

A NEW GENUS OF FOSSIL CETACEANS FROM SANTA
CRUZ TERRITORY, PATAGONIA; AND DESCRIP-
TION OF A MANDIBLE AND VERTEBRÆ
OF PROSQUALODON

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WITH THREE PLATES

Some months ago Prof. W. B. Scott, of Princeton University, placed in my hands for study two specimens of fossil cetaceans from Patagonia, one of which proves to belong to an undescribed genus; the other represents the genus *Prosqualodon*, and affords new information regarding the mandible, teeth, and vertebræ.

The first of these specimens (No. 15459) comprises two large and two small fragments of a skull of a fossil toothed whale, collected by the late J. B. Hatcher, April 24, 1899, in the Patagonian Beds at Darwin Station, Santa Cruz Territory, Patagonia. Upon examination it proves to be an undescribed form, allied to *Inia*, but much larger. In order to bring it to the attention of cetologists I propose to describe it under the name of

PROINIA PATAGONICA, new genus and species

The specimen consists only of the cranium, from which the rostrum has been broken off immediately in front of the blowholes. It has been strongly compressed vertically, so that the basioccipital and supraoccipital are nearly in the same plane. The blowholes have also been forced backward and upward. All the under parts of the skull anterior to the basioccipital, together with the earbones, jugals, and the right zygomatic process are lacking. The remaining parts are in a good state of preservation, but the surface and contours have been considerably modified by excessive chiseling.

The skull resembles *Inia* more closely than it does any other recent or fossil form with which I am acquainted, but is much larger. The most salient points of resemblance are the strongly elevated vertex, consisting of the large, rectangular anterior median processes of the frontal; the relatively narrow orbital plates of the frontal; the anterior position of the orbit; the quite large temporal

fossæ, bounded above by strong ridges, and internally by the convex surfaces of the parietals and squamosals.

The similarity to *Inia* in the foregoing characters is close enough to make it quite certain that the form is really allied to that genus, but the skull presents differences of sufficient importance, in my opinion, to justify its separation under a distinct generic name. These differences are as follows: The free margins of the orbital plates of the frontal, instead of being nearly parallel, as in *Inia*, diverge strongly anteriorly. The greater part of the surface of the plates is, furthermore, nearly horizontal, but is strongly curved downward anteriorly, and the external free margin is not bent upward. The temporal fossæ appear not to have extended to or beyond the line of the occipital condyles, as they do in *Inia*, and the region of the exoccipitals is broad and flat, rather than narrow and concave, as in *Inia*. The zygomatic process is oval and convex externally, as in many of the Delphinidæ, rather than rectangular and concave externally, as in *Inia*.

The most anterior portion of the skull which has been preserved consists of the orbital plates of the frontal. These are smooth superiorly, and might be considered to consist of the maxillary and frontal plates consolidated, but the smoothness is, I think, due in part to excessive chiseling, and the structure, as shown in section at the broken edges, seems to support this view. The greater part of the surface is flat, but posteriorly it becomes concave, and anteriorly convex and curved downward. The plates diverge strongly, and the right one is broken off a little in front of the postorbital process. This process is short and rather blunt, and is directed downward. Its form is, therefore, quite unlike that of *Inia*. The orbit, which is situated well forward, appears to have been relatively quite large. The free margin of the orbit is thin.

The median processes of the frontal at the vertex are very large and strongly elevated, and are squared and smooth superiorly. They resemble the nasals of the Right whales. The external surfaces are vertical. The nasals and premaxillæ are lacking.

The shape of the maxillary plates can not be determined, but was probably the same as in *Inia*, the postero-internal angle being bent up so as to rest against the vertical sides of the median frontal processes.

The position of the blowholes has been altered by vertical compression, so that they stand above the level of the orbital plates of the frontal. They are small, relatively, and are separated from each other by a wide interval, which appears to indicate that the superior portion of the septum has been broken off. Anteriorly, the end of the large elliptical mass of the mesethmoid is seen.

On the under surface of the frontal plates the most conspicuous feature is the optic canal, which is deep proximally, and runs at an angle of 45° with the longitudinal axis of the skull. It dies away distally, before reaching the free margin of the orbit.

