75, length of rostrum 13·25.

Distribution. Malabar coast.

The description of the type skull is copied from *True*. The name *longirostris* cannot stand, as there is a different species to which the name was previously given by *Gray*, *D. capensis*, *Gray*, I find, on examining the skull, is quite distinct, having only $\frac{53}{51}$ rather large teeth and a much shorter mandibular symphysis.

D. roseiventris may also occur in Indian seas. It is known from the Moluccas and Torres Straits, and is a small species, rather less than 4 feet long, with $\frac{48}{43}$ teeth, and the bony palate intermediate in form between that of typical dolphins like *D. delphis* and that of aberrant types like *D. malayanus*.

396. *Delphinus malayanus*. *The Malay Dolphin.*

Delphinus malayanus, *Lesson*, *Voy. Coquille*, *Zool.* i, p. 184, *Atlas*, pl. ix, fig. 5 (1826).

† *Delphinus velox*, *Dussum.*, *Cuv. Règne An.* éd. 2, i, p. 288 (1829); *F. Cuv. Hist. Nat. Mam.* pl. 425; *Fucheran*, *Rev. Mag. Zool.* 1856, p. 453.

Steno attenuatus, *Gray*, *Zool. Ereb. & Terror*, p. 44 (1846); *id. Cat. Seals & Whales B. M.* 1866, p. 235; *Blyth*, *J. A. S. B.* xxviii, p. 492, footnote; *id. Cat.* p. 92.

Prodelphinus attenuatus, *Flower*, *List Cetacea B. M.* 1885, p. 30; *W. Sclater*, *Cat.* p. 324.

Prodelphinus malayanus, *True*, *Delphinidæ*, pp. 67, 165, pl. xvi, figs. 1, 2.

Teeth about $\frac{40}{40}$. No lateral grooves on bony palate.

Colour uniform ashy grey.

Dimensions. Total length 6 ft. 3 in., height of dorsal fin 8·5 inches, length of pectoral 13·8, expanse of tail 24. A skull is 15·5 inches long, 6 broad across the orbits; length of rostrum 9·5.

Distribution. Indian Ocean, obtained in the Bay of Bengal near the Sundarbans.

There is much confusion regarding *Delphinus malayanus*, *D. attenuatus*, and *D. franatus* (*D. doris*, *Gray*), all of which have been reported from the Indian Ocean. The skulls are very similar; but *True* has collected evidence showing some important distinctions in



coloration—*D. malayanus* being uniform ashy, *D. attenuatus* dark above, ashy grey below, and *D. frænatus* dark above, white below, the dark parts spotted or speckled with white. The number of vertebrae is also different. The specimen described by Blyth agreed in colour with *D. malayanus*; but if the other forms deserve separation, it is probable that one or both of them will be found on the Indian coasts. *D. longirostris*, Gray, with teeth $\frac{52}{52}$, may also occur*.

Delphinus velox is not mentioned by True, and must remain a doubtful species for the present. It was founded on a specimen, one of a very numerous shoal, that was harpooned at sea between Ceylon and the Equator. The dorsal and pectoral fins were much falcate, the teeth $\frac{41}{41}$; the colour black throughout. The length of the specimen was 5 feet, the height and base of the dorsal fin each about 5.5 inches, the pectoral 10 inches long, expanse of the tail 13. The movements of these dolphins were very swift, hence the name. The type may have been a young *D. malayanus*.

Family PLATANISTIDÆ.

The last family of Cetacea is composed of three genera, each containing a single species. All are fluviatile or estuarine; two are South-American (one, *Inia*, inhabiting the river Amazons, the other, *Pontoporia*, living in the Rio de la Plata estuary), and the third, *Platanista*, is Indian. This distribution may indicate that the family, which in some respects is less specialized than other Cetaceans, was once marine and widely spread, and that the few living representatives, as in the parallel case of Ganoid and Dipnoan fishes, owe their survival to their adaptation for a life in rivers, where the struggle for existence is less severe than in the sea.

The size of the *Platanistidæ* is relatively small. Teeth are numerous in both jaws, which are long and narrow. The symphysis exceeds half the length of the mandible. The head is divided from the body by a slightly constricted neck. The cervical vertebrae are all free. The tubercular and capitular articulations of the ribs are distinct in front and blend gradually behind as in ordinary mammals. Pterygoids elongate, in contact, not involuted.

Genus PLATANISTA, Wagler (1830).

A long compressed beak, slightly enlarged at the extremity; dorsal fin rudimentary, replaced by a low ridge; pectoral fin

* Owen (Tr. Z. S. vi, p. 23) calls *D. longirostris*, Gray, the Black Dolphin of the Cape and Ceylon. There is probably some confusion with *D. longirostris*, Cuv. (*D. dussumieri*, ante, p. 588), from Malabar.

triangular, fan-shaped; eye very minute, rudimentary, without a crystalline lens; blowhole longitudinal, linear. A small cæcum. No pelvic bones.

