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I. *Prodrome of a Monograph of the Pinnipedes.*

BY THEODORE GILL.

(Communicated October 16, 1865.)

The Seals of America have been hitherto little known, and in the general works on the mammals of the northern continent, they, like the bats and cetaceans, have been omitted.

With a view to the elucidation of the species, and at the suggestion of Professor Baird, I have been induced to undertake the examination of the collection of specimens in skin, and the skulls and skeletons possessed by the Smithsonian Institution and the Academy of Natural Sciences of Philadelphia. To Mr. F. W. Putnam, Superintendent of the Museum of the Essex Institute, and Professor Wyman, I am much indebted for the kindness manifested in transmitting to me the specimens they possessed, and the opportunity thus afforded for comparison and study of more extensive material. The results of the examination of these specimens are now given, in so far as the classification and relations of the primary groups and genera are concerned, while I am obliged to defer until a more convenient season the more elaborate exposition of the views I have been compelled to embrace, as well as the discussion of the limits and nomenclature of the species.

Passing over the changes which the seal exhibits in its progress to adolescence, I would advert to the peculiarities in the geographical distribution of the several groups in connection with their systematic relations.

The three primary groups which may be elevated to the rank of families, in the first place, are very differently distributed.

The PHOCIDÆ are cosmopolitan, and representatives are found in the tropical seas, as well as in the waters of the extremest north and south, the Indian Ocean being the only large body of water in which no species are found. While such, however, is the expression of the general distribution of the family, its minor groups are much more narrowly restricted. The three subfamilies, into which the family is divided, are each distinguished by peculiarities in limitation. The PHOCINÆ are almost confined to the polar and northern temperate seas, representatives of a single genus extending southwards to or beyond the tropic of Cancer,\* while the STENORHYNCHINÆ, after the exclusion of *Monachus*, whose affinities are essentially with the *Phocinæ*, are confined as strictly to the opposite hemisphere. The CYSTOPHORINÆ, on the other hand, are represented at both extremes; the species of one genus, *Cystophora*, inhabiting the Arctic seas, whence it descends into the more northern temperate Atlantic on both sides; while *Macrorhinus* is represented by a species found in the Antarctic seas, whence it advances to the Patagonian shores and the Pacific coast of temperate South America, the southern Australian seas and the Cape of Good Hope, and on the other side of the Equator, but still in the Pacific ocean, is replaced by a species peculiar to the warmer waters that bound the North American continent on the west. The exact limits of these species require, however, yet to be ascertained. The ROSMARIDÆ are entirely confined to the northern Polar seas. The OTARIIDÆ have their metropolis in the Pacific ocean, and are represented by species along

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\* The "*Halichærus antarcticus*" of Peale, very erroneously identified with *Lobodon carcinophaga* by Dr. J. E. Gray, is a typical species of *Phoca*, but appears to be identical with a species occurring along the California and Oregonian coasts, and, consequently there must be some error as to its assigned habitat in the antarctic seas. I am happy to add that Mr. Peale himself now doubts the correctness of the labels on the faith of which he gave its habitat, and as a change of name is desirable, I would propose that of *P. Pealii*.

The relations of the Jamaican seal, rejoicing in the two names, *Phoca tropicalis* Gray and ———? ! *Wilkianus* Gosse (1851), are very uncertain. Mr. Gosse obtained a single skin. The exact origin of the *Cystophora antillarum* was not mentioned in the *original* description, and its West Indian habitat requires confirmation.

the entire western coast of America, except the tropical regions, while on the eastern they ascend towards Brazil. They are likewise abundant along the Australian coasts.

In conclusion, it may be added, as Peron and Dr. Gray have before insisted, that the species of the entire group are restricted within as distinct geographical limits as are any other mammals, and as are especially the marine fishes.

Without further preface, I submit the following classification to the judgement of naturalists :

## FAMILY I. PHOCIDÆ Brookes, Gervais.

### SUBFAMILY I. PHOCINÆ (Gray), Gill.

#### GENUS 1. PHOCA Linnæus.

SYN. *Callocephalus* F. Cuvier, 1824, Gray, 1844.  
*Halicyon* Gray, 1864.

*Type.* PHOCA VITULINA Linnæus.\*

#### GENUS 2. PAGOMYS Gray, 1864.

*Type.* PHOCA FÆTIDA Müller.

#### GENUS 3. PAGOPHILUS Gray, 1844.

*Type.* PHOCA GRÆNLANDICA Müller.

#### GENUS 4. ERIGNATHUS Gill, 1865.

SYN. *Phoca* Gray, 1844.

*Type.* PHOCA BARBATA Fabricius.

#### GENUS 5. HALICHÆRUS Nilsson, 1820.

*Type.* PHOCA GRYPUS Fabricius.

