NOTES ON THE OSTEOLOGY OF THE INSECTIVORA.

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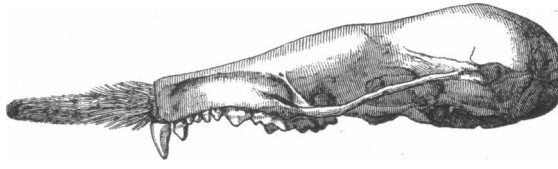
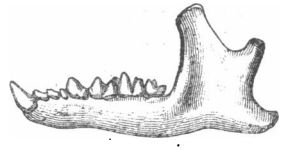
Urotrichus[1]. This genus presents marked differences from the last two very talpoid genera, though still having a great number of characters in common with the mole. It is represented in the British Museum by a single skeleton, the skull of which is a little injured, and the skin of the palate unremoved. It agrees, as far as I have been able to observe, with the description above given of our second type (*Talpa*), except in the following particulars.



Urotrichus. Scale, 2 natural size.

There is a very small, but distinctly marked, sagittal ridge, and there are also small but distinct pterygoid fossæ; also the pterygoid region is not so inflated. The semicircular canals do not appear to be so salient in the cranial cavity, and the pterotic is much smaller.



Urotrichus. Scale, 2 natural size.

The mandible is shorter in proportion to its height, and its inferior margin is rather less undulating. The inside of the coronoid process (which rises higher above the condyle and is less truncated) is more strongly concave. The fissure which in *Talpa* borders the epiotic is here represented by a mere suture. The spheno-palatine foramen is placed very far forwards in a fossa situated between the roof of the palate and the cranium. The lachrymal foramen is not upon the cheek, but immediately above the middle of the infra-orbital foramen.

The dentition is probably

$$\text{I. } \frac{2-2}{1-1}, \text{ C. } \frac{1-1}{1-1}, \text{ P.M. } \frac{4-4}{3-3}; \text{ M. } \frac{3-3}{3-3} = \frac{20}{16} = 36.$$

showing a remarkable approximation to Sorex in the number of the lower incisors. As to the number of superior incisors, that of course

[1] For the skeleton of this genus see Temm. *Faun. Japon.* I. tab. 4.

depends on the position of the premaxillary suture, which I have been unable to find any traces of. The 1st upper incisor is very large, in contact with its fellow of the opposite side, and much like that of *Scalops*. It is the most vertically extended tooth of the upper jaw. The 2nd upper incisor is about half the size of the preceding; it is simple and conical. The canine (if it is a canine) is the smallest tooth in the upper jaw, and is exceedingly minute. The next three teeth are simple conical premolars, gradually increasing in size from before backwards.

Grinding surface of left dental series of upper jaw of *Urotrichus*.
Scale, 2 natural size.

The last premolar is much larger, and quite like the corresponding one of *Talpa*, except that it is slightly more produced inwards, and in so far resembles *Scalops* and approximates to *Sorex*. The 1st and 3rd upper true molars closely resemble those of *Talpa;* but the 2nd is more complex, presenting two inner cusps, and besides these a third prominence from the internal cingulum.

In the lower jaw the incisor is long, conical, and pointed. It is strongly grooved internally, in a vertical direction, and diverges as it ascends from its fellow of the opposite side. The lower canine is

Grinding surface of right dental series of lower jaw of *Urotrichus*.
Scale, 2 natural size.

small, simple, and somewhat procumbent. The 1st premolar closely resembles the canine, the 2nd is much smaller, and is the smallest tooth in the mandible. The 3rd and last premolar is larger, and closely resembles its homologue in *Sorex*. The lower true molars are quite like those of *Talpa*.

As regards the rest of the skeleton, there are 13 dorsal, 7 lumbar, and 5 sacral vertebræ. The manubrium is much smaller, though still strongly keeled. The clavicles are stout, though not nearly so much so as in *Talpa;* they still however articulate with the humeri, which are much more cylindrical, though still very strongly ridged. There is, I believe, no sickle-like carpal bone; but the form of the ultimate phalanges of the manus I could not ascertain. The scapula is like that of the mole, except that it has a distinct metacromion process.

MYOGALE[1]. Unfortunately no skeleton or skull of *M. muscovita* exists, to my knowledge, in this country; but a skeleton and a separate skull of *M. pyrenaica* are preserved in the national collection.

[1] The skeleton of *M. pyrenaica* is represented by De Blainville, also the skull and dentition, *loc. cit.* Pl. II. V. and IX.

The near resemblance of this form to *Talpa* is manifest; and as regards the points mentioned in describing the last-named genus, the only differences I have been able to detect are as follows: The interorbital, lateral constriction of the cranium is more marked, and consequently the temporal fossæ are larger. There are hardly any traces of cranial ridges, except the lateral parts of the lambdoidal ridge. The palate extends back decidedly beyond the last molar; its posterior margin is thickened, but it has no defects of ossification. There are well developed pterygoid fossæ, and the pterygoid region is not inflated. The meso-pterygoid fossa scarcely, if at all, narrows posteriorly. The glenoid surface is rather larger. The premaxilla is probably more developed than in *Talpa*, and the supra-occipital is even rather more so than in that genus. External to the exoccipital is a considerable vacuity in the cranial parietes. The pterotic is no doubt large; but I have not observed it distinct as in *Talpa*. There are no marked depressions beneath the basi-occipital; but the basi-sphenoid is very thin, there being, in one specimen, even a small defect of ossification in the floor of the *sella turcica*. The coronoid process of the mandible is much higher than in *Talpa*, reaching as high as the summit of the cranium. It is also more inclined forwards, and its apex is not at all truncated. The large rounded opening before mentioned appears to supply the place of the aperture which borders the epiotic in *Talpa*. A posterior palatine foramen opens on each side a little in front of the anterior end of the posterior fourth of the palate. The anterior palatine foramina are exceedingly and remarkably large. The spheno-palatine foramen is situated far forwards as in *Scalops*. The infra-orbital foramen is about as large as in *Talpa*, but the spiculum above it is very much larger. The lachrymal foramen is exceedingly small, and opens (above the middle of the infra-orbital foramen) at the anterior side of the upper end of the lamella, bounding posteriorly the infra-orbital foramen. The mental foramina open only a little in front of the middle of the horizontal ramus of the mandible.

The dentition seems to be

$$\text{I.}\ \frac{2-2}{2-2},\ \text{C.}\ \frac{1-1}{1-1},\ \text{P.M.}\ \frac{5-5}{5-5},\ \text{M.}\ \frac{3-3}{3-3} = \frac{22}{22} = 44.$$

Yet there appear traces of the premaxillary suture behind the first upper tooth of the British Museum specimen[1]. The first tooth in the upper jaw is much larger and more vertically extended than is any

[1] Also in F. Cuvier's *Dents des Mammifères*, Pl. 21. The above formula expresses the views of Professor Peters, kindly communicated to me in a letter in which he says, "I find in a young skull of *M. moschata* the 1st and 2nd upper teeth are entirely and the 3rd *partly* in the intermaxillary bone." Possibly then the true reading may be

$$\text{I.}\ \frac{3-3}{3-3},\ \text{C.}\ \frac{1-1}{1-1},\ \text{P.M.}\ \frac{4-4}{4-4},\ \text{M.}\ \frac{3-3}{3-3},$$

which would harmonize much better with the other genera of Insectivora than does the formula provisionally given in the text.

other tooth in the skull. Its crown is triangular, it is in contact with its fellow of the opposite side, and predominates more than does the first incisor of any other form yet reviewed, except perhaps that of *Sorex*, from which however it differs much in form. The two next teeth (which are close together, but separated from the first by a considerable interval) are exceedingly small teeth, and they are simple and conical. The next is larger; it has two roots, but a simple conical crown. The three next are similar in form, and do not differ much in size, though the first of them is rather smaller than either its anterior or posterior neighbour. The next, which is the last upper premolar, is like that of *Scalops*, and rather more extended inwardly than in *Talpa*. The true molars are very like those of *Urotrichus*. In the lower jaw the 1st tooth is much smaller than the 2nd, but much larger than the 3rd. The 4th, and the four following teeth, are simple and conical, gradually increasing in size from before backwards; but the last two have a very small additional postero-external cusp. The lower true molars are quite like those of *Talpa*.

As regards the rest of the skeleton there are 13 or 14 dorsal, 5 or 6 lumbar, 5 sacral, and many caudal vertebræ. The spinous process of the axis is the only cervical one, and that is small. The neural arches are mere filaments. All the dorsal vertebræ, except the first 2, have small spines. The other vertebral processes of the trunk appear to be as in *Talpa*, except that the lumbar metapophyses are rather more developed. The manubrium is small, and has but a very slight keel. The clavicle is elongated but stout (much as in *Urotrichus*), and scarcely, if at all, articulates with the humerus, which is elongated (though much ridged), and has a large supracondyloid perforation. There is an os intermedium, but no sickle-shaped ossicle. The ultimate phalanges are not longer than the proximal ones. They are pointed, and antero-posteriorly directed dorsal grooves alone indicate a tendency to bifurcation. The scapula has a large metacromion process. The third trochanter of the femur is more distinct, and the pes is very much longer, both absolutely and compared to the manus, in which *Mygale* differs not only from *Talpa*, but from *Condylures*, *Scalops*, and *Urotrichus* also.

As regards *M. muscovita*, Dr Brandt's[1] description shows that it closely agrees with *M. pyrenaica* in the form of its skeleton. It has 13 dorsal and 6 lumbar vertebræ, and the palatine plate of each maxillary bone has a considerable oblong opening. It has openings in the occiput as in *M. pyrenaica*[2].

[1] *Archiv für Naturgeschichte*, 1836. Vol. I. pp. 180—182.

[2] Since the above was in type, I have had the opportunity of seeing, at Paris, the skeleton of *M. muscovita*. The skull has a well developed sagittal ridge which, at its junction with the lambdoidal crest, develops a peculiar prominence. The openings external to the supra-occipital are very large, but the spiculum above the infra-orbital foramen is slender. The coronoid process of the mandible is not inclined forwards or truncated, though it rises nearly to the summit of the cranium. There is a minute spinous process to the sixth cervical ver-

ERICULUS. No skull of this Madagascar form as yet exists in the national collection, but it is well represented by Isid. Geoff. St Hilaire[1], and by De Blainville[2], and, as I have already said, the kindness of Professor Newton of Cambridge has enabled me to examine the cranial characters of the genus as fully as is possible without mutilation of the skull.

As has been generally recognised *Ericulus* is closely allied to *Centetes*, and indeed corresponds with the description above given of that genus, except in the following points. The skull is very much smaller, smaller even than in *Erinaceus*, and, as might almost be anticipated, there is no marked sagittal ridge. The palate projects backwards much beyond the last molars, but its posterior margin is not thickened. The meso-pterygoid fossa narrows very much as it proceeds from before backwards; and the process of the squamosal, the under surface of which articulates with the mandible, is separated by a deep notch from the mastoidal process, so that, together with the par-occipital process, there are here three distinct processes on each side. The premaxillæ do not nearly reach the frontals, and the latter form a larger portion of the cranial roof. The posterior margin of the mandible, between the angle and condyle, is more concave. No second prominence, anterior to the angle, is developed from the inferior border of the mandible. There is no glenoid foramen, but (as sometimes in *Erinaceus*) a conspicuous opening just beneath the foramen ovale leads into the tympanic cavity. The posterior palatine foramina are smaller than in *Centetes*, but there are numerous minute perforations scattered over the palate. The spheno-palatine foramen is rather nearer to the foramen rotundum than in the last-named genus, though the approximation is not nearly so great as in *Erinaceus*. The dental formula appears to be

$$\text{I.}\ \frac{2-2}{2-2},\ \text{C.}\ \frac{1-1}{1-1},\ \text{P.M.}\ \frac{3-3}{3-3},\ \text{M.}\ \frac{3-3}{3-3} = \frac{18}{18} = 36.$$

In the upper jaw, the incisors are rather larger as compared to the other teeth, than in *Centetes*, and the 2nd is not so much curved. The canine is not caniniform, but is like the 2nd incisor, only much larger, and with two roots. The 1st premolar is larger and more complex than in *Centetes*, and much resembles the 2nd premolar of that genus, except that it is relatively less vertically extended. The 2nd premolar is more like the true molars than in *Centetes*. It somewhat resembles the 2nd premolar of that genus, but the principal cusp is less developed, while the postero-internal one is very much more so, and no less than three small cusps are developed from

tebra. The clavicle does articulate with the humerus, and the ultimate phalanges of the manus are longer than the proximal ones. The metacromion process of the scapula is very long, and the posterior end of the spine of the scapula sends out a similarly directed process. The third trochanter is very large and the pes exceedingly elongated.

[1] *Magasin de Zoologie*, 1839. *Mammifères*, Pl. IV.

[2] *Loc. cit.* Pl. VI. and X.

an external cingulum. The 3rd premolar and first two molars are as in *Centetes*. The 3rd molar is smaller as compared to the others, than in the last-named genus. In the lower jaw the 1st incisor is a little smaller than the 2nd, and the 2nd than the canine. The crowns of the two last-mentioned teeth each consist of a large anterior part, which is notched, and a small posterior portion, so that each has in fact three lobes, the first however being very minute. The lower canine is thus very different from its homologue in *Centetes*. Its apex also is not received into an excavation of the upper jaw. The 1st premolar is like the canine, but smaller, and relatively more extended antero-posteriorly. The 2nd premolar is very unlike that of *Centetes*. It consists of a large anterior portion, which is tricuspid, and of a small, low, transverse, posterior ridge. The more posterior teeth closely resemble their correspondents in *Centetes*.

