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PRODROMUS

OF

PALSÆONTOLOGY OF VICTORIA;

OF

FIGURES AND DESCRIPTIONS

OF THE

VICTORIAN ORGANIC REMAINS.

DECADE VII.

BY

FREDERICK Mccoy, F.R.S.,

P.G.S.; HON. F.G.S.; C.M.S.; HON. F.G.S.; HON. M.G.S., ETC.

AUTHOR OF "SYNOPSIS OF THE CARBONIFEROUS LIMESTONE FOSSILS OF IRELAND;" "SYNOPSIS OF THE SILURIAN FOSSILS OF IRELAND;" "CONTRIBUTIONS TO BRITISH PALÆONTOLOGY;" "ONE OF THE AUTHORS OF "BRITISH PALEOZOIC ROCKS AND FOSSILS," ETC.

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M.DCCC.LXXII.
Geological Survey of Victoria.

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FREDERICA McCOY, F.R.S.,

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PREFACE.

As the publications of a Geological Survey cannot properly be limited to the maps and sections, but would be incomplete without figures and descriptions of the fossil organic remains made use of for the determination of the geological ages of the different geological formations of the country, it has been determined to issue a "Prodromus," or preliminary publication of the Victorian Organic Remains in Decades, or numbers of ten plates each, with corresponding letterpress, on the plan of the Decades of the Geological Survey of England, followed by the Geological Surveys of Canada, India, and several other Governments.

The Decades will contain figures and descriptions in the first place of the more characteristic fossils of each formation, of which good specimens may be in the National Collection; so that observers in the field may make use of them for preliminary or approximate determination of the geological ages of the strata they may meet. A portion of the impression of the plates will be kept back until a complete systematic treatise on the fossils of each formation may be issued when the materials approach completion.

* "Paleontological researches forming so essential a part of geological investigations, such as those now in progress by the Geological Survey of the United Kingdom, the accompanying plates and descriptions of British fossils have been prepared as part of the Geological Memoirs. They constitute a needful portion of the publications of the Geological Survey."—Sir Henry T. De la Beche, Director-General of the Geological Survey of the United Kingdom in notice prefixed to the first of the Decades of the English Geological Survey.
In this seventh Decade, the first plate illustrates the remains proving the existence of the recent Dingo, or Native Dog, in the Pliocene and Pleistocene Tertiary periods of geology, probably long before the advent of man, and contemporary with the extinct genera of gigantic marsupials, the *Diprotodon*, *Nototherium*, and *Thylacoleo*; while, as the figures show, there is no departure from the structure of the living examples.

It also includes figures of the lower jaw of the Tasmanian Devil, found with the above-named genera.

The two following plates illustrate such perfect skulls and teeth of the fossil Tasmanian Devil (*Sarcophilus ursinus*) as can leave no doubt of the perfect identity of these remains, so common in the ossiferous caves and in the Pleistocene and Pliocene clays and sands of Victoria, with the species to which I refer them—a species still living in Tasmania in abundance, but which has never been seen or heard of in the living state on this continent; in which these remains prove that it formerly abounded in the most recent Tertiary times.

The five next plates make known several new species of extinct *Echinodermata*, or Sea Urchins, strengthening my previous references of the strata in which they are found to the Miocene Tertiary period, by their dissimilarity to the forms now living in Victorian seas. These fossils, enabling the observer to distinguish the older Tertiaries, in which gold drifts are not known to occur, from the Pliocene and more recent deposits, in which they are habitually worked, are of great practical importance in the attempts to test the theory of the non-auriferous character of the Miocene beds, when prospecting for new leads.

The ninth plate shows the occurrence in the Miocene Tertiary quarries near Geelong of teeth of the great Two-toothed Whales of the genus *Ziphias*, related to those Prof. Owen has made known in the Crag formation of similar age in the S.E. of England.
PREFACE.

And the last plate gives a figure of the sacrum of the Pliocene Wombat.

The three remaining Decades required to complete the work will continue the illustration of the fossil collections made in the course of the Geological Survey of the colony.

FREDERICK McCoy.

1st September 1881.
PLATE LXI., FIGS. 1-4.

CANIS DINGO (BLUMENBACH).

THE DINGO.


Gen. Char.—Dental formula: —c₁, 3-3; c₂, 1-1; p. m., 4-4; m, 2-2 (3-3) = 42. Small hind tubercular molar of both jaws well developed. Anterior feet with five toes, hind feet with usually four toes. Claws blunt, not retractile. Head moderate or elongate. Tail elongate, curved.]

DESCRIPTION.—The most interesting and important of the specimens is that represented by figures 2 and 2a in our plate, discovered by Mr. Adeney in the deposit at Lake Colungulac, about 80 miles S.W. of Melbourne, in which he found, more than thirty years ago, the first recorded example of the so-called Marsupial Lion, the *Thylacoleo carnifex*, established by Professor Owen on his fossil. This is a small portion of the left side of the lower jaw with a perfectly well preserved tooth, the 1st true molar (*m. 1*) which in all the species of *Canis* is modified to form the opposing blade to the sectorial tooth of the upper jaw. The whole is mineralized in exactly the same way with red ferruginous infiltrations as our specimens of *Thylacoleo* figured in our Plate XXI. from the same spot. The length of the crown is 1 inch; height of principal cusp, 7 lines from its base; height of anterior cusp from its base, 5½ lines; greatest thickness (between middle and anterior cusps), 5 lines; greatest thickness of posterior tribucular talon, 5 lines; height of outer posterior tubercle of talon from its base, 4 lines; the 2 tubercles of posterior talon, and the tubercle at inner base of principal cusp, are more prominent, and the latter more posterior (so that the cusp line is more oblique), than in the usual living dogs; this, together with the slightly greater size of the whole tooth, less slender middle cusp, anterior cusp directed more upwards or diverging less forwards than in the living form, and the somewhat greater size and prominence of the posterior tubercles, mark the var. *fossili* of the *C. dingo*, which with its slightly greater depth of jaw under this tooth (13 lines) is perceptibly more robust than the modern variety, in which the length is 1½ lines less, and the middle cusp only 6 lines high; and depth of jaw 11 to 12 lines. Prof. Huxley’s detailed measurements of various living species of *Canis* (Proc. Zool. Soc. April 1880*) show that in each such differences of measurement are indicative of varieties only, but the other differences I have mentioned of proportion and direction of the cusps mark greater departures from the type, although in these respects approaching more to the *C. familiaris* of the English greyhound type.

