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DATES OF PUBLICATION OF AUTHOR'S SEPARATES.

- ART. I and II, April 25, 1877. ART. VI and VII, March 22, 1889. ART. IX-XI, June 7, 1889. ART. XII, June 17, 1889. ART. XIII, June 28, 1889. ART. XIV, July 5, 1889. ART. XV, July 10, 1889. ART. XVI and XVII, October 21, 1889. ART. XVIII, October 31, 1889. ART. XIX, December, 1889. ART. XX, February 21, 1890.

From page 117 to the end of the Volume a small number of copies of the Bulletin were issued in sheets as soon as they were printed.

ADDITIONS AND CORRECTIONS.

Page 1, lines 25 and 26 from top, for "the British Museum specimen, it is said, having disappeared," read *except the original British Museum specimen*. This correction was made in a "Postscript," issued as an "inset" to face page 1, of the regular edition of the Bulletin. This self-explanatory postscript is for obvious reasons here reproduced.

"Postscript [to Art. I].

"Since the separates of the paper on the West Indian Seal were published, I have been kindly informed by Oldfield Thomas, Esq., Curator of the Department of Mammals in the British Museum, that Gosse's original specimen, the type of *Monachus tropicalis*, is still in the British Museum, 'stuffed and exhibited in the Mammal Gallery, as well as the so-called '*Cystophora antillarum*.' The statement on page 1 (line 25), that 'the British Museum specimen, it is said, having disappeared,' was made on what was with good reason supposed to be trustworthy authority. (See *Science*, Vol. III, No. 72, June 20, 1884, p. 752.) It proving otherwise, I am desirous of making the necessary correction.

"The second reference in the synonymy (page 3) should be cancelled, as the specimen later described by Dr. Gray as *Phoca tropicalis* was in this connection referred to merely incidentally, as stated on page 24, line 5.—J. A. ALLEN.

May 25, 1887."

Page 1, dele lines 12 and 13 from bottom.

"45, line 10 from bottom, for **Tryblidium** read **Triblidium**.

"72, line 9 from top, for **Spermophila** read **Sporophila**.

"80, line 8 from bottom, for m. (= millimetres) read mm., and so in all similar cases from p. 80 to p. 100, inclusive.

"87, line 3 from bottom, for Brazilian read Bolivian.

"91, line 15 from top, for 92.5 m. read 9.25 mm.

"95, line 9 from bottom, for *Formiccivora* read *Formicivora*.

"134, line 12 from top, for Northwestern read Northeastern.

"165, lines 2 and 9 from bottom, and p. 166, line 17 from top, for Hidalgo read Hacienda.

"167, line 11 from top, for **Sciurus alstoni** read **Sciurus nayaritensis**.*

"195, line 4 from bottom, for *Miopagis* read *Myiopagis*.

"195, line 1 from bottom, for *Myopagis* read *Myiopagis*.

* Since the publication of the paper entitled "Notes on a Collection of Mammals from Southern Mexico," etc. (pp. 165-181, published Oct. 21, 1889), my friend Mr. Oldfield Thomas, Curator of Mammals in the Natural History Department of the British Museum, has called my attention to the fact that the name *Sciurus alstoni*, given as above, is preoccupied by a *Sciurus alstoni* Anderson, published in 1878. I therefore take this opportunity of substituting *nayaritensis* for *alstoni* as the designation for the species named *Sciurus alstoni* on p. 167.—J. A. ALLEN.

Page 214, line 8 from bottom, for **Anthus**, sp. incog., and for the following seven lines, substitute the following :

Geobates pœcilopterus (*Wied*).

Anthus pœcilopterus WIED, Beitr. Naturg. Bras., III, i, 1830, p. 633.

Geobates pœcilopterus SCLATER, P. Z. S., 1866, p. 205, pl. xxi ; PELZELN, Orn. Bras., i, 1868, p. 35.

Not in the Am. Mus. Nat. Hist. ; not entered in the Wied MS. Catalogue.

This species is the subject of a short paper by Mr. Sclater, published in 1866 (l. c.), in which he identified Wied's *Anthus pœcilopterus* as above, giving a figure of this rare species, apparently from a specimen collected by Natterer.

I am indebted to Mr. Osbert Salvin for kindly calling my attention to Dr. Sclater's paper.—J. A. ALLEN.

Page 217, line 19 from top, dele sentence beginning "Opposite this entry," etc. See footnote to p. 274.

" 223, line 6 from bottom, for **hypoleucus** read **hypoleuca**.

" 251, line 9 from top, and p. 275, line 2 from bottom, for **rufimarginata** read **rufimarginatus**.

" 261, line 1 from top, for **aethereus** read **æthereus**.

" 265, line 7 from bottom, for *pulsatris* read *pulsatrix*.

" 273, line 2 from bottom, right hand column, for *Leucopternus* read *Urubitinga*.

" 274, line 36 from top, right hand column, for *Anthus*, sp. incog., read *Geobates pœcilopterus*.

POSTSCRIPT.

Since the separates of the paper on the West Indian Seal were published, I have been kindly informed by Oldfield Thomas, Esq., Curator of the Department of Mammals in the British Museum, that Gosse's original specimen, the type of *Monachus tropicalis*, is still in the British Museum, "stuffed and exhibited in the Mammal Gallery, as well as the so-called '*Cystophora antillarum*'." The statement on page 3 (line 25), that "the British Museum specimen, it is said, having disappeared," was made on what was with good reason supposed to be trustworthy authority. (See *Science*, Vol. III, No. 72, June 20, 1884, p. 752.) It proving otherwise, I am desirous of making the necessary correction.

The second reference in the synonymy (page 3) should be cancelled, as the specimen later described by Dr. Gray as *Phoca tropicalis* was in this connection referred to merely incidentally, as stated on page 24, line 5.

May 25, 1887.

J. A. ALLEN.

ARTICLE I.—*The West Indian Seal (Monachus tropicalis Gray).*

By J. A. ALLEN.

PLATES I-IV.

THE existence of a Seal in the sub-tropical waters of the Gulf of Mexico and Caribbean Sea has been known for nearly four centuries, but only within the last fifty years has it been formally recognized in systematic zoölogy, and not till within the last two or three years have we had any knowledge of its characters beyond the information given by Hill and Gosse, published about forty years ago, based on two specimens taken off the coast of Jamaica. An imperfect skin, without skull, was soon after transmitted by Mr. P. H. Gosse to the British Museum, which, up to the present time, has constituted the only specimen of this animal known to be extant in any European museum. It was on this precious relic that the late Dr. J. E. Gray based the name *Phoca* (later *Monachus*) *tropicalis*.

No other specimen appears to have come into the hands of naturalists till 1883, when a half-grown individual was captured on the coast of Cuba, and fell into the hands of Professor Felipe Poey, of Havana, who had it mounted, and in October of the same year presented it to the U. S. National Museum. The specimen, when afterward remounted, was found to contain the skull, which was removed, and has been recently described and figured.*

This, up to December, 1886, was practically the only specimen known to be anywhere extant, the British Museum specimen, it is said, having disappeared.† During this month Mr. Henry L. Ward, of Rochester, son of Professor Henry A. Ward, the well-known 'museum-builder,' visited the three little keys off the north-west coast of Yucatan known as The Triangles, for the express purpose of securing specimens of this rare animal—Professor Ward having a short time before heard of its occurrence at this locality. Mr. H. L. Ward was joined in his expedition at Campeche by Mr. Fernando Ferrari-Perez, Naturalist-in-chief of the Mexican Geographical and Exploring Commission, where they

* The West Indian Seal (*Monachus tropicalis*, Gray). By Frederick W. True and F. A. Lucas. < Smiths. Rep., 1884, pt. II (Dec., 1886), pp. 331-335, pls. i-iii.

† Since the above was written I have learned from Mr. H. L. Ward that there are "two small skins in Mexico," in the National Museum of the City of Mexico, which are said to have been taken about five years since at the East Triangle, by the crew of a vessel which was blown out of her course and compelled to anchor there by stress of weather.

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together chartered a small schooner to visit The Triangles, which they reach Dec. 1, 1886. They found the Seals there in considerable numbers, but the weather proved unpropitious, and at the end of three days they were obliged, by the approach of a violent 'norther,' to put to sea with their work unfinished. Several dead Seals had to be abandoned on the keys, and the specimens secured they were obliged to hastily put aboard their vessel without proper care for their preservation; but they fortunately reached Campeche in fair condition, and were then properly preserved for the homeward trip. Forty-nine Seals were killed, forty-two of which were taken away, but one of them was afterward lost. The specimens finally secured numbered thirty-four skins and seven skeletons, which were equally shared by Mr. Ward and Mr. Ferrari-Perez. The greater part of Mr. Ward's share of the spoils, including the skins, one skeleton, and a series of skulls, reached Rochester January 2, 1887; and, through the kindness of Professor Ward and his son, I had the opportunity two days later of examining in Rochester this interesting material, and of taking measurements and notes of the full series of skins and skulls. These included adult males and females, and other specimens in various stages of immaturity. Three of the skins—an adult male, an adult female, and a suckling young one (the only very young one secured)—and the skeleton (an adult male), were immediately purchased for the American Museum of Natural History. Three additional skulls and the skeleton of an adult female were loaned me by Mr. Ward for use in the preparation of the present paper. I am thus greatly indebted to the Messrs. Ward,* father and son, for their kindness in promptly placing in my hands the important material forming the basis of the present article.

A preliminary notice of this material was published in *Science*, in the issue for Jan. 14, and a supplementary notice in the following number of the same journal.†

In preparing the following pages I have had, for purposes of

* Professor Ward had been for several years on the alert for this hitherto almost mythical species, and last year, while in Mexico, learned for the first time of the probable whereabouts of a small colony of them. To his son, Henry L. Ward, however, is due not only great credit for energy and enterprise in undertaking the search and successfully accomplishing the expedition, but for his readiness to assume all the risks attending it.

† *Science*, Vol. IX, No. 206, p. 35, Jan. 14, 1887, and No. 207, p. 59, Jan. 21, 1887.

comparison, not only complete skeletons of the common Harbor Seal (*Phoca vitulina*) and the Bearded Seal (*Erignathus barbatus*), but a good series of skulls of these species, and of the Hooded Seal (*Cystophora cristata*), and of other species of the genus *Phoca*, and one skull of the Gray Seal (*Halichærus grypus*), all belonging to the collection of the American Museum, and also a portion of a disarticulated skeleton of *Cystophora cristata*, kindly loaned me by the Cambridge Museum of Comparative Zoölogy, through the kind offices of Dr. D. D. Slade, curator of the Osteological Department. A few of the measurements given in the following pages are taken from my 'History of North American Pinnipeds,' published in 1880. I have also made use of G. Cuvier's description of the osteology of the Monk Seal* (*Monachus monachus*†) as a basis of comparison with its West Indian congener, and of Messrs. True and Lucas's excellent paper (l. c.) on the skull of the Cuban specimen of *Monachus tropicalis*. I regret that I am unable to compare this species, as regards its osteology, with any of the Phocids of the Southern Hemisphere, with which it seems to be in some respects allied, although not intimately, judging from the external characters and the published figures of the skulls of the Southern Phocids.

Monachus tropicalis GRAY.