As regards the rest of the skeleton of *Ericulus*, the vertebral column, scapula, clavicle, pelvis and femur, are entirely unknown to me, but the other bones present the following characters: the humerus has a supra-condyloid foramen, but no inter-condyloid perforation. The radius and ulna are complete and distinct. The carpus has an os intermedium, but the scaphoid and semilunar bones are separate. The tibia and fibula are both complete their whole length not anchylosing together inferiorly. The metatarsus is short.

ECHINOPS. This small genus, also from Madagascar, is only known from my late lamented friend Mr Martin's description[1], and from the skeleton (minus the cranium and bones of the extremities) of the individual described by him, which is now preserved in the Osteological collection of the British Museum. It is, as Dr Peters has announced[2], nearly allied to *Centetes*, and the only differences I have been able to detect are these. The skull is shorter in proportion to its breadth, as is also the palate, the posterior margin of which is not thickened. There is no sagittal ridge. The meso-pterygoid fossa contracts in width *very* much from before backwards, but (judging from the figure) it ends in no hemispherical excavation. As in *Ericulus*, there are three processes in each side of the posterior part of the skull. The premaxilla does not join the frontal; the mandible is like that of *Ericulus*, except that the coronoid process is higher and more pointed. As to the foramina all that can be said is[3], that the posterior palatine ones appear to be smaller than in *Centetes*, the infra-orbital canal to be smaller and somewhat longer, so that it opens anteriorly, decidedly in front of the lachrymal foramen. The dental formula is

$$\text{I.}\ \frac{2-2}{2-2},\quad \text{C.}\ \frac{1-1}{1-1},\quad \text{P. M.}\ \frac{2-2}{2-2},\quad \text{M.}\ \frac{3-3}{3-3} = \frac{16}{16} = 32.$$

[1] *Trans. Zool. Soc.* Vol. II. p. 249, Pl. 46.
[2] *Monatsber. Akad. W. Berlin*, 1865, p. 286.
[3] No ali-sphenoid canal is represented in Mr Martin's plate, but I strongly suspect that it exists.

The 1st upper incisor predominates more over the 2nd than in *Centetes* or *Ericulus*. The specimen figured had the teeth much worn, but the incisors probably resemble in form those of *Ericulus*. The canine also, except that it may be more vertically extended. The upper premolars appear to be very much like the first two of *Ericulus*, and the three upper molars are like the molars of that genus.

In the lower jaw the teeth appear closely to resemble those of *Ericulus*, the 2nd premolar of the latter being removed.

As regards the rest of the skeleton, I find 16 (if not 17) dorsal, 6 (perhaps 5) lumbar, and 3 sacral, and but few caudal, vertebræ. The spine of the axis vertebra is mutilated, but seems to have been only of moderate size. The dorsal spines are not more elongated than in *Erinaceus*, but the lumbar ones agree with those of *Centetes* in being more antero-posteriorly extended than in the former genus. The lumbar transverse processes are rather smaller than in *Centetes*, the hyperapophyses, on the other hand, are more marked. The scapula has its infra-spinous fossa rather smaller, as compared to the supra-spinous one, than in *Centetes;* and the free margin of the spine is less undulating. The humerus is of about the same length as the scapula. The fore-arm is unknown to me, also the tibia, fibula, and pes; but the femur closely resembles that of *Centetes*.

SOLENODON. This West Indian genus has been first described by Brandt[1], more recently by F. Poey[2], and lastly by Dr Peters[3]. The last-named author refers it to his sub-family *Centetina*, justly remarking its many striking affinities to *Centetes*.

This genus is not represented by either skeleton or skull in the British Museum or in that of the Royal College of Surgeons; but the great kindness of Professor Peters has (as I said in the commencement of this article) enabled me to examine the original skull (described and figured by him) of *S. cubanus*. I find that it entirely corresponds with *Centetes* in all the points above enumerated in the description before given of my sixth type except as regards the following details:—When viewed above, the cranium is much less cylindrical, there being a marked interorbital constriction, and the face is relatively narrower. The posterior end of the skull appears less truncated on account of the very strong backward projection of the large lambdoidal ridge. Anteriorly the premaxilla projects much forwards at the side of the anterior nares, giving a peculiar contour to that part. There is a slight ridge at the front of the orbit running upwards immediately before and above the lachrymal foramen, and resembling much that of *Erinaceus*. The upper end of this ridge is continued very faintly backwards and inwards till it

[1] *Mém. de Petersburgh.* 1833. Sixth Series. II. Tab. 1 and 2. Copied by Dr Blainville. *loc. cit.* Pl. V. and IX., and by Owen, *loc. cit.* Pl. III. fig. 1.

[2] *Memorias sobra la historia natural de la Isla de Cuba.* I. Habana, 1851, p. 23.

[3] *Abhandlungen der K. Akad. der Wissenschaften zu Berlin.* 1864. Vol. I. Pls. I. to III.

meets its fellow of the opposite side, the two uniting to form a slightly developed sagittal ridge. There is scarcely any concavity at the side of the muzzle, but a marked one on the summit of the cranium between the orbits. There is a rather small defect of ossification at the middle of the palate towards its hinder part, in *S. cubanus*, but, apparently, not in *S. paradoxus*. There are no pterygoid fossæ whatever, and the meso-pterygoid one (which slightly expands laterally as it proceeds backwards) ends in no hemispherical or other excavation, but its roof is continuous with the posterior part of the under surface of the *basis cranii*. There are no basi-sphenoidal processes, and there is no paroccipital process. The rudimentary mastoidal one is found with the glenoidal projection of the squamosal, so that there is but one lateral projecting process here on each side—in *S. cubanus*, at least. The glenoid surface is smaller and more strongly concave from behind inwards to before outwards, an obliquely situated, depending process acting as both an anteglenoidal and postglenoidal one. This process is larger than in *Centetes*, and approximates somewhat to that of *Sorex*. The presphenoid does not appear to be swollen out by a large internal cavity. The premaxilla is rather large, but does not meet the anterior prolongation of the frontal. The anterior rudiment of the zygoma is strongly concave in front, externally to the infra-orbital foramen. The mastoidal portion of the epiotic does not join with an occipital prominence to form a paroccipital process, but nevertheless it bifurcates below. Part of the external surface of the ascending ramus is deeply concave, and the condyle is much extended transversely. The prominence which in *Centetes* is developed from the inferior margin of the mandible in front of the angle has here become a sharp and strongly-marked process. There is a double precondyloid foramen on each side. Several small venous foramina open on the outside of the hinder part of the skull, and there is a very large postglenoid foramen. The small optic foramen is not hidden by the alisphenoidal lamella. Three orbital foramina open just above and in front of the optic one. The moderate sized posterior palatine foramina open close to but distinct from the spheno-palatine foramen. The lachrymal foramen opens just at the anterior margin of the orbit. The dental foramina (on the side in which there are two) are not wide apart on the outer side of the mandible.

The dental formula is apparently

$$\text{I.}\ \frac{2-2}{2-2},\quad \text{C.}\ \frac{1-1}{1-1},\quad \text{P.M.}\ \frac{4-4}{4-4},\quad \text{M.}\ \frac{3-3}{3-3} = \frac{20}{20} = 40.$$

The third upper tooth on each side has its crown in front of the premaxillary suture, but Professor Peters calls attention[1] to the fact that its root extends into the maxilla, and the predominance of its maxillary relations is well seen when the palate is looked at.

The 1st upper incisor is the most vertically extended tooth of the upper jaw, like that of *Mygale*, and, as Dr Peters remarks[2], it has

[1] *Loc. cit.* p. 7. [2] *Loc. cit.*

considerable resemblance to that of *Scalops*. The inner border of the crown of the tooth develops a small process which is in contact with the similar process of the first incisor of the opposite side. The 2nd incisor is a simple conical tooth with a rudimentary talon. It is very much smaller than the 1st incisor, from which it is separated by a considerable interspace, where is a depression for the reception of the apex of the 2nd inferior incisor. The canine is similar in form to the second incisor, but is smaller; it being the smallest tooth in the upper jaw. It is placed close to the second incisor. The 1st premolar is separated by a considerable interval from the canine. It is a large stout, rounded, obtusely pointed, conical tooth with two roots. The 2nd premolar is similar, except that it is smaller and especially shorter. It is separated by a slight interval from the first premolar. The 3rd premolar very much resembles the second premolar of *Centetes*, but is considerably smaller, and does not predominate, in vertical extent, over the tooth next behind. The 4th premolar is quite like the third of *Centetes*, except that the principal cusp is more vertically extended. The true molars are quite like those *Centetes*, except they decrease in size from the first to the third in a marked degree. In the lower jaw the teeth are close to each other, and the incisors (as Dr Peters remarks[1]) resembles those of *Scalops aquaticus*. The 1st incisor is exceedingly small, indeed the smallest tooth of the entire dentition. Its crown slightly broadens towards its summit which is notched.

The 2nd incisor is exceedingly large, pointed and conical, and has a wonderfully deep groove on its inner side. The canine is a small obtusely pointed tooth, which has a slight anterior production and also a small posterior talon. The 1st premolar is similar to the canine but larger, and the anterior and posterior processes are relatively less marked. The 2nd premolar is a simple, rounded, conical, obtusely pointed tooth. The 3rd premolar is like the second in all respects except it develops a slight postero-internal process at the base of its crown. The 4th (and last) premolar would be very like the 3rd (and last) premolar of *Centetes* if the antero-internal cusp of the latter were suppressed. The true molars are quite like those of *Centetes*, except that the basal posterior portion of the last is more developed. As regards the rest of the skeleton there are 15 dorsal, 4 lumbar, 5 sacral, and many caudal vertebræ.

All the other skeletal characters before attributed to *Centetes* exist certainly in *Solenodon* with the exception of the undulating outline of the margin of the spine of the scapula and the excavation at the lower end of the front of the femur, which may exist but are not figured.

POTOMOGALE. The osteology of this highly interesting African Insectivore is only known to me by the skull so kindly sent to me by Professor Allman, and by his description[2], and that of Professor

[1] *Loc. cit.* p. 9.
[2] *Trans. Zool. Soc.* Vol. VI. p. 1, Pl. I. and II.

Barboza du Bocage[1]. On comparing the cranium with the crania of other genera of the order, there can, I think, be little doubt but that on the whole it more resembles *Centetes* than any other form, though it has also a certain superficial resemblance to *Sorex;* and comparing it with the first-named genus, I find that the skull is much less cylindrical, the cranium proper narrowing considerably and continuously forwards from the interglenoidal region to the cribriform plate. The muzzle, as in *Solenodon*, is much narrower than the cranium proper, and its lateral walls are nearly parallel. There is no trace of a post-orbital process. The skull is not truncated at either end, for anteriorily the nares slope backwards as in *Centetes*, while posteriorly the occiput slopes strongly forwards. There is no ridge or process at the front of the orbit, but a very slight sagittal ridge and a considerable lambdoidal one, which (as in *Ericulus* and *Solenodon*) is most marked at the sides. The temporal fossa is large, and there is a deep concavity at the side of the muzzle immediately in front of the infra-orbital foramen, but none on the summit of the cranium. The palate is long and narrow, of nearly equal width throughout, but narrowing a little from behind forwards. It is also slightly concave from behind forwards; but there is no median antero-posterior ridge, nor any defect of ossification, though there are many small foramina which perforate the palatine plate of the maxillæ but not of that of the palatine bones. Indeed the extent to which the maxillæ are perforated is very remarkable. The posterior margin of the palate is not thickened, but is narrow and concave backwards. There is no trace of a pterygoid fossa, but the meso-pterygoid one is deep, narrow, and becomes rapidly narrower still from before backwards, its lateral walls tending inwards remarkably. It does not end posteriorly in a hemispherical or other excavation, but its roof is continuous with the rest of the basis cranii, though a slight median depression marks the under surface of the basi-sphenoid. The basi-occipital is large, and its under surface ascends from before backwards, as in so many other aquatic mammals. The auditory bullæ appear to be completed by large basi-sphenoidal processes. The foramen magnum is very large, especially in width, and looks directly backwards, or even slightly upwards. There are well-marked, though rather small, paroccipital processes which are peculiar, because, as Professor Allman remarks[2], they extend "horizontally backwards." There is only a rudimentary mastoid process which (as in *Centetes* and *Solenodon*) is closely united to the glenoid process of the squamosal; thus there are here only two distinct processes on each side. The mastoid contributes but very slightly to the formation of the paroccipital process. The glenoid surface is made transversely concave by a strongly projecting ento-glenoid process, which is placed obliquely so as to serve also as a post-glenoid process. Its development closely re-

[1] Noticia acerca dos caractéres e affinidades naturaes de uno novo genero de Mammiferos insectivoros da Africa occidental, Bayonia velox, 1ª Classe da Academia de 27 d'Abril, 1865. Lisboa.