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\* In the Syst. Nat. 10th ed., 1758, the first in which the binomial system was introduced, four species were included by Linnæus in the genus PHOCA; 1, *P. ursina*, = ARCTOCEPHALUS URSINUS; 2, *P. leonina*, = MACRORHINUS LEONINUS; 3, *P. rosmarus*, = ROSMARUS OBESUS; 4, *P. vitulina*. The name PHOCA must be retained for one of these, and as the third, second and first species were successively elevated to the rank of generic types, and the genus was thus by elimination restricted to the fourth species, for that and its allies, the generic name must necessarily be reserved.

GENUS 6. MONACHUS Fleming, 1822, Gray, 1850.

SYN. *Pelagios* F. Cuvier, 1824, Gray, 1844.

*Heliophoca* Gray, 1854.

Type. PHOCA MONACHUS Hermann.

SUBFAMILY II. CYSTOPHORINÆ Gray.

GENUS 7. CYSTOPHORA (Nilsson, 1820), Gray, 1844.

SYN. *Stemmatopus* F. Cuvier, 1824.

Type. PHOCA CRISTATA Erxleben.

GENUS 8. MACRORHINUS F. Cuvier, 1824.

SYN. *Mirounga* Gray, 1827.

*Macrorhyna* Gray, 1827.

*Morunga* Gray, 1844.

Type. PHOCA LEONINA Linnæus, 1758.

SUBFAMILY III. STENORHYNCHINÆ (Gray), Gill.

GENUS 9. LOBODON Gray, 1844.

Type. PHOCA CARCINOPHAGA Hombron and Jacquinot.\*

GENUS 10. STENORHYNCHUS F. Cuvier, 1824.

Type. PHOCA LEPTONYX Blainville.

GENUS 11. LEPTONYX Gray, 1836.

Type. STENORHYNCHUS WEDDELLII Lesson.

GENUS 12. OMMATOPHOCA Gray, 1844.

Type. OMMATOPHOCA ROSSII Gray.

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\* The *Halichærus antarcticus* Peale, referred by subsequent authors to *Lobodon carcinophaga*, has no affinity with it. The species is a typical *Phoca*, closely allied to *P. vitulina*, and was correctly described by Mr. Peale. The type specimens of skins and skull are in the Smithsonian Museum.

**FAMILY II. OTARIIDÆ Brookes, Gervais.**

GENUS 1. OTARIA Peron, 1816.

SYN. *Platyrrhynchus* F. Cuvier, 1824.*Otoes* Fischer.*Platyrrhinus* Lesson.*Otiphoca* Blainville.*Type.* PHOCA JUBATA Schreber.

GENUS 2. ARCTOCEPHALUS F. Cuvier,\* 1824.

SYN. *Callorhinus* Gray, 1864.*Type.* PHOCA URSINA Linnæus.

GENUS 3. EUMETOPIAS Gill, 1865.

*Type.* OTARIA CALIFORNIANA Lesson., = ARCTOCEPHALUS MONTERIENSIS Gray.†

GENUS 4. ZALOPHUS Gill, 1865.

*Type.* OTARIA GILLIESPII Macbain.

GENUS 5. HALARCTUS Gill, 1865.

*Type.* ARCTOCEPHALUS DELALANDII Gray.**FAMILY III. ROSMARIDÆ Gill.**SYN. *Trichechidæ* Brookes, Gervais.

GENUS 1. ROSMAREUS Scopoli, 1777.

SYN. *Odobænus* (Brisson), Illiger.*Trichechus* Auct. recent.‡*Type.* TRICHECHUS ROSMAREUS Linnæus.

\* ARCTOCEPHALUS F. Cuv. was especially established for a species considered identical with *Phoca ursina* Linn, and as no other species was mentioned, and, as the identification appears correct, the name must be retained for that species.

† Is not *A. monteriensis* Gray identical with *Otaria Stelleri* Mull. Arc. fur Nat. 1841, I. 330?

‡ TRICHECHUS was originally based solely on the Manati (*T. Manatus*) by Linnæus, Syst. Nat. 10 ed. 1758, I. 34. It must therefore be retained for that animal.

These families, subfamilies and genera may be distinguished as follows:

### PHOCIDÆ.

The Phocidæ are the most elongated in form, and have the external ears obsolescent. The skull has the postorbital processes null or obsolete; "no alisphenoid canal; the mastoid processes swollen and seeming to form part of the auditory bulla."\* Incisors  $\frac{6}{4}$ ;  $\frac{4}{4}$ ;  $\frac{4}{2}$ . Canine teeth normally developed. Molars  $\frac{5}{5}$  |  $\frac{5}{5}$ ; rarely  $\frac{6}{5}$  |  $\frac{6}{5}$  (in *Ommatophoca*). Anterior and posterior feet provided with claws; the anterior legs smaller than the posterior, with the digits of the feet successively abbreviated; the posterior flippers emarginated; the third and fourth digits being shortest. Scapula in the Phocinæ expanded upward and backward toward the postero-superior angle, the surface behind the spine being enlarged.