The next specimen (represented on our plate by fig. 3) is a portion of the right side of the upper jaw, from a cave 5 miles S. by E. of Gisborne, containing the 2nd, 3rd, and 4th premolars (*p. 2, p. 3, p. 4*), the latter being the great sectorial tooth; behind which are the two true molars (*m. 1, m. 2*). The second premolar is 5½ lines long, the principal cusp 3 lines high from its base, with two smaller cusps on the posterior third of the compressed crown, the whole agreeing exactly with the

* On the Cranial and Dental Characters of the Canidae.

[ 7 ]
corresponding tooth of the living Dingo, or perhaps slightly thicker. The third premolar (p. 3) is 6 lines long, 2½ lines wide, and exactly agrees with the living one in size and shape, having two small cusps behind the principal one and a slight thickening at the anterior end. The great sectorial premolar (p. 4) is 9 lines long and 5 lines wide in front where the tubercle is developed from the inner side of the base of the anterior or principal cusp; I see no difference between this, as far as preserved, and the corresponding tooth of the living Dingo. The first upper molar (m. 1) is 5½ lines long along the two outer cusps, and 8 lines wide across the subtuberculate low, broad, internal talon, agreeing completely with the tooth of the living types. In the same cave were several young skulls of different ages with the milk teeth unshed; the anterior portion of one of these is represented in our plate, fig. 1. These accord exactly with skulls and teeth of similarly young individuals of the Dingo with which I have compared them; the greater space between the 1st, 2nd, and 3rd premolars, and the relatively smaller size of the teeth and the more acute narrow cusps, agree exactly with cubs of the living Dingo.

Reference.—Canis dingo, Blumenbach Handbuch, p. 103; = C. familiaris, Australasia, Desm. Mam., p. 190.

The origin of the domestic Dog is a question of great difficulty and interest, which it has been suggested could be best investigated by a study of the Dog known to the lowest types of the human race; and the aboriginal natives of Australia and the Dingo were thought to afford these conditions. On the other hand, the remarkable absence of the higher orders of mammalian quadrupeds in Australia was supposed to render it highly probable that the Dingo, or Australian Dog, was not really a native of the place, but was brought at some remote period from some other country by human savage races arriving to constitute the population of Australia. Taking the case of the Dingo, it was certain that the native Dogs of continental Asia were not clearly related, to the extent of specific identity, with the Australian one, nor could any near analogues be found anywhere; while, on the other hand, the facts are beyond dispute:—1st, that the Dingo is singularly averse to domestication and man's society when compared with other dogs; 2nd, that it is extremely abundant, with little or no variation, over the whole of Australia; and 3rd, that the farther you go from human haunts, near the coast, into the desert interior, the more numerous do the Dingoes appear, indicating that the species was a really indigenous one.

The announcement, many years ago, of my recognition of bones and teeth of the Dingo in the Pliocene Tertiary strata of Colac, and other Victorian localities, in company with similarly
mineralized remains of *Thylacoleo, Diprotodon, Nototherium, Procoptodon*, and other extinct genera, therefore excited great interest, as proving that the Dingo was really one of the most ancient of the indigenous mammals of the country, and abounded as now most probably long before man himself appeared. The Dingo, in fact, as Bell* remarks, is an example of a dog more removed from all the influences of domestication than any other, and the above-mentioned discovery of its remains in strata with so many extinct genera establishes it as by far the most ancient of any of the living species of Dogs. The savage temper, want of general attachment to man, and the bushy tail, show departures from the characteristics of the ordinary Dogs towards those of the Wolves, from which the European domestic Dog most probably originated; but in the small structural details of the skull, &c., which distinguish these two groups of the *Canidae*, the Dingo is a true Dog of the genus *Canis* in all respects. The Dingo not barking nor growling when vexed or teased is another suggested evidence of the Dingo being a good distinct species, peculiar to Australia. The Palaeontology of Dogs is so little known that some years ago it was thought there were no fossil Dogs, but now remains have been found in the bone caves of Brazil by Lund of genera and species of *Canidae* resembling existing South American types; and in France M. Pomel has a Pliocene Tertiary *Canis*, his *C. megamastoides* (=*C. Borbonidus*) from Cerdé, Issoire; and M. Filleol has a series of French Upper Eocene Tertiary Dogs of the genus *Cynodictis*, which give the greatest antiquity known for the family *Canidae*. Our present species, although still living in great numbers, I have no doubt dates from the Pliocene Tertiary time, and I find, on the most minute comparison and measurements, no difference between the fossil and the recent individuals, either of the adult age or of the younger periods before the milk teeth were shed to give place to the permanent premolar teeth.

In Professor Huxley's paper "On the Cranial and Dental Characters of the *Canidae*" (Proc. Zool. Soc. Lond., 6th April 1880) a curious character may be noted in favor of my conviction

* History of British Quadrupeds.
that the *Canis dingo* is a truly indigenous and peculiar Australian species, and not any variety of the domestic Dog, namely, that taking the basicranial* axis as the standard of comparison (=100) the sectorial tooth *p. m.* 4 and the first tubercular grinder above *m.* 1 of the Dingo have only a ratio of 30 and 20 respectively, as compared with 32·5 and 23·2 in the Wolf, which latter agrees with the domestic Dog, although greatly larger than the proportion in any of the South American species of Dog, between which and the Old World Wolves and Dogs it is intermediate.

**Explanation of Figures.**

Plate LXI.—Fig. 1, palatine view of young skull with milk teeth, natural size. Fig. 1a, same specimen, viewed from the side. Fig. 2, inner side of portion of left mandible with 1st true molar, natural size. Fig. 2a, same tooth, viewed from outside (both figures reversed in printing), natural size. Fig. 3, portion of upper jaw, right side, viewed from without (reversed in printing), with 2nd, 3rd, and 4th premolars and the two true molars, natural size. Fig. 3a, same specimen, viewed from above, natural size. Fig. 4, sectorial premolar of left side, natural size (reversed). [Fig. 5, left mandible of *Sarcophilus ursinus*, natural size, viewed from outside (reversed). Fig. 5a, same specimen, viewed from above. See Plates LXII. and LXIII.]