The larger fragment of the skull consists of the occipital, squamosal, and parietal bones. The basioccipital¹ is somewhat fractured, and the inferior surface has been abraded and more or less altered by chiseling. It is broad and nearly flat medially, and appears not to have had the transverse ridge which is so noticeable in *Inia*. The lateral free margins are thick.

Nearly all of the median portion of the supraoccipital is lacking, but the general surface appears to have been nearly plane, with the lateral margins nearly parallel and the anterior margin forming an obtuse angle. The occipital crest is low and broad, with sloping sides, rather than thin and erect, as in *Inia*. It appears not to have been greatly thickened anteriorly, as it is in *Inia*. Posteriorly it dies away altogether, so that there is no barrier between the squamosal and occipital. This conformation is due to the small extension of the temporal fossæ posteriorly, as compared with *Inia* and many of the Delphinidæ. The exoccipitals are oblong, broad, nearly flat, and but little inclined backward. They resemble the same parts in *Balænoptera* and other whalebone whales, rather than in *Inia*. The occipital condyles are rather narrow, and do not project much from the surface of the occipital bone.

The squamous portion of the temporal is oblong and slightly concave below, and is separated from the zygomatic process by a very shallow groove. The latter process is short and convex externally, and appears to have been moderately acute anteriorly, but the apex is broken off on the left side, while on the right the whole process is lacking. The free margin of the zygomatic process is thin, and the postgenoid is well developed, thin, and directed downward. The interval between it and the exoccipital is small relatively. The temporal fossa gets its great breadth chiefly from the breadth and inclined position of the parietal bone, and very little from the lateral extension of the zygomatic process, the root of which is very short.

The glenoid surface is broad and only moderately concave, and is rendered uneven by several low, rounded, transverse ridges. The inferior mastoid surface is broad and concave. The periotic region, unlike that of *Inia*, is quite smooth, but the position of the various vacuities and foramina cannot be determined.

¹ I am not sure that a portion of the basisphenoid is not attached to this.

Dimensions of the type-skull of Proinia patagonica

	<i>mm.</i>
Breadth between the orbits (est.).....	292
Length from posterior margin of the frontal in the median line to anterior end of the mesethmoid.....	121
Length of the nasal process of the frontal.....	52
Breadth of the two nasal processes.....	86
Greatest breadth of the orbital process of the frontal.....	57
Least breadth between the blowholes.....	36
Greatest breadth across zygomatic processes (est.).....	350
Length from surface of occipital condyles to anterior end of basioccipital	91
Breadth across occipital condyles.....	112
Least distance between condyles.....	9
Greatest breadth of right condyle.....	35
Height of the same.....	67
Greatest breadth of basioccipital.....	159
Distance from occipital condyle to post-glenoid process of zygomatic.....	122
Breadth between exoccipitals (est.).....	250
Length of zygomatic process (apex lacking).....	80
Breadth of glenoid surface.....	37
Breadth of temporal fossa.....	90
Length of temporal fossa (est.).....	218
Distance from superior margin of occipital condyles to vertex.....	140
Least distance between temporal fossæ (est.).....	113

CERVICAL VERTEBRA

This skull is accompanied by a cervical vertebra (fig. 76), collected at San Julian by Mr. Hatcher two days before the former. There seems little room for doubt that this vertebra belongs to the same species as the skull. The neural canal has almost the same width as that of the foramen magnum.

The vertebra resembles the third cervical of *Inia* in general appearance, but differs from it in size and thickness, and in various details. The centrum is somewhat more than one-half as long as broad; the neural canal is as broad as the centrum and is about one-half as high as it is broad, while in *Inia* it is much higher than broad and much less broad than the centrum. The neural spine is somewhat broken, but was evidently very small when complete. On account of the length of the centrum and of the top of the neural arch, the anterior and posterior zygapophyses are widely separated, instead of overlapping, as they do in *Inia*. The zygapophyses themselves are oval, or nearly circular, and quite flat. The anterior pair are directed upward and inward, and the posterior downward and outward. The transverse process is very broad, and is pierced by the

vertebrarterial foramen, which is elliptical and very large, and was complete originally. The base of the portion of the process below the foramen is thick and nearly horizontal, while the terminal portion is expanded and rather thin, and is nearly vertical, but a little inclined forward below. The portion above the foramen is slender and nearly cylindrical. The process as a whole resembles that of *Inia*, but in that genus the vertebrarterial foramen is incomplete.