WEST INDIAN SEAL.

Seal, DAMPIER, Voy. round the World, Vol. II, pt. 2, 3d ed., 1705, p. 23.

Cystophora antillarum GRAY, Proc. Zoöl. Soc. Lond., 1849, p. 93 (in part only).

Phoca tropicalis GRAY, Cat. Seals Brit. Mus., 1850, p. 28.

—— *wilkianus* GOSSE, Naturalist's Sojourn in Jamaica, 1851, p. 307.

Monachus tropicalis GRAY, Cat. Seals and Whales, 1866, p. 20 ; Hand List of Seals, 1874, p. 11.

* Des Phoques vivans et de leur Ostéologie. < Ossem. fossiles, Vol. V, pt. 1, 1823, pp. 199-231, pl. xvii.

† *Phoca monachus* Hermann, Beschäft. d. Berlinische Gesells. Naturf. Freunde, IV, 1779, p. 456, pll. xii, xiii ; *Phoca albiventer* Boddaert, Elen. Anim., 1785, p. 170 ; *Monachus albiventer*, auct. recent. The specific name *monachus* having priority over *albiventer* is here adopted. (Cf. A. O. U. Code of Nomenclature, Canon XXX.)

Monachus? tropicalis ALLEN, Hist. N. Am. Pinn., 1880, p. 708.

Monachus tropicalis ELLIOTT, Science, Vol. III, No. 72, p. 752, June 20, 1884 (the Cuban specimen, with figure of the animal).—TRUE and LUCAS, Smiths. Rep., 1884, pt. ii (Dec., 1886), p. 331, pll. i-iii (the Cuban specimen, with figures of the skull).—ALLEN, Science, Vol. IX, No. 206, p. 35, Jan. 14, 1887; *ibid.*, No. 207, p. 59, Jan. 21, 1887 (preliminary notice of the present material).—WARD (H. A.), Nature, Vol. XXXV, No. 904, p. 392, Feb. 24, 1887 (account of the rediscovery of the species at The Triangles).

Lobos marinos, early Spanish Voyagers.

Pedro Seal, GOSSE, l. c.

Jamaica Seal, Gray, l. c.

EXTERNAL CHARACTERS (Pl. I).—The color above in the adult is brown, tinged with gray, caused by the hairs being light at the extreme tip. The color becomes lighter on the sides, and gradually passes into pale yellow or yellowish-white on the ventral surface of the body. The front and sides of the muzzle, and the edges of the lower lip anteriorly are yellowish-white. The limbs are colored like the back. The mystacial bristles are smooth, tapering, and mostly white; some wholly so, others with the basal portion dusky, while a few of the shorter ones are often wholly dusky. They are set in about six rows, four of which are quite regular and distinct. The longest barbs in the adult are about three inches in length, but in the younger animals the longest reach a length of four and a half inches.

In the newly born young the hair is long, soft, and glossy black, and the mystacial bristles are wholly dark or blackish.

The color varies more or less in different individuals, according to age, particularly in respect to the front of the muzzle, which is sometimes dusky centrally; the ventral surface is more ochery and the back rather yellower in the younger individuals. The mystacial bristles also vary in color with the age of the specimen, they becoming lighter with age; and also shorter, thinner, and more tapering.

The fore feet are provided with well-developed nails, which attain a length of 18 mm. to 25 mm., about two-thirds of this

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length being fully exposed beyond the skin. On the hind limbs the nails are extremely rudimentary, forming merely minute, nearly concealed horny points.

The length of the adult, from the point of nose to end of the tail, is about seven and a half feet in the male, varying from about seven to nearly eight. The female is only slightly smaller, and is nearly indistinguishable from the male by either color, size, or form. The length of twelve flat or unfilled skins, measured in a straight line from the tip of the nose to the end of the tail, ranges from 4 feet 4 inches (1,311 mm.) to 7 feet 2 inches (2,166 mm.). Three immature specimens (probably two-year-olds) measure respectively 4 feet 4 inches, 4 feet 7 inches, and 4 feet 9 inches. Three others range between 5 and 6 feet. Another measures 6 feet 9 inches, and two exceed 7 feet (7 feet 1 inch and 7 feet 2 inches respectively). The skins being much contracted by the salt and alum applied to them to preserve them, these measurements are unsatisfactory, being obviously much too small, since two pregnant females, measured by Mr. Ward in the flesh, give a length respectively of 7 feet and 7 feet 4 inches; while a roughly cleaned, ligamentary adult male skeleton measures 7½ feet. The flat skin of a young specimen, only a few days old, measures 3 feet 6 inches; and an unborn foetus, measured by Mr. Ward in the flesh, gave a length of 2 feet 9 inches.

The following detailed measurements of a pregnant female, measured in the flesh, are kindly furnished by Mr. H. L. Ward :

Tip of nose to end of tail.....	2,140 mm.
“ “ “ hind limbs	2,390 “
Extent of outstretched fore limbs	1,170 “
Length of manus.....	300 “
Breadth “	200 “
Length of pes.....	320 “
Breadth of pes at tarsus.....	100 “
“ “ at end of phalanges.....	450 “
End of nose to eye.....	120 “
Distance between eyes.....	90 “
Circumference of body at axillæ.....	1,700 “
“ “ at hips.....	640 “
“ of head at ears.....	67 “

Doubtless adult males will range in length, in the flesh, from 7 to 8 feet, measured from the point of the nose to the end of the tail, and from about 7 feet 6 inches to 8 feet 10 inches from the nose to the end of the outstretched hind flippers, the latter measurement being about 10 inches greater than the length from tip of nose to end of tail.

OSTEOLOGICAL CHARACTERS.—The skeleton of *Monachus tropicalis* indicates an animal of robust form and great strength, its bony framework being very heavy, and the processes for muscular attachment well developed. The species most strictly comparable with it in general form (excepting of course *M. monachus*), is the common Harbor Seal (*Phoca vitulina*); in size it is quite equal to the Bearded Seal (*Erignathus barbatus*), from which latter, however, it differs notably in the relative size of different parts, as will be presently shown.

Skull (Pl. II).—The brain-case is broad and somewhat depressed, the interorbital region broad and considerably arched; the prefrontal region sloping, but very broad, to give place for the very heavy dentition, the breadth of muzzle being exceptionally great in proportion to the general breadth of the skull. The zygomata are strongly developed and well arched, the breadth at the most expanded part of the zygomatic arches being considerably greater than at the mastoid processes. The anterior nares are broad and rather low, owing to the depression of the prefrontal outline of the skull. The posterior nares are broad, and much vaulted. The paroccipital processes are strongly developed, in aged individuals attaining a length of 14 to 20 mm. The occipital crests become strongly developed in old individuals, in which also the sagittal becomes well marked. There is also in old age a quite distinct frontal process. The mastoid region is rather weakly produced, and the auditory bullæ are unusually small and depressed, being not only relatively but absolutely much smaller than in *Phoca vitulina*, or even in *Phoca fætida*. The (relatively) slightly expanded bulla presents, in the adult, a gradually sloping anterior and inner border, strongly in contrast with the abrupt, nearly vertical corresponding borders in most other Phocids, and is further exceptional in the position of the foramina

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on its inner wall, which it situated at the inner posterior angle, and opens posteriorly, instead of perforating the inner wall at a considerable distance from its posterior end, as in *Phoca*, *Halichærus*, and *Erignathus*. The palatine bones are broadly expanded anteriorly, and join the maxillaries by a nearly straight transverse suture; posteriorly they are deeply and triangularly emarginated, the excavation extending considerably more than one-half the distance from the pterygoid hamuli to the palato-maxillary suture, instead of much less than one-half, as is the case in *Phoca vitulina*, *P. fœtida*, *P. grænlandica*, *Erignathus barbatus*, and the other true Phocids generally. The pterygoid hamuli are well produced, but thin, flat, and directed laterally.

The chief structural peculiarity of the anteorbital portion of the skull is the extension of the malar upon the maxillary, the nearly closed and apparently half-obliterated anterior palatine foraminæ, and the extension backward in a narrow sharp angle of the palatal surface of the premaxillaries. The nasals are relatively very narrow, quite as narrow in front as in average specimens of *Phoca vitulina*, and taper nearly uniformly to a point.

The lower jaw (Pl. II, figg. 5, 6) is remarkable, as already noted by Messrs. True and Lucas (l. c.), for the very low position of its condyle, the lower border of which is on a level with a line through the points of the molar teeth. The lower border of the ramus, posteriorly, is rolled outward, instead of inward as in most Phocids; the angle is but little produced and arises mainly from the inner border of the ramus; the coronoid is strongly developed, a little recurved, and turned somewhat outward. The symphysial portion of the jaw is thick and heavy, the symphysis quite extended and firm, and in old age the two rami appear to become firmly united.

The subjoined table gives detailed measurements of two adult and one very young skull, and with them, for purposes of comparisons, the corresponding measurements of adult skulls of *Monachus monachus*, *Phoca vitulina*, *Erignathus barbatus*, and *Cystophora cristata*, the measurements of *M. monachus* being from Cuvier.*

* Ossem. fossiles, Vol. V, pt. 1, 1823, pp. 228, 229.

MEASUREMENTS OF THE SKULL.

	M. tropicalis.				M. monachus.	E. barbatus.	P. vitulina.		C. cristata.
	♂	♀	♀	♂			♀	♂	
Total length from posterior border of occipital condyles to anterior border of premaxillaries.....	280	270	(?)193	175	(?)232	223	212	232	283
Distance from anterior border of premaxillaries to nasals....	45	46	...	37	...	44	35	35	80
“ “ “ frontals.....	90	88	45	64	91	92	52	63	130
“ “ “ pterygoid hamuli....	150	146	...	90	...	130	110	125	175
“ “ “ posterior edge of last molar.....	96	90	...	67	...	76	72	80	95
“ “ “ posterior wall of maxillary condyle....	200	188	...	114	...	155	140	154	200
“ “ “ palato-maxillary suture.....	96	98	...	60	...	82	72	78	120
Length of palatine bones.....	100	90	...	50	...	69	59	71	...
Width of palatines at anterior border.....	65	60	...	40	...	48	34	41	62
Length of nasal bones.....	62	68	...	47	...	60	59	57	70
Width of nasal bones at front border.....	23	20	...	16	...	23	20	18	35
Width of skull at greatest expansion of zygomatic arches....	177	170	122	108	215	113	126	129	235
“ “ paroccipital processes.....	115	115	...	86	...	101	78	78	117
“ “ mastoid.....	165	155	...	107	...	132	122	128	183
Least width of interorbital region.....	32	31	25	22	32	25	13	12	42
Width of muzzle at base of canines.....	60	56	45	41	78	48	40	43	71
Width of posterior nares at pterygoid hamuli.....	36	38	...	26	...	36	27	27	60
Width of anterior nares, transversely.....	41	38	...	23	...	33	29	26	65
“ “ “ vertically.....	29	31	...	23	...	24	29	26	56
Length of interorbital region (from fronto-maxillary suture to brain-case).....	80	80	...	40	...	41	41	42	75
Length of zygomatic foramen.....	76	74	...	38	...	41	50	53	57
Width of “ “ “.....	55	55	...	31	...	35	48	42	66

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MEASUREMENTS OF THE SKULL.—Continued.