**Frederick McCoy.**

* A line in the bisected skull from the posterior edge of the basioccipital bone, to junction of presphenoid and ethmoid bones, or from the same point to opposite the middle of the interval between the optic and ethmoidal foramina, a little behind the posterior extremity of the vomer.
DESCRIPTION.—Teeth (upper jaw):—In the fossil the 6 incisors occupy a space of 11 lines, gently curved, with convexity outwards, all close together; there is a shallow concave space (for point of lower canine) between the outer incisor and the canine on each side, 2\(\frac{3}{4}\) lines long. Canines, crown 7 lines long, 5 lines in antero-posterior diameter at base, and slightly less (4 lines) in transverse diameter, very broad oval in section, slightly arched backwards. Dental series from front of canine to back of hind molar, 2 inches 4 lines. First premolar (\(p^3\)) moderately compressed, obtusely triangular, posterior side nearly twice longer than the anterior, apex therefore inclined forwards; length, height, and width of crown, each about 2 lines; a slight cingulum at inner base. Second premolar (\(p^2\)) acutely triangular, posterior side only slightly longer than the anterior; longitudinal diameter, 3 lines, transverse diameter slightly less; height of crown, 3 lines. First molar (\(m^1\)), 5\(\frac{1}{2}\) lines in longitudinal diameter, 4\(\frac{1}{2}\) lines transverse diameter; posterior outer cusp large; anterior cusp smaller, undivided; inner lobe small. Second molar (\(m^2\)), length, 6 lines; width, 5 lines; posterior cusp large; anterior cusp, small, partially divided; inner lobe moderate. Third molar (\(m^3\)), length, 6\(\frac{1}{2}\) lines; width, 4 lines; anterior lobe distinctly divided into two cusps; inner lobe small. Fourth molar (\(m^4\)), very small, transverse; transverse diameter, 3 lines; longitudinal diameter, 2 lines; of one external and one median cusp, and a small inner lobe. (Lower jaw):—Molar series from front of first premolar to back of fourth molar, 2 inches 3 lines. First premolar transverse, 2 lines long, 3 lines wide, and height of crown 1\(\frac{1}{4}\) lines. Second premolar triangular, obliquely inclined forward from the anterior side, being only half the length of the posterior; length, 3\(\frac{1}{2}\) lines; width, 3 lines; height, 2\(\frac{1}{4}\) lines. First molar inclining backwards from the forward leaning of the second premolar; anterior and posterior cusps only slightly marked; length, 4 lines; width, 3\(\frac{1}{2}\) lines; height of central cusp, 3\(\frac{1}{4}\) lines. Second molar, with the anterior and posterior lobes well defined; hinder one largest; length, 5 lines; width, 3\(\frac{1}{4}\) lines; height of central cusp, 4 lines. Third molar much higher and more acute; the anterior lobe twice as large as the posterior one; length, 6\(\frac{1}{4}\) lines; width, 3\(\frac{1}{2}\) lines; height of middle cusp, 6 lines. Fourth molar largest; middle cusp proportionately larger and more acute than in
the others; anterior lobe large; posterior lobe almost obsolete; length, 6 lines; width, $3\frac{1}{2}$ lines; height of middle cusp, $6\frac{1}{2}$ lines.

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All these measurements are identical with those of skull of same size of recent examples.

The genus *Sarcophilus* differs mainly from the true *Dasyuri*, or "Native Cats," by the thick, short body, and the smaller and less hairy tail; the enormous width of the skull, with its greatly extended zygomatic arches, indicative of its *Hyaena*-like bone-crushing power, and the close crowding of the premolars, and their not being compressed, but as thick transversely as in the antero-posterior length, as well as the less development of the slightly bifid posterior lobe of the lower molars, and their wanting the inner middle cusps, are characters enabling the palæontologist to discriminate the genera by the bones and teeth.

It is a very curious circumstance that I find the skulls and teeth of the "Tasmanian Devil," *Sarcophilus ursinus* (Har.) very common in the most recent Tertiary clays, and in the various ossiferous caves of Victoria, perfectly identical in all respects, on the most careful comparison, with the corresponding parts of the individuals now living in Tasmania; while there is not a trace of the species now living, or evidence of its having existed, on the continent during the modern period. It is still common in Tasmania, although much persecuted, and how or why it became extinct in the much more extended mainland on which it abounded in the Pliocene period is quite inexplicable at present.

The beautifully perfect skull figured on Plate LXII. was forwarded to me for the Museum by Dr. Williams from the sandy beds intercalated with the Pliocene Tertiary limestone near Queenscliff, in which the extinct Eared Seal, *Arctocephalus Williamsi* (McCoy) and the extinct Wombat, *Phascolomys pliocenus* (McCoy)
occur. For an almost similar one I am indebted to Miss Wales, who kindly wrote me a most interesting account of the cave in which it was found; the entrance to the cave being situated in a precipitous cliff on the shore of Lake Burrumbeet, at Camperdown; the bone in each of these skulls is so little altered that it scarcely adheres to the tongue, and is not mineralized at all. The portion of left ramus of lower jaw figured on Plate LXI., fig. 5, is from a cave five miles S. by E. of Gisborne, and, like the remains of the Dingo found with it, is highly mineralized and stained by ferruginous infiltrations. A skull and teeth in perfect preservation was got by the officers of the Geological Survey deeply buried in the red clays of Baringhup, on the River Loddon.

Locality: Common in the ossiferous caves and Pleistocene deposits of Victoria, near Camperdown, Queenscliff, Gisborne, &c.

EXPLANATION OF FIGURES.

Plate LXI.—Fig. 5, left mandible, or half of lower jaw, viewed from outside (lithograph reversed), natural size. Fig. 5a, same specimen, viewed from above.
Plate LXII.—Fig. 1, skull from sandy beds under the Pleistocene limestone of Queenscliff, natural size, viewed from above. Fig. 1a, same specimen, viewed from below. Fig. 1b, half of lower jaw, viewed from above.
Plate LXIII.—Fig. 1, view of skull and lower jaw of same specimen, from the side. Fig. 1a, teeth of upper jaw, viewed from the outside, magnified two diameters. (Fig. 2, outline of corresponding teeth, similarly magnified, from recent specimen.) Fig. 1b, teeth of lower jaw, viewed from outer side, magnified two diameters. (Fig. 2a, outline of corresponding teeth, similarly magnified, from recent example.) Fig. 1c, teeth of upper jaw, viewed from inner side, magnified two diameters. Fig. 1d, teeth of lower jaw of same specimen, viewed from inner side.