[2] *Loc. cit.* p. 10.

sembles that of the same part in *Centetes*. The rhinencephalic chamber is much smaller than in *Erinaceus*, but the pre- and basi-sphenoids are narrow and not swollen out by internal cavities. The premaxilla is large, but does not meet the anterior prolongation of the frontal. The nasals unite early together, but do not extend backwards so far as do the maxillæ. The parietals form a very large part of the cranial roof. The zygoma is wanting, only a small process extending backwards and outwards above the last molar. The squamosal is all but entirely excluded from the cranial cavity, but the mastoidal region of the periotic is largely visible on the exterior of the skull. The mandible has its ascending ramus only slightly concave externally; its posterior margin, between the condyle and the angle, is short but deeply concave. The horizontal ramus is not constricted behind the last molar, but the inside of the ascending ramus above the mylohyoid ridge is markedly concave. The angle is sharp and elongated. The condyle is almost as much transversely extended as in *Erinaceus*, though not so much so as in *Solenodon;* and the broad coronoid process ascends much above it when compared to the distance between the condyle and the angle, which latter is small and much flattened from above downwards. There is a distinct indication of the second process which, in *Solenodon*, projects from the inferior margin of the mandible in front of the angle.

The precondyloid foramen is enormous[1]; and the jugular foramen is continued forwards as a narrow fissure, separating the periotic from the basi-occipital and basi-sphenoid. I have not found a distinct carotid foramen, though small foramina perforate the base of the basi-sphenoidal tympanic processes. A venous foramen opens near the margin of the squamosal: there is also a very small glenoid foramen. The Eustachian tube opens just beneath the foramen ovale. One large opening represents both the foramen rotundum and the sphenoidal fissure. The optic foramen is very small, and, with the just mentioned opening, is hidden by the alisphenoidal lamella. The optic nerve traverses no long bony canal, as in *Erinaceus*. There is a small but distinct sub-optic foramen communicating with its fellow of the opposite side, and not with the cranial cavity. Immediately above this is an orbital foramen. A conspicuous alisphenoidal canal opens just in front of the foramen ovale; but there is no external alisphenoidal canal. A very small posterior palatine foramen opens below, near the posterior end of the palate. Above, it opens just behind the spheno-palatine foramen, which is situated rather far forwards, and widely separated from the opening representing the foramen rotundum. The anterior palatine foramina (one on each side) are large, but not so much so, relatively, as in *Mygale*. The infra-orbital foramen is single and very large, and is the anterior opening of an *extremely* short canal. There is no lachrymal foramen.

[1] This large basi-occipital perforation, the sloping upwards behind of that bone and the forward inclination of the supra-occipital, are all characters more or less commonly present in aquatic beasts.

Two mental foramina open at some distance from each other outside the horizontal ramus of the mandible; the more anterior being between (and below) the canine and the first premolar; the more posterior below the first true molar. The teeth in the specimen examined by me are 36 in number, 9 on each side of each jaw. Professor Allman considers that the tooth which I prefer to call canine should rather be considered a premolar, on account of its complete similarity in form to the undoubted premolar behind it. But the two incisors have also very nearly the same shape, and unless a tooth developed in the maxilla but close behind the premaxillary suture be in all cases called canine (whatever its shape), great uncertainty and inconvenience would result in dental nomenclature. In the fully adult specimen however, described and figured by Professor Barboza du Bocage, the number of teeth is 10 on each side of each jaw; and a close inspection of the Edinburgh specimen shows that another grinder is probably yet enclosed in its alveolus on each side of the mandible[1], while the posterior end of each maxilla has apparently been fractured and the last existing molar has not come fully into place[2].

In Professor du Bocage's plate (fig. 2) the premaxillary suture is represented as separating the second tooth from the third; but in the Edinburgh specimen it is very distinct, and (not only at the side of the face, but also on the palate,) clearly separates the third tooth from the fourth; the third tooth being evidently implanted in the premaxilla exclusively; thus the dental formula for this appears to me to be

$$\text{I.}\ \frac{3-3}{3-3},\ \text{C.}\ \frac{1-1}{1-1},\ \text{P.M.}\ \frac{3-3}{3-3},\ \text{M.}\ \frac{3-3}{3-3} = \frac{20}{20} = 40.$$

The 1st incisor is very large, being the most vertically extended tooth of the upper jaw. It has considerable resemblance to that of *Solenodon*, even developing a slight process on its inner side, though this is situated higher up, and is very much less marked than in the last-mentioned genus. The 2nd upper incisor is, as Professor Allman observes[3], "separated from the first by a narrow space, which receives the second incisor of the lower jaw when the mouth is closed; it is triangular, compressed, with a sharp anterior and a sharp posterior edge—the anterior edge being convex, and the posterior slightly concave. The third incisor is of the same form as the second, but a little smaller. The incisors are each implanted by a single fang." The canine and 1st upper premolar are very similar in shape to the posterior incisors, but rather more antero-posteriorly

[1] On my returning the skull to Prof. Allman, he discovered the missing tooth: "it was a mere rudiment still in its capsule," as he was kind enough to inform me. A notice of this circumstance was communicated by him to the Zoological Society, on March 14, 1867.

[2] The imperfectly united condition of the epiphyses of the limb-bones seems to be indicated in Plate II. of Professor Allman's Memoir.

[3] *Loc. cit.* p. 7.

extended, while each has two fangs. The 2nd upper premolar is very much like the second of *Centetes*. The 3rd premolar and the first two upper molars are very much alike and very interesting, inasmuch as they present as it were a transitional structure between molars (such as those of *Talpa*) with two triangular prisms each, and molars (as those of *Centetes* and *Ericulus*) which have each only one such prism[1]. For each of these teeth have three or four very small cusps developed from the external cingulum, a very large cusp arising from the internal cingulum, and two median cusps, from each of which two slightly marked diverging ridges proceed outwards to the external cingulum, forming two very narrow triangular prisms so close together that a little more approximation would reduce them to a single prism, such as exists in *Cetetes* and *Solenodon*. These three teeth successively increase somewhat in transverse extent from before backwards. The third and last molar is absent in the specimen examined by me; but from Professor du Bocage's figure it is similar to, but somewhat smaller and less developed than, the other molars.

In the lower jaw the 1st incisor is very small (the smallest tooth in the mandible), its crown is expanded laterally however, and inclines to and meets its fellow of the opposite side. The 2nd incisor is large and canine-like, like that of *Solenodon*. It is somewhat grooved behind and also on the inner side, and presents a slight process at its base behind, and another, also towards its base, on its inner margin. The 3rd incisor is small, simple, procumbent, with a slight posterior process at its base. The canine is of similar form, except that it is less procumbent; it is also larger, and more vertically extended. The 1st premolar is similar as to its crown, though smaller. It differs from the more anterior teeth of the mandible, in that it is implanted by two fangs. The 2nd premolar is larger, with a small tubercle at its base in front, and another one behind; the posterior cutting edge also develops a small cusp. The 3rd premolar is very like that of *Centetes*, and consists of a triangular prism (with an angle turned outwards), and a posterior basilar process. The first two molars are of similar form; and all three have the posterior basilar process more developed than in the corresponding teeth of *Solenodon* or *Centetes*. The 3rd and last lower molar appears, from Professor du Bocage's figures, to be of the same shape as the preceding molars, but rather larger in size. In the greater size of the posterior basilar process of the lower molars we again see an approximation (similar to that existing in the upper molars) to that type of dentition which presents us (as in *Talpa*) with two triangular prisms to each lower molar.

As regards the rest of the skeleton, there are, according to Professor Allman[2], 16 dorsal and 5 lumbar, 3 sacral and many caudal vertebræ. The spinous process of the axis is exceedingly large; and the other cervical vertebræ have all more or less elongated spinous

[1] See below, woodcut on page 138.

[2] *Loc. cit.* p. 8.

processes. The cervical transverse processes are not much expanded antero-posteriorly. The 3rd, 4th, 5th, and 6th cervical vertebræ have hypapophysial processes. The dorsal spines are elongated, and those of the lumbar region are much antero-posteriorly extended. The metapophyses, anapophyses and transverse processes are small; but there are well marked hyperapophyses[1] on the two last dorsal and the first four lumbar vertebræ. Small hypapophyses are developed beneath the first four dorsals, and the caudal vertebræ are provided with large chevron bones. The manubrium is of moderate size and not keeled. The clavicle, by a most remarkable exception amongst Insectivora, is entirely absent. Both supra- and infra-spinatus fossæ are well developed in the scapula, which has no metacromion process, and the acromion is very slender. The humerus is decidedly longer than the scapula, and its lower end has neither olecranal nor supra-condyloid perforation. The great tuberosity is exceedingly elongated[2]. The radius and ulna are complete and distinct. The carpus has eight bones; and these Professor Allman has been kind enough to inform me, are the usual ones, there being no intermedium, and the scaphoides and semilunare being separate. The pelvis is wide with a very small pubic symphysis. The ilium is not markedly concave either within or without. The femur has but a slight ectogluteal ridge: whether the inferior, anterior depression exists as in *Centetes*, I cannot say. "The tibia and fibula are confluent with one another for the lower third of their length[3]." The metatarsus is not much elongated.

CHRYSOCHLORIS[4]. This African genus presents us with remarkable characters different from any we have yet met with. It has usually however been associated with *Talpa*, but if compared with that genus it will be seen to differ from it in many respects, and strikingly in the general form of the cranium. Indeed the rapidity with which the skull narrows from behind forwards is greater than in any other Insectivore, and is most nearly approached by *Macroscelides proboscidens*. The vertical extent of the cranium is also much greater in proportion to its length than in *Talpa*. The greatest breadth of the skull too, unlike that of the last-named genus, is situated between the posterior roots of the zygomata, and these, instead of being slender, are exceedingly strong and much vertically extended arches. The

[1] See *loc. cit.* Pl. II.

[2] "A strong pyramidal projection, by which the axis of the shaft is continued for about $\frac{2}{10}$ths of an inch beyond the head." Allman, *loc. cit.* p. 12. "Quanto ao humerus, esse distingue se muito bem do humerus do *Solenodon*, e de todos os insectivoros, por uma grande apophyse vertical e conica que occupa precisamente o logar da grande tuberosida. Esta apophyse, que se encontra egualmente na extremidade superior do humerus d'outros mammiferos não claviculados, os ruminantes, tornaria por si só impossi vel a juncção do clavicula à crísta da omoplata." *Barboza du Bocage, l. c.* p. 12.

[3] *Loc. cit.* p. 13.

[4] The skull, dentition and various parts of the skeleton of this genus are represented by De Blainville, *loc. cit.* Pls. V. VII. VIII. and IX. For the dentition also, see F. Cuvier, *loc. cit.* No. XVIII., and Owen, *loc. cit.* Pl. CX. fig. 1.

orbits however are incomplete, and there is not even a trace of a post-orbital process, though the skull is slightly constricted laterally, behind the orbits. The occiput is very large, as in *Talpa*, but it does not slope forwards as in that genus. The anterior nares are very remarkable, the premaxilla on each side being produced forwards in a very singular way, resembling that already noticed in *Solenodon*, but greater in degree. The processes are so twisted that the flattened surfaces of each look rather upwards and downwards than inwards and outwards; so that when the extremity of the muzzle is looked at from above, it has somewhat the appearance of a miniature representation of the same part in the skull of the *Ornithorhynchus*. There is no sagittal ridge, but a lambdoidal one traverses the summit of the cranium and becomes continuous on each side with the zygoma, so that between the posterior end of this arch and the proper cranial wall a remarkable fossa is formed. There is no ridge or process in front of the orbit. The temporal fossa is rather large but in *C. capensis* is encroached upon by the well-known[1] bony vesicle. The palate is short and wide, and widest between the last premolars. It is rather strongly concave antero-posteriorly, but has no longitudinal median ridge. There are no defects of ossification in the palate, nor is there any thickening of, or median projection from, its posterior margin, which is either some little distance behind the last molars, or almost on a line with them. There are no pterygoid fossæ, and the well-defined meso-pterygoid fossa narrows but very slightly backwards and ends in no excavation. The pterygoid region itself is not inflated; though the vesicular enlargement behind it on each side is more prominent and sharply marked than in *Talpa*. The foramen magnum is large, but looks rather more backwards than in *Talpa*. There are no paroccipital or mastoidal projections. The glenoid surface is triangular and very small; it is situated quite behind the foramen ovale and above the external opening of the auditory meatus. The cranial wall bounds it both internally and behind. The cribriform plate is very large, but the pre- and basi-sphenoids project but little into the cranial cavity. The periotic is not nearly so salient inwards as in *Talpa*. The cranial bones anchylose together very early, but Professor Peters[2] has detected the limits of the premaxilla, which is of considerable size. There is no distinctly marked pterotic or any lateral occipital fissure.

The mandible is very peculiar, the upper part of the ascending ramus having the appearance of having been sharply cut off; its summit being nearly straight, and the coronoid process not rising so high as the condyle, the little elevation of this process reminds us of *Macroscelides*. The condyle is not transversely extended, but is rounded. The horizontal ramus and the symphysis are short; the

[1] See De Blainville, *loc. cit.* p. 15, and J. L. Wagner, *loc. cit.* p. 580. See also Hyrtl, *Vergleichend. anat. Untersuch. über das innere Gehörorgan des Menschen und Säugethiere*. Prag. 1845, p. 60.

[2] *Reise nach Mossambique*, p. 71.

angle much produced, expanded and truncated at its extremity, and considerably bent inwards.