The centrum of the vertebra of *Proinia* has a median ridge superiorly and inferiorly, while the sides opposite the vertebrarterial foramina are deeply concave. The anterior epiphysis is slightly convex and the posterior one a little concave. Both are ankylosed to the centrum and are thin.

The dimensions of the vertebra are as follows: Length of centrum, 31 mm.; breadth of centrum, 51; depth of centrum, 46; greatest breadth of vertebra across transverse processes, 108 (?); greatest height from inferior margin of centrum to tip of neural spine, 85; height of neural canal, 30; breadth of the same, 51; length of neural arch in the median line above, 18; distance between tips of anterior and posterior zygapophyses on either side, 50; length of anterior zygapophysis, 15; breadth of the same, 14; length of posterior zygapophysis, 19; breadth of the same, 15; height of vertebrarterial foramen, 24; breadth of the same, 17.

Without more complete material, it appears to me unwise to attempt many generalizations as to the origin and relationships of the form here described. It is much larger than *Inia*, and that it is quite distinct will, I think, be conceded; as also that it is rather closely related to the latter genus, warranting its assignment to the family Iniidae. I am unable to see that it throws any considerable light on the origin of this family, although it is in some respects less specialized than *Inia*. As compared with the latter, generalized characters are observable in the thin walls, large size, and only moderately anterior position of the orbit; the larger extension of the frontals at the vertex; short postorbital process; moderately large temporal fossæ, and perhaps the flat basioccipital and the meniscoid zygomatic processes; also in the length of the cervical vertebrae.



FIG. 76.—Third cervical vertebra of *Proinia patagonica*, new species. Anterior surface. One-half nat. size.

If Professor Abel's views¹ regarding the origin of the Iniidæ be correct, *Proinia* should show a much closer approximation to *Squalodon* than does *Inia*. I do not see that such is the case. The only characters which might be construed as showing a leaning toward *Squalodon* are, perhaps, the shape of the zygomatic processes and of the median processes of the frontals, and the rather flat basioccipital region. *Squalodon* is in many respects a specialized form, and, in my opinion, hardly to be considered as belonging on the main stem of development. Of known forms, I should prefer to take the point of departure from *Agorophius*, but *Proinia* appears to show no closer resemblance to that genus than it does to *Squalodon*.

It has to be considered also, as is indicated below, that *Proinia* occurs with *Prosqualodon*, a near relative of *Squalodon*, in the Patagonian beds. It can hardly be supposed that *Proinia* has been derived from this form, which appears to be contemporary. The squalodont type and the inioid type appear to have been thoroughly differentiated and well established in the early Miocene, and we must look back further for the progenitors of the latter, as we certainly must for those of the former.

OTHER ACCOMPANYING VERTEBRÆ

A series of five thoracic vertebræ and a caudal vertebra, No. 15439, collected at Darwin Station by Mr. Hatcher, April 22, 1899, might from a superficial examination be considered as possibly belonging with the skull and cervical vertebra of *Proinia*. It is my opinion, however, that they are rather too small, and they do not exhibit any tangible inioid characters. Most of the epiphyses are detached, showing that the individual was comparatively young; two of them, which are very thin, have been preserved separately. The anterior metapophyses are much elevated above the centra, horizontal, flattened, and continued backward on the sides of the neural arch as a sharp ridge. The neural spines were broad antero-posteriorly, and, except in the caudal, appear to have been strongly inclined backward. The transverse processes are preserved on one or both sides of two of the thoracics. In one case they are flat, broad antero-posteriorly, linear, and not expanded at the extremity. In another thoracic they appear to have been somewhat expanded at the extremity, at least anteriorly.

All the vertebræ have sharp, thin median inferior carinæ on the centra. The latter are shorter than broad, and somewhat pentagonal

¹ Mém. Mus. Roy. Hist. Nat. Belgique, 3, 1905, pp. 41 and 123.

in outline anteriorly and posteriorly, but the upper margin is more or less rounded. The two sides of the centra below the transverse processes are quite concave, but without distinct channels.