FREDERICK McCOY.
PLATES LXIV. AND LXV.

PERICOSMUS GIGAS (McCoy).


Gen. Char.—Test heart-shaped, broadly rounded and deeply notched in front; slightly narrowed and truncate at the posterior end, and deeply hollowed for the anal opening; ambulacral summit slightly excentric. *Ambulacra:*—Anterior ambulacrum in a deep sulcus, composed of two rows of very small, closely approximate, pairs of pores; lateral pairs of *ambulaca* elongate, petalliform, deeply excavated, anterior pair longer than the posterior, each of two rows of pairs of pores, the outer pore of each pair larger than the inner one, with which it is connected by a sulcus. *Fasciole:*—A narrow peripetalous fasciole, deeply indented between the two pairs of lateral ambulacral petals; a marginal narrow fasciole, not connected with the peripetalous fasciole, completely surrounding the test a little above the lateral margins, descending in front, passing in front of the mouth on the under side, and descending under the anal opening on the posterior end; no subanal fasciole, nor internal fasciole. Tubercles very numerous, small, subequal, crenulated and perforated, surrounded by small milliary granules. Extinct. Tertiary.

The species were formerly referred by Agassiz to *Micraster*, from which the absence of subanal fasciole, and presence of peripetalous fasciole distinguish *Pericosmus*, as well as the disconnected lateral fasciole, unlike that of any other genus.

Description.—Broad, ovate, greatest width a little behind the middle, very deeply notched in front, slightly narrowed and subtruncate behind; margin narrow, rounded except on the rhomboidal overhanging posterior space, on upper portion of which the anal opening is placed; upper surface moderately convex, sloping with gradually less convexity to the margin, but rising into an obtuse ridge from vertex to posterior end. Under side moderately convex. Mouth close to anterior notch, transversely lunate, posterior lip prominent. Anterior ambulacrum sunk in a very deep sulcus, deeply notching the front margin; composed of two rows of distant, small pairs of closely approximate, simple, slightly ovate or nearly round pores, about 4 in the space of six lines at middle. Anterior lateral pair of ambulacra forming with each other an angle of 140°, arching gently forwards from the apical system for three-fourths of their length and then giving a slight sigmoid bend backwards; about 8 pairs of pores in a space of six lines at middle; posterior pair of ambulacra straighter and making an angle of about 55° with each other. Peripetalous fasciole narrow, distinct, commencing at about one-fifth the length of the anterior ambulacral ridges from the front margin, then at about half their length turning outwards nearly at right angles, curving forwards slightly at the end to surround closely the end of each anterior lateral ambulacrum, along the posterior side of which it runs, with several flexures and irregularities of depth, until at about one-fourth the length of the ambulacrum from the vertex it turns backwards at rather more than right angles, again turning at a slightly obtuse angle backwards and outwards along the outer side of the posterior pair of ambulacra, curving closely round their ends and then forwards and inwards along the inner margin of the posterior ambulacra for almost the distal third of their length; and then arching across the back. Lateral fasciole narrower and less distinct, starting from about the middle of side a little above the margin, from a slight tubercular swelling of posterior lateral interambulacral plate, turning downwards at the posterior end, apparently terminating at edge of posterior truncation a little below the level of the
anal opening (but faint indistinct traces apparently visible on the abraded surface of the figured specimen of a V-shaped continuation from one side to the other descending under the anal opening). Tuberculation nearly uniform (averaging 14 in a space of six lines) over the whole of the upper surface, except on each side of the anterior sulcus, which has a few rows of larger and more widely separated ones (averaging about 5 to 8 in six lines); slightly smaller and more crowded within the fasciole near the vertex; each mammillated and perforated crenulated tubercle is surrounded by a few miliary rows of granules. Length, 7 inches 0 lines; in proportion thereto, greatest width, a little behind middle, $\frac{3}{100}$; apex to front margin, $\frac{4}{100}$; depth, $\frac{4}{100}$; length of anterior lateral ambulacra, $\frac{1}{10}$; greatest width of ditto, $\frac{1}{10}$; length of posterior lateral ambulacra, $\frac{3}{10}$; width of ditto, $\frac{4}{10}$; depth of notch in front margin, $\frac{1}{10}$.

This gigantic species is rarely preserved entire, and I am as yet uncertain whether the lateral marginal fasciole is continuous under the anal aperture, owing to the imperfect preservation of the surface in the specimens at my disposal; I think I see traces of it in the normal position proper to the genus; it is perfectly clear on both sides from the middle to the posterior end as figured, and it is also perfectly clear that it does not join the peripetalous fasciole; so I refer the fossil provisionally to *Pericosmus* as an aberrant species, although the marginal fasciole seems obsolete in the anterior half.

The species of *Pericosmus* are chiefly known in the Miocene Tertiary beds of Malta, and none are known of more recent age, thus bearing out my original reference to the Miocene period of the strata of the Victorian localities in which the following species occur.

Rare in the Miocene Tertiary beds on bank of Murray, near Junction with the Darling (the figured specimen presented by J. Wigley, Esq.), and in similar strata of Corio Bay.

**Explanation of Figures.**

Plate LXIV.—Fig. 1, upper surface, natural size, showing form of peripetalous fasciole, the ambulacra and the lateral fasciole from its apparent origin on each side behind the middle. Fig. 1a, one of the crenulated tubercles, viewed from above, magnified. Fig. 1b, same, viewed from side. Fig. 1c, portion of fasciole, magnified. Fig. 1d, lateral ambulacral plate and pair of pores, magnified. Fig. 1e, plate of anterior ambulacrum and small pair of pores, magnified.

Plate LXV.—Fig. 1, same specimen, viewed in profile, natural size, showing peripetalous fasciole and the posterior lateral fasciole. Fig. 1a, same specimen, viewed from posterior end, showing the narrow posterior depression with the downward bend of the lateral fasciole on each side near it.

**Frederick McCoy.**
Pl. LXVI

PALÆONTOLOGY OF VICTORIA

(Echinodermata)

1a

2

2a

PERICOSMUS NELSONI (McCoy).