There are small double pre-condyloid foramina, and carotid foramen (as in *Talpa*), and a small glenoid one. The foramen ovale is of moderate size and separated by a bony bridge from the large opening representing both the foramen rotundum and sphenoidal fissure, if not the optic foramen also, which I have not detected as a separate opening. The palate is perforated by numerous small apertures, but there are no marked posterior palatine foramina. The anterior palatine foramina are rather small. The infra-orbital foramen is large and single, and bounded above by a moderately stout spiculum of bone. The lachrymal foramen is minute and situated just behind the summit of the anterior end of the just mentioned spiculum. One or two mental foramina open outside the mandible beneath the first or last premolar.

The dentition of this genus, Dr Peters having determined the number of the incisor teeth, appears to be as follows:

$$\text{I.}\ \frac{3-3}{3-3},\ \text{C.}\ \frac{1-1}{1-1},\ \text{P.M.}\ \frac{3-3}{3-3},\ \text{M.}\ \frac{3-3}{3-3}\ \text{or}\ \frac{2-2}{2-2} = \frac{18}{18}\ \text{is}\ \frac{20}{20} = 36 \text{ or } 40.$$

The 1st upper incisor reminds us of *Scalops*, *Solenodon*, and *Potomogale;* the 2nd is smaller, with a rudimentary anterior cusp, and the 3rd smaller still and quite simple. The upper canine is slightly smaller than the second incisor, and has a small posterior cusp. The 1st premolar has one principal cusp and two small cusps developed from the external cingulum. The 2nd and 3rd premolars, and all the molars, except the occasional 3rd, consist of one long principal cusp, two smaller from the external cingulum, and one internal cusp from the internal cingulum; so that each tooth consists of a single triangular prism with an angle turned inwards; the prism being much extended transversely and very narrow antero-posteriorly, and attached to a supporting surface which develops an internal prominence[1]. The 3rd molar is small and rudimentary, and is absent in some forms.

In the lower jaw the 1st incisor is much smaller than the 2nd, again reminding us of *Scalops*, *Solenodon*, and *Potomogale*. It is exceedingly slender. The 2nd incisor is large and pointed, the 3rd is very small, but has a small posterior cusp. The canine and first premolar are similar, but rather larger in size. The 2nd premolar and the teeth behind it are alike in shape and size; each is a lofty, antero-posteriorly compressed, triangular prism with an angle turned outwards, and separated from its neighbours by an interval. In some species[2] each of these teeth has a small posterior basal talon, but in *C. capensis* this is not the case, and the molars of this species offer the maximum of concentration of the whole order.

[1] See below, woodcut, page 138.

[2] It is so in the specimen of *C. rubra* in the British Museum, and it is so represented in Professor Peters' figure of *C. obtusirostris*. *Reise nach Mossambique*, Tab. XXII. fig. 22 a.

I am inclined to think that the species with the reduced number of teeth $\left(\text{i.e. M. } \frac{2-2}{2-2}\right)$ with the basal talon to the lower grinders and destitute of the peculiar prominence in the temporal fossa, should perhaps be separated as a distinct genus from the original form *C. capensis*. It may perhaps be conveniently distinguished under the generic term *Calcochloris*. As regards the rest of the skeleton I can only speak, from observation, of *C. capensis* or *Chyrsochloris* proper. In this form there are 20 or 19[1] dorsal, 3 lumbar, some 3 or 4 sacral, and a few caudal vertebræ. The spinous process of the axis is small, and none are developed on the other cervical vertebræ, the neural arches of which are however more antero-posteriorly developed than in the *Talpidæ*. The transverse processes are not greatly overlapping, nor are there conspicuous cervical hypapophyses. The dorsal spines are fairly developed, except the first two. The lumbar processes are feeble; and there are no hyperapophyses or autogenous hypapophyses, though the first lumbar vetebra developes a hypapophysial ridge. The manubrium though keeled is small; and the clavicle is exceedingly long and slender, and does not articulate with the tolerably long humerus, the internal condyle of which is perforated. The scapula is quite unlike that of the *Talpidæ*, being broad, with a lofty spine, and large, though blunt, metacromion process. The radius and ulna are complete and distinct; and in addition an ossification of a tendon[2] gives a third bone to the fore-arm. The carpus has the scaphoid and semi-lunare separate[3], no intermedium, and no sickle-shaped ossicle. There are only 4 digits, no one of them has more than 2 phalanges[4].

There is not only no pubic symphysis, but the 2 pubes are wide apart. The ischiatic tuberosities also are somewhat everted. The tibia and fibula are anchylosed together inferiorly. There is a marked difference from *Talpa* in the position of the shoulder-girdle, which is far back, leaving the cervical vertebræ free, instead of more or less concealing them. There are 5 digits to the pes, each with but 2 phalanges[5].

GALEOPITHECUS. The last genus to be here considered is one which has by most naturalists[6] been associated with the Lemurs or Bats, and not with the *Insectivora*, where is, I think, unquestionably its true home.

[1] 19 in the specimen in the Museum of the Royal College of Surgeons, also the number given by De Blainville, *loc. cit.* p. 14, also by Prof. Peters, *loc. cit.* p. 72. In *C. obtusirostris* (my *Calcochloris*) Dr Peters found 19 dorsal, 4 lumbar, and 5 sacral vertebræ, *loc. cit.* p. 72.

[2] Peters, *loc. cit.* p. 72.

[3] *Reise Nach Mossambique*, Pl. XXII. fig. 23, n. s.

[4] Peters, *loc. cit.* p. 72.

[5] Peters, *loc. cit.* p. 73.

[6] See De Blainville, *Ostéographie*, Primates, Lemur, Pl. V. F. Cuvier, *loc. cit.* No. XIV. Owen, *loc. cit.* Pl. CXIV. fig. 1. Waterhouse, *Trans. Zool. Soc.* II. p. 335, Pl. 58. A. Wagner, Dr Peters, and Prof. Huxley have however placed it amongst the Insectivora.

The skull of Galeopithecus is broad and depressed, more resembling, in this respect, *Rhynchocyon* than any other Insectivore, though the muzzle is broader and more obtuse than in that genus. The upper surface of the skull is constricted between the orbits; and the cranium is broadest between the posterior roots of the zygomata, which are complete and stout but exceedingly short arches. The orbits are limited posteriorly by a large post-orbital process, which descends towards but does not nearly attain a very much smaller post-orbital process developed from the upper border of the zygoma. Posteriorly the skull is truncated, but scarcely so in front. A strong ridge bounds the orbit anteriorly, and continues backwards to the post-orbital process just mentioned; moreover there is a very slight process projecting just in front of the lachrymal foramen. Temporal ridges proceed from the upper post-orbital processes, and join, separately, but very near together, the lambdoidal ridge. The temporal fossa is rather small, the muzzle is slightly concave on each side, and a marked concavity is produced on the upper surface of the cranium by the elevation of the superior margin of each orbit. The palate is wide, and without any defects of ossification. Its posterior margin is rather thickened (or rather bent downwards), and extends forwards as far as the anterior end of the penultimate molar, being strongly concave, with a marked backward median projection. The pterygoid fossæ are so minute as to be hardly noticeable. They are somewhat like those existing in *Tupaia*, only still smaller; the divergence of the minute ectopterygoid lamella taking place lower down. The mesopterygoid fossa is large and shallow, narrows slightly backwards as far as the pterygoid fossæ, and then widens a little. It does not end in a posterior excavation, nor does the basi-sphenoid develope lateral processes. The foramen magnum looks directly backwards. There is no paroccipital process, but a large and swollen mastoidal one on each side. The glenoid surface is transversely extended, but made strongly concave antero-posteriorly by the extreme forward curvature of the post-glenoid process, which reminds us of its form in *Sorex*. The cribriform plate is rather small, and the pre- and basi-sphenoids are not inflated. The premaxillæ are of moderate size, but are widely separated from the frontals, while the nasals become very broad towards their posterior termination. They extend backwards a little further than do the maxillæ above. The parietals form only a moderate part of the cranial roof. The malar is large, and forms part of the floor of the orbit; it is imperforate.

The mandible is remarkable for the very small extent to which the condyle and coronoid process rise above the level of the lower dental series, in which respect *Galeopithecus* resembles *Chrysochloris*, while the coronoid process but mounts little above the condyle, in which respect it approaches *Macroscelides* and its allies. Although the ascending ramus is so little developed, yet the angle is large, rounded, and somewhat arched outwardly, its margin being a little incurved. The symphysis is short, and the horizontal ramus increases in depth from before backwards. Both the outer and inner sides of the ascend-

ing ramus are rather concave. The concavity being superior outwardly, inferior inwardly. The condyle is much extended transversely. The coronoid process is very small, narrow, and rather pointed.

There is a single pre-condyloid foramen on each side, but no carotid or glenoid foramen, nor any kind of ali-sphenoid canal. The optic foramen is large, and the optic nerve does not traverse any long canal. Close to the last-mentioned foramen (and separated from it by a very small lamella) is the opening which represents both the sphenoidal fissure and the foramen rotundum. The foramen ovale is at some distance behind, at the inner side of the glenoid surface. There is no suboptic foramen, but a supra-orbital one at the anterior part of the root of the orbit. There is a small posterior palatine foramen on each side, but a remarkably large anterior palatine. The spheno-palatine foramen is small, and a little below and in front of an orbital-foramen. Two or three very small infra-orbital foramina open on each cheek, and the rather small lachrymal foramen opens just within the margin of the orbit. There is much irregularity in the situation of the mental foramina.

The dentition of this genus may be represented by the formula:

$$\text{I.}\ \frac{2-2}{3-3},\ \text{C.}\ \frac{1-1}{1-1},\ \text{P.M.}\ \frac{2-2}{2-2},\ \text{M.}\ \frac{3-3}{3-3} = \frac{16}{18} = 34.$$

The form of the very peculiar incisors and canines in this genus is so well known and has been so often described that it is unnecessary here to describe them again, but it will, I think, be well to call attention to the structure of the last premolar and the three molars, both above and below. Each of these upper teeth consists of 2 triangular prisms with an angle turned inwards, 2 very small cusps internal to the angles just mentioned, and, finally, a very large internal cusp. Of all the forms before reviewed *Urotrichus* is that in which this form of upper molar is most nearly approached[1]. The lower molars each consist of two small triangular prisms (with an angle turned outwards), connected together by a very large cusp or external ridge (convex outwards), a deep depression existing between this external parapet and the two triangular prisms. This shaped lower grinder exists in no other Insectivore, but perhaps the nearest approximation to it may be found in *Sorex*.

As regards the rest of the skeleton, there are 14 dorsal, 5 lumbar, 5 sacral, and many caudal vertebræ[2]. The axis has a moderate spine, and a small one is developed in each cervical vertebra behind it. There are a pair of hypapophysial processes at the posterior end of the under-surface of the bodies of the same vertebræ[3]. All the dorsal and lumbar vertebræ have moderately high spines, which are however much antero-posteriorly extended. The lumbar metapophyses, anapophyses, and transverse processes are small. The ribs are very broad.

[1] See below, woodcut, page 138.

[2] De Blainville says, 13 dorsal, 6 lumbar, and 6 sacral. *Ostéographie*, Primates, Lemur, p. 28.

[3] Mentioned by Prof. Huxley in his Hunterian Lectures for 1865.

The clavicles are long and rather slender; the scapulæ are singularly extended antero-posteriorly, reminding us of those of man, certain apes, and the pteropine bats. There is a well-developed spine, but no metacromian process, though the acromian sends a prolongation forwards; the coracoid is T-shaped[1]. The manubrium is small, and not distinctly keeled. The humerus has its inner condyle perforated, and the ulna is fused inferiorly with the radius. The carpus is provided with a scapho-lunar bone, but there is no os intermedium. The proximal phalanges are much shorter than the median.

The pelvis has a very narrow ilium, without any marked concavity, the pubic symphysis is short but constant. The tuberosities of the ischia are produced slightly backwards. The femur has a third trochanter, the fibula is not only complete inferiorly but it becomes more slender towards its upper end than towards its lower termination, thus shewing a tendency to approach the cheiropterous type of structure. The metatarsus is shorter than the digits of the pes, but longer than the tarsus. Each extremity is furnished with fine unguiculate digits.

With *Galeopithecus* ends the list of insectivorous genera; and now it may be well to review the more remarkable characters which we have seen presented by the various forms. First, with regard to the general form of the skull: the two extremes are presented by *Centetes*, *Ericulus*, and *Echinops*, on the one hand; and *Macroscelides*, *Petrodromus*, *Tupaia*, and *Chrysochloris*, on the other. In *Rhynchocyon* and *Galeopithecus* it is, we have seen, exceptionally broad in proportion to its height.