	M. tropicalis.				M. mon- achus.	E. bar- batus.	P. vitulina.		C. cris- tata.
	♂	♀	♀	♂			♀	♂	
Length of superior incisor series.....	28	29	...	22	...	28	24	23	♂
“ “ molar series.....	68	66	60	48	65	52	45	49	35
Distance between outer borders of 1st upper molar.....	45	44	35	28	48	42	33	34	55
“ “ “ 5th.....	85	78	63	62	84	70	58	59	80
Width of foramen magnum.....	30	30	33	30	27	30	30	30	35
Height.....	20	20	27	26	23	31	26	26	24
Width (transverse) of occipital condyles.....	70	69	...	55	...	69	58	63	70
Length of auditory bulla.....	43	43	...	32	...	43	53	57	78
Width.....	43	43	...	32	...	47	43	45	75
Height of skull at occipital condyles.....	86	89	70	77	96	87	80	85	118
“ “ pterygoid hamuli.....	80	85	...	60	...	87	70	74	117
Total length of lower jaw.....	195	185	134	110	210	153	133	145	193
Distance between outer borders of coronoid processes.....	124	121	89	84	161	97	...	94	127
“ “ outer edges of condyles.....	158	150	112	100	190	134	...	116	163
Width of condyle.....	38	37	...	20	46	30	...	29	48
Distance between front edge of lower jaw and posterior edge of last molar.....	88	85	...	56	...	69	61	64	65
Distance between last molar and posterior edge of condyle.....	103	100	...	46	...	86	75	86	122
Depth of lower jaw at coronoid process.....	78	78	(?) 45	43	102	65	57	72	112
Distance between angle of jaw and upper surface of condyle.....	39	41	27	20	63	64	...	...	76
Height of coronoid process.....	40	35	...	19	...	38	25	26	27
Depth of jaw at last molar.....	34	28	...	20	...	23	21	23	31
“ “ jaw at third molar.....	35	29	...	19	...	...	21	22	28
Length of symphysis.....	54	50	37	35	58	...	21	24	...
Width of jaw in front at canines.....	36	34	27	20	51	25	25	25	34
Length of incisor series.....	22	19	...	12	...	10	16	14	17
“ “ molar series.....	67	64	60	54	54	48	42	45	43

Teeth.—The dentition in *Monachus* constitutes one of the most striking features of the genus, not only in respect to the large size of the teeth, but to the incisive formula, which is $\frac{2-2}{2-2} = 4$, instead of $\frac{3-3}{2-2} = \frac{6}{4}$, as in the other genera of the Phocinæ. In form the teeth (Pl. II, figg. 1, 3, 5, 6, and Pl. IV, fig. 1) may be considered as an exaggeration of the type seen in *Phoca vitulina*, being of the same general character but disproportionately more massive. The molars are closely and somewhat obliquely implanted, the inner front edge of one passing by the hinder edge of the one standing next in front of it.

The outer upper incisors stand vertically, and are two to three times the size of the intervening pair, which, in old specimens, are often considerably inclined inward. The canines are very large, but not otherwise peculiar. Of the five molars, the three middle ones are much the largest, the first and fifth being small in comparison with the others. The third molar is slightly the largest, the second, fourth, first, and fifth successively decreasing in size. The first is about twice the size of the fifth. The first four have each a main or principal cusp, with a smaller accessory one in front of it, and two behind it. In unworn teeth the main cusp is much more pointed and higher in the second, third, and fourth than in the first. The fifth has but three cusps, of which the two anterior ones are most pronounced. All the molars are double-rooted except the first; are provided with a heavy cingulum, and in unworn teeth the crown-surface of all the teeth is minutely rugose. (Pl. IV, fig. 1, represents the upper teeth of the right side, one-half natural size, as seen in a half-grown male.)

The lower teeth are in general similar in conformation to the upper, but smaller. The two middle incisors are implanted behind the line of insertion of the outer pair, and are directed more or less forward, in some instances nearly horizontally so. The first molar is very much smaller than the fifth, which is but little smaller than the fourth. The unworn molars show the same number of cusps as the corresponding upper ones.

In old age the teeth become very much worn, the cusps becoming nearly or quite obliterated, and the crown surface loses in a great degree its rugose character.

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The following measurements (in millimeters) indicate the average size in fresh unworn teeth :

	UPPER SERIES.			LOWER SERIES.		
	Height of Crown.	Length of Crown.	Width of Crown.	Height of Crown.	Length of Crown.	Width of Crown.
Canine	14	13	11	14	11	9
Outer incisor....	8	9	8	5	6	5.5
Inner incisor....	7	6	5	5.5	4	4.5
First molar.....	7	10	8	6.5	10	7
Second molar ..	9	15	10	8	15	9.5
Third molar.....	9.5	15	10	8	16	9
Fourth molar ...	8	14	10	9	15	10
Fifth molar	5.5	10	7.5	7	12	8.5

The spacing of the molars is somewhat irregular. In some specimens there is a well-marked interval between the first and second ; occasionally the interval is between the second and third, but often there is no interval between any of the teeth, which are generally crowded, but are sometimes slightly separated, just as in the case in *Phoca vitulina*.

In the skull of a young individual (Pl. III) only three or four days old,* the milk-teeth have disappeared, but none of the permanent teeth have cut the gum. All, however, are visible. The tooth most advanced is the last molar on each side, which in both jaws had already pushed its crown slightly above the alveolus. The two middle incisors are also just pricking through the gum, considerably in advance of either the outer incisors or the canines. This skull, it may be added, presents the usual embryonic aspect, particularly in the relatively large size of the brain-case, the swollen and well-rounded bullæ, the large size of the foramen magnum, and the low position of the mandibular condyle, which is much lower even than in the adult. In this young specimen the auditory bullæ have nearly the form seen in adult examples of *Phoca vitulina*.

The following table gives the ratios of the length of the different regions of the skull to the total length of the skull, the latter being considered as 100.

* Detailed measurements of this skull are given in the table of skull measurements on pp. 8 and 9.

	M. tropicalis.		M. monachus.	E. barbatus.	P. vitulina.	C. cristata.
	♂ ad.	o				
Prefrontal region to total length of skull.....	32	36.6	33	41	30	46
Interorbital region to total length of skull.....	28.5	22.9	.....	18.6	18	26.2
Distance between front edge of intermaxillaries and palatamaxillary suture to total length of skull.....	34.3	34.7	.....	36.8	33.6	42.4
Distance from front edge of intermaxillaries to pterygoid hamulus, to total length...	53.6	51.4	.....	58.3	54	62
Greatest width to length....	60	60	77	50.7	56	83
Height to length.	30.7	44	34	34.9	36.6	41.7

Skeleton.—The skeleton of *Monachus tropicalis* presents several striking peculiarities, as compared with the skeleton in other Phocids, the pelvis being extremely short, the scapula very short and very broad, the humerus short and peculiarly formed, etc. Excepting in the shortness of the sacral region, the axial skeleton differs in respect to the development of the different vertebral regions very little from the skeleton of *Erignathus barbatus*, with which it agrees very closely in general size. The anterior portion of the thoracic cavity is, however, more expanded, and the vertebræ are rather heavier, particularly through the greater development of the apophysial elements. The agreement is much less close with *Phoca vitulina*, in which the dorsal segment is relatively short, and the cervical and cranial segments long. The following table shows the ratios of the length of the different regions of the axial skeleton to its whole length, the total length of the skeleton, including the skull, being considered as 100.

	M. tropicalis.	E. barbatus.	P. vitulina.
Skull to the whole skeleton.....	12.4	10.5	15.0
Cervical vertebræ to the whole skeleton.....	12.4	11.3	14.6
Dorsal " " ".....	36.4	36.4	31.0
Lumbar " " ".....	16.8	16.9	15.0
Sacral " " ".....	5.0	8.4	8.0
Caudal " " ".....	16.8	16.0	16.0

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The vertebral formula is as follows : Cervical vertebræ, 7; dorsal, 15; lumbar, 5; sacral, 3; caudal, 11; total, 41. I have found the number of caudal vertebræ to vary in different species of Phocids from ten to fourteen, but the number of the sacral is nearly uniformly four; I have found three in only *Phoca grænlandica** and the present species.

The scapula (Pl. III, figg. 4, 5) is very unlike that seen in any other genus of Phocids, but is nearest in general form to that of *Cystophora cristata*, and most unlike that of *E. barbatus*. The infra-acromial portion, or shaft, is short, and, compared with that of either *P. vitulina* or *C. cristata*, presents nothing peculiar. The acromion process, sometimes much reduced or even absent in the Phocids (there is no trace of it in *Erignathus*), is strongly developed, rising to a height (above the blade) of 23 mm., with a length of 22 and a thickness of 6 mm.; it is slightly recurved. The spine is represented by a broad shelving ridge, rapidly falling away from a height of 15 mm. just above the acromion process to the level of the general surface of the blade 30 mm. from its superior border. Instead of being a thin, vertical plate of bone as in the allied genera it is merely a broad low ridge. The total length of the scapula is 160 mm.; its extreme breadth, 278 mm. The pre-scapular portion is greatly produced, its greatest development being at the lower border at a point in line with the lower edge of the acromion process. The post-scapular portion is also strongly developed, extending backward in a long angular point; its lower border is nearly straight (not recurved toward the point as in *P. vitulina* and most other Phocids), while the whole upper border is gently arched. The form of the scapula is therefore much less sickle-shaped than in most other Phocids, and its superior border is more evenly and uniformly rounded throughout its extent. It most nearly resembles, in general form and proportions, the scapula of *Cystophora cristata*, which is not only short but has the pre-scapular portion greatly developed, its breadth quite equaling that of the post-scapular portion. The following table indicates the ratios of the breadth of the scapula to its length, and of the pre- and post-scapular portions to the length, in the three species in mention.

* See N. Am. Pinn., 1880, p. 570.

	M. tropicalis.	P. vitulina.	E. barbatus.
Length of scapula to breadth.	1 to 1.793	1 to 1.417	1 to 0.754
“ “ to pre-scapular fossa.	1 to 0.621	1 to 0.417	1 to 0.267
“ “ “ post-scapular fossa.	1 to 1.103	1 to 0.833	1 to 0.427

The humerus (Pl. III, figg. 6-8) is rather short for the size of the animal, being about one-tenth shorter than in *E. barbatus*; it is very stout, and more or less peculiar in all the details of its configuration. It differs strikingly from all other Phocids through the absence of the supra-condylar foramen, of which there is no trace, it agreeing, however, in this respect with the Otaries. The internal tuberosity is low, barely rising to the height of the head; it is thick both antero-posteriorly and transversely, and extends downward for only about one-third the length of the shaft, instead of for one-half the length, as is usually the case. The external tuberosity is likewise low, and the superior external angle is low and rounded, not produced into a high protuberance as in *Phoca* and *Erignathus*, neither is the outer wall deeply excavated as in those genera, but uniformly convex and evenly rounded over to the body of the shaft. The deltoid ridge, however, is strongly developed and continued nearly the whole length of the shaft. The bicipital groove is broad, shallow, and not at all covered, or narrowed externally by the approach of the outer borders of the tuberosities, which partly inclose it in *Phoca* (see Pl. III, fig. 9) and *Erignathus*. The distal extremity is very thick, being relatively but little flattened antero-posteriorly. The external condyle is but slightly produced, being very short, and projecting but one or two millimeters beyond the border of the trochlea; the internal condyle recedes from the edge of the trochlea before expanding, and then becomes strongly developed, being quite as thick as the shaft itself, but, as above stated, presents no trace of a supra-condylar foramen. The ulnar border of the trochlea forms a high, thin ridge. There is also a distinct anconeal fossa—a further peculiarity not usually seen in Phocids.