DESCRIPTION.—Ovato-cordate, greatest width about the middle; obtusely and broadly rounded in front, with a very shallow, wide, slightly indicated sinus, gradually narrowing to the posterior end, which has a subtrigonal or rhomboidal slightly hollowed truncation, the dorsal margin of which overhangs or projects more backwards than the ventral broad side; the anal opening being a little above the middle, vertically ovate, in depression; margin very obtusely rounded; lower side moderately convex, with a very prominent lip projecting forwards over the lunate mouth, which is rather more than its own width from the anterior edge; greatest depth and projection of upper and under surface a little behind the middle of the length; upper surface tumid, with an obtusely rounded prominent ridge from a little behind the apex to posterior end, the surface sloping on each side with moderate convexity to the obtusely rounded lateral margins, and abruptly rounded in front from a point at the junction of the ambulacra much in advance of the middle. Anterior ambulacral space smooth, flat, with a very slightly marked depression towards the front margin, the ambulacral pairs of pores very small, close, simple, about 6 in the space of 6 lines near the middle; two lateral pairs of ambulacra very slightly depressed in the petaloid part, anterior lateral pair make an angle of about 130° with each other, and about 70° with posterior ones; 14 pairs of pores in 6 lines at middle of petal. Peripetalous fasciole distinct posteriorly round the posterior pair of ambulacra, re-entering angularly between them and the anterior lateral pair, along the posterior edge of which it extends outwards and downwards on each side, in one specimen ending near end of petaloid part of ambulacra, in another one continuing to join the lateral fasciole. Lateral fasciole strongly marked, slightly interrupted or irregular along the sides, broad and distinct on the front, making a slight downward wave at the margin in front of the mouth, and making a deeper downward wave under the anal opening on the posterior truncation. Tuberculation nearly uniform over the whole of the upper surface (averaging 24 in a space of 6 lines), except along the anterior ambulacral space, which is nearly smooth, and not being smaller nor more crowded within the peripetalous fasciole. The ambulacra are so distinct near mouth as to form a slightly defined fasciole. The tuberculation is larger on the lower than on the upper side, largest on the middle, broad, ovate, convex plastron, seeming to diverge in rows from an impressed midline, from the lip to a prominence under the posterior truncation; the course of the two posterior lateral ambulacra being marked by two broad, nearly smooth bands, minutely granulated, with very few primary tubercles irregularly scattered on them. Spines on under side slender, striated longitudinally; about 4 lines long. The four genital pores are very large, rounded, and close together at the apex.

Length, usually 4 inches; in proportion thereto, taking length as 100, greatest width about middle, \( \frac{1}{2} \); apex from front margin, \( \frac{2}{3} \); depth, \( \frac{1}{2} \); length of depressed portion of anterior lateral ambulacra, \( \frac{3}{4} \); greatest width of ditto, \( \frac{1}{4} \); length of posterior lateral ambulacra, \( \frac{3}{4} \); width of ditto, \( \frac{1}{6} \); depth of notch in front margin, \( \frac{1}{2} \).
This species is easily distinguished from *P. gigas* and *P. compressus* by the more tumid, obtusely ovato-cordate form, and the very slight depression of the anterior furrow, as well as the slightness of the depression of the petaloid portion of the four posterior lateral ambulacra. It occurs in some abundance in one particular bed in the Waurn Ponds quarries, which will be best recognised by the following section and extract from a note furnished to me by Mr. W. Nelson, to whom I have dedicated the species, one of the first specimens of which was found by him and forwarded to me through Mr. Panton, who always takes a lively interest in Natural Science:

"The bed in which the new *Pericosmus* is found is almost the lowest in the quarry. I have thought it desirable to send a vertical section of the whole face.

"In the bed at *a* is a deposit of hard flattened nodules of limestone, firmly cemented together; and in this deposit I find the *Pericosmus* in its natural position, with the lower half generally resting on the soft bed beneath the boulders (nodules)—locally termed 'Flint Balls'—and the upper portion embedded in the flint. I have occasionally found the *Pericosmus* in the block underlying *a*; but I have never discovered it in any of the blocks above *a*.

"The bed at *b* is remarkable for its numerous *Pectens*. Sharks' teeth sometimes are found here, the enamel of which has an ivory appearance. *Cetotolites* rarely found so low, and when found are so much decomposed that they cannot be taken out except in exceedingly small fragments.

"At *c* there is a strange mixture of small and irregularly-shaped quartz-gravel in the limestone, and numerous fragments of varieties of coral."

[18]
In the blocks between c and d are found the largest and most perfect specimens of the *Graphularia Robincæ* (McCoy).

Perhaps the most interesting bed in the quarry is d, at the bottom of the marl, and on top of the limestone. There is a deposit there of immensely hard and most irregularly-shaped nodules of limestone. In or about this stratum have been found the *Cetotolites Leggei* (McCoy), *C. Pricei* (McCoy), and *C. Nelsoni* (McCoy); the various teeth of the *Squalodon Wilkinsoni* (McCoy); vertebral and flattened bones, small Echinoderms, and the largest of sharks' teeth.

Although fossils are to be found in almost any part of the quarry, the four beds which I have described are the places to look in order to see them in profusion.

**EXPLANATION OF FIGURES.**

**PLATE LXVI.,** Fig. 1.—View of posterior end, showing the longitudinal posterior ridge of back, the posterior depression with the anal opening and fasciole curving below it, natural size. Fig. 1a, portion of ambulacra, magnified. Fig. 1b, portion of anterior ambulacrum, magnified. Fig. 2, lower side of another specimen, natural size, showing the position of the oral and anal openings and the anterior and posterior parts of the lateral fasciole. Fig. 2a, portion of the same specimen, magnified, to show more clearly the characters of the ambulacral pores and tuberculation near the mouth.

**PLATE LXVII.,** Fig. 1.—Profile view of another specimen, natural size, showing the peripetalous fasciole, the lateral ambulacra and the lateral fasciole, natural size. Fig. 1a, portion of the fasciole, magnified four diameters. Fig. 1b, portion of tuberculation of anterior part of plastron, magnified ten diameters.