The cranium is almost always broadest between the posterior roots of the zygoma or glenoid surfaces; but in *Talpa*, *Condylura*, *Scalpus*, *Scapanus*, *Urotrichus*, and *Myogale*, the greatest breadth is more posteriorly situated. In the same genera, and in *Sorex*, the supra-occipital is exceedingly developed, extending far forwards. In the last-mentioned genus, as also in *Centetes*, *Ericulus*, *Echinops*, *Solenodon*, and *Potomogale*, there is no zygomatic arch. In the other genera it is present, though generally more or less slender, and exceedingly so in *Talpa* and its allies. On the other hand, in *Chrysochloris* it is deep; and it is very well-developed, though short, in *Galeopithecus*. Post-orbital processes are entirely absent, except in *Rhynchocyon*, *Hylomys*, *Galeopithecus*, *Ptilocercus*, and *Tupaia*. In the last-named genus alone is the orbit completely encircled by bone, though it is almost so in *Ptilocercus*. In these two genera and in *Hylomys* there is a malar perforation. In *Tupaia*, *Erinaceus*, and *Gymnura*, there is a ridge in front of the orbit, and in *Galeopithecus* the orbital margin is very sharp. A more or less marked process also projects outwards in front of the lachrymal foramen in these genera (with the exception of *Tupaia*) and also in *Solenodon*. A very large lambdoidal ridge exists in *Centetes*, *Solenodon*, *Gymnura*, and sometimes in

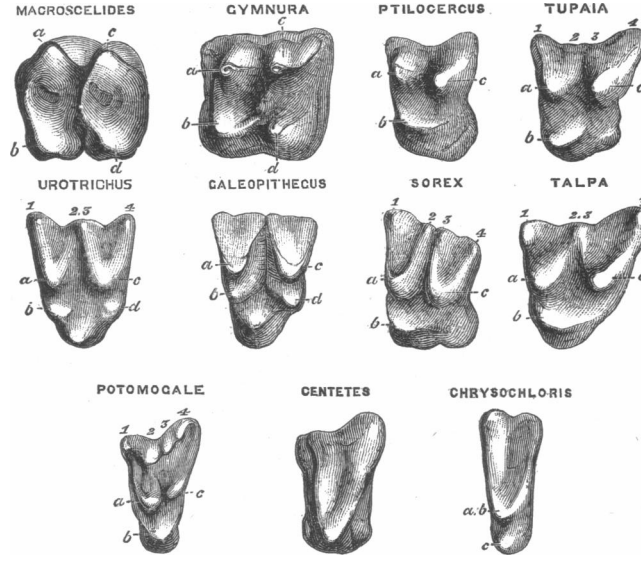
[1] These points, as well as the shortness of the proximal phalanges, were noticed by Prof. Huxley in his Hunterian Lectures for 1865.

Sorex. In *Sorex* and *Galeopithecus* the post-glenoid process projects very strongly forwards as it descends. The premaxilla is produced strongly forwards in *Solenodon*, *Chrysochloris*, and *Calcochloris*, but in no others. Defects of ossification in the palate occur in widely-different forms, namely, in *Erinaceus*, *Talpa*, *Myogale*, *Tupaia*, *Macroscelides*, *Petrodromus*, and *Solenodon*. The posterior margin of the palate is more or less thickened in *Centetes*, *Solenodon*, *Erinaceus*, *Gymnura*, *Myogale*, *Ptilocercus*, and *Galeopithecus*. In *Erinaceus* and *Gymnura* only is there a transverse bony plate behind this thickening. No pterygoid fossa exists in *Talpa*, *Condylura*(?), *Scalops*, *Centetes*, *Ericulus*, *Echinops*, *Solenodon*, *Potomogale*, *Chrysochloris*, and *Calcochloris*. The mesopterygoid fossa often narrows as it extends backwards, but only in *Centetes*, *Ericulus*, and *Erinaceus*, does it end in an excavation of the *basis cranii*. An ali-sphenoid canal exists in *Centetes*, *Ericulus*, *Solenodon*, and *Potomogale*, and probably also in *Echinops*, but in no other form. An external ali-sphenoidal canal is to be found in *Gymnura*, *Tupaia*, *Ptilocercus*, and probably also in *Hylomys*. Par-occipital processes exist in *Centetes*, *Ericulus*, *Echinops*, *Solenodon*, *Erinaceus*, and *Gymnura*, also in *Potomogale*, where they are peculiarly bent backwards. Well-developed mastoid processes are to be found in *Galeopithecus*, *Erinaceus*, *Gymnura*, *Ericulus*, and *Echinops*. The two nasal bones anchylose together rapidly in the two last-mentioned genera, and also in *Centetes*, *Solenodon*, and *Potomogale*.

A distinct carotid foramen does not appear to exist in those genera in which the nasal bones soon unite together, nor in *Erinaceus*, *Gymnura*, and *Sorex;* but in the other genera there is a foramen, which probably serves for the carotid artery. A large pterotic bone is only found in *Talpa* and its allies. The foramen rotundum is distinct from the sphenoidal fissure in *Tupaia*, *Gymnura*, and generally in *Erinaceus;* and in the two last genera, and in them only, the optic nerve traverses a more or less long, though very small, bony canal. In the same two genera, as also in *Macroscelides*, *Petrodromus*, *Rhynchocyon*, and *Potomogale*, there is a sub-optic foramen. I have not observed this in other genera. The infra-orbital canal is single, except in *Galeopithecus;* it is generally a short canal, but it is more or less prolonged in *Erinaceus*, *Gymnura*, *Tupaia*, *Hylomys*, and *Sorex*. In *Macroscelides*, *Petrodromus*, *Rhynchocyon*, and *Galeopithecus* the lachrymal foramen opens well within the orbit. In the others it is at, or in front of, the anterior margin of the orbit; and in *Talpa* it is well forwards on the cheek. The exceedingly truncated ascending ramus of *Chrysochloris* is peculiar to that family; and the deep fossa inside the mandible of *Sorex* is found exclusively in the *Soricidæ*.

There are very generally 3 incisors above, and 3 below, on each side, but there are several genera in which this is not the case. The 1st upper incisor is mostly much larger than the 2nd; but in the lower jaw the 2nd is often (as is *Centetes*, *Ericulus*, *Echinops*, *Solenodon*, *Potomogale*, *Scalops*, *Myogale*, and *Chrysochloris*) much larger than the 1st. An incisor has sometimes two fangs, as in

Galeopithecus and *Petrodromus;* and very often the upper canine is similarly furnished. In *Echinops, Sorex,* and *Galeopithecus* there are less than 3 premolars above; and in the same genera and in *Erinaceus* there are less than 2 such below. In *Gymnura, Talpa, Condylura, Scapanus, Myogale,* and *Hylomys,* there are more than 3 premolars both above and below. The true molar teeth of the upper jaw in the Insectivora exhibit an interesting series of modifications, from *Macroscelides,* on the one hand, to *Chrysochloris* on the other; and these modifications parallel in a remarkable manner, and the difference presented by the different genera of Marsupials[1].



Grinding surfaces of left upper molars of different genera.
a. antero-external cusp. *b.* antero-internal cusp. *c.* postero-external cusp. *d.* postero-internal cusp. 1, 2, 3, 4, cusps of external cingulum.

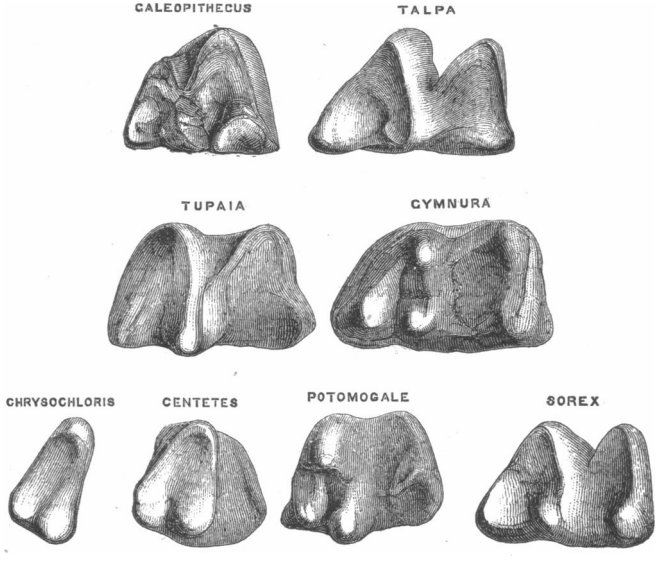
An upper molar, as we have seen, may sometimes, as in *Erinaceus* and *Gymnura,* present 4 well-developed cusps (the antero-internal and postero-external ones being united by an oblique ridge) and a small external cingulum. These 4 cusps may, as in *Macroscelides, Petrodromus,* and *Rhynchocyon,* be united by transverse ridges—one such ridge joining the anterior pair of cusps, the other the posterior pair. This very peculiar form of tooth is more or less approached by that seen in *Phalangista* and the *Macropodidæ;* and it is the more singular that there should be this resemblance between the

[1] See Waterhouse's *Natural History of the Marsupiata.* Pl. XXII. figs. 4 to 11, and p. 552.

molars of these long-legged, long-footed, saltatory, African Insectivores and those of the kangaroos and kangaroo rats, as the upper incisors also shew a certain degree of resemblance[1].

Sometimes the external cingulum is more developed as in *Ptilocercus;* and in *Tupaia* it is still more so, producing, in conjunction with the two outer principal cusps, the appearance of two triangular prisms; while the postero-internal principal cusp becomes much diminished in size. In other forms the external cingulum developes 3 or 4 small but distinct cusps; which, being united by ridges with the external pair of principal cusps, form with them two very well-marked triangular prisms, as in *Talpa,* where the postero-internal principal cusp has disappeared.

Sometimes, however, all four principal cusps coexist with those of the external cingulum, together with an additional prominence of the internal cingulum. This may be seen in *Urotrichus,* but especially in *Galeopithecus,* when the molar exhibits the maximum of complexity in the order. *Potomogale* shows, as has been said, a very interesting approximation of the triangular prisms; the two external principal cusps still however remaining distinct, though in close juxtaposition. In *Centetes* it appears as if the concentration had been carried further, the two prisms uniting into one, as also the



Grinding surfaces of right lower molars of different genera.

[1] The resemblance between the structure of the molar teeth of the *insectivorous* Marsupials and that of the molars of many placental Insectivora has often been remarked.

two external principal cusps. The single representative of these, however, has two small prominences on its inner side. In *Chrysochloris* we have the maximum of concentration, there being but a single triangular prism, the internal angle of which represents the two external principal cusps of *Erinaceus* and others, while internal to this there is but a single prominence to represent the two internal principal cusps.

The lower molars present less variation in shape, consisting generally of two triangular prisms, which may be, as in *Talpa*, about equally developed; or the posterior may be more or less abortive. This abortion is very marked in *Potomogale*, more in *Centetes* and *Solenodon*, and most in *Chrysochloris Capensis*, where each molar is reduced to an absolutely single triangular prism, separated from its neighbour by a marked interval. One very large lower incisor on each side is a condition peculiar to Sorex.

As regards the rest of the skeleton the most prominent features are as follows. The number of dorsal and lumbar vertebræ taken together is pretty uniform, ranging and varying from 19 (or very rarely 18) to 23 or very rarely 24. The dorsal vertebræ are most numerous in *Chrysochloris* (19 or 20), and then in *Centetes* (18 or 19). In other forms there are often but 13 such. The lumbar vertebræ are 8 in *Rhynchocyon*, in *Chrysochloris* but 3. The sacral vertebræ vary from 3 to about 5 in number. The spine of the axis is largely developed in *Centetes*, *Solenodon*, *Potomogale*, *Gymnura*, *Macroscelides*, *Petrodromus*, and *Rhynchocyon*. In *Talpa*, as Professor Owen has shown[1], the transverse processes of the cervical vertebræ are singularly expanded antero-posteriorly. The caudal vertebræ are few in number in *Erinaceus*, *Centetes*, *Ericulus*, *Echinops*, *Talpa*, *Condylura*, *Scalops*, *Scapanus*, *Urotrichus*, *Chrysochloris*, *Calcochloris*, and *Hylomys;* in the other genera they are numerous. In *Talpa* and its allies as also in the *Chrysochloridæ* the 5 posterior cervical vertebræ are destitute of spines; but in the last-named family the dorsal spines are rather long, and they are very so in *Macroscelides*, *Petrodromus*, *Rhynchocyon*, *Solenodon*, *Potomogale*, and *Centetes*. The lumbar spines are much antero-posteriorly extended in the last three genera in *Echinops*, in *Galeopithecus*, and doubtless also in *Ericulus*. The lumbar transverse processes are very long in *Tupaia*. In *Macroscelides*, *Petrodromus*, and *Rhynchocyon*, they are much developed antero-posteriorly, and in all four genera the metapophyses are large. Large cervical hypapophyses exist only in *Sorex* and *Potomogale*[2]. In *Talpa* and its allies there are hypapophysial ossicles beneath the interspaces of the lumbar vertebræ; and processes are developed, in *Tupaia*, beneath some of the trunk vertebræ. Hyperapophyses are well marked in *Centetes*, *Echinops* (no doubt *Ericulus* also), *Solenodon*, *Potomogale*, *Sorex*, *Macroscelides*, *Petrodromus*, and *Rhynchocyon*.

The peculiar developement of the manubrium, clavicle, and hu-

[1] *Anatomy of Vertebrates*. II. p. 386.

[2] Allman, *loc. cit.* p. 8.

merus of *Talpa* and its allies is familiar to all. The clavicle is present in all except *Potomogale*. It is exceptionally slender, however, in *Chrysochloris*. There is almost always a supracondyloid foramen in the humerus; though in *Erinaceus* it is generally absent, and sometimes so in *Sorex*. It is also wanting in *Potomogale*[1]. The radius and ulna are both completely developed, except in *Galeopithecus*, *Macroscelides*, and *Petrodromus*. There is a scapho-lunar bone in *Galeopithecus*, *Tupaia*, *Centetes*, *Solenodon*, *Erinaceus*, *Gymnura*, and *Talpa*, and its allies. An os intermedium exists in the same genera, except *Galeopithecus*, and also in *Ericulus*, *Macroscelides*, *Petrodromus*, and *Rhynchocyon*.