Teeth rather large, conical, circular in section, and sharp-pointed in the young, gradually becoming worn down and acquiring enlarged

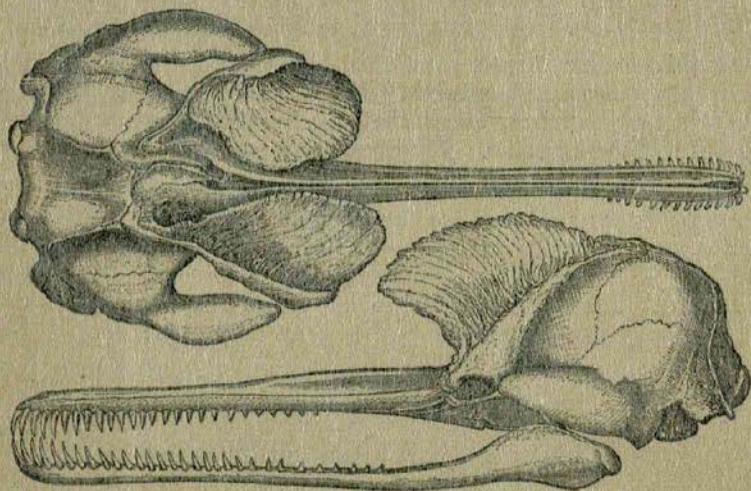


Fig. 193.—Skull of *Platanista gangetica*, young. (Copied from Sterndale.)

flattened roots. Symphysis one half (in males) to two thirds (in old females) the length of the mandible, the teeth on the two sides in the anterior part of the rostrum and mandible being so close together as almost to touch. Proximal portion of maxillæ bearing very high, longitudinal, incurved bony crests, which bend over and almost meet above. Zygomatic process of squamosal very broad. Vertebrae: C. 7, D. 10-11, L. 8-7, C. 26=51.

A full account of the anatomy, distribution, and habits of the only member of this genus has been given by Anderson.

397. *Platanista gangetica*. *The Gangetic Dolphin*.

Delphinus gangeticus, Lebeck, *Neue Schr. Ges. nat. Freunde Berl.* iii, p. 280 (1801); *Roxburgh, As. Res.* vii, p. 170, pl. v (1801).

Platanista gangetica, Gray & Hardw. *Ill. Ind. Zool.* ii, pl. xxiv; Eschricht (translated by Wallich), *A. M. N. H.* (2) ix, pp. 161, 279, pls. v-vii; Blyth, *Cat.* p. 92; Jerdon, *Mam.* p. 159; Anderson, *An. Zool. Res.* p. 417, pls. xxv, &c.; W. Selater, *Cat.* p. 315.

Platanista indi, Blyth, *J. A. S. B.* xxviii, p. 493; *id.* *Cat.* p. 92; Jerdon, *Mam.* p. 159.

Sûs, Sûsû, H.; *Sûsûk, Sishûk*, Beng.; *Sisûmar*, Sans.; *Bhulan, Sûnsar*, Sind.; *Hiho, Seho*, Assam; *Hûh*, Sylhet.

Rostrum much shorter in males than in females. Teeth about 30 on each side, generally rather more below than above.

Colour blackish throughout.



Dimensions. Very variable; adults usually 7 to 8 feet long, but a specimen from the Jumna in the Allahabad Museum is said to measure 12 feet. Females are larger than males. In a female 89 inches long the anterior border of the pectoral fin measured 12·5, and the expanse of the tail 19. A large female skull measured 27·25 inches in basal length and 10·25 in greatest breadth; a large male skull 19·4 by 8·9.

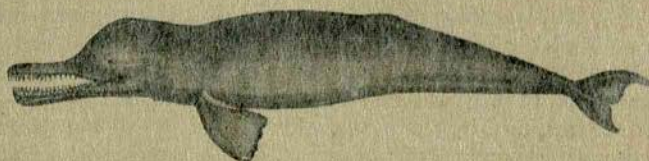


Fig. 194.—*Platanista gangetica* (Flower, Art. Mammalia 'Encyclopædia Britannica').

Distribution. Indus, Ganges, and Brahmaputra, with all their larger tributaries, from the sea to the base of the mountains. This dolphin is common in tidal waters, but never enters the sea.

Habits. According to Anderson the Gangetic dolphin is not gregarious, although several individuals may be seen about the same part of the river. It keeps chiefly to the deeper channels and is probably migratory to some extent, as none are seen in the Hoogly near Calcutta during the hot season from March to June, though many may be noticed in the cold months from October to March. In the rains (June to October) this dolphin undoubtedly remains in the tidal waters, for it is frequently captured, though it is seldom observed. It rises to breathe like other dolphins, remaining but a very short time at the surface. Sometimes in the cold months it throws itself out of the water.