The foregoing combination of characters appears to me to indicate a relation to some of the North American forms which have been assigned to the nominal genus *Priscodelphinus*, such as *P. harwkinsi*, *harlani*, etc.

The dimensions of the vertebræ are as follows:

Dimensions of five thoracic vertebræ, No. 15139

	1.	2.	3.	4.	5.
	mm.	mm.	mm.	mm.	mm.
Length of centrum.....	39	40	40	40	45
Height of anterior face of centrum.....	45	45	47	.....	49
Breadth of anterior face of centrum.....	52	52	54	54	55
Height of posterior face of centrum.....	42.5	46	.....	45	47
Breadth of posterior face of centrum.....	50.5	52	54	54	57
Height to anterior extremity of metapophysis.....	71	74	.....	73	74(?)
Projection of metapophyses anteriorly beyond margin of neural arch.....	13+	23	.....	21	.....
Breadth of neural arch at base, antero-posteriorly.....	29	29	30	31	27
Breadth of neural canal anteriorly.....	26.5	22	20	.....	16
Breadth of neural canal posteriorly.....	26	24	20	23.5	18
Antero-posterior breadth of neural spine in a horizontal line immediately above zygapophyses.....	48	47	.....	.....	34
Breadth of transverse process at base.....	34	33	35	32	35
Breadth of transverse process at extremity...	28(?)	26	.....	.....	.....

PROSQUALODON AUSTRALIS Lydekker

Prosqualodon australis LYDEKKER, Anal. Mus. de la Plata, Pal. Argentina, vol. 2, art. 2, p. 8, pl. 4, Apr., 1894; Proc. Zool. Soc. London, 1899, p. 199, figs. 1, 2.

The material turned over to me for study by Professor Scott includes portions of the skeleton of this species, comprising (1) a portion of the right half of a mandible with two teeth in position; (2) a portion of a left ramus; (3) eight separate teeth; (4) a nearly perfect atlas and two thoracic vertebræ; (5) two pieces of ribs; (6) a tympanic bone; (7) a periotic bone. These were collected from the Patagonian beds at San Julian, April 22, 1899, by J. B. Hatcher.

A detailed comparison of these remains with Doctor Lydekker's figures and description leaves no doubt in my mind that they represent *Prosqualodon australis*. The right ramus of the mandible is nearly complete posteriorly, the coronoid process being perfect and

the condyle nearly so, while only a small portion of the angle is lacking. The jaw contains five alveoli, in two of which—the penultimate one and the next but one anterior to it—the teeth are still in position. The fragment of the left ramus is very imperfect, only a small portion of the inferior border being complete and no alveoli present. Of the separate teeth, one appears to be a right lower molar, and probably belongs between the two which are in place in the mandible; three others are single-rooted teeth from the anterior end of the mandible on the right side, and the remaining four appear to belong to the upper jaw. Of the latter, two are single-rooted, one has indications of three roots, and is probably a premolar, and the last is a short tooth with two fused roots—possibly a last molar.

MANDIBLE

The dimensions of the jaw, compared with those of the same part in the type specimen, as indicated by Doctor Lydekker's figures, are as follows:

Dimensions of two mandibles of Prosqualodon australis

	15441. San Julian, Patagonia.	Type of <i>P. australis</i> .
Total length of the fragment containing 5 posterior alveoli.....	mm. 445	mm. 420 (?)
Distance from condyle to posterior alveolus.....	290	297
Height of jaw at coronoid process.....	217 ¹	.....
Distance from highest part of coronoid process to inferior margin of condyle.....	204	225 (?)
Depth of jaw at posterior alveolus.....	95	78 ²
Length of last four alveoli taken together.....	124	120
Length of penultimate tooth at alveolus.....	30	30
Breadth of penultimate tooth at alveolus.....	18	.....
Least distance externally between crown and alveolus of penultimate tooth.....	17	9
Length of crown at base.....	21	21
Thickness of crown at base.....	14	.....

¹ Angle defective.

² Border defective below (?).

The correspondence in size and proportions between the two specimens is evidently very close, the chief difference, apparently, being that the teeth protrude more from the alveoli in the San Julian jaw.