In general form the humerus presents an unexpectedly close agreement with that of *Cystophora cristata*, a species from which it is widely separated by its dentition and cranial characters. In

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C. cristata, however, there is the usual supra-condylar foramen, but in other features the differences are those which distinguish the humerus of *C. cristata* from this bone in *Phoca* and *Erignathus*, on, however, an exaggerated scale.

In regard to the bones of the forearm, the anconeal process of the ulna is short but very broad, with the superior border distinctly hollowed, instead of strongly convex as in *Phoca* and *Erignathus*. The radius presents no special modifications.

The manus is relatively very long, broad, and strong. The second digit is slightly longer than the first and third, which are equal; the fourth is a little shorter, and the fifth is much reduced, being little more than two-thirds the length of the fourth. The metacarpal and the first phalanx are both greatly lengthened in the first in comparison with those of the other digits, this being the chief peculiarity of the manus in the present species.

The relative length of the fore limb (excluding the scapula) to the length of the skeleton in the three species under mention is as follows: in *Monachus tropicalis* as 23 to 100; in *Erignathus barbatus* as 22.2 to 100; in *Phoca vitulina* as 25.3 to 100; the fore limb being relatively longest in *P. vitulina*. The relative length of the humerus and forearm is practically the same in each, but the manus is relatively considerably longer in *M. tropicalis*, as shown by the following table of ratios:

	M. tropicalis.	E. barbatus.	P. vitulina.
Humerus to fore limb	30 to 100	33.3 to 100	31.3 to 100
Radius "	28 to 100	29 to 100	29 to 100
Manus "	48 to 100	37.8 to 100	40 to 100

The pelvis (Pl. IV, figg. 3-5) in *M. tropicalis* presents many peculiar features, the most striking of which is its shortness in comparison with that of other Phocids. The length of the pelvis in this species is the same as in *Phoca vitulina**—an animal not half its size—and only two-thirds as long as in *Erignathus barbatus*, which is an animal of practically the same size. In consequence of the large size and stout form of the body, the iliac

* In *Phoca vitulina* the pelvis is short in comparison to its length in *P. grænlantica* and *P. setida*. (See N. Am. Pinn., 1880, p. 568.)

portion of the pelvis is broadly expanded, the ilia being broad and thick, with the border much everted. Behind the acetabula the pelvis narrows rapidly, the pubic bones converging abruptly and strongly opposite the middle of the thyroid foramen. The ischia are thin and narrow, being but little heavier than in *P. vitulina*, with only a thin rim of bone below the thyroid foramen—less than half as broad as in *P. vitulina*. The transverse breadth of the ilium nearly equals its length; the eversion of the iliac bones is much less abrupt than in allied forms, the external face of the bone standing at about an angle of 45° with the axis of the body. This surface is flat—not deeply excavated, as in *P. vitulina* and some other species, nor even hollowed, as in *E. barbatus*. The ischia, except in slenderness, differ little from what is seen in *P. vitulina*. The pubes are well developed, and have the internal anterior border flattened and produced, nearly meeting for some distance in front of the symphysis, which is unusually extended and heavy; the pectineal tubercle is well developed. The thyroid foramen is remarkably broad, being more than half as broad as long (in *P. vitulina* it is about three times as long as broad), the posterior end very abruptly rounded, instead of gradually narrowed, as in other Phocids. As already noted, only three vertebræ are ankylosed to form the sacrum.

The femur shares the remarkable shortness of the pelvis, this bone being not longer than in *P. vitulina*!* The shaft is of nearly the usual form, being very much flattened antero-posteriorly, but very thick, and but slightly constricted. The greater trochanter is very large, with its outer extremity greatly and unusually thickened; there is no trace of the usual digital fossa, so strongly developed in *P. vitulina*. The distal extremity is greatly broadened through the strong development of the tuberosities, which extend upward for half the length of the shaft. The intercondylar notch is rather shallow; the articular surface of the condyles is very broad and unusually flat, particularly that of the inner one.

The second segment of the limb—the tibia and fibula—is likewise rather short, being but little longer than in *P. vitulina* (which species even is rather exceptional in this respect), and much

* The femur in *P. vitulina* is relatively even shorter than in either of its congeners, showing further the exceptional shortness of this bone in *M. tropicalis*.

shorter than in *E. barbatus*, or even *Phoca grænlandica*. The bones themselves offer little that is peculiar; the proximal portion of the posterior face of the tibia, however, is comparatively but slightly hollowed.

The pes is of medium length, being little shorter than in *E. barbatus*. Its chief peculiarity is the shortness of the third digit, which is only about three-fourths the length of the first, giving a deeply emarginate border to the foot. The digits, in order of length, measure as follows: I, 265 mm.; V, 260 mm.; II, 230 mm.; IV, 215 mm.; III, 180 mm. The first digit is, as usual, much thicker than the fifth.

The hind limb, considered as a whole, is exceptionally short, the ratio of its length to that of the whole skeleton being as 34.4 to 100, the same ratio in *Erignathus barbatus* being as 38.4 to 100, in *Phoca vitulina* as 40.4 to 100, and in *Phoca grænlandica* as 41.5 to 100. It is even actually shorter than in *Phoca grænlandica*, a much smaller animal.

The relative length of the different segments of the limb to the length of the whole limb in several of the Phocids (*Monachus tropicalis*, *Erignathus barbatus* and *Phoca vitulina*) is as follows, the length of the limb being considered as 100 :

	M. tropi- calis.	E. barba- tus.	P. vitu- lina.	P. græn- landica.
Femur to hind limb.....	17	18	20	16
Tibia " "	33	35.8	34.4	37.7
Pes " "	50.8	45	46.4	46.3
Pelvis " "	33.8	38	34	34
Femur to pes	33	40	41.4	31.6

In *M. tropicalis* a very short femur is thus correlated with a long pedal member.

The following table gives detailed measurements of the skeleton in *M. tropicalis*, *M. monachus*, *Phoca vitulina*, *P. grænlandica*, and *Erignathus barbatus*, the measurements of *M. monachus* being taken from Cuvier.*

* Ossem. fossiles, Vol. V, pt. 1, 1823, pp. 229-231.

MEASUREMENTS OF THE SKELETON.

	M. tropicalis.		M. monachus.	P. vitulina.	P. grandica.	E. barbatus.	
	♂	♀				♀	♂
Total length of skeleton, including skull.....	2180	2066	2345	1440	1630	2195	2010
Length of skull.....	280	270	282	220	210	230	225
cervical vertebrae.....	270	263	288	210	240	250	230
" dorsal.....	790	760	830	445	510	800	760
" lumbar.....	366	378	350	216	255	390	340
" sacral.....	110	125	150	120	100	175	160
" caudal.....	365	380	340	230	317	350	295
first rib (osseous portion only).....	76	83	.....	.....	.....	.....	58
" third rib.....	190	145	.....	.....	.....	.....	165
" sixth rib.....	270	250	.....	.....	.....	.....	270
" tenth rib.....	295	290	.....	.....	.....	.....	275
" twelfth rib.....	265	250	.....	.....	.....	.....	272
" fifteenth rib.....	200	193	.....	.....	.....	.....	140
sternum, including cartilagineous extremities.....	660	580	.....	.....	.....	.....	.....
" osseous portion only.....	470	408	.....	.....	.....	.....	.....
" scapula.....	160	160	163	135	152	210	197
Breadth of ".....	278	235	(?)266	.....	.....	.....	130
Height of acromion process.....	24	22	19	.....	.....	.....	0
Length of fore limb (without scapula).....	530	538	.....	480	550	487	480
humerus.....	150	155	146	165	123	162	165
" radius.....	140	143	140	137	130	140	137
" manus.....	240	240	.....	145	145	185	190
Length of 1st digit (including metacarpal).....	202	203	202
" 2d.....	195	200	190
" 3d.....	180	180	180

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MEASUREMENTS OF THE SKELETON.—Continued.

	M. tropicalis.		M. monachus.	P. vitulina.	P. greenlandica.	E. barbatus.	
	♂	♀				♀	
Length of 4th digit (including metacarpal)	160	160	162	...	...	...	...
" 5th	128	124	184	...	...	...	...
" pelvis	225	240	284	200	255	320	300
Distance between outer borders at iliac crests	220	228	218	...	...	...	...
Breadth of pelvis at proximal border of acetabula	140	145	...	...	...	...	...
" pelvic basin at proximal end of sacrum	70	69	...	...	...	...	...
" " posterior distal angle of ischia	50	25	...	...	...	...	...
" " ischiac tuberosities	52	65	59	...	...	...	...
Length of ilium	70	70	70	...	...	...	...
" ischium	150	165	...	...	...	...	...
" thyroid foramen	95	110	90	...	...	...	...
Breadth of "	50	48	50	...	...	...	...
Length of symphysis	40	30	26	...	...	...	...
" os penis	167	...	...	...	...	...	...
" hind limb	655	665	...	582	677	843	750
" femur	110	110	108	112	109	163	152
" tibia	225	215	236	200	255	310	274
" pes	320	340	...	270	313	380	395
" tarsus	70	75	...	...	...	80	80
Breadth of "	55	60	...	...	...	...	43
Length of 1st digit (including metatarsal)	265	254	257	...	...	...	320
" 2d	230	220	218	...	...	...	255
" 3d	180	182	172	...	...	...	250
" 4th	215	210	218	...	...	...	245
" 5th	260	260	276	...	...	...	287

SEXUAL DIFFERENCES.—As already stated, in external characters the sexes differ very little, the females being apparently little if any smaller than males of corresponding age. In the skeleton the bones are a little lighter and slenderer in the female than in the male, but there is little difference in the linear measurements of the entire skeleton or of any of its parts. The two skeletons before me are both fully adult, but the male skeleton is evidently that of a somewhat older animal than the other. The bones of the female are throughout not only somewhat slenderer than in the male, but the crests of the skull are less developed, and the suprascapular epiphysis is less ossified. It is thus evident that the female skeleton would have become heavier in old age, and the differences now perceivable have become much diminished. The pelvis, however, is evidently much slighter in the female than in the male, regardless of any differences due to age, the pubic bones being much lighter in the female, and the pubic symphysis less extended, while the ischia are reduced to about one-third of their development in the male, they being simply slender, flattened rims of bone bounding the thyroid foramina. (See Pl. IV, fig. 5). This is the only clearly marked sexual difference in the two skeletons under consideration.

There are other differences that are obviously individual, as in the scapula, which in the male is less symmetrically developed than in the female, showing deficient ossification at its suprascapular edge, particularly along the superior border of the pre-scapular fossa. Another difference which may be sexual, but is more probably individual, is seen in the axial skeleton, in which the cervical and dorsal series of vertebræ are 27 mm. longer in the male than in the female, while the lumbar, sacral and caudal are together 42 mm. shorter than the corresponding series in the female, the caudal series being not only longer in the female but containing two more vertebræ. The dorso-cervical portion of the vertebral series is thus relatively somewhat shorter, and the posterior portion much longer in the female than in the male in the two examples under consideration.