This cetacean is quite blind; sight would be useless in the thick muddy waters of the Indus at all times of the year, and of the Ganges and Brahmaputra at most seasons. Its food consists of fish and prawns, and amongst the former Anderson found the remains of mud-haunting Siluroids. Doubtless these are captured by the *Platanista* feeling for them on the mud with its snout.

The period of gestation is said to be eight or nine months; the young, almost always one in number, very rarely two, are born between April and July, and it is stated that the young dolphin at times holds on by its mouth to the base of the mother's pectoral fin. These details require confirmation.

Platanista is captured by fishermen in parts of the country either by nets or by harpooning. The flesh is eaten by particular castes, and the oil is used for burning and other purposes.



Order SIRENIA.

The Manatees and Dugongs, formerly classed with the *Cetacea*, and subsequently assigned by De Blainville and others to the *Ungulata* (or *Pachydermata*), are now placed in a separate order, the *Sirenia*, which has certainly no affinity to Cetaceans and very little, if any, to Ungulates. The *Sirenia* resemble *Cetacea* in their fish-like form, in the absence of external hind limbs and of a distinct sacrum, and in the rudimentary condition of the pelvis, in the horizontal expansion of the tail to form a swimming organ, in the pectoral limbs being converted into paddles without separate digits, in the small eyes, and in the want of an ear-conch. On the other hand, the head is of moderate size and rounded, the nostrils are always separate, valvular, and anteriorly situated, the mouth small and the teeth, in all living forms, of two kinds, incisors and molars; there is no dorsal fin; and hairs or bristles occur on the lips at all ages and are sometimes scattered over the body. The muzzle is truncated, and horny plates, doubtless used in mastication, are developed on the anterior portion of the palate and of the lower jaw.

The bones are dense and massive. The skull is peculiarly formed, but very unlike that of any Cetacean. The anterior narial aperture is large and high in position, and the nasal bones are generally wanting in living forms. There is a thick rostrum, chiefly formed by the premaxillaries. The flat ends of the bodies of the vertebrae do not ossify separately, as in nearly all other mammals. The radius and ulna are generally united together at both ends. The digits are five in number, and the phalanges, which are never more numerous than in ordinary Mammalia, are flattened. The stomach is compound, the intestines long, and there is a cæcum. The testes are abdominal, the uterus bicornuate, and the placenta non-deciduous and diffuse. The mammae are two in number and are pectoral and postaxillary.

The order contains only one family and two living genera, which are purely herbivorous, feeding on aquatic plants, and which inhabit shallow seas, estuaries, and rivers. They are never found out at sea, like *Cetacea*, nor do they ever voluntarily go ashore.

Family MANATIDÆ.

Characters of the order. Of the two living genera one, *Manatus*, is found in rivers and estuaries on both sides of the tropical Atlantic, the other, *Halicore*, inhabits the coasts of the Indian Ocean.



A third genus, *Rhytina*, formerly lived on the shores of Behring's Island, but has been extinct for more than a century.

In Flower and Lydekker's 'Introduction to the Study of Mammals,' each of the genera named is classed as the type of a family.

Genus **HALICORE**, Illiger (1811).

Nostrils on upper part of muzzle. Tail crescent-shaped, concave behind. Pectoral fins ovate. No nails on digits.

The thick rostrum and the mandibular symphysis bent downward. Teeth altogether, i. $\frac{4}{3}$, m. $\frac{5-5}{5-5}$; but only two upper incisors are found in adults and two or three molars on each side above

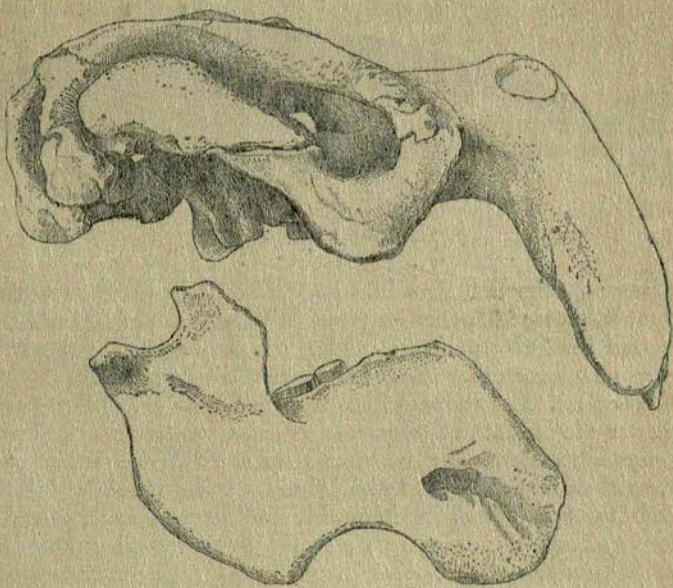


Fig. 195.—Skull of *Halicore dugong*.

and below. The adult incisors are rootless, straight, tusk-like, large in the male, not exerted in the female. The anterior molars are circular in section, and increase in size backward, the last appears as if formed of two cylinders joined together; the anterior molars fall out before the posterior molar appears above the gum. All are rootless and destitute of enamel.