FREDERICK McCoy.
PALÆONTOLOGY OF VICTORIA
Echinodermata

A. Bartholomew del. et lith.  Prof. M'Coy direc'd  Steam litho, Govt. Printing Office
PERICOSMUS COMPRESSUS (McCoy).

DESCRIPTION.—Orbicular, a little wider than long, slightly truncated behind, very deeply notched in front, depressed, moderately convex above, no distinct ridge along posterior interambulacrum, which is a little more convex than the others; a deep furrow with abruptly rounded sides extends from the apex to the very deep, anterior, marginal, parallel-sided notch; margin much compressed, narrow, except on obliquely-overhanging, rhombic, posterior space which contains the anal opening near its upper edge; under-surface very flat; central, tuberculated, plastron and sides very slightly convex, broad, more finely granulated; ambulacral spaces slightly concave. Mouth half its width from margin of anterior notch. Apex a little in front of centre; anterior ambulacrum in the broad, deep, anterior sulcus; the two rows of pairs of small, nearly rounded, closely-approximated pores (about 6 pairs in a space of 3 lines a little above middle of length); two lateral pairs of ambulacra nearly straight and nearly equal, the anterior scarcely exceeding the others, very deeply excavated; the anterior lateral pair make an angle of 120° with each other, the posterior pair make an angle of 70° with each other; there are about 18 pairs of pores in six lines at middle of four posterior ambulacra. Fascioles:—Peripetalous fasciole distinctly surrounding the two lateral pairs of ambulacra, close to the tips of the depressed petaloid portions, and indented between them across the posterior and two lateral interambulacra, but becoming indistinct (in our specimens) after rounding the ends of the anterior pair, about half-way to the anterior sulcus; marginal fasciole very narrow, but prominent and distinct all the way round a little above the margin (indistinct where dipping under anus in our specimens). Tuberculation:—Primary tubercles close and nearly uniform above, about 27 in 6 lines; about 12 in 6 lines on middle plastron, below; largest, more scattered on sides until the curve of the margin is reached. Length, 3 inches 3 lines; in proportion thereto, greatest width about middle, \( \frac{11}{12} \); apex to front margin at side of notch, \( \frac{1}{12} \); greatest depth, \( \frac{1}{10} \); length of anterior lateral ambulacra, \( \frac{2}{8} \); greatest width of ditto, \( \frac{7}{6} \); length of posterior ambulacra, \( \frac{1}{2} \); depth of notch in front margin, \( \frac{1}{10} \).

From the general shape, size, and near equality of the four posterior ambulacra and the very deep anterior notch, I should have thought the *Megalaster compressus* of Prof. Duncan (J. G. S., v. 33, p. 62 and 68) might have been identical with this fossil; but as Prof. Duncan forms a new genus of his form, and repeats his remarks as to the absence of all fascioles, while the peripetalous and marginal fascioles are unmistakable in ours, which consequently belongs to the genus *Pericosmus*, I suppose there can be no doubt of their distinctness; our fossil has, also, a convexity instead of a concavity between the two posterior
ambulacra above. In case the fascioles should be found in Prof. Duncan's species, I have used the same specific name.

Rare in the Miocene Tertiary strata of beds A° 22 and A° 23; at Bird Rock Point, near mouth of Spring Creek, 15 miles S. of Geelong.

**Explanation of Figures.**

Plate LXVII.—Fig. 2, side view of specimen, natural size, showing the position of mouth and anal opening, the posterior pairs of ambulacra and the peripetalous fascioles, natural size. Fig. 2a, same specimen, viewed from behind, showing the posterior depression with the anal opening, the posterior ambulacra and the peripetalous and lateral fascioles, natural size.

Plate LXVIII.—Fig. 1, upper surface of specimen, natural size, showing the five ambulacra and peripetalous fasciole. Fig. 1a, pores of anterior ambulacrum, magnified. Fig. 1b, pores of lateral ambulacra, magnified four diameters. Fig. 2, underside of another specimen, showing the plastron and tuberculation, natural size.

**Frederick McCoy.**
PLATE LXIX.

ZIPHIUS (DOLICHODON) GEELONGENSIS (McCoy).


Gen. Char.—Skull with a long, slender, edentulous beak or rostrum, abruptly expanding between the orbits, behind which the premaxillaries and maxillaries rise with the frontal to form a projecting wall, concave above and towards the front, the middle portion of which, formed of the premaxillaries and nasals, arches forward to overhang the nostrils. Lower jaw with usually one pair of lateral teeth near the anterior end, larger or only visible in the males. Blow-hole single, crescentic; a small falcate dorsal fin; pectorals small; caudal broadly emarginate. Sub-gen. Dolichodon (Gray), mandibular pair of lateral teeth, with a small enamelled denticle, elevated on upper end of a greatly elongated bony, strap-shaped fang, often over-arching the upper jaw.]

DESCRIPTION.—Tooth: Strap-shaped shaft or fang, with moderate pulp cavity at upper rounded end; opening towards outer side; general form, moderately compressed, nearly straight in the longitudinal direction (not laterally incurved), moderately arched upwards and backwards, slightly widening towards the base, which is very obliquely truncated with obtusely rounded ends. Pulp fissure at base, rather nearer to the concave than the concave face, and nearer to the side towards which the pulp cavity at base of denticle on upper end of fang opens than the other; laterally compressed; surface with irregular longitudinal grooves and pores. Length along concave face, nearly 10 inches; along concave face, about 6 inches; oblique, truncated, basal end, about 2 inches 6 lines; greatest antero-posterior diameter, 2 inches 1 line, 1 line less near upper end; thickness, 1 inch near broad end of ovate section (posterior or inferior concave side), half an inch near narrow end (superior or anterior convex side). Length of slit-like lower end of pulp cavity in base of fang, 5 lines; width, 1 line; longitudinal diameter of enlarged pulp cavity near distal end, 9 lines; transverse diameter, 6 lines; pulp cavity contracted to 3 lines in diameter at 3 inches from distal end, and irregularly rounded.

Professor Owen has made known portions of the snouts of six or seven species of Ziphius from the lower part of the Red Crag of Suffolk, probably a mixture of older Pliocene and Upper Miocene Tertiary, and dwells on the fact that these Cetacean remains are confined to the bottom layer, and are certainly derived by denudation from an older deposit of the age of the “Sable noir” of the “Système Diestien” of Nyst and Von Koenen, of Belgium; and Van Beneden has described some others from the old “Crag noir,” near Antwerp, and several others have been published by the Vicomte Du Bus from the Crag of Anvers; so that the Upper
Miocene is singularly rich in species of Ziphioid Whales, so rare in the existing seas. It is with great pleasure therefore that I draw attention to the similar occurrence of such remains in those Tertiary strata at and near Geelong, to which, from other evidence, I had formerly assigned the Miocene Tertiary age for the maps of the Geological Survey.