In the latter specimen the apex of the coronoid process is obtuse and is directed backward. The superior margin of the jaw near the apex of this process is 15 mm. broad and is inclined outward. Anteriorly it becomes more everted, narrower, and more rounded, but broadens out again as it approaches the posterior alveolus, and is

nearly horizontal. The internal surface below the apex of the coronoid process is concave.

The condyle is oval, small, and projects outward strongly. Originally it was about 50 mm. deep and 35 mm. broad. The orifice of the inferior dental canal is situated about 180 mm. anterior to the condyle and appears to have been relatively small. Opposite the penultimate tooth the jaw is 33 mm. broad.

The alveoli are shallow, the penultimate one being about 19 mm. deep. The septa between the molars are not more than one or two millimeters thick, but appear to have reached the level of the superior margin of the jaw when complete. The teeth themselves were very close to each other, if not actually in contact.

TEETH

All the teeth are closed at the roots, and, with one exception, have a large part of the crown worn away, indicating (as do the vertebræ) that the individual was adult or old. The dimensions of the several teeth preserved are given below. The separate teeth are referred to by the numbers of the figures on plate XLIV.

Dimensions of teeth of Prosqalodon australis

	Lower molariform teeth.					Lower single-rooted teeth.			Upper molariform teeth.		Upper single-rooted teeth.	
	Posterior alveolus.	Penultimate tooth.	Ante-penultimate alveolus.	Fourth tooth.	Fifth alveolus.	Fig. 5.	Fig. 6.	Fig. 7.	Fig. 3.	Fig. 4.	Fig. 1.	Fig. 2.
Total length.....	.....	58 ²	.....	.....	.....	62 ²	81 ²	74 ²	72 ⁴	43	82 ⁴	97 ²
Length of root.....	.....	43	.....	.....	.....	51	74	63	51	29	82	85
Greatest antero-posterior diameter of root.....	30 ¹	28	30 ¹	29	25 ¹	18	20	22	26	27	17	17
Greatest transverse diameter of root....	11 ¹	18	19 ¹	15	10 ¹	15	18	18	20	15	16	17
Antero-posterior diameter of crown at base.....	.....	22	.....	25	.....	.....	15	18	22	16	..	.....
Transverse diameter of crown at base...	.....	15	.....	14	.....	13	15	15	13	12	.....	.....

¹ Alveolus.

² Crown worn.

³ Three-rooted, crown somewhat worn.

⁴ Crown lacking.

The two lower molars which are in position, and the separate one, are all very similar in form and size. The crowns are worn on top, and also posteriorly, except the penultimate molar, which is much abraded anteriorly. All three teeth present a form similar to that of the tooth figured by Doctor Lydekker in 1899, but the two branches of the root are not so widely divergent. They are nearly parallel and curve backward inferiorly. In the separate molar (pl. XLIV, fig. 8) the anterior branch of the root is bent upward like a fish-hook at the lower end and the tip lies on the outer side of the posterior branch. The two branches are united nearly to the tip by a portion which is thinner than themselves. On the outer side, between the two branches, is a low, rounded eminence, like a rudimentary third root.

The molars present a distinct neck, above which is an equally distinct cingulum, having the appearance of an appressed band, with the upper free margin developed in the form of small denticles. The cingulum is most prominent and highest internally and posteriorly. The crown is deeply wrinkled, the ridges being numerous, vertical, and covered with rounded tubercles. The inferior molars which are in position have one or two prominent denticles each on the posterior edge of the crown, near its base, and others were probably present higher up. The separate molar has a similar denticle on the anterior edge.

The three single-rooted teeth, which appear to me to belong to the lower jaw, resemble one another in form, the roots being fusiform and more or less curved backward. The crowns of two of them (pl. XLIV, figs. 6 and 7) are worn away obliquely, but that of the third (pl. XLIV, fig. 5) has the upper surface horizontal. In all three teeth the crowns are rugose, but rather less so than in the molars. In one (pl. XLIV, fig. 7) the root shows a deep longitudinal groove internally, indicating an incipient division into two branches. The crowns are lowest posteriorly.

Of the upper single-rooted teeth, one (pl. XLIV, fig. 1) consists only of the root, which is conical and nearly straight. The second (pl. XLIV, fig. 2) is strongly curved and resembles the lower single-rooted teeth. The crown is entirely worn away anteriorly.