COMPARISON WITH ALLIED SPECIES.—The only species at all closely related to *Monachus tropicalis* is its single known congener, the *M. monachus* of the Mediterranean and adjoining seas. So

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far as can be judged by descriptions of the latter, the resemblance in size and external characters is very close. The skeleton, judging by Cuvier's plate* of *M. monachus*, presents several notable points of difference, although it must be premised that the skeleton figured by Cuvier was that of a very old individual, in which the crests and processes of the skull were well developed—much more so than in my examples of *M. tropicalis*--and the teeth much worn. But there are other tangible differences with which age can have little to do. In *M. monachus*, for instance, the fifth upper molar is decidedly smaller than the first, while just the reverse of this occurs in *M. tropicalis*. Again, the lower jaw is much heavier in *M. monachus*, the ramus being much deeper and thicker, and the coronoid process very much higher and broader. This may be due partly, but probably not wholly, to greater age. There is also a well-marked difference in the relative length of the fifth digit of the manus in the two species, this digit being relatively about one-fourth longer in *M. monachus* than in *M. tropicalis*, as shown by both Cuvier's measurements and his plate. Another striking difference is seen in the sacrum, which in *M. tropicalis* consists of only three anchylosed vertebræ, and in *M. monachus* of four. In neither of my specimens of *M. tropicalis* would a fourth vertebra have ever become anchylosed to the third sacral, while it is evident that the sacral vertebræ are unquestionably four in the specimen of *M. monachus* figured by Cuvier.† The caudal vertebræ vary in number in my two examples of *M. tropicalis*, there being only 11 in the male and 13 in the female; there are 12 in Cuvier's specimen of *M. monachus*.

In respect to the skeleton in general, Cuvier's example of *M. monachus* is more heavily ossified than either of my examples of *M. tropicalis*, the tuberosities for muscular attachment being more strongly developed throughout in correlation with the heavy sagital and occipital crests and processes of the skull, a difference more or less attributable to differences of age. In all other respects Cuvier's figures of the osteology of *M. monachus* would serve equally well for that of *M. tropicalis*.

* Ossem. fossiles, V. pt. i. pl. XVII.

† This difference is evidently not of great importance, since the number of sacral vertebræ is found to sometimes vary in individuals of the same species; while one species of *Phoca* (*P. groenlandica*) has normally only three sacral vertebræ and its congeners normally four.

AFFINITIES OF THE GENUS *MONACHUS*.—The osteology of the genus *Monachus* presents a few features slightly recalling the structure of the Otaries. This is more especially seen in the general form of the skull, as well as in its strongly developed crests and processes, and the robust character of the skeleton in general, and especially the strong vertebral processes, and also in the absence of the supra-condylar foramen of the humerus, found, so far as I am aware, in all other Phocids. These resemblances are, however, slight and superficial, in comparison with the radical differences which separate trenchantly the Otaries from the Phocids. They merely seem to give to the genus *Monachus* a rather specialized character and a rather higher order of structure than is seen in any other Phocine genus. As already noted, the form of the scapula and humerus in *Monachus*, in general features, is more like what is seen in *Cystophora* than in any member of the subfamily Phocinæ; from which, however, in cranial and many other features it is more widely separated than any other genus of the Phocids. In cranial characters and dentition (the dental formula aside), *Monachus*, compared with the Northern Phocids, is most nearly related to *Phoca*, of which it almost seems to be an exaggerated type. The principal bones of the limbs, however, differ exceedingly in details of structure from those of either *Phoca* or *Erignathus*.

In respect to cranial characters, and in some external details—as the elongation of the outer toes of the pes and the absence of well-developed nails in the posterior digits—*Monachus* approaches the Antarctic Phocids, which seem to differ quite as much from each other as some of them do from *Monachus*. In all the peculiar form and reduced size of the auditory bulla closely conforms to what is seen in *Monachus*; there is the same prolongation backward of the malar process of the maxillary, the similar deep emargination of the bony palate, and the same incisive formula ($\frac{2}{2}-\frac{2}{2}=\frac{4}{4}$). The general form of the skull is also similar to that of *Lobodon* and *Ogmorhinus*. The essential characters of the Ogmorhininæ (= Stenorhynchinæ of authors*) are thus found in *Monachus*, with which group it seems to be more intimately related

* The generic name *Stenorhynchus*, formerly applied to *Phoca leptonyx* of Blainville, being untenable in mammalogy, through prior use in carcinology and entomology, the subfamily name based thereon also lapses. See A. O. U. Code of Nomenclature, p. 25, Canon V.

than with the Phocinæ. Its association by some German writers, as notably Wagner and Giebel, with the Antarctic Phocids is thus not without reason, *Monachus* certainly standing more aloof from the Phocinæ than from the Ogmorhininæ. Gray made of it a distinct 'tribe' or subfamily, a group of coördinate rank with the Phocinæ and Cystophorinæ.

GENERAL HISTORY.—The West Indian Seal was doubtless the first American species of Seal met with by the explorers of the New World, it having been killed for food by Columbus's sailors during his voyage to the West Indies in 1494.* It must have been well known to the buccaneers of the seventeenth and eighteenth centuries, and during the eighteenth century, according to Dampier, was the basis of a profitable Seal fishery. As will be shown later, its destruction for its oil seems to have been carried so far as nearly to exterminate the species, only the remnants of once populous colonies, confined to remote keys and reefs, having survived the ravages of the oil hunter.

Dampier, Sloane, and other early writers who refer to the species give no description of the animal, specimens of which seem not to have come under the observation of naturalists till near the middle of the present century. The first explicit account of its size and external appearance was published by Mr. Richard Hill, in the "Jamaica Almanack for 1843"—a popular, ephemeral publication, now almost inaccessible. Mr. Hill's account, however, was republished by Mr. Philip Henry Gosse in 1851, in his work entitled "A Naturalist's Sojourn in Jamaica," who added some further account of the species. Mr. Hill's specimen was a young one, only about four feet in length, which he had opportunity of observing for a time in confinement. It was taken on the Pedro Kays, a reef of rocks lying off the south coast of Jamaica. In the spring of 1846 an adult male was obtained at the same locality by Mr. George Wilkie, who presented it to Mr. Gosse, by whom it was later sent to the British Museum. A description of this specimen is added by Mr. Gosse to the account of the young one given by Mr. Hill.

* Near the end of August, 1494, Columbus came to anchor off the southern coast of Hispaniola, near the rocky islet of Alta Vela. "Several seamen were ordered to climb to the top of the island, which commanded a great extent of ocean, and to look out for the other ships.... On their return, the sailors killed eight sea wolves, which were sleeping on the sands."—*Irving's Life and Voyages of Columbus*, revised ed., Vol. I, 1848, p. 434.

In 1849, two years before the publication of Mr. Gosse's above cited work, Dr. J. E. Gray referred to the specimen Gosse had presented to the British Museum; he spoke of it as an imperfect skin, without any bones, and described the appearance of the whiskers. He referred to the specimen merely incidentally,* without describing or naming it. The following year (1850), Dr. Gray formally described the species as "*Phoca tropicalis*. Jamaica Seal,"† basing the name and description on the "Skin, imperfect, without skull," referred to (as above stated) in his paper of the previous year. No reference is made to Mr. Gosse, nor to any previous description, Mr. Gosse's book on Jamaica not having at that time appeared.

Mr. Gosse, in his work already cited, published in 1851, proposed "the trivial name of *Wilkianus* for the species, in honour of George Wilkie, Esq.," to whose courtesy he was indebted for "the skin of an adult specimen, shot by himself." The name, however, was not only antedated by *tropicalis* of Gray, but was further untenable from Mr. Gosse having failed to refer the species to any genus. He says, "From Mr. Hill's description it appears to have the incisors and nailless hind feet of *Stenorhynchus*, with the molars of *Calocephalus*. The data are perhaps not sufficient to warrant the formation of a new genus, but I may be permitted to propose" etc. (the trivial name as above cited).

In 1866 Dr. Gray referred‡ his *Phoca tropicalis* to the genus *Monachus*, republishing his original description of the species without change, but remarking, under the genus *Monachus*, "As the other subtropical Seal, *Phoca tropicalis* (Gray, Cat. Seals, B. M. 28), from Jamaica, described from an imperfect skin without a skull, has similar small smooth whiskers [as *M. albiventer*], it may very probably, when its skull has been examined, be found to belong to this genus, which will then prove to be a subtropical form of the family."§

Up to this time Dr. Gray had nowhere cited the accounts of either Hill or Goss, but in his "Additions and Corrections" to

* On the variation of the Teeth of the Crested Seal, *Cystophora cristata*, and on a new species of the genus from the West Indies. <Proc. Zool. Soc. London, 1849, pp. 91-93.

† Catalogue of the specimens of Mammalia in the Collection of the British Museum. Part II, Seals, 1850, p. 28.

‡ Catalogue of Seals and Whales in the British Museum, 1886, p. 20.

§ This shrewd conjecture has since been amply confirmed, although the West Indian Seal continued for nearly twenty years to be only provisionally referred to the genus *Monachus*.

the work now under notice (op. cit., pp. 367, 368), he not only cites both Hill and Gosse, but quotes the descriptive portions of their accounts as given in Gosse's "Naturalist's Sojourn in Jamaica"—not however under *Monachus tropicalis* but under *Cystophora antillarum*!—thus completing most effectually the muddle he had previously brought about in relation to the West Indian Seals, of which he persistently recognized two species, referring one of them to *Cystophora* and the other (latterly at least) to *Monachus*.

As I have already shown at length,* Gray's *Cystophora antillarum*, first named in 1849,† was based on a stuffed skin and a skull of a very young specimen of *Cystophora cristata*, erroneously supposed to have come from the West Indies, and later affirmed to have been presented by Mr. Gosse. Hence doubtless his reference in 1866 of Hill's and Gosse's accounts to his mythical *Cystophora antillarum*, as above noted. In his first account of *C. antillarum* he refers also to the "imperfect skin" received "from Jamaica," which later became the type of his *Phoca tropicalis*; he thus referring in his first account to *three* specimens of Seals from the West Indies, which later were all credited to Mr. Gosse. Mr. Gosse, however, has assured me, in a letter already published,‡ "that Dr. J. E. Gray was in error, in supposing that more than *one species* [specimen] was actually delivered to the British Museum, from Jamaica," by him, this being the skin mentioned in his "Naturalist's Sojourn in Jamaica."

The next notice of importance relating to the West Indian Seals, following Dr. Gray's several accounts, was my *résumé* of the subject published in 1880,§ in which all the previous accounts were passed under analytical review, and the confusion in relation to the occurrence of two species of Seal in the West Indian seas in a measure cleared away. Although no specimens came under my notice, the literature of the subject was summarized, and some new matter added in relation to its distribution and former abundance. The species was provisionally assigned to *Monachus*.

* See Hist. N. Am. Pinnipeds, 1880, pp. 715-720.

† Proc. Zool. Soc. Lond., 1849, p. 93.