The snout is formed of the maxillaries and premaxillaries on the sides, and the prefrontal above and vomer below in the midline.

The excessively hard, dense, porcellaneous character of the bones of the snout of the Ziphioid Whales is in singular contrast to those of other Cetacea, or other parts of the skeleton of these; and this accounts for the preservation of the hard, ringing, stony remains so characteristic of these portions of the various species and so-called genera of fossil Ziphioids described from the English and Belgian Crag formations. Exactly similar, dense, bony fragments, no doubt forming portions of the snouts of Ziphioid Whales, are in the Museum collection, from the same layer in the Waurn Ponds quarries as have afforded the present tooth, and some of these I have no doubt belong to the same species, but none of the fragments are sufficiently perfect to enable me to indicate the characters of the skull; these fragments were contributed by the late Rev. Mr. Legge, of Brighton, the Rev. Mr. Price and Mr. Nelson, of Geelong.

In Prof. Turner's "Report on the bones of the Cetacea," forming Part IV. of the Zoology of the Challenger, the interesting fact is mentioned that ear-bones of Ziphioid Whales have been dredged in abundance from the surface of the sea-bottom at the greatest depth of the South Pacific, at 2,350 to 2,750 fathoms, in company with numerous extinct Tertiary species of sharks' teeth of the genera Carcharodon, Lamna, and Oxyrhina, an association which occurs with the present animal in the Waurn Ponds quarries, near Geelong. The scientific staff of the Challenger suggesting that there being little or no earthy deposits at this depth, the Ziphioid and extinct Sharks have lain there since the Tertiary times, with occasional additions of recent species in more modern times; an observation which, as Sir C. Wyville Thomson remarks, is among the most curious and interesting results of the Expedition.
This tooth, by its large strap-shaped compressed fang, obviously lateral and non-terminal in position in the jaw, and directed upwards and backwards, belongs to the sub-genus *Dolichodon* of Gray, and seems to differ from all the known ones in the abrupt backward arching of the fang, bringing the tip down nearly to the level of the base. The outer side is more convex than the inner, and the concave posterior or inferior edge is thicker than the convex anterior or upper edge, both edges being obtusely rounded. There is no perceptible inward curvature, such as makes the corresponding teeth nearly meet over the rostrum in some of the living species. The rounded distal end and the relative obliquity of the truncation of the base resembles the recent *Z. (D.) Layardi*, but the tooth is relatively thicker and much more arched backwards. The denticle, or true crown of the tooth, has not been observed, but doubtless surmounted the large pulp cavity on the outer face of the distal end. A transverse section at 3 inches from distal end shows the abrupt narrowing of the pulp cavity as in Prof. Turner's figures of the living *Mesoplodon Layardi*, and the naked eye, or a low power, shows in transverse longitudinal fractures of this, as in that, the same proportions and disposition of modified vaso-dentine, about 3 lines thick of which occupies the middle of the shaft or fang, traversed by coarse flexuous branching canals running nearly vertically; outside this is a much denser layer, from 1½ to nearly 3 lines thick, with much finer tubes directed almost perpendicularly to the surface. On the surface is a very thin layer of cement.

It is curious that the three or four species of ear-bones or *Cetotolites* found in the same beds near Geelong as these remains of teeth and hard snout-bones of Ziphioid Whales exhibit rather the type of those of the Balenoid Whales; and the same happens in the English Crag, where the great number of species of *Ziphius*, determined by their snout-bones, are accompanied by 4 or 5 species of ear-bones of *Balena*.

In some thinner and shorter examples than that figured the pulp cavity seems entirely absorbed, the middle being filled with the modified vaso-dentine, with longitudinal small flexuous cylindrical canals, and the denser layer with much finer tubes perpend.
dicular to the surface surrounding it. These may be old teeth of females.

Locality—Not uncommon in the Miocene Tertiary of the Waurn Ponds quarries, near Geelong. The Rev. Mr. Legge, the Rev. Mr. Price, and Mr. Nelson, having forwarded the specimens with portions of snout bones.

Explanation of Figures.

Plate LXIX.—Fig. 1, base or fang of left mandibular tooth, viewed from outside, showing large pulp cavity at outer side of obtusely rounded apex, and the diminished pulp fissure to which it is reduced at obliquely truncated base (marked †), natural size. Fig. 1a, same, viewed from front, showing the absence of lateral inarching. Fig. 1b, section near apex. Fig. 1c, section near base. (Note.—The lettering has been accidentally placed on the wrong end of the plate, so that the base of the tooth is uppermost.)

Frederick McCoy.
PLATE LXX.

PHASCOLOMYS (Species).


Gen. Char.—All the teeth with long curved hollow bases, without solid fangs; incisors, 2; canines, 2; premolars, 2; molars, 3. Incisors scalpriform; the molars, except the first, are divided each into two nearly equal parts by a very deep inflection of the enamel on the outer side, and a shallow inflection on the inner side in the lower jaw, and the deeper inflection in the inner side in the upper series. Body short, thick; tail rudimentary; head large, depressed; eyes and ears small; legs short, nearly equal; anterior feet, with five short stout toes, each with broad solid little-curved claws; hind feet with five toes, of which the inner one is very small, without claw, and placed at right angles to the others, which have curved claws, hollow below; the three middle toes joined. Confined to Australia in the recent and fossil state.]

Description.—Pelvis: sacrum of four anchylosed sacral vertebrae, the diaphyses dilated at their ends and anchylosed together by their distal thirds; the whole of the first and second and the anterior half of the third articulating with the ilia; the diaphyses of the fourth vertebra are smallest and produced forward to anchylose with the ends of those of the third vertebra. The three following caudal vertebrae with broad diaphyses dilated at the outer ends, the two last, or second and third, anchylosed together by their distal ends. Length of bodies of 4 sacral vertebrae 4 inches 2 lines, width across distal ends of diaphyses of second sacral vertebra 2 inches 9 lines; length of articulation with ilium 2 inches 5 lines, width 10 lines; length of three following caudal vertebrae 2 inches 1 line; width across diaphyses of third caudal vertebra 2 inches 7 lines; height from inner surface of body to top of neural spine of 1st sacral vertebra 1 inch 5 lines; corresponding measurement of 2nd sacral vertebra 10 lines.