Of the two upper molariform teeth in this series, the larger (pl. XLIV, fig. 3), probably a right premolar, resembles the lower molars in general form. The two branches of the root are nearly parallel and but slightly curved. The lower closed ends overlap each other. On the inner side, between the two branches of the root, is a third branch, directed inward nearly at right angles with the two others,

and extending about 7 mm. beyond their inner surface. This third branch is shorter than the two principal ones. The crown is compressed and conical, but worn away at the apex, and also anteriorly. It is rugose, like the lower molars, and presents bases of two large denticles on the posterior edge.

The smaller upper molariform tooth (pl. XLIV, fig. 4) is different from any of the others in form. It is probably the last left upper molar, or possibly a premolar. The root is triangular, broadest at the base, very uneven, somewhat curved inward, convex externally, and marked internally by a narrow longitudinal groove, representing an incipient division into two branches. The neck is strongly marked and very smooth. The crown, which is nearly complete, is thick, conical, and very rugose. Beside the ordinary rugosities, there are on the posterior edge the remains of five denticles, arranged in two rows, and marking the boundaries of an elliptical area, which terminated near the apex of the crown. This peculiarity is of much interest, as a similar arrangement of denticles is found in various genera belonging to families allied to the Squalodontidæ. On the anterior edge of the tooth are the bases of two similar denticles in a single row.

TYPANIC BULLA

The right tympanic bulla and periotic bone, which accompany the jaw, appear at first sight too small to have belonged to the same individual as the latter, but on comparing them with Lortet's figure of *Squalodon bariensis*, a species of about the same size as *Prosqualodon australis*, I find that the bulla of the Patagonian specimen is quite as large, or even larger. It bears a superficial resemblance in form to that of *Schizodelphis*, but this is chiefly because the anterior portion is broken off, leaving a sharp point. Originally the bulla was probably nearly as broad anteriorly as posteriorly, and presented, therefore, much the same shape as that of *Squalodon*.

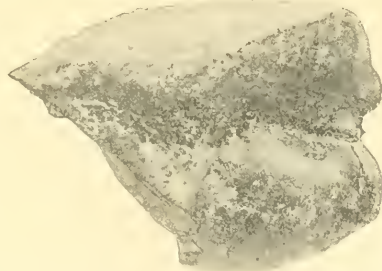


FIG. 77.—Tympanic bone of *Prosqualodon australis* Lydekk.
Inferior surface. Nat. size.

The bulla (fig. 77) is everywhere quite rugose. Viewed from the inner side, the inferior outline is nearly straight, and the posterior

outline almost at right angles with it. The outer lip is very high posteriorly. The inner lip is also high, and is peculiar in that it is divided longitudinally below the middle by a distinct groove, resembling the median inferior groove. Viewed from above, the great breadth of the bulla, its rectangular outline, and the breadth of the Eustachian canal are especially noticeable. The upper border of the inner lip is only slightly emarginate. A principal feature of the under surface of the bulla is the great breadth of the groove between the two lips, or lobes. It is quite deep as well as broad, and extends to the anterior end of the bulla (as far as preserved), dividing it into two nearly equal portions. The two lobes are nearly equal in size and downward extension, differing greatly in the latter respect from such forms as *Mesoplodon*, *Berardius*, etc. The posterior end of the outer lobe, or lip, is well rounded, but that of the inner lobe is strongly compressed, presenting a prominent thin ridge, directed obliquely upward and outward. The interior of the bulla, as in *Schizodelphis*, presents two pits separated by a rounded, transverse ridge. The posterior pit, or concavity, is much the deeper.

The dimensions of the bulla are as follows: Greatest length (as preserved), 50 mm.; greatest breadth, 36; greatest height, 30; transverse breadth of the involuted portion of the inner lip, 20.

PERIOTIC BONE

The right periotic bone (fig. 78), which is the one preserved, is small and of a peculiar form, unlike that of any living toothed whale with which I am acquainted, but somewhat resembling that of *Berardius* and other ziphioid genera. The bone is a little abraded, but not so much as to materially alter its original form.

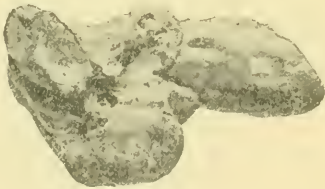


FIG. 78.—Periotic bone of *Prosqualodon australis* Lydekk.
Inferior surface. Nat. size.