‡ Hist. N. Am. Pinnipeds, 1880, p. 720, footnote.

§ Ibid., pp. 707-723.

The next contribution to the literature of the subject was an account by Mr. Henry W. Elliott, in June, 1884,* of the specimen then recently received at the U. S. National Museum from Professor Felipé Poey of Havana, as already noticed (see p. 1). He gives a figure from the mounted specimen, and briefly describes its external characters, adding a short summary of the history of the species.

In December, 1886, Messrs. F. W. True and F. A. Lucas published an important paper† on the cranial characters of the species, based on the skull of the specimen received at the U. S. National Museum from Professor Poey. The paper is illustrated with three plates of the skull (the figures drawn two-thirds natural size), and is a most valuable contribution to the subject. The species is for the first time shown to be unequivocally referable to the genus *Monachus*. The specimen, however, proves to have been immature; in fact scarcely more than half the adult size.

On the present material coming into my hands, early in January, 1887 (as already noted—see p. 2), I published a preliminary notice of it on January 14,‡ followed by a second brief notice on January 21.§ At the time of writing the first notice I had not seen the paper of Messrs. True and Lucas. A few weeks later Prof. H. A. Ward gave an account|| of the rediscovery of the species at The Triangles.

Finally, I may mention in this connection a paper entitled "Notes on the Life History of *Monachus tropicalis*," by Mr. Henry L. Ward, based on his experience with the species at The Triangles in December, 1886, prepared for publication in the "American Naturalist." It contains the fullest account of the life history of the species which I have yet seen, and the only information on this subject available, aside from the scanty notes of Hill and Gosse, published nearly sixty years ago.¶

* The monk-seal of the West Indies, *Monachus tropicalis* Gray. <Science, Vol. III, No. 72, pp. 752, 753, June 20, 1884.

† On the West Indian Seal, *Monachus tropicalis*, Gray. <Smiths. Report for 1884, pt. ii (Dec., 1886), pp. 331-335, pll. i-iii.

‡ The West Indian Seal. <Science, Vol. IX, No. 206, p. 35, Jan. 14, 1887.

§ Ibid., No. 206, p. 59, Jan. 21, 1887.

|| The West Indian Seal (*Monachus tropicalis*). <Nature, Vol. XXXV, No. 17, Feb. 24, 1887, p. 392.

¶ I am indebted to the kindness of Mr. Ward for a manuscript copy of his paper, received February 14, 1887, for use in the present connection, extracts from which are given in the following pages.

GEOGRAPHICAL DISTRIBUTION.—The West Indian Seal, two centuries ago and earlier, appears to have been an abundant species in many parts of the Gulf of Mexico and in portions of the Caribbean Sea. It extended eastward to the Bahamas, and was very numerous there as late as the beginning of the eighteenth century. Sir Hans Sloane, in his great work on the Natural History of Jamaica,* published in 1707, says (Vol. I, Introduction, p. lxxxviii.): “The *Bahama* Islands are filled with Seals; sometimes Fishers will catch one hundred in a night. They try or melt them, and bring off their Oil for Lamps to the Islands.” This not only attests their abundance there at this date, but the rapidity with which they were destroyed.

It ranged as far westward as the keys and islets lying north and west of Yucatan, where some still exist, Mr. Ward’s specimens having been obtained at The Triangles, situated about one hundred and fifty miles west of Yucatan.

At the Alacran Islands, about seventy-five miles north of Yucatan, they existed, two hundred years ago, in great numbers. Dampier, writing of these islands in 1675, says: “Here are many Seals: they come up to sun themselves only on two or three of the Islands.... There we Anchored and lay three or four days, and visited most of them, and found plenty of such Creatures [Seals], as I have already described.” He further states that there is here “such plenty of Fowls and Seals (especially of the latter), that the Spaniards do often come hither to make Oyl of their Fat; upon which account it has been visited by English-men from *Jamaica*, particularly by Capt. Long: who, having the Command of a small Bark, came hither purposely to make Seal-Oyl, and anchored on the North side of one of the sandy Islands, the most convenient Place, for his design.” Captain Long was nearly shipwrecked “by a fierce North-wind, which blew his Bark ashore;” but he afterward repaired his vessel, filled all his casks with oil, “and lading his Oyl,.... went merrily away for *Trist*.”† It was doubtless not long before the

* A Voyage to the Islands Madera, Barbados, Nieves, S. Christophers and Jamaica, with the Natural History of the Herbs and Trees, Four-footed Beasts, Fishes, Birds, Insects, Reptiles, &c, of the last of those Islands....[etc.] Two volumes, folio. Vol. I, 1707; Vol. II, 1725.

† Dampier, Voyage round the World, Vol. II, part ii, 3d ed., 1705, pp. 23, 24.

Seals became scarce, through man's cupidity, and the few that survive to the present day are merely the scattered remnants of once populous colonies.

On the coast of Honduras, in about latitude 16° —a few miles northeast of the Mosquito Coast—is a group of islets known as Seal Keys, and some two hundred miles further south, on the same coast, in about latitude $12^{\circ} 40'$, is another Seal Key, which facts may be doubtless safely taken as an indication that in early times the range of the West Indian Seal extended southward to the Bay of Honduras.

As shown by the account of this Seal already quoted from Mr. Gosse, a small colony existed as late as 1846 at a reef of rocks known as the Pedro Kays, lying off the south coast of Jamaica. Ten years ago Mr. R. W. Kemp wrote me* that two were seen about 1875 near Cape Florida, which were supposed to have strayed from some of the Bahama Islands. He also wrote me that he had been informed by trustworthy persons that Seals were to be found in great numbers at some islands situated between the Isle of Pines and Yucatan. His informant claimed to have landed there and killed some, "merely 'for fun'." Mr. Kemp alludes to their great rarity on the coast of Florida, where they occur "only once or twice in a lifetime," but affirms their existence in comparative abundance on the coast of Yucatan, and their occasional occurrence at the Bahamas. Their presence at Salt Key Bank, between Florida and the Bahamas, as late as 1868-69, is attested by information received some years since from the late Count L. F. de Pourtalès.† The capture of a specimen near Havana, Cuba, in 1883, seems to indicate that some still exist in the vicinity of Salt Key Bank. In the southern part of Caicos Bank, the charts give a group of islets under the name Seal Keys, in latitude $21^{\circ} 15'$, a little southwest of Turk's Island.

As I stated in 1880, on the authority of Mr. S. Garman, they are well known to the wreckers and turtle-hunters of the West Indian waters, and I have since conversed with whalers who had also met with them while cruising for Whales in the Gulf of Mexico.

* See N. Am. Pinnipeds, p. 721.

† Ibid., p. 722.

Their recent discovery by Mr. Ward at The Triangles confirms a portion of Mr. Kemp's statement, cited above, and renders it quite probable that other small colonies exist at some of the many islands off the Yucatan coast.* I have met, however, with no reference to their occurrence in or near the Lesser Antilles, nor anywhere to the eastward of Jamaica.

The habitat of the West Indian Seal may therefore be briefly stated as extending, formerly at least, from the islands off the west and north coasts of Yucatan, south to the Bay of Honduras, and eastward to Jamaica, Cuba, the Florida Keys, and the Bahamas.

It is certain that the species still exists among the islets of Salt Key Bank, north of Cuba, and at some of the islands off the coast of Yucatan, and probably at other islands between Cuba and Yucatan.

HABITS.—Very little can be gleaned respecting the habits of this species. Mr. Hill, as quoted by Gosse (l. c.), thus describes the behavior in confinement of the young one on which his original account of the species was based: "When the specimen from which these notes were made first arrived it was very lively, and so sensible to the slightest touch, that however lightly the hand might be placed on the fur, it felt the contact, and moved rapidly away, jerking the whole body forward. When left unmolested it was playful. It ploughed the water with the nose, and snorted as it drew the head out. It grunted like a pig, and barked, growled, and snarled, like a dog. It was fond of turning upon the back and lying dozing. In this posture it slept and basked in the sun. It refused all food, and lived four months without eating. Symptoms of dullness only appeared in the last month, when it was found to be laboring under some disease of the head; and when it died it was discovered to have become totally blind, the dark pupil of the eye having disappeared, together with the crimson color of the iris.† It was surprisingly

* Mr. Ward mentions the capture of a young one alive, November 29, 1886, near the city of Campeche, during his stay there, but he believes it is quite uncommon along the coast at that point, as it was regarded by the people as a great curiosity, and was afterward taken by its owners to Progresso for public exhibition.

† The crimson color of the iris ("irides crimson") noted in Mr. Hill's description was doubtless due to inflammation, as Mr. Ward informs me that in the living examples he met with at The Triangles the irides were dark reddish-brown, and the expression of the eye dull and lusterless.

fat, notwithstanding its long fast. The fat was four inches thick, and yielded four gallons of oil. It was a male, but the organs of generation were not externally perceptible.”*

Mr. George Wilkie, according to Mr. Gosse, visited the Pedro Kays in the spring of 1846, and succeeded in obtaining a larger specimen. The notes made by Mr. Wilkie respecting these Seals in their native element were communicated through Mr. Hill to Mr. Gosse, who published them in his work on Jamaica. From these notes I extract the following : “When Mr. Wilkie’s party first landed . . . they surprised five Seals on shore. They immediately succeeded in heading a ‘Bull,’ or Male Seal, both big and burly, and killed him. He proved to be an aged patriarch, with teeth worn nearly to the stumps, and a hide gashed and seamed with scars, got in many a fierce fight . . . In the scramble which the Seal makes to regain the water, nothing is to be remarked but the violence and impatience with which he jerks his body forward ; but when he plunges from the shore into the sea, it is no small treat to see the suddenness with which the uncouth animal, so unwieldy and helpless on land, becomes gracefully alert in the ocean. The command with which he strikes through the water, the velocity with which he cleaves the flood, the ease with which he winds the mazes of the rocks, and dashes forward into the hidden recesses of the deep, are beautifully interesting in a creature looking so essentially a quadruped. When the boat is afloat again, the Seals come trooping out to reconnoitre. At a depth of about three feet they paddle about, gazing up through the clear liquid with an expression of countenance beaming with curiosity and intelligence. They dodge around the boat, occasionally ascending to the surface, to renew their inspirations of air, and to look upon their island home, to ascertain whether they may return thither and be at rest.

“A grown-up cub about four feet long had been taken by the people. One Seal was observed more persevering in her watchfulness and assiduity to regain the shore, than the rest. This was conjectured to be the dam of the slaughtered young one. The maternal instinct did not exhibit any stronger emotion than this anxious vigilance. The young one was sufficiently grown to

*Gosse’s Nat. Soj. in Jamaica, p. 108.

be no longer dependent on the mother. Had it been still sucking, there was enough to show that parental passion would have merged fearlessness into fury, and inquietude for the safety of its young, into unsparing vengeance for its fate. . . .

"I must not omit to mention that our friends had one opportunity of closely observing the progression of the Seal when ascending the beach. The advance was by zigzag movements. It was evident that the ground was first gripped by one fore flipper, then by the other, that the body advanced first to the right, then to the left, as one or the other flipper took its hold of the earth, and helped the body onward. They seemed to delight in basking in the sun, and to huddle together, and grunt out their pleasure in each others company."