The pubic symphysis is generally very small or absent; but it is long in the three last-mentioned genera and in *Tupaia*, and most probably also in *Ptilocercus* and *Hylomys*. The tibia and fibula are generally anchylosed together inferiorly, but they are complete and separate in *Galeopithecus*, *Tupaia*, *Centetes*, *Ericulus* (most likely also in *Echinops*), and *Solenodon*. The metatarsus is exceptionally elongated in *Rhynchocyon*, *Petrodromus*, and *Macroscelides;* and in the last two genera and in the *Chrysochloridæ* alone amongst Insectivores are there less than five digits to each extremity.

As Professor Peters has pointed out[2] *Tupaia*, *Macroscelides*, *Rhynchocyon*, and *Galeopithecus*, differ from the rest of the order in the possession of a cœcum.

The affinities which become evident from the variations in structure above enumerated correspond, as I observed in the first part of my paper, very closely to those already detected by Professor Peters, who divides the Insectivores into seven families, as follows:

1. Galeopitheci :—*Galeopithecus.*
2. Tupayæ :—*Cladobates*, *Ptilocercus*, *Hylomys.*
3. Macroscelidoidæ :—*Rhynchocyon*, *Macroscelis.*
4. Centetina :—*Solenodon*, *Centetes*, *Ericulus*, *Echinogale*, *Potomogale*[3].
5. Erinaceina :—*Erinaceus*, *Gymnura.*
6. Talpina :—*Myogale*, *Urotrichus*, *Condylura*, *Scalops*, *Talpa*, *Chrysochloris.*
7. Sorices :—*Sorex.*

Nevertheless there are many cross-relationships between these families; and, of course, it is quite impossible to arrange them naturally in any single series. Yet I do not think that they can be united in any larger natural groups, but on the contrary, that even two more primary divisions may well be instituted, and the order *Insectivora* be made to consist of nine natural families; *Potomogale* being on

[1] Allman, *loc. cit.* p. 12.

[2] Table of a classification proposed for the Insectivora at the end of the article on *Solenodon Cutanus* before referred to. *Abhand. d. K. Akad. d. W. zu Berlin*, 1864. p. 20.

[3] I add *Potomogale* here because Dr Peters has recently published his opinion that it should form part of the *Centetina*. See *Monatsbr. Akad. W. Berlin*, 1865, p. 286.

the one hand separated from Dr Peters's *Centetina*, and *Chrysochloris* from his *Talpina*. It is true that *Potomogale* agrees with the *Centetina* in the presence of the ali-sphenoid canal, the anchylosed nasals, the absence of a zygoma, and the presence of hyperapophyses, and some other points, but the peculiarities before enumerated, some of which are repeated below, appear to me to fully justify its separation.

Chrysochloris and *Calcochloris* resemble Dr Peters's Talpina in certain characters; but these appear to me to be *adaptive*, not essential; while the remarkable form of the molars (an exaggeration of the *Centetes* type), together with the slender clavicle and numerous dorsal vertebræ, would almost induce me to regard it as rather a modification of a type allied to *Centetes* and *Potomogale* than of one allied to *Talpa*, and its geographical distribution strongly confirms this view.

The genera *Erinaceus* and *Gymnura* have many relations with Dr Peters's *Tupayæ*, as the presence of a scapho-lunar bone and an os intermedium, the pterygoid fossa, the distinct foramen rotundum, also, a considerable similarity in the form of the molars, and some other points, as well as geographical distribution. On the other hand, the same two genera resemble *Talpa* and its allies in the union of the tibia and fibula, the absence of any post-orbital process and of a cœcum. Although the presence of a cœcum tends to connect Dr Peters's *Macroscelidoidæ* with his *Tupayæ*, as also do the presence of an os intermedium, the long pubic symphysis, the large metapophyses, and the carotid and glenoid foramina, yet they are widely separated by other characters, and indeed the structure of the molars in the former groups isolates it from all the other families of the order. In the presence of the peculiar sub-optic foramen it allies itself with *Erinaceus*, *Gymnura*, and *Potomogale*.

On the whole, the arrangement of the Insectivora given at the commencement of the first part of this memoir, is the one which appears to me to be the most natural. The number of families may appear great in comparison with that of the genera. But such a condition might be expected in an order consisting of forms which are the survivors of many kindred extinct organisms; and M. Pornel has called attention, in his very interesting memoir[1], to the numerous and varied insectivorous forms which have become extinct in Europe since the Miocene period.

The characters of the several groups, as derived from the skeleton, the dentition, the presence or absence of a cœcum, and from geographical distribution, may be thus expressed:

GALEOPITHECIDÆ. GALEOPITHECUS. Pallas[2].

Dentition. $\text{I.}\ \frac{2-2}{3-3},\ \text{C.}\ \frac{1-1}{1-1},\ \text{P.M.}\ \frac{2-2}{2-2},\ \text{M.}\ \frac{3-3}{3-3} = 34.$

[1] *Bulletin de la Soc. Géologique de France*. 1849. Vol. VI. p. 56.

[2] Pallas. *Acct. Petrop.* IV. I. p. 208, Tab. VIII. De Blainville, *Ostéographie*, Lemur. Pls. VI. VIII. IX. Waterhouse, *Trans. Zool. Soc.* II. p. 335, Pl. LVIII. Wagner, *Schreb. Supplem.* I. p. 318, V. p. 522.

Cranium broad, depressed; muzzle obtuse; skull broadest between posterior roots of zygomata, which are complete and strong, but short; well-developed post-orbital processes, sometimes enclosing orbits; margin of orbit sharp, with a small process in front; orbit large, temporal fossa rather small; no ali-sphenoid canal; concave posterior margin of palate far forwards; pterygoid fossa minute; no basi-sphenoidal or paroccipital processes; large swollen mastoid process on each side; strong post-glenoid process, tending much forwards; optic foramen large; foramen rotundum and sphenoidal fissure represented by one opening; a supra-orbital, but no sub-optic foramen; several small sub-orbital foramina on each side; anterior palatine foramina very large; lachrymal foramen small, opening within the orbit; upper canine and second incisor each with two roots; lower incisors pectinated; upper and lower molars very complex; 13 or 14 dorsal, 5 or 6 lunar, 5 or 6 sacral, and many caudal vertebræ; ribs very broad; clavicles long, a scapho-lunar bone, but no os intermedium; ulna anchylosed to radius; fibula complete, but smallest towards its upper end; metatarsals shorter than digits; 5 digits to each extremity; a large cœcum. *Habitat.* South-eastern Asia and Indian Archipelago.

MACROSCELIDIDÆ.

Dentition. I. $\frac{}{3-3}$, C. $\frac{1-1}{1-1}$, P.M. $\frac{3-3}{3-3}$.

Skull broadest between posterior roots of zygomata, which are complete and rather deep; orbits not encircled by bone; generally no post-orbital processes; dorsum of muzzle concave transversely; palate sometimes decidedly extending backwards beyond last molar; orbit large, temporal fossa very small; no ali-sphenoid canal, malar imperforate; carotid, post-glenoid, and sub-optic foramina; one opening representing both sphenoidal fissure and foramen rotundum; foramen ovale large; lachrymal foramen opening well within the orbit; coronoid process of mandible not rising much, if at all, above condyle; canine close to premaxillary suture; last upper premolars not more vertically extended than the true molars; upper molars quadricuspid, the anterior and posterior cusps being connected by transverse ridges; 13 dorsal and 6 or 8 lumbar vertebræ; lumbar transverse processes much extended antero-posteriorly; no hyperapophyses; hypapophyses beneath lumbar vertebræ; scapula with a long metacromion; clavicles slender; scaphoid and semi-lunar separate; pelvic symphysis elongated; metatarsus as long as, or longer than, digits, and much longer than tarsus; sometimes only 4 digits; a cœcum. *Habitat.* Africa.

MACROSCELIDES[1]. Smith.

Dentition. I. $\frac{3-3}{3-3}$, M. $\frac{3-3}{3-3}$ or $\frac{3-3}{4-4}$.

[1] De Blainville, *Ostéographie.* Insectivores, p. 57, Pls. III. V. VII. VIII. X. Wagner, *Schreber Supplem.* II. p. 81, V. p. 534. Duvernoy, *Mém. de Strasb.* I.

Skull sometimes much inflated by air cavities; always much contracted between orbits; no post-orbital process; large defects of ossification in the palate; pterygoid fossa extending forwards to posterior margin of palate; sub-optic foramen not conspicuous; infra-orbital canal very short, the lachrymal foramen opening immediately above posterior termination of infra-orbital canal; angle of mandible elongated; upper incisors and canines all of much the same size; third incisor with a single root; third lower molar but little smaller than the first or second; 6 or 7 lumbar vertebræ; cervical spines very rudimentary; ulna anchylosed to radius; five digits to each extremity. *Habitat.* Africa, including the northern part.

PETRODROMUS[1]. Peters.

Dentition. I. $\frac{3-3}{3-3}$, M. $\frac{3-3}{3-3}$.

A strongly-marked sagittal ridge; skull never much inflated; no post-orbital process; large defects of ossification in the palate; pterygoid fossa extending forwards to the posterior margin of palate; sub-optic foramen conspicuous; infra-orbital canal short; angle of mandible elongated; first upper incisor very much larger than the second; third incisor with two roots; third lower molar but little smaller than the first or second; 7 lumbar vertebræ; cervical spinous processes very small; ulna anchylosed to radius; 5 digits to the manus, 4 to the pes. *Habitat.* Eastern Africa.

RHYNCHOCYON[2]. Peters.

Dentition. I. $\frac{1-1}{3-3}$ or $\frac{0-0}{3-3}$, M. $\frac{3-3}{3-3}$.

A strongly-marked sagittal ridge; skull never much inflated; cranium proper, broad, flattened above and very little narrowed between the orbits; a marked post-orbital process; no defects of ossification in the palate; pterygoid fossa not nearly extending so far forwards as the posterior margin of the palate; premaxilla very small; sub-optic foramen conspicuous; infra-orbital canal very long, the lachrymal foramen opening in front of its posterior termination; angle of mandible very short; canine very much larger than the incisor, and with two roots; third lower molar considerably smaller than the first or second one; 8 lumbar vertebræ; cervical spines pretty well developed; ulna complete; only 4 digits to either manus or pes. *Habitat.* Eastern Africa.

Tab. I. II. III. p. 50. Dr Andrew Smith, *Zool. South Africa*, Pl. XV. Prof. Peters, *Reise Nach. Mossambique*, p. 87, Tab. XXII. Geoff. St Hilaire, *Ann. Sc. Nat.* 1829. XVIII. p. 165—173.

[1] Prof. Peters, *Reise nach Mossambique*, p. 92, Tab. XXII. and XXIII. Wagner, *Schreb. Supplem.* v. p. 538.

[2] Prof. Peters, *Reise nach Mossambique*, p. 100, Tab. XXII. and XXIII. Wagner, *Schreb. Supplem.* v. p. 531.

TUPAIIDÆ.

$$\text{I.}\ \frac{\quad}{3-3},\quad \text{C.}\ \frac{1-1}{1-1},\quad \text{M.}\ \frac{3-3}{3-3};$$

skull broadest between the posterior roots of the zygomata, which are complete and slender; orbits enclosed by bone or at least a post-orbital process; dorsum of muzzle convex transversely; an external ali-sphenoid canal; molar perforated; carotid and post-glenoid foramina, but no sub-optic foramen; foramen ovale a narrow aperture widely separated from the spheno-orbital opening; lachrymal foramen at margin of orbit or rather without it; coronoid process of mandible rising much above condyle; canine not close to premaxillary suture; upper molars with four more or less marked principal cusps and an external cingulum, which tends to form, with the two outer principal cusps, two triangular prisms; 13 dorsal, 5 to 7 lumbar vertebræ; lumbar transverse processes not much antero-posteriorly extended; well-developed hyperapophyses; no hypapophyses; scapula with only a rudimentary metacromion; clavicles slender; a scapho-lunar bone and os intermedium; pelvic symphysis elongated; tibia and fibula distinct[1]; metatarsus but very little longer than the tarsus; 5 digits to each extremity; a cœcum. *Habitat.* South-eastern Asia and the Indian Archipelago.

TUPAIA[2]. Raffles.

Dentition. $\text{I.}\ \frac{2-2}{3-3},\ \text{C.}\ \frac{1-1}{1-1},\ \text{P.M.}\ \frac{3-3}{3-3},\ \text{M.}\ \frac{3-3}{3-3}$; skull much narrowed anteriorly; zygoma very slender; orbits large and completely encircled by bone; anterior margin of orbit sharply prominent; a process above the lachrymal foramen; temporal fossa very small; posterior margin of palate not thickened; small defects of ossification in palate; pterygoid fossa very small, and distant from palate; no paroccipital process; post-glenoid process rudimentary; molar with a large perforation; foramen rotundum distinct from spheno-orbital fissure; a supra-orbital foramen; infra-orbital canal long and narrow; posterior palatine foramen large; cingulum of upper molars developing cusps; triangular prisms rather well-developed; the two hinder upper premolars much more vertically extended than the true molars; caudal vertebræ numerous. *Habitat.* South-eastern Asia and Indian Archipelago.

PTILOCERCUS[3]. Gray.