The vertebral bones forming the sacrum are singularly diverse in each of the living species of Wombat or Phascolomys, and were supposed to afford good specific characters, but I find the variations of individuals of each species so great that I attach no value to characters which, without this experience, might seem specific.

Professor Owen was the first, in his memoir "On the Osteology of the Marsupialia" (Trans. Zool. Soc., v. 8) to point out the singular differences in the sacrum of the three living species of Wombat known to him; and as he has remarked that "the endeavour to restore the lost species of Wombat presumes a power of recognising the bones or portions of bones when discovered in a fossil state; and that this can only be acquired by a knowledge of the characters of the corresponding bones of the existing species," I figure the sacrum and os innominatum of a
fossil Wombat which may be the *Phascolomys pliocenus* (McCoy), the characters of the mandible or lower jaw of which I have previously described (Decade 1, plates 3, 4, and 5,) from our gold drifts and other Pliocene Tertiary deposits. It has a few peculiar characters, in some respects intermediate between the common living *P. platyrhinus* (Ow.) of Victoria and the *P. latifrons* (Ow.) = *P. McCoyi* (Gray) of South Australia, and totally different from the species living in Tasmania, although in the same deposits the Tasmanian Devil (*Sarcophilus ursinus*) is common—a species still living in Tasmania but not now living in Victoria or elsewhere on the mainland.

In the Tasmanian Wombat, *Phascolomys Wombatus*, the sacrum is composed of seven vertebrae ankylosed by the centra, the four anterior sacral vertebrae have the ends of the diapophyses expanded and ankylosed together, and these four articulate with the ilia in old, but only the anterior two in young individuals; the three posterior vertebrae have their diapophyses directed outward and backward and are also dilated at their ends and ankylosed together (in some cases the diapophyses of the first caudal are directed forwards and articulate with the sacral).

In the South Australian hairy-nosed Wombat, *Phascolomys (Lasiorhinus) latifrons*, there are four ankylosed sacral vertebrae, the hinder half of the diapophyses of the first and the whole of those of the second articulating with the ilia (in one of the skeletons before me of this species there are only three of the sacral vertebrae with confluent diapophyses, another equally adult having four as in Professor Owen’s example); the distal halves of the expanded diapophyses of the first and second vertebrae are confluent and a less proportion of the third and fourth; the distal end of the last extended forward. The three following caudal vertebrae have broad depressed diapophyses directed backwards, and free at their ends.

In *P. platyrhinus* Prof. Owen notes a difference in the only two skeletons known to him; a large full-grown one having four sacral vertebrae with the ends of their diapophyses coalescing; the articulation with the ilium being by the whole width of the first and second; the diapophyses of the fifth vertebra, or first caudal,
are directed backwards, but on one side is confluent with the following vertebra. In the second (immature) example the diapophyses of the fifth (or first caudal) vertebra, coalesce with the fourth sacral on one side, the sixth and seventh (second and third caudal) vertebrae have their diapophyses directed backwards and ankylosed by their extremities. The articulation with the ilium is more extended than in *P. latifrons* and formed by the first and second sacrals. In a moderately adult specimen before me the four sacral vertebrae are united by the distal ends of their diapophyses and the three following caudal vertebrae have their diapophyses directed backwards without bony union; but in a very large specimen, otherwise identical, the sacrum by coalescence of the outer ends of the diapophyses by strong bony union includes five vertebrae, the diapophyses of the following caudal vertebrae being directed backwards and not united by bony ankylosis. In several of the specimens the neural spine of the first sacral vertebra is, like our fossil, nearly as high as those of the lumbar vertebrae contrasting with the abruptly lowered or undeveloped neural spines of the following sacral vertebrae, giving the impression that the last lumbar became sacral by ankylosis with the body of the succeeding one and by articulation of its diapophyses with the ilia as Prof. Owen noticed in *Phalangista Cooki* (see "Comparative Anatomy and Physiology of Vertebrata," vol. 2, page 331). In most of the skeletons before me of *P. platyrhinus* the third sacral vertebra takes a small part in the articulation with the ilium.

The *os innominatum* of the *P. platyrhinus* differs from *P. latifrons* in the greater production of the iliac angle, and, according to Prof. Owen, in the narrower and less robust body of the ilium (although I find on comparing two skeletons of *P. latifrons* and three of *P. platyrhinus* that the latter is the more robust, so perhaps the character is variable), in the greater length, less width, and less definite bipartition of the articular surface for the sacrum; in the less prominence of the ilio-pubic process and of the rectus tuberosity; in the longer and more slender pubis; in the shorter ridge for the marsupial bone; in the larger obturator foramen, and the absence of the projection from its ischio-pubic margin; in the narrower ischium before the expansion of the tuberosity, the less
size and more triangular form of the expansion. The entering groove of the acetabulum is also narrower.

In all these characters the approach of the pelvis here figured is most near to those of the *P. platyrhinus*; but the anterior sacral vertebra, in its long slender neural spine, agrees with those of the lumbar region more closely than in any living skeleton I have seen. And the second and third caudal vertebrae are more massive and largely ankylosed.

The specimen figured is from the clay of Bulleen Merri.

**EXPLANATION OF FIGURES.**

*Plate LXX.*—Sacrum and left os innominatum, viewed from within, natural size (reversed in the lithographing).

**FREDERICK McCoy.**
CONTENTS OF DECADES.

N.B.—The originals of all the Figures are in the National Museum, Melbourne.

DECADE I.

PLATE I.—Phylograptus folium (HIs. sp.). Var. Typus (Hall).—Diplograpsus mucronatus (Hall sp.).—Diplograpsus pristis (His. sp.).—Diplograpsus rectangularis (McCoy).—Diplograpsus (Climaco-graptus) bicornis (Hall).—Graptolites (Didymograpsus) fructicosus (Hall sp.).—Graptolites (Didymograpsus) quadrabraciatus (Hall sp.).—Graptolites (Didymograpsus) beyonoides (Hall sp.).—Graptolites (Didymograpsus) octobraciatus (Hall sp.).—Graptolites (Didymograpsus) Logani (Hall sp.).

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