The stomachs of those examined proved empty, but "the opinion that the more experienced fishermen expressed was, that they fed as generally on molluscous animals as on fish, and that their teeth suffered much wear and tear in the work of breaking shells."*

Mr. Ward's account of the habits of this species differs materially from the observations above cited. He says "The whole character of this Seal is that of tropical inactivity," and that "several of those collected had such a growth of minute fungi on their back and flippers, more especially the hinder ones, as to appear quite green."

"Upon first approaching them" says Mr. Ward,† "they appeared to have no dread whatever of the human presence, lazily looking at us, perhaps uneasily shifting their position, and then dozing off in restless sleep. Upon advancing to within three or four feet they would somewhat rouse themselves, bark in a hoarse, gurgling, death-rattle tone, and uneasily hitch themselves along a few paces. At first the Seals offered very little resistance, and only upon the second day of our stay, when they had become somewhat accustomed to our presence, and when we made an onslaught upon a group of several, did they show fight at all. On this occasion their numbers and their being huddled together seemed to give them courage, as well as making our attempts to

* Gosse's Nat. Soj. in Jamaica, pp. 112-114.

† Manuscript paper, previously cited.

kill them with clubs and daggers (we had early decided not to use firearms, because of the danger of frightening them away from such small islands) dangerous and more or less abortive. Not infrequently would they make savage rushes for a yard or two at some one of our attacking party and, failing to reap revenge upon us, would fall upon their dead or dying fellows, biting and shaking them in impotent rage; or occasionally two would engage each other in savage conflict for a moment or two, the heavy gnashing of their teeth as their powerful jaws closed giving us a lively idea of how unpleasant it would be to fall within their reach. Nevertheless, the whole aspect of the animals was one of indecision. Instead of stampeding when molested, they only roused themselves to action upon being individually attacked. As another illustration of their lack of intellectual acuteness, I may mention that on the following morning we found several Seals that had 'hauled up' during the night among the dead ones surrounded by skinned carcasses.

"In the water they showed no particular curiosity in regard to a boat or its occupants, a curiosity usually so very marked among Seals, nor did they disport themselves in play as does the Harbor Seal. That they are generally peaceful is borne out by their appearance, very few scars of combat being observed, and some of them were not unlikely inflicted by the myriads of sharks surrounding the islands. The contents of the stomachs of several were examined, but nothing except fluids was found, which gave no clue to their food. It undoubtedly consists largely of fish; one in captivity was fed on this food and appeared to thrive well. They are greatly infested with intestinal parasites several inches in length which, shortly after death, swarm out of anus and vagina, dying as they reach the air.

"On land or in shallow water the Seal progresses by drawing forward the hind parts, thus throwing the line of the back into a strong curve, then pitching itself forward on to its breast to again repeat the same action. The distance covered is usually about a foot, the difference between the chord of the arc and the horizontal length between the fore and hind flippers; but when this movement is violent the Seal throws itself forward with so much force as to somewhat overshoot this. The appearance of one

[April,

moving is much like that of an 'inch-worm';—a continual bobbing up and down of the middle of the back. One was noticed, which, when under considerable excitement, evidently forgot how to run; but lay on its belly trying to scull through the sand with its hind flippers as though it were in the water."

Mr. Ward reached The Triangles on December 1, 1886, and, as already stated, left on December 4.* "This," says Mr. Ward, "proved to be the time of parturition among the Seals, for upon making a landing on the East Island we killed a female with a foetus nearly ready for birth, and in a little interior pond of salt water found a female lying on her side suckling her young. She paid no more attention to our approach than would the familiar denizens of the barn yard under similar circumstances. Subsequently four other females were killed containing nearly ripe foetuses. In one case, when the foetus was removed immediately after killing the mother, it kicked and squirmed for one or two minutes in such a lively manner as to indicate that delivery would have occurred in a few moments had the female not been molested. Following the usual order with Seals, there is but one offspring at a birth. The female can have little difficulty in nursing it, as in any but a perfectly prone position one or more of her four teats will always be within reach of the young.

"The foetus is quite large, one measuring 85 cm. in length from the tip of nose to end of tail. The hair is long, very soft and woolly, and of a glossy black color. Parturition probably occurs in shallow water, as the three females noticed nearest this period were lying stranded on the beach, half in and half out of water. The young Seal previously mentioned was of a uniform black color, including its mystacial bristles, with large, dark-brown, lustrous eyes that looked inquiringly at me; more intelligent in appearance than were the adults. This youngster we took with us on leaving the islands and had it in captivity for a week or more at Campeche, where it eventually died, probably from lack of proper nourishment. Its teeth were uncut, and so it had no thoughts of offering resistance when handled. It was totally devoid of fear; but most too young to make any demonstrations of friendship.

* For a detailed description of these remote sandy islets, see Mr. Ward's paper in the "American Naturalist," above cited.

Its time on shipboard was spent in aimlessly roaming to and fro, serenely regardless of such trivial obstructions as people standing in its way, uttering every few moments its cry—a long drawn out, guttural *ah*, with a series of vocal hitches during its enunciation. At Campeche this little Seal seemed to enjoy its daily bath in the sea, plunging its head under water and blowing and snorting as if in great glee, yet ever and anon uttering its plaintive cry, as if in momentary mourning for its lost parent."

As shown by Mr. Ward's observations, the West Indian Seal brings forth its young about December 1. In this respect it differs in habits from nearly all the species of Seals inhabiting the Northern Hemisphere, the Gray Seal (*Halichærus grypus*) being the only other species known to bring forth young in autumn.

Mr. Wilkie's meeting with a young one, already weaned, in the spring (as noted above), further indicates that parturition occurs late in the autumn or early in winter.

DESCRIPTION OF PLATES I-IV.

Monachus tropicalis.

PLATE I.—Adult male, adult female, and young a few days old. From photographs of mounted specimens.

PLATE II.—Skull of adult male, $\frac{1}{3}$ natural size.

PLATE III.—*Fig.* 1-3. Skull of a very young example, slightly under $\frac{1}{2}$ natural size.

Fig. 4. Scapula of adult female, $\frac{1}{3}$ natural size.

Fig. 5. Superior border of scapula of adult male, $\frac{1}{3}$ natural size.

Figs 6-8. Humerus of adult male, a little less than $\frac{1}{3}$ natural size.

Figs. 9-11. Humerus of *Phoca vitulina*, for comparison with that of *M. tropicalis*, same scale.

PLATE IV.—*Fig.* 1. Dentition of young male (teeth unworn), $\frac{1}{2}$ natural size.

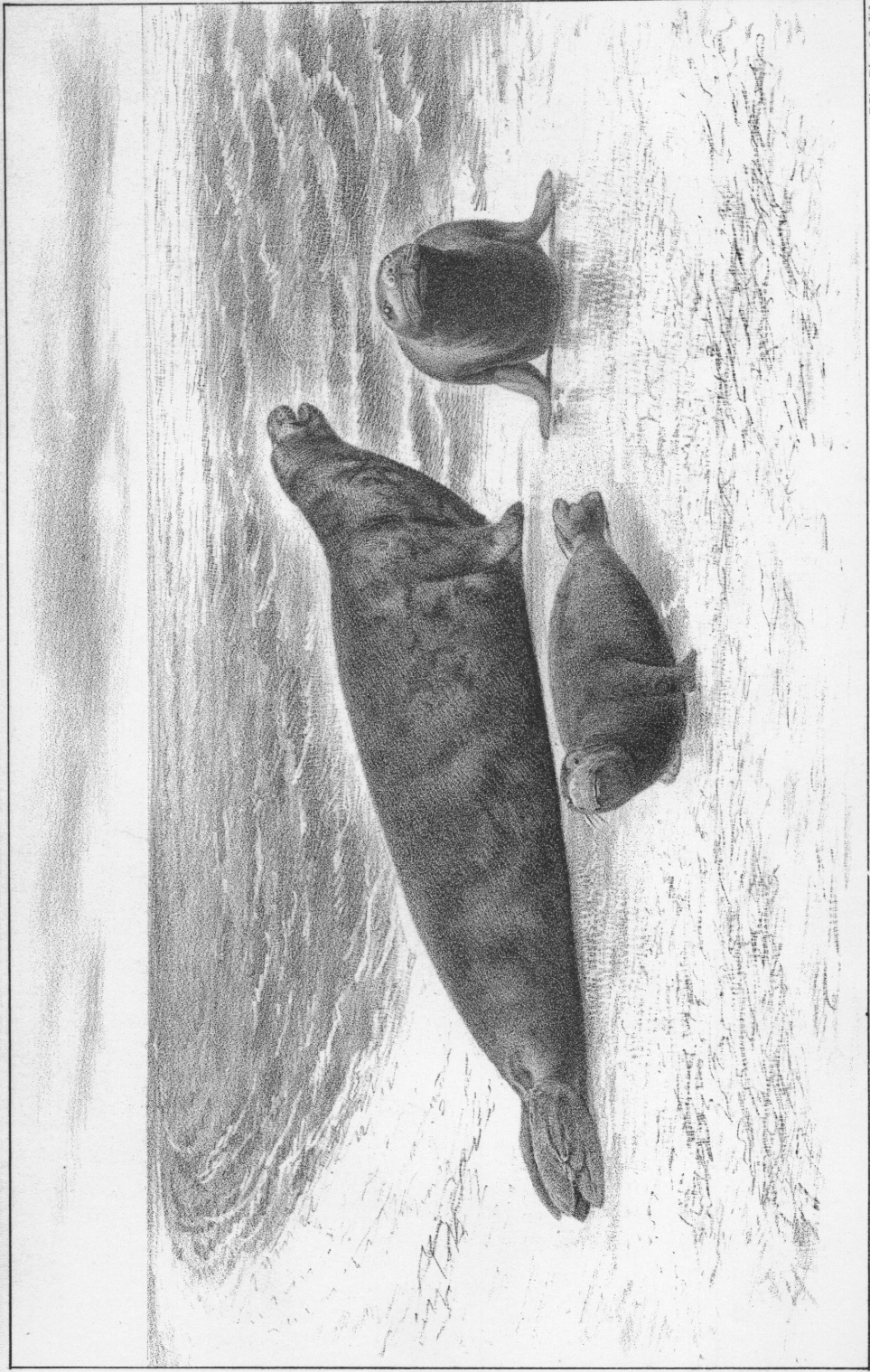
Figs. 2 and 3. Femur of adult male, $\frac{1}{3}$ natural size.

Figs. 3 and 4. Pelvis of adult male, 2-5 natural size.

Fig. 5. Innominate bone of adult female, 2-5 natural size.

Figs. 6 and 7. Atlas of adult male, $\frac{1}{3}$ natural size.

Fig. 8. Os penis, $\frac{1}{3}$ natural size.