Dentition. $\text{I.}\ \frac{2-2}{3-3},\ \text{C.}\ \frac{1-1}{1-1},\ \text{P.M.}\ \frac{3-3}{3-3},\ \text{M.}\ \frac{3-3}{3-3}$; skull much

[1] I presume that *Ptilocercus* and *Hylomys* agree with Tupaia in this character.

[2] Horsfield's *Zool. Researches*, 1824. 3 plates. Raffles, *Linn. Trans.* XIII. p. 257. Müller und Schlegel. *Verhandel.* 1839—1844. De Blainville, *Insectivores.* Pls. III. VI. and X. F. Cuvier's *Dents des Mammifères*, No. XVII. Owen's *Odontography*, Pl. CXI. fig. 3. Wagner, *Schreb. Supplem.* II. p. 37, v. p. 525.

[3] Gray, *Pro. Zool. Soc.* 1848, p. 24, and *Zoology of Voyage of H.M.S. Samarang*, 1850, p. 18, Pl. 5. Wagner, *Schreber Supplem.* v. p. 528.

narrowed behind the post-orbital processes; orbits very nearly encircled by bone; the anterior margin of each not sharply prominent; no process above the lachrymal foramen; temporal fossa large; posterior margin of palate slightly thickened; no defects of ossification in palate; pterygoid fossæ distant from palate; a ridge-like paramastoid process; post-glenoid process rather large; malar perforation very small; foramen rotundum and spheno-orbital fissure represented by a single opening; no supra-orbital foramen; infra-orbital canal large, but very short; posterior palatine foramen very small; external cingulum of upper molars not developing distinct cusps; last upper premolar much more vertically extended than the true molars, caudal vertebræ numerous. *Habitat.* Borneo.

HYLOMYS[1]. Müller and Schlegel.

Dentition. I. $\frac{3-3}{3-3}$, C. $\frac{1-1}{1-1}$, P.M. $\frac{4-4}{4-4}$, M. $\frac{3-3}{3-3}$; skull not much narrowed anteriorly; rather so between the orbits; only a small post-orbital process; a process above the lachrymal foramen; no defects of ossification in palate; pterygoid fossæ extending forwards to posterior margin of palate; malar with a small perforation; infra-orbital canal rather large, but not much elongated; no supra-orbital foramen; external cingulum of upper molars not developing cusps; last upper premolar much more vertically extended than the true molars; caudal vertebræ few in number. *Habitat.* Java, Sumatra, and South-eastern Asia.

ERINACEIDÆ.

I. $\frac{3-3}{}$ C. $\frac{1-1}{1-1}$, M. $\frac{3-3}{3-3}$; skull broadest between the posterior roots of the zygomata, which are complete, though somewhat slender; no post-orbital process; a ridge and process in front of orbit; temporal fossa large; pterygoid fossæ well developed; a transverse ridge at posterior part of palate, with a narrow transverse plate behind it; paroccipital and mastoid processes; nasals separate; malar imperforate, small, suspended in zygoma; a glenoid but no distinct carotid foramen; foramen rotundum distinct from sphenoidal fissure; optic nerve traversing an elongated and very small canal; a sub-optic foramen; infra-orbital canal rather long; no true ali-sphenoid canal; lachrymal foramen opens just in front of orbit; ascending ramus of mandible very concave externally; first two upper molars quadricuspid, with an oblique ridge in each connecting the postero-external cusp with the antero-internal one; 14 or 15 dorsal vertebræ and 5 or 6 lumbar vertebræ; no hyperapophyses or hypapophyses; all lumbar processes small; clavicles slender; scapula with a long, pointed metacromion process; ulna complete and distinct; a scapho-lunar bone and os

[1] Müller und Schlegel, *Verhandel.* I. p. 50, Tab. XXV. fig. 4—7. Wagner, *Schreber Supplem.* II. p. 554, and V. p. 530. Blyth, *Journal Asiatic Soc.* Bengal, 1859, p. 293.

intermedium; pubic symphysis very small or absent; fibula anchylosed below to tibia; metatarsus short; 5 digits to each extremity; no cœcum. *Habitat.* Europe, Asia, Africa.

ERINACEUS[1]. Linnæus.

I. $\frac{3-3}{2-2}$, P.M. $\frac{3-3}{2-2}$; skull slightly constricted between the orbits; transverse plate behind the posterior palatine ridge, continuous with outer walls of pterygoid fossæ; defects of ossification in palate; no external ali-sphenoid canal; mesopterygoid fossa ending posteriorly in an excavation of the *basis cranii;* sub-optic foramen small and hidden; spheno-palatine foramen close to the foramen rotundum; upper canine small, generally with two roots; third upper and lower molars very small; 3 sacral vertebræ; caudal vertebræ not numerous; spinous process of axis moderate; humerus generally with no supracondyloid foramen; tuberosity of ischium not much prolonged backwards; femur with a moderate ecto-gluteal ridge. *Habitat.* Europe, Asia, Africa.

GYMNURA[2]. Vigors and Horsfield.

I. $\frac{3-3}{3-3}$, P.M. $\frac{4-4}{4-4}$; skull much constricted between the orbits; transverse plate behind posterior ridge of palate, not continuous with outer walls of pterygoid fossæ; no defects of ossification in palate; an external ali-sphenoid canal; meso-pterygoid fossa not ending posteriorly in any excavation; sub-optic foramen large and conspicuous; spheno-palatine foramen remote from foramen rotundum; upper canine large and conical, with one root; third upper molar quadricuspidate; third lower molar quite like the second; 5 sacral vertebræ; caudal vertebræ numerous; spinous process of axis very large; tuberosity of ischium much prolonged backwards; femur with a very strong ecto-gluteal ridge. *Habitat.* Malacca, Sumatra.

CENTETIDÆ.

I. $\frac{2-2}{}$, C. $\frac{1-1}{1-1}$, M. $\frac{3-3}{3-3}$;

skull very cylindrical, broadest between the glenoid surfaces; no zygoma; no post-orbital process; no process and, generally, no ridge in front of the orbit; temporal fossa large; no pterygoid fossa; paroccipital and mastoid processes; nasals united; malar imperforate; a glenoid, but no distinct carotid foramen; foramen rotundum one with sphenoidal fissure; optic foramen very small, but not forming a long

[1] De Blainville, *Insectivores*, p. 36, Pl. VI. VII. VIII. and X. F. Cuvier, *Dents des Mammifères*, No. XVI. Owen, *Odontography*. II. Pl. CX. fig. 5. Wagner, *Supple*. II. p. 10.

[2] De Blainville, *Insectivores*, Pl. VI. and X. Owen, *Odontography*. II. Pl. CXI. fig. 4. Horsfield and Vigors, *Zoolog. Journal*. III. p. 246, Pl. VIII. Wagner, *Schreb. Supplem.* II. p. 45, V. p. 533.

canal; no sub-optic foramen; infra-orbital canal short and wide; lachrymal foramen opening close to, or just in front of, anterior margin of orbit; a true ali-sphenoid canal; no external ali-sphenoid canal; upper true molars each forming one triangular prism, the two external principal cusps of a quadricuspid molar being here represented by a single prominence; lower true molars with very small posterior processes; 15 to 19 dorsal vertebræ; lumbar processes small; no hypapophyses in the trunk, but distinct hyperapophyses; scapula with an obtuse metacromion process; a supra-condyloid foramen to humerus; an os intermedium; pubic symphysis very small; tibia and fibula distinct[1]; metatarsus short; 5 digits to each extremity; no cœcum. *Habitat.* Madagascar and West Indies.

CENTETES[2]. Illiger.

I. $\frac{2-2}{3-3}$, P.M. $\frac{3-3}{3-3}$; no inter-orbital constriction; skull exceedingly cylindrical; posterior margin of palate thickened; meso-pterygoid fossa ending posteriorly in an excavation of the *basis cranii;* a slightly-marked prominence from the inferior margin of the mandible, and placed some distance in front of the angle; a glenoid foramen; posterior palatine foramen large; no defects of ossification in palate; ascending ramus of mandible only slightly concave externally; canines long, pointed; apex of lower canine received into a fossa; first upper incisor small; second upper premolar not like the true molars; 18 or 19 dorsal vertebræ; a scapho-lunar bone. *Habitat.* Madagascar.

ERICULUS[3]. Is. Geoff.

I. $\frac{2-2}{2-2}$, P.M. $\frac{3-3}{3-3}$; no inter-orbital constriction; posterior margin of palate not thickened, and projecting much backwards beyond the last molars; meso-pterygoid fossa ending posteriorly in an excavation of the *basis cranii;* no glenoid foramen; no defects of ossification in palate; posterior palatine foramen small; ascending ramus of mandible only slightly concave externally; canines not much elongated; second upper premolar shaped like the true molars; scaphoid and semi-lunar bones separate. *Habitat.* Madagascar.

ECHINOPS[4]. Martin.

I. $\frac{2-2}{2-2}$, P.M. $\frac{2-2}{2-2}$; no inter-orbital constriction; posterior margin

[1] I presume that *Echinops* agrees with the other genera of the *Centetidæ* in this character.

[2] De Blainville, *Insectivores.* Pl. IV. VI. and X. F. Cuvier, *Dents des Mammifères*, No. XIX. Owen, *Odontography.* Pl. CX. fig. 6. Wagner, *Schreb. Supplem.* II. p. 30, v. p. 582.

[3] Is. Geoff. *Mag. de Zool.* 1839, p. 25. De Blainville, *Insectivores.* Pl. VI. and X. Wagner, *Schreb. Supplem.* II. p. 33 and 551, and v. p. 584. Peters, *Monatsber. Akad, Wissen. Berlin.* 1865, p. 286.

[4] Martin, *Trans. Zool. Soc.* II. p. 249, Pl. XLVI. Peters (Echinogale),

of palate not thickened, and projecting a little beyond last molars; meso-pterygoid fossa not ending posteriorly in an excavation of the *basis cranii;* posterior palatine foramen small; ascending ramus of mandible only slightly concave externally; first upper incisor much larger than the second; canines not much elongated; second upper premolar shaped like the true molars. *Habitat.* Madagascar.

SOLENODON[1]. Brandt.

I. $\frac{2-2}{2-2}$, P.M. $\frac{4-4}{4-4}$; skull not very cylindrical; cranium somewhat constricted between the orbits; posterior margin of palate thickened; a ridge in front of the orbit; meso-pterygoid fossa not ending posteriorly in an excavation of the *basis cranii;* no paroccipital process; premaxilla somewhat produced; ascending ramus of mandible deeply concave externally; condyle much transversely extended; a sharp process from the inferior margin of the mandible some distance in front of the angle; large glenoid foramen; posterior palatine foramen moderate; lachrymal foramen just in front of the orbit; first upper incisor much larger than the second; canine very small; apex of second lower incisor received into a fossa; 15 dorsal vertebræ; a scapho-lunar bone. *Habitat.* Hayti and Cuba.

POTOMOGALIDÆ[2]. POTOMOGALE. Du Chaillu.

Dentition. I. $\frac{3-3}{3-3}$, C. $\frac{1-1}{1-1}$, P.M. $\frac{3-3}{3-3}$, M. $\frac{3-3}{3-3}$; skull not cylindrical; broadest between the glenoid surfaces; no zygoma; no post-orbital process; no ridge or process in front of the orbit; temporal fossa large; no pterygoid fossa; paroccipital processes directed backwards; nasals united; molar imperforate; very large precondyloid perforations; a small glenoid but no distinct carotid foramen; foramen rotundum one with spheno-orbital fissure; optic-foramen very small, but not forming a long canal; a sub-optic foramen; infra-orbital canal short and wide; no lachrymal foramen; a true ali-sphenoid canal; no external ali-sphenoid canal; upper true molars each forming two very narrow and approximated triangular prisms, the two external principal cusps of a quadricuspid molar being represented by two distinct prominences; lower true molars with rather large posterior processes; 16 dorsal vertebræ; caudal vertebræ numerous; lumbar processes small; decided hyperapophyses; scapula without a metacromion; no clavicles; no supra-condyloid foramen to humerus; ulna

Monatsbr. Akad. W. Berlin. 1865, p. 286. Wagner (Echinogale), *Schreb. Supplem.* II. p. 30 and 549, v. p. 585.

[1] Brandt, *Mem. de Petersb.* 1833, 6th series, II. F. Poey, *Memorias sobra la historia natural de la Isla de Cuba.* I. Habana, 1851, p. 23. Peters, *Abhandlungen des K. akad. der Wissen. zu Berlin.* 1864, p. 1, Pl. 1—3. De Blainville, *Insectivores*, p. 53, Pl. V. and IX. Owen, *Odontography*, Pl. CXI. fig. 1. Wagner, *Schreb. Supplem.* II. p. 79, v. p. 566.

[2] Prof. Allman, *Trans. Zool. Soc.* VI. p. 1, Pl. I. and II. Prof. J. V. Barboza du Bocage, 1ª *Classa da Academia* de 27 d'Abril, 1865. Lisbon, described under the name *Bayonia velox.* Peters, *Monatsbr. Akad. W. Berlin.* 1865, p. 286.

complete and distinct; scaphoid and semi-lunar bones separate; no os intermedium; pubic symphysis very small; tibia and fibula anchylosed together below; five digits to each extremity; no cœcum. *Habitat.* Old Calabar.

CHRYSOCHLORIDÆ[1].