Viewed from within, the anterior petrous body is separated from the remainder of the bone by a deep emargination below, and is

oval in outline, and moderately bent downward. The convex portion of the periotic containing the cochlea is small, and the internal *porus acusticus* oval and oblique. The superior outline of the main mass of the bone when viewed from the inner side is nearly straight, but that of the anterior petrous body is inclined downward at an angle of 45° . The process for the articulation of the tympanic, which is seen on the under side of the bone, is small, and its inner margin overhangs the short, curved canal for the facial nerve.

The dimensions of the periotic are as follows: Greatest length, 42 mm.; greatest breadth at posterior end, 27; length of anterior petrous portion, 18; depth of the same, 11.

VERTEBRÆ

As already stated, an atlas and two thoracic vertebræ accompany the mandible, and, from their size, complete ossification, and color, appear to have belonged to the same individual. (Pl. XLV.)

The atlas resembles that of *Eurhinodelphis*. The articular facets for the occipital condyles are large, broad, deep, and but little inclined outward. They are separated below by a space of about 17 mm. The foramen above these facets on either side is complete, and of large diameter, and is situated nearly in the middle of the length (antero-posteriorly) of the neural arch. The arch is comparatively narrow, thin anteriorly, but with a broad, concave surface posteriorly in the median line above. The spine is rudimentary. The posterior articular facets are large, nearly circular, flat, and project strongly from the body of the vertebra. Below in the median line there is a broad, shallow concavity, indicating that the odontoid process of the axis was large and prominent. There is also a large median rugosity on the postero-inferior surface of the vertebra, which represents the remains of a strong process which extended below the body of the axis. On either side of the vertebra are two short, thick transverse processes superimposed, as in *Eurhinodelphis*.

The two thoracic vertebræ are from near the posterior end of the series, and probably belong near one another. The body of the more nearly complete one, seen from the front, is broadly cordate in outline. The inferior outline, seen from the side, is deeply concave. The epiphyses appear to be thin. The transverse processes are short, thick, directed outward, and somewhat expanded at the extremity. Their upper surface is nearly in line with that of the body of the vertebra. The metapophyses are prominent, rather thin, and rectangular. The anterior zygapophyses are large and only slightly concave, and are placed obliquely. The posterior zygapophyses are oval in form, and directed obliquely downward and outward. The neural spine is somewhat incomplete, but was originally inclined backward more or less. It is broad antero-posteriorly, with a thin anterior edge, and quite thick posterior edge.

The second thoracic vertebra (pl. XLV, figs. 5 and 6) is quite imperfect, lacking the whole of the neural arch and spine and one of the transverse processes. The remaining process is similar in form

to those of the vertebra just described, but longer, both transversely and antero-posteriorly, with a long and deeply concave articular facet at the extremity. There is no facet on the body of the vertebra for the articulation of the head of a rib. The body itself resembles that of the vertebra previously described in form and size, but the epiphyses are elliptical, rather than cordate.

The dimensions of the vertebræ are as follows:

Dimensions of three vertebræ of Prosqualodon australis.

	Atlas.	Thoracic vertebra a.	Thoracic vertebra b.
	<i>mm.</i>	<i>mm.</i>	<i>mm.</i>
Greatest length of centrum.....	67	75	77
Greatest depth of centrum.....	.....	68	69
Greatest breadth of centrum.....	129 ¹	90	87
Breadth, including transverse processes.....	155	155	184(?)
Length of transverse process.	20 ²	29	39
Least breadth of transverse process antero-posteriorly.....	18	36	52
Greatest diameter of transverse process at extremity.....	17	45	51
Breadth of neural canal.....	51	42	31
Height of neural canal anteriorly.....	67	36	.....
Breadth of neural spine antero-posteriorly at base.....	.....	57	.....

¹ Across posterior articular facets. The breadth across the anterior facets is the same.

² The superior one, from anterior base.