Three species have been described; but it is doubtful whether *H. tabernaculi*, from the Red Sea, and *H. australis*, from Australia, are distinct from the Indian species *H. dugong*.

398. *Halicore dugong*. *The Dugong or Duyong*.

Trichechus dugong, *Erzleben, Syst. Reg. An.* p. 599 (1777).

Halicore dugong, *Illiger, Prod.* p. 140; *Gray & Harlow, Ill. Ind. Zool.* ii, pl. xxiii; *Blyth, J. A. S. B.* xxviii, pp. 271, 483, 494; *id. Cat.* p. 143; *id. Mam. Birds Burma*, p. 53; *Jerdon, Mam.* p. 311; *W. Schlater, Cat.* p. 326.

Halicore indicus, *Desm. Mam.* p. 509; *Cantor, J. A. S. B.* xv, p. 274; *Kelaart, Prod.* p. 89.

Talla mala, *Muda ura*, Cing.; *Duyong*, *Parampuan laut*, Malay.

Colour either bluish grey throughout or the lower parts whitish or white.

Dimensions. Extreme length of adults 8 to 9 feet, usually 5 to 7; much larger dimensions are given in books, but are open to doubt.



Fig. 196.—*Halicore dugong*.

In a large specimen 8 ft. 6 in. long and 6 ft. in circumference, the pectoral fins were 16 inches long and 8 inches broad, and the breadth of the tail from tip to tip 31. The skull of a male from Ceylon measures 14·5 inches in basal length and 8·5 in breadth.

Distribution. The shores of the Indian Ocean from E. Africa to Australia for about 15 degrees on each side of the Equator. Dugongs have been observed on the coast of Malabar, the north-west coast of Ceylon from the Gulf of Calpentyne to Adam's Bridge, around the Andaman Islands, and in the Mergui Archipelago.

Habits. Formerly dugongs were said to be found in large herds of some hundreds of individuals, and to be in places so tame as to allow themselves to be handled. As their flesh is by all accounts excellent and their fat yields a clear limpid oil of great value, they have everywhere been hunted and are now in most places rare. They are said to be slow in their movements and unintelligent. Their food consists of marine algæ. They haunt shallow bays, salt-water inlets, and mouths of estuaries, but do not, like the Manati, ascend rivers. The female gives birth to but one young at a time, and is said to hold it with her pectoral fin. Some writers have suggested that the dugong has given rise to the myth of the mermaid (hence, indeed, the name *Halicore*); but it should be remembered that stories of beings half man or woman, half fish, are as common in temperate as in tropical seas, and that some of them are more ancient than any European knowledge of the dugong.



Order EDENTATA.

The last order of placental mammals, containing the Sloths, Anteaters, Armadillos, Cape Anteaters, and Pangolins or Scaly Anteaters, is quite as distinct from all other mammalian orders as the Cetacea and Sirenia are; but it is far less homogeneous than either, there being very few structural characters common to all the different suborders included in it, except the absence of teeth in the front of the jaw. In some of the Edentates, as in the only Indian genus belonging to the order, teeth are entirely wanting; when teeth are present they are rootless, destitute of enamel, and similar to each other in shape, and, with a single exception (the genus *Tatusia*, an armadillo), there are no milk-teeth. All known species of Edentates are terrestrial or arboreal and resemble ordinary mammals in external form.

As only one genus is found in India it is unnecessary to describe here the very great structural differences of the various suborders and families. These are, according to Flower's latest classification (P. Z. S. 1882, p. 358):—I. Suborder Pilosa, containing the families (1) *Bradypodidae* and (2) *Myrmecophagidae*, both South-American; II. Loricata, with the family (3) *Dasypodidae*, also South-American; III. Squamata, consisting of the (4) *Manidae*, Asiatic and African; and IV. Tubulidentata, containing the (5) *Orycteropodidae*, confined to Africa.

Suborder *SQUAMATA*.

No teeth. The whole upper surface and the sides of the body and tail covered with large imbricate horny scales. Limbs short, 5 toes on each foot. Tongue long, vermiform, capable of great protrusion. Uterus bicornuate. Placenta diffused and non-deciduate. No cæcum.

A single family with only one living genus.

Family MANIDÆ.

Genus **MANIS**, Linn. (1766).