I. $\frac{3-3}{3-3}$, C. $\frac{1-1}{1-1}$, M. $\frac{3-3}{3-3}$; skull very broad and high, tapering sharply forwards; greatest breadth between the posterior roots of the zygomata which are complete, and rather deep arches; no post-orbital process; occiput not sloping much forwards; premaxilla peculiarly produced; lambdoidal ridge traversing summit of cranium; no ridge or process in front of orbit; no ali-sphenoid canal; no pterygoid fossa; no paroccipital process; glenoid surface very small; ascending ramus of mandible very low, peculiarly truncated; coronoid process very low; a carotid foramen; a small glenoid foramen; sphenoidal fissure and foramen rotundum represented by one opening; infra-orbital foramen large and single; lachrymal foramen minute; true molars each in the form of a triangular prism; first upper incisor larger than the second; canine small; 19 or 20 dorsal vertebræ; cervical neurapophyses not very narrow antero-posteriorly; no cervical hypapophyses; spines of dorsal and lumbar vertebræ well developed; no hyperapophyses; no hypapophysial ossicles beneath the lumbar vertebræ; manubrium slightly keeled, but not much enlarged; clavicles long and very slender; humerus not very short; ulna complete and distinct; scapula broad, with a blunt metacromion; scaphoid and semilunar distinct; no sickle-shaped carpal ossicle or os intermedium; pelvis widely open below; tibia and fibula anchylosed together inferiorly; 4 digits to manus, 5 to pes; no cœcum; an ossified tendon in the fore-arm. *Habitat.* Southern and Eastern Africa.

CHRYSOCHLORIS. Lacépède.

M. $\frac{3-3}{3-3}$; a vesicular enlargement in the temporal fossa; lower molars without any posterior process.

CALCOCHLORIS. St G. Mivart.

M. $\frac{2-2}{2-2}$; no enlargement in the temporal fossa; lower molars with a marked posterior process.

TALPIDÆ.

C. $\frac{1-1}{}$, M. $\frac{3-3}{3-3}$; cranium very broad behind, but not high;

[1] De Blainville, *Insectivores.* Pl. V. VII. VIII. and IX. F. Cuvier, *Dents des Mammifères.* No. XVIII. Owen, *Odontography.* Pl. CX. fig. 1. Wagner, *Schreb. Supplem.* II. p. 118, V. p. 579. Peters, *Reise nach Massambique.* p. 69, Tab. XXII.

tapering much, but gradually, forwards; greatest breadth behind the posterior roots of the zygomata, which are complete but exceedingly slender arches; occiput inclined much forwards; no post-orbital process; no ridge or process in front of the orbit; temporal fossa small; no ali-sphenoid canal; meso-pterygoid fossa not ending posteriorly in any excavation of the *basis cranii;* foramen magnum very large; no par-occipital or mastoid processes; glenoid surface small, and situated high up; no distinct post-glenoid process; ascending ramus of mandible not very low; supra-occipital enormous; generally a large pterotic; meatus auditorius externus opening decidedly below the glenoid surface; a carotid, but no glenoid foramen; foramen rotundum and spheno-orbital fissure represented by one opening; infra-orbital foramen very large; lachrymal foramen very small; molars above and below each formed of two triangular prisms; cervical neurapophyses very narrow antero-posteriorly; no cervical hypapophyses; spines of dorsal and lumbar vertebræ small; no hyperapophyses; autogenous hypapophysial ossicles beneath the interspaces of the lumbar vertebræ; manubrium keeled; scapula long and very narrow; radius and ulna distinct; an os intermedium; no symphisis pubis; tibia and fibula confluent below; 5 digits to each extremity; no cœcum. *Habitat.* Europe, Asia, including Japan, and North America.

Talpina.

No distinct pterygoid fossa[1]; pterygoid region inflated; coronoid process not very elevated; spiculum of bone bounding infra-orbital foramen above, very narrow; as many as three incisors above; manubrium very elongated; clavicles very short and broad; no meta-cromion process; a sickle-shaped carpal ossicle. *Habitat.* Europe, Asia, North America.

Talpa[2]. Linnæus.

I. $\frac{3-3^{3}}{2 \text{ or } 3-3 \text{ or } 2}$, C. $\frac{1-1}{1-1}$, P.M. $\frac{4-4}{4-4}$, M. $\frac{3-3}{3-3}$; cranium very slightly constricted between the orbits; palate with no posterior thickening, but a small defect of ossification on each side; a very large pterotic; a fissure bordering epiotic; posterior palatine foramen large; anterior palatine foramen small; all the incisors very small; upper canine very elongated; lower canine small; posterior cusps of premolars very small; 5 or 6 lumbar vertebræ; caudal vertebræ few;

[1] I cannot be sure as to Condylura in this respect.

[2] De Blainville, *Ostéographie Insectivores.* Pl. I. V. and IX. F. Cuvier, *Dents des Mammifères.* No. XXII. Owen, *Odontography.* Pl. CX. fig. 3. C. Giebel, *Zeitschr. f. d. ges. Naturwiss.* Halle, Bd. 12. 1858. p. 395 to 405. Wagner, *Schreb. Supplem.* II. p. 106, v. p. 576.

[3] Since the above was written Mr C. Spence Bate, F.R.S. has proved by an examination of the young the correctness of Prof. Owen's formula. Abstract of a paper read at the Odontological Society of Great Britain, published in the *Annals and Mag. of Nat. Hist.* for June 1867.

ultimate phalanges of manus much the longest, bifurcating. *Habitat.* Europe and Asia.

CONDYLURA[1]. Illiger.

I. $\frac{3-3}{3-3}$, C. $\frac{1-1}{1-1}$, P.M. $\frac{4-4}{4-4}$, M. $\frac{3-3}{3-3}$; no fissure bordering epiotic; meatus auditorius with a very large external opening; muzzle much attenuated anteriorly; first and third upper incisors much larger than the second; upper canine very small; lower canine much larger than lower incisors; lower third incisor much smaller than the first or second; posterior cusps of premolars very large; 7 lumbar vertebræ; caudal vertebræ numerous; ultimate phalanges of manus not bifurcating. *Habitat.* North America.

SCAPANUS[2]. Pornel.

I. $\frac{3-3^{5}}{3-3}$, C. $\frac{1-1}{1-1}$, P.M. $\frac{4-4}{4-4}$, M. $\frac{3-3}{3-3}$; no fissure bordering the epiotic; cranium with a very slight inter-orbital constriction; palate not extending back beyond the last molars; first upper incisor much larger than the second or third one; the two upper posterior incisors, the upper canine, and first two premolars, all of nearly the same size; lower incisors, canines, and premolars, very gradually increasing in size from before backwards. *Habitat.* North America.

SCALOPS[4]. Cuvier.

I. $\frac{3-3}{2-2}$, C. $\frac{1-1}{0-0}$, P.M. $\frac{3-3}{3-3}$, M. $\frac{3-3}{3-3}$; cranium with a very marked inter-orbital constriction; no fissure bordering the epiotic; palate extending back beyond the last molars; first incisor very large, second and third minute; upper canine long and conical, and much more vertically extended than the first upper premolar; second lower incisor much larger than the first. *Habitat.* North America.

MYOGALINA.

A distinct pterygoid fossa; pterygoid region not inflated; no open fissure bordering epiotic; coronoid process very lofty; never as many

[1] De Blainville, *Insectivores.* Pl. I. V. and IX. F. Cuvier, *Dents des Mammifères.* No. XXII. bis. Wagner, *Schreb. Supplem.* II. p. 113, V. p. 574. S. F. Baird, *Mammals of N. Western America*, p. 71.

[2] Pornel, *Bulletin de la Soc. Géologique de France.* 1849. VI. S. F. Baird, *Mammals of N. Western America.* p. 58, Pl. XXX. Le Conte, *Pro. of Acad. of Philadelphia.* VI. p. 326. Bachman, *Journ. Acad. n. s.* Phil. VIII. 1839. 58. Wagner, *Schreb. Supplem.* V. p. 574.

[3] Prof. Peters considers that there are but four upper incisors.

[4] De Blainville, *Insectivores.* Pl. V. and IX. F. Cuvier, *Dents des Mammifères.* No. XXII. Owen, *Odontography.* Pl. CX. fig. 2. Giebel, *Zeitschr. f. d. ges. Naturwiss.* Halle, Bd. 12. 1858. p. 395—405. Wagner, *Schreb. Supplem.* II. p. 102, V. p. 571, 807. Baird, *Mammals of N. Western America.* p. 58, Pl. XXX. Bachman, *Boston Journal N. H.* 1843. IV. 28. Le Conte, *Pro. of Acad. of Philadelphia.* VI. p. 326.

as three incisors above[1]; first upper incisor longest tooth of upper jaw; manubrium not very large; clavicle and humerus elongated; a metacromion process; no sickle-shaped carpal bone.

MYOGALE[2]. Cuvier.

I. $\frac{2-2}{2-2}$, C. $\frac{1-1}{1-1}$, P.M. $\frac{5-5}{5-5}$, M. $\frac{3-3}{3-3}$; cranium with a very marked inter-orbital constriction; palate prolonged beyond the last molar; its posterior margin thickened; a large perforation in each exoccipital; anterior palatine foramen very large; infra-orbital foramen bounded above by a broad spiculum of bone; the *very* small lachrymal foramen opens at the anterior side of the upper end of the spiculum; first upper incisor the largest and longest of all the teeth; second upper incisor very small; cervical neurapophyses mere filaments; many caudal vertebræ; pes rather, or very, elongated, both absolutely, and compared to manus. *Habitat.* Eastern and Western Europe.

UROTRICHUS[3]. Temminck.

I. $\frac{2-2}{1-1}$, C. $\frac{1-1}{1-1}$, P.M. $\frac{4-4}{4-4}$, M. $\frac{3-3}{3-3}$; lachrymal foramen immediately above the middle of the infra-orbital foramen; no large exoccipital perforation; infra-orbital foramen bounded above by a very slender spiculum of bone; second upper incisor of considerable size, though not nearly so large as the first incisor; few caudal vertebræ; pes not elongated. *Habitat.* Japan and Western N. America.

SORICIDÆ, SOREX[4]. Linnæus.

I. $\frac{4-4}{1-1}$, C. $\frac{1-1}{1-1}$, P.M. $\frac{2-2}{1-1}$, M. $\frac{3-3}{3-3}$,

or I. $\frac{3-3}{1-1}$, C. $\frac{1-1}{1-1}$, P.M. $\frac{2-2}{1-1}$, M. $\frac{3-3}{3-3}$,

or I. $\frac{3-3}{1-1}$, C. $\frac{1-1}{1-1}$, P.M. $\frac{1-1}{1-1}$, M. $\frac{3-3}{3-3}$,

or I. $\frac{2-2}{1-1}$, C. $\frac{1-1}{1-1}$, P.M. $\frac{1-1}{1-1}$, M. $\frac{3-3}{3-3}$;

[1] Possibly there may also be only four upper incisors in *Scalops* and *Scapanus*.

[2] J. F. Brandt, *Archiv fur Natur.* 2 Jahrg. 1836. I. p. 176. Geoff. *Mem. du Mus.* I. Tab. XV. figs. 10—12. 1815. De Blainville, *Insectivores.* Pl. II. V. and IX. F. Cuvier, *Dents des Mammifères.* No. XXI. Wagner, *Schreb. Supplem.* II. p. 95, v. p. 567.

[3] Temminck, *Fauna Japan.* I. p. 22, Tab. IV. fig. 6—11. Wagner, *Schreber Supplem.* v. p. 569. Spencer F. Baird, *Mammals of Western N. America.* p. 76. Pl. XXVIII.

[4] De Blainville, *Insectivores.* Pl. II. V. and X. F. Cuvier, *Dents des Mammifères.* No. XX. Owen, *Odontography.* Pl. CX. fig. 4. Duvernoy, *Magasin de Zoologie.* 1842. Wagner, *Schreb. Supplem.* I. p. 47, v. p. 539 and 802. Dr E. Brandt, *Russian Memoir of* 1865, before referred to. Spencer F. Baird, *Mammals of Western N. America.* p. 7—56.

cranium broad behind, tapering forward; greatest breadth behind the glenoid surfaces; no post-orbital process; occiput sloping much forwards; no pterygoid fossa; no zygoma; pterygoid region not inflated; meso-pterygoid fossa ending posteriorly in no excavation of the *basis cranii;* no ali-sphenoid canal; a large aperture on each side of the base of the skull; large and antero-verted post-glenoid processes; foramen rotundum and sphenoidal fissure represented by one opening; infra-orbital foramen considerable, limited above by a thick bar of bone; inside of ascending ramus of mandible with a peculiar and deep excavation; articular surface of condyle looking backwards; angle very attenuated; first incisor much larger than the others, and always with 2 cusps; upper canine always smaller than the smallest upper incisor; upper molars with two triangular prisms; lower incisor very elongated; lower canine smallest tooth of mandible; 13 to 15 dorsal vertebræ; 5 or 6 lumbar vertebræ; large cervical hypapophyses; no lumbar hypapophysial ossicles; well-marked hyperapophyses; manubrium broad, but not keeled; clavicle small and slender, not joining humerus; scapula short and broad; a bifurcating acromion process; generally a supra-condyloid foramen in humerus; radius and ulna distinct; no sickle-shaped bone or os intermedium in carpus; ultimate phalanges not bifurcating; pelvis narrow, symphysis widely open; femur with a third trochanter; tibia and fibula confluent below; 5 digits to each extremity; no cœcum. *Habitat.* The Old World, and N. America.