The jaw and teeth above described confirm many of Doctor Lydekker's statements regarding *Prosqualodon australis*, and especially its size, the small number of teeth as compared with *Squalodon*, and the peculiar form of these organs. The size of the skull figured by Doctor Lydekker in 1899¹ is not given, but assuming that it was about as large as the type skull, it seems likely that the number of two-rooted molariform teeth did not exceed ten in the lower jaw. The Patagonian material here described affords us the information that the anterior teeth were single-rooted, as might, of course, have been expected.

The vertebræ are especially interesting on account of their resemblance to those of *Eurhinodelphis*, a genus which Professor Abel derives from the *Squalodontidæ*. It is to be observed, however, that the atlas of *Squalodon* figured by Van Beneden² is quite different in form from that of *Prosqualodon*. The former is much more

¹ Proc. Zool. Soc. London, 1899, p. 919, figs. 1, 2.

² Recherches sur les Squalodons, 1865, pp. 45, 46, pl. 3, fig. 2.

like that of *Physeter*, or of a whalebone whale, especially as regards the transverse processes, of which there is but a single broad and thick one situated very high up on either side. According to Van Beneden, it was found in the shell-marl of Salles, while the type-beak of *Squalodon*, with which it was associated, was found at Liognan. Johann Müller also mentioned this atlas in 1849, remarking that Grateloup had written to him that it probably belonged to *Squalodon*.¹ If this association be correct, which seems somewhat doubtful, the atlas and (by inference) the axis of *Squalodon* are very different from those of *Prosqualodon*. Additional information regarding the vertebræ of the different species of *Squalodon* is very much to be desired.

¹ Die Zeuglodonten von Nord Amerika, 1849, p. 29.

EXPLANATION OF PLATES

PLATE XLIII

- FIG. 1.—*Proinia patagonica*, new species. No. 15459, Princeton Univ. Coll. Type skull. Patagonian beds, Darwin Station, Santa Cruz Terr., Patagonia. Collected by J. B. Hatcher, April 24, 1899.
Superior surface. About $\frac{3}{8}$ natural size.
- FIG. 2.—*Prosqualodon australis* Lydekker. No. 15441, Princeton Univ. Coll. Portion of right ramus of mandible. Patagonian beds, San Julian, Santa Cruz Terr., Patagonia. Collected by J. B. Hatcher, April 22, 1899.
External surface. About $\frac{1}{4}$ natural size.

PLATE XLIV

Teeth of *Prosqualodon australis* Lydekker. No. 15441.

- FIG. 1.—Root of an upper incisor.
- FIG. 2.—A right upper incisor. Inner surface.
- FIG. 3.—A right upper premolar. Inner surface, showing three roots.
- FIG. 4.—Left posterior upper molar? Outer surface.
- FIGS. 5 and 6.—Right lower incisors. Inner surface.
- FIG. 7.—Right lower canine or premolar? Inner surface.
- FIG. 8.—A right lower molar. Outer surface.
Natural size.

PLATE XLV

Vertebrae of *Prosqualodon australis* Lydekker. No. 15441.

- FIG. 1.—Atlas. Anterior surface.
- FIG. 2.—The same. Right side.
- FIG. 3.—Thoracic vertebra. Anterior surface.
- FIG. 4.—The same. Right side.
- FIG. 5.—Another thoracic vertebra. Anterior surface.
- FIG. 6.—The same. Right side.
One-half natural size.



1

TYPE SKULL OF PROINIA PATAGONICA, NEW SPECIES

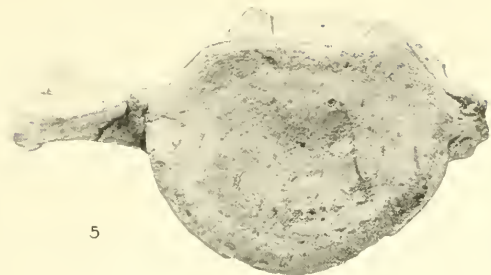


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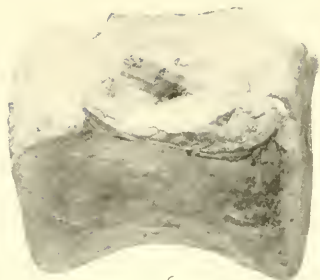
MANDIBLE OF PROSQUALODON AUSTRALIS LYDEKK



TEETH OF *PROSQUALODON AUSTRALIS* LYDEKK



5



6



3



4



1



2