Head small, long and pointed in front; mouth very small. Eyes small. Ear-conch small or rudimentary. The upper part of the head, the back and sides of the body, the whole tail, and the outside

of the limbs covered with large imbricate scales; lower surface of head and body, sides of head, and inner surface of limbs scaleless, scantily covered with hair. Generally there are a few coarse hairs between the scales. All the toes bear slightly curved claws, those



Fig. 197.—Skull and lower jaw of *Manis pentadactyla*.

on the fore feet longer than those on the hind, third claw the longest on all feet, claws of pollex and hallux short. In walking, the dorsal surfaces and outer sides of the phalanges belonging to the two outer digits of the fore feet rest on the ground, so that the animal walks with its fore toes doubled under the feet. The hind feet are plantigrade and, as a rule, rest on the ground normally.

The skull is of very peculiar shape; it is rounded behind, and diminishes gradually in front, being almost conical; it is quite

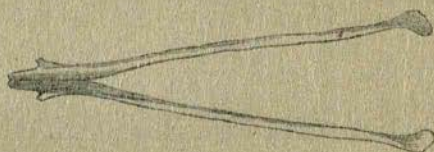


Fig. 198.—Lower jaw of *Manis pentadactyla*, from above.

smooth, without any crests. The zygomatic arch is imperfect, there being no malar bone. There is no distinction between the orbits and the temporal fossæ. Palate long and narrow, produced far backwards; the pterygoids extend backwards to between the tympanics, each of which forms a small crescentic bulla. Rami of mandible very slight and straight, without angle or coronoid process, but each ramus bears anteriorly on its upper border a small pointed process projecting outwards. No clavicles. No third trochanter to the femur. Ungual phalanges bifid distally. Two pectoral mammae. Stomach with thick muscular walls, especially towards the pyloric end, and with a special gland near the middle of the great curvature. A gall-bladder present.

The Pangolins or Scaly Anteaters are burrowers and live entirely



in ants and termites, the long extensile tongue being used for the capture of the insects. They roll themselves into a ball for defence, and exhibit an enormous muscular power that defies any ordinary attempt to unroll them.

The genus inhabits the Oriental and Ethiopian regions, the African forms being rather more numerous than the Asiatic and exhibiting more variety. The three Asiatic species agree with each other in having the tail tapering, the limbs entirely covered with scales outside, and the middle row of scales above the tail continuous to the end. All three occur within our area.

Synopsis of Indian, Ceylonese, and Burmese Species.

A. Fore claws about twice length of hind claws.

a. 11 to 13 rows of scales round body *M. pentadactyla*, p. 597.

b. 15 to 18 rows of scales round body *M. aurita*, p. 599.

B. Fore claws but little longer than hind claws. *M. javanica*, p. 599.

A characteristic terminal phalanx of a large species of *Manis*, closely allied to the African *M. gigantea*, has been found in the Pleistocene cave-deposits of Kurnool. Another phalangeal bone, referred to the genus *Macrotherium*, has been described from the Lower Siwalik of Sind; but this genus, I am informed by Mr. Lydekker, is probably ungulate, not edentate as formerly supposed.

399. *Manis pentadactyla*. The Indian Pangolin.

Manis pentadactyla, *L. Syst. Nat.* i, p. 52, partim (1766); *Sykes, P. Z. S.* 1831, p. 104; *Horsfield, Cat.* p. 196; *Blyth, J. A. S. B.* xi, p. 453; xvi, p. 1273, pl. iv; *id. Cat.* p. 179; *Jerd. Mam.* p. 314; *Anderson, An. Zool. Res.* p. 341, pl. xxiv, figs. 1, 2; *W. Schater, Cat.* p. 330.

Manis brachyura, *Erzt. Syst. Reg. An.* p. 98 (1777), partim; *Blyth, J. A. S. B.* xii, p. 181.

Manis crassicaudata, *Geoffr. St.-Hilaire, Cat. Mam.* p. 213, partim (1803); *Elliot, Mad. Jour. L. S.* x, p. 218; *Tickell, J. A. S. B.* xi, p. 221; *Kelaart, Prod.* p. 74.

Pholidotus indicus, *Gray, P. Z. S.* 1865, p. 368.

Bājra-Kūt, Sanser. and H.; *Bājra Kapta*, *Surāj-mukhi*, *Silu*, *Sāl Sālī*, *Sakainphor*, H.; *Kishaur*, *Pushtu*; *Challa*, *Mirān*, *Sind*; *Shālma*, *Bauri*; *Armā*, *Kol*; *Thiriya*, *Kauli-mah*, *Kauli-manjra*, *Kassoli-manjur*, *Mahr.*; *Alawa*, *Tel.*; *Alangū*, *Tam.* and *Mal.*; *Kabalaya*, *Cing.*; *Banrohu* (jungle carp), *Deccan*, &c.; *Keyot-mach*, *Rangpore*; *Kat-pohu*, *Bengal*.