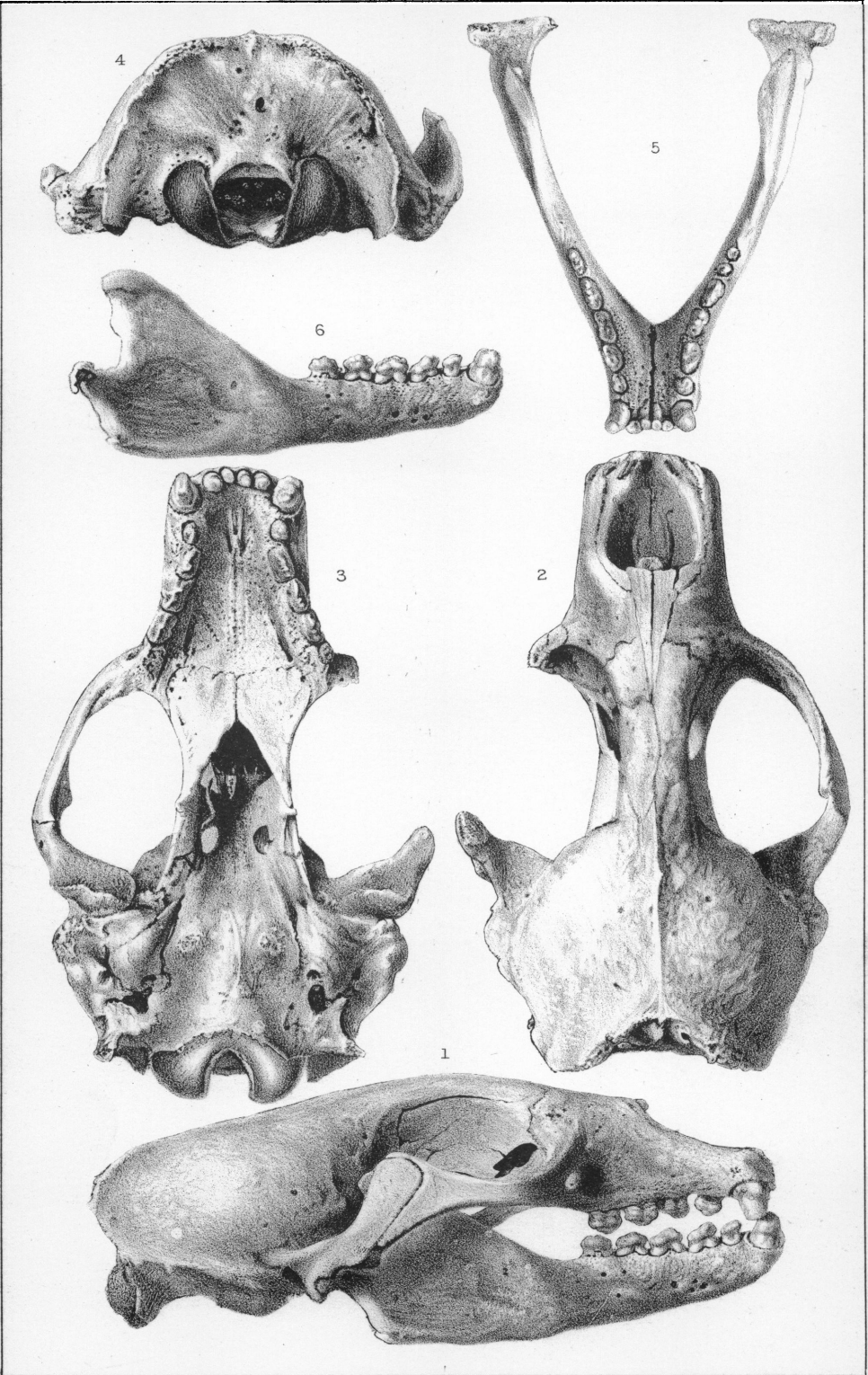


Male

Young

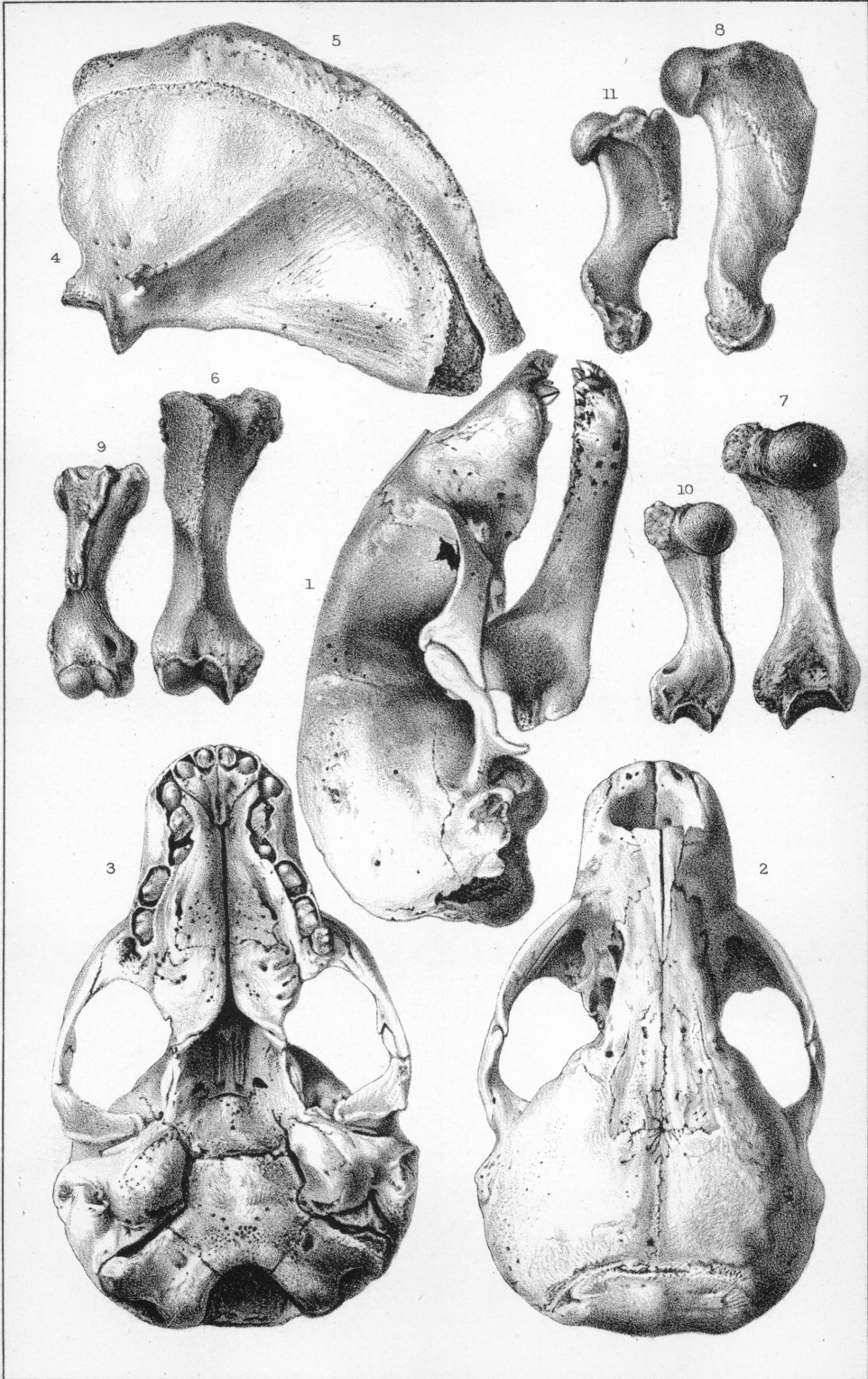
Female

MONACHUS TROPICALIS.



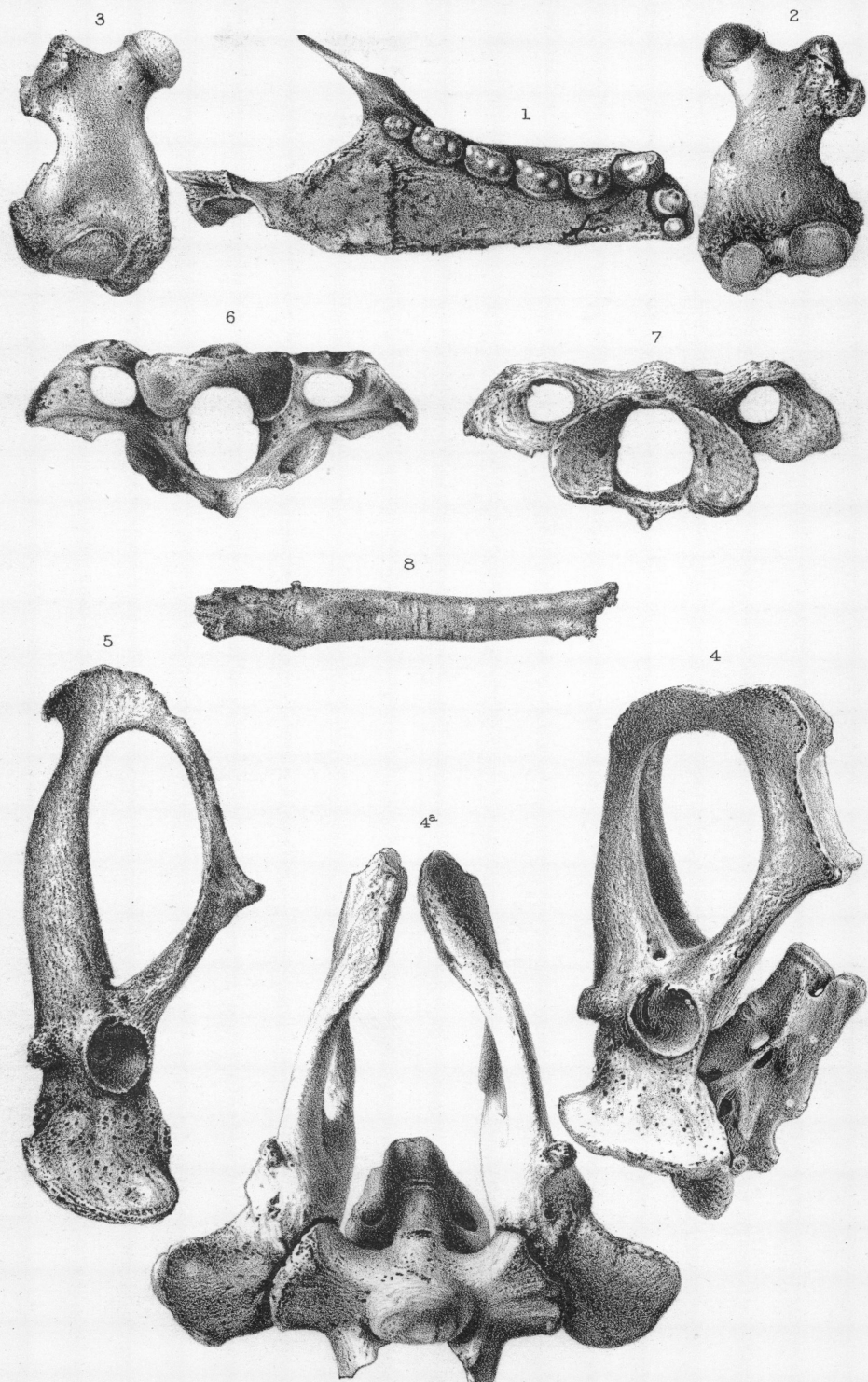
Julius Baer & Co. Lith.

MONACHUS TROPICALIS.
2/3 Natural Size.



MONACHUS TROPICALIS

Julius Bien & Co. lith.



MONACHUS TROPICALIS.