Body and tail stout. Claws of fore feet very long, the middle fore claw double the length of the middle hind claw. Scales on body large, none keeled, as a rule, in adults. There are 11 to 13 longitudinal rows of scales round the body, 14 to 17 in the median (longitudinal) row above the tail, the tail being taken to commence where the scales at the sides become angulate. The scales are about twice as broad as in the other two Indian species.

Colour of scales light yellowish brown throughout; naked skin flesh-coloured, nose more livid.



Dimensions. Head and body of a male 24·5 inches, tail 18, of another specimen 26 and 18. Ceylon specimens appear to have longer tails; Kelaart gives head and body 23·5, tail 22·5, Hornaday for a female 19 and 17. A skull measures 3·25 in basal length, greatest breadth 1·75. Weight of adults 20 to 27 lb.; of a large specimen 42, according to Kelaart.

Distribution. India proper and Ceylon. This species is found on the mainland from Peshāwar (Stewart, J. A. S. B. xxxii, p. 235) and Sind (probably also Baluchistan) to Bengal and Orissa, and from the base of the Himalayas to Cape Comorin. It is not reported from any part of the Himalayas, though it probably occurs in the lower ranges to the westward. Jerdon's statement that it was found by Hodgson in Nepal appears due to some mistake. It occurs on the Shevroy hills, Madras Presidency, up to at least 3500 feet above the sea.

Habits. Good accounts have been given by Elliot and Tickell. Like other species of the genus, this pangolin, as a rule, only moves about at night, and hides during daylight in burrows dug by itself or amongst rocks. I, however, once in Orissa found an adult moving about in jungle some time after sunrise. The burrow, according to Elliot, descends in a slanting direction to a depth of from 8 to 12 feet below the surface and ends in a large chamber about 6 feet in circumference, in which the pangolins live in pairs, with, at times, one or two young. The entrance to the burrow is closed with earth when the animals are in it.

The food consists of various kinds of ants and termites, especially of the latter. The ants' nests are torn open by the powerful claws of the Manis, which thrusts its long tongue into the passage-ways and then withdraws it with numerous ants adhering to it. This animal also drinks (in confinement) by rapidly extending and withdrawing its tongue; whether it drinks frequently or at all in the wild state may be questioned, for it often inhabits places where no water is procurable. Stones have repeatedly been found in the gizzard-like stomach and may aid, as in birds, in triturating the food. Blyth gave to a Manis that had been starved for some time chopped raw meat and cooked egg and rice, on which the animal fed freely after nightfall, but it died soon after, probably from repletion.

The only sound known to be produced by this animal is a hissing noise that it makes when annoyed. In confinement it soon grows tame, but there is often some difficulty in feeding it. It walks very slowly, with the back well arched, and is in the habit of standing up on its hind feet with the body not vertical, but inclined forward.

The breeding-habits are imperfectly known. A single young one is generally produced, more rarely two, in the Deccan from January to March, according to Elliot. In the Shevroy hills, however, a female kept for some time by Mr. W. H. Daly produced a young one weighing 1 lb. on July 11th.

400. *Manis aurita*. *The Chinese Pangolin.*

Manis pentadactyla, *L. Syst. Nat.* i, p. 52 (1766), partim.

Manis aurita, *Hodgson, J. A. S. B.* v, p. 234 (1836); *Blyth, Cat.* p. 179; *Jerdon, Mam.* p. 316; *Anderson, An. Zool. Res.* p. 352, pl. xxiv, figs. 3, 4; *Jentink, Notes Leyd. Mus.* iv, p. 202; *W. Selater, Cat.* p. 330.

Manis javanica, *Blyth, J. A. S. B.* xi, p. 454, xvi, p. 1274, *nee Desmarest.*

Bijarkit, H.; *Salak*, Khas; *Kwengnya*, Newari.

Body and tail more slender than in *M. pentadactyla* and scales much smaller and darker coloured. Fore claws long; middle fore claw twice as long as middle hind claw. Scales without keels in adults or only 3 or 4 outer rows on body keeled. Round the body the longitudinal rows are 16 to 18 in number, usually 17; 16 to 20 scales in the median row above the tail. More hair between the scales than in other Indian forms, and the ear-conch is more developed.

Colour. Scales dark brown throughout in adults, sometimes with pale concentric bands in young animals; naked parts flesh-coloured.

Dimensions. Head and body 19 to 23 inches, tail 13 to 15. A skull measures 3.5 in basal length, 1.6 in greatest breadth. Weight of adults 15 to 17 lb.

Distribution. Himalayas as far west as Nepal, at moderate elevations, Assam, hills north of Bhámo, Karennee, and Southern China (Amoy, Hainan, Formosa).

Habits, so far as known, similar to those of the last species.

401. *Manis javanica*. *The Malay Pangolin.*

Manis javanica, *Desmarest, Mamm.* p. 377 (1822); *Cantor, J. A. S. B.* xv, p. 259; *Horsfield, Cat.* p. 197; *Blyth, Cat.* p. 179; *Anderson, An. Zool. Res.* p. 352, pl. xxiv, figs. 5-8; *Jentink, Notes Leyd. Mus.* iv, p. 199; *W. Selater, Cat.* p. 331.

Manis leptura, *Blyth, J. A. S. B.* xi, p. 454, xvi, p. 1273; *id. Cat.* p. 180.

Manis leucura, *Blyth, J. A. S. B.* xvi, p. 1274.

Pangolinus leucurus, *Blyth, Mam. Birds Burma*, p. 53.

Theng-khwe-khyat, Burmese; *Pangoling*, *Tangiling*, Malay.

Form more slender than in either of the preceding species and tail generally longer. Fore claws but little longer than the hind, never more than half as long again. Scales longer, more pointed behind, and rather less closely adpressed, the posterior edges chipped, not worn, and with a median keel frequently visible in adults, especially on the tail, sides, and limbs; 15 to 19 rows (usually 17) round the body, 20 to 30 (usually 24 to 27) scales in the median row above the tail.

Colour dark brown, the sides and the terminal portion of the tail sometimes whitish, and all the scales in a few instances particoloured. Naked skin whitish.

Dimensions. A large male measured, head and body 21·5 inches, tail 20; basal length of a skull 4·1, greatest breadth 1·75.

Distribution. From Sylhet and Tipperah, and from the lower ranges near Bhámo, throughout Burma, Cochinchina, and Cambodia, the Malay Peninsula, Sumatra, Java, and Borneo to Celebes. I have not been able to ascertain whether this species or *M. aurita* inhabits the hills south of Assam.

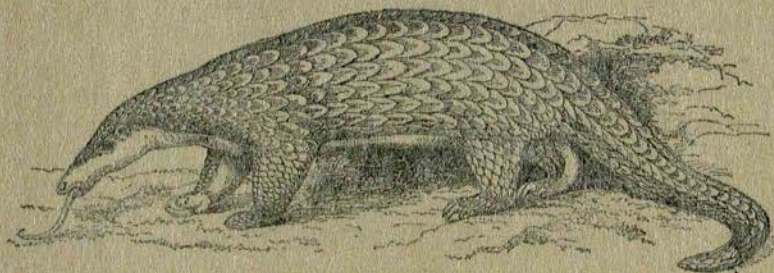


Fig. 199. — *Manis javanica*. (From a drawing by Col. Tickell.)

Habits. From Tickell's MS. notes it may be inferred that this species sometimes turns both fore and hind claws under the feet in walking. It is probably less of a burrower than the other two species, as its fore claws are much smaller and its scales less worn. S. Müller states that in Java it ascends trees and conceals itself in fissures, especially in several kinds of fig-tree; but it also burrows in the earth, though it is rarely found amongst rocks. Similar statements as to its habits in Borneo are made by Motley and Dillwyn (Nat. Hist. Labuan, p. 51).



APPENDIX AND ERRATA.

Introduction, p. iv, line 27, for 'some of these forms' read 'some of the Ethiopian and Palearctic types.'

P. 1. Add to the characters of Mammalia the following:—

The occipital condyle is double. Each ramus of the lower jaw is composed of a single piece and articulates directly with the squamosal, no quadrate bone intervening.

Pp. 7, 9. The hoolock, according to Mr. Sterndale's observations, sometimes drinks in the ordinary way, sometimes by dipping its hand in water, and licking the drops off its fingers.

P. 23, line 10 from bottom, for 'longer' read 'shorter.'

P. 42. This footnote, I am informed by Mr. Theobald, is not quite accurate. The collection of skulls was made over by Mr. Theobald to Dr. Oldham without reservation and was presented by the latter to the British Museum. The specimens are therefore correctly labelled as presented by Dr. Oldham. The essential fact is that the collection was made by Mr. Theobald, as stated.

P. 50, line 9, for 'heel' read 'keel.'

P. 54, lines 11 and 13 from bottom, for 'cusp' read 'lobe.'

P. 60. A tiger killed by Mr. Hornaday in the Anaimalai forest, South India ('Two Years in the Jungle,' p. 159), measured 9 feet 8½ inches long to the end of the tail-vertebrae, and weighed 495 lb. Weights of Cooch Behar tigers varying from 450 to 493 lb. are given in the 'Asian' (April 3rd, 1891, p. 3). There can be no question as to Mr. Hornaday's accuracy, and it is evident that some tigers are much heavier than those weighed by Elliot and Sanderson. Forsyth's estimate of 450 to 500 lb. is clearly not excessive as it appeared. Tigresses 9 feet 11 inches and 10 feet 2 inches long are recorded by Mr. F. A. Shillingford ('Asian' Sept. 18th, 1891).

P. 112, line 1, for '*P. zeylonensis*' read '*P. aureus*.'

P. 143. It would be better to adopt the spelling *deccanensis* for the specific name of the wild dog.

Pp. 182-188. Mr. Thomas has published (P. Z. S. 1889, p. 190) some important notes on the characters and synonymy of different species of otter. He has come to the conclusion that the type of *Lutra aurobrunnea* is, as I suggested, a dyed skin of a young *L. vulgaris*, and he is convinced that the skull described by Gray as *Barangia nepalensis* belonged to a female *L. vulgaris*, dwarfed by captivity. Thus these species may be entirely dismissed as fictitious, a conclusion in which I agree. The other three Indian species remain as described in the text; but Mr. Thomas shows that the clawless otter, *Lutra leptonyx* of Horsfield (1824), must take the earlier title of *L. cinerea*, Illiger (1815). He applies to the otter called in the present work *L. ellioti* the name *L. barang*, F. Cuv. (1823). But Dr. Scully, being in Paris, re-examined Cuvier's type of *L. barang* and found that it belonged to *L. vulgaris*. As, however, Mr. Thomas has also shown, the otter named by Dr. Gray *L. macrodus* (P. Z. S. 1865, p. 128), and supposed to have been brought from Brazil, is really the smooth Indian otter, and con-



sequently this name will have to be used. The following is the revised nomenclature:—

- No. 92, p. 182. *Lutra vulgaris*.
No. 93, p. 185. *L. macrodus*.
No. 94 must be omitted altogether.
No. 95, p. 187. *Lutra cinerea*.

P. 221. I have now seen a specimen of No. 110, which, following Dobson, I called *Gymnura suilla*. I regard it as generically distinct from *Gymnura*, and it should, I think, stand as *Hylomys suillus*. Under these circumstances the name to fig. 59, p. 222, will not need correction.

P. 227. The last footnote is erroneous and due to a mistake.

P. 240. I was informed by Dr. Day, shortly before he died, that the type specimen of *Crocidura dayi* was from Trichur in Cochin, and was brought to him by a tank-digger.

P. 253, line 2, for '*Scotophilus*' read '*Nycticejus*.'

P. 265, No. 142. *Cynopterus blanfordi*, Thomas (not Doria & Thomas). The description has appeared, Ann. Mus. Civ. Genova, (2a) x, p. 884.

P. 317. Add after No. 190:—

Vesperugo tylopus, Dobson, P. Z. S. 1875, p. 473; *id. Mon. As. Chir.* p. 114; *id. Cat. Chir. B. M.* p. 236.

This bat belongs to the subgenus *Vesperugo*, with two upper premolars on each side, but has the lower surface of the basal half of the thumb and the soles of the feet furnished with fleshy pads as in *V. (Vesperus) pachypus*, p. 307. See P. Z. S. 1876, p. 532, pl. lv, figs. 3, 3a. Forearm 1·2 inches.

Originally described from North Borneo, recently found by Mr. L. Fea in Karennue.

P. 325. Add after No. 198:—

Harpyiocephalus auratus, M.-Edw. Rech. Mam. p. 250, pl. xxxvii b, fig. 1, and pl. xxxvii c, fig. 2 (1872); Dobson, *Mon. As. Chir.* p. 153; *id. Cat. Chir. B. M.* p. 279.

In this species the first upper premolar is smaller than the second, as in *H. suillus* and *H. tubinaris*, but the upper third of the outer margin of the ear-conch is convex or straight. Each nostril forms a distinct tube directed sublaterally, with a circular aperture marked by a very small notch on the outer and upper margin. Forearm 1·1 inch. Colour of fur black, above with golden-yellow tips, below with white.

Described from Eastern Tibet. A dried skin has been discovered by Mr. Thomas amongst some specimens from Sikhim formerly belonging to me.

Also add:—

Harpyiocephalus feæ, n. s., Thomas, Ann. Mus. Civ. Genova, (2a) x, p. 884; thus described:—

"Allied to *H. auratus*, M.-Edw., but distinguished by the colour being brown instead of golden-yellow, by the smaller nasal tubes, and by having the forearms, hind limbs, and posterior edge of the interfemoral membrane almost naked. Anterior lower premolar very markedly shorter than the canine. Distinguished from *H. leucogaster* by its smaller size, smaller ears, and by the inner upper incisor not being longer than the outer. Forearm 29 mm (1·14 inches)." Found by Mr. L. Fea in Karennue.

P. 335. *Vespertilio dobsoni*. Mr. Thomas informs me that he finds a dried skin in the small Sikhim collection already mentioned.

P. 413. *Mus chiropus*, Thomas, described, Ann. Mus. Civ. Genova, (2a) x, p. 884.

P. 463. It should have been noticed in the text that the identity of the Sumatran and Indian elephant was conclusively demonstrated by Falconer.



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