In the family, thus limited, three subordinate types are embraced, which may be distinguished as subfamilies. These are especially differentiated by modifications of the skull and feet. In the discrimination of the genera, many characters have been omitted, as unadvisable to introduce in a mere synopsis. Most of the characters selected for the distinction of the subfamilies have been hitherto overlooked. Their universality and their coincidence have been verified by reference to all the known types. †

### PHOCINÆ (Gray.)

Maxillar zygomatic process with the posterior surface subvertical, or very oblique. Malar oblong-rhomboid, emarginated above and below. Intermaxillaries narrow, prolonged, and wedged behind between the supramaxillaries and nasals. Nasal bones narrow, diminishing in width backwards. Incisors  $\frac{6}{4}$ ; exceptionally  $\frac{4}{4}$ .

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\* TURNER. *Proc. Zool. Soc. London*, 1848, p. 88. The constancy of the characters used by Turner has been verified by myself, by reference to all the types.

† The genera *Monachus*, *Lobodon*, *Leptonyx* and *Ommatophoca* are autotopically unknown to me, but the published illustrations demonstrate the applicability of the characters in question.



*Synopsis of genera.*

\*Incisors  $\frac{6}{4}$ ; curved, conic, small. Bony palate produced forward between lateral extensions of the maxillaries, quite or nearly to a line with the posterior molars.

† Skull declining at nasal region; anterior nares moderate; molars, except first, with two roots.

‡ Maxillar zygomatic processes arising from edge of jaw, with the surface very oblique and the suborbital foramen inferior. Jaws rectilinear.

a. Lower jaw with its branches flattened within. Teeth complex.

PHOCA.

b. Lower jaw with its branches inflected inwards. Teeth simple.

1. Palate emarginated behind; very deeply incised at the septum narium.

PAGOMYS.

2. Palate entire and transverse behind; septum narium entire and continued to the posterior edge of palate.

PAGOPHILUS.

‡‡ Maxillar zygomatic process high up, with the surface little oblique, and the suborbital foramen anterior. Jaws curved outward. Palate very broad, emarginated. Base of skull with posterior lateral vacuities obsolescent.

ERIGNATHUS.

†† Skull increasing in height forward. Anterior nares very large; molars single rooted.

HALICHÆRUS.\*

\*\* Incisors  $\frac{4}{4}$ ; enlarged, transversely notched behind their edges. Bony palate emarginated behind and with a notch at suture; the bones not produced as far forward as the inner margin of orbit.

MONACHUS.†

**CYSTOPHORINÆ Gray.**

Maxillar zygomatic process with the posterior surface subvertical, or very oblique. Malar bone elongate-rhomboid, emarginated above and below. Intermaxillaries terminating far from nasals. Nasal bones narrow and rather short. Incisors  $\frac{4}{2}$ .

*Synopsis of genera.*

\* Bony palate nearly square, subtruncated behind. Adult males with a large dilatable compressed hood extending from the nose to occiput.

CYSTOPHORA.

\*\* Bony palate very short, emarginated by a deep sinus behind. Adult males with an extensible tubular proboscis.

MACRORHINUS.

\* The affinity of *Halichærus* to *Rosmarus* (*Trichechus* Auct.) is not evident.

† *Monachus*, approximated by all preceding naturalists to the *Stenorhynchi*, appears to be far more nearly related to the *Phocæ*.

**STENORHYNCHINÆ (Gray.)**

Maxillar zygomatic process with its lower and posterior surface extended horizontally backwards, and its angle continued far behind along the inner side of the malar. Malar elongated, bow-shaped, and curved upward in front. Intermaxillaries narrow, not continued backward between nasals and supramaxillaries. Nasal cavity expanded, with the nasal bones widest toward the middle, and very long. Incisors  $\frac{4}{4}$ .

*Synopsis of Genera.*

1. Molars  $\frac{5}{5}$ ; deeply lobed. Snout much longer than orbits, which are moderate.

\* Molars (except first) unequally lobed, with a large recurved lobe; a small one in front, and two or three behind. Occipital condyles widely diverging upward. **LOBODON.**

\*\* Molars trilobed. Occipital condyles nearly parallel.

**STENORHYNCHUS.**

2. Molars  $\frac{5}{5}$ ; "with a small conical tubercle on the hinder edge, and a sharp edged ridge round the inner side of the base." Snout shorter than the orbits, which are rather large. **LEPTONYX**

3. Molars  $\frac{6}{5}$ ; "compressed, with a central incurved lobe, and a small lobe on each side of it." Snout shorter than the orbits, which are very large. **OMMATOPHOCA.**

**OTARIIDÆ.**

The Otariidæ are less attenuated than the Phocidæ and have distinct external ears. The skull has "a post-orbital process; an alisphenoid canal; mastoid process strong and salient, standing aloof from the auditory bulla" (Turner). Incisors  $\frac{6}{4}$ . Canines normally developed. Molars  $\frac{5}{5} | \frac{5}{5}$  or  $\frac{6}{5} | \frac{6}{5}$ . Anterior legs about as large as the posterior, their toes decreasing in a curved line, and without claws; posterior feet, with the digits nearly coterminous, with long, membranaceous longuiform flaps extending beyond their tips, and with the three median toes only clawed. Scapula curved backward to the upper angle, but with its spine or crest near the posterior margin.\*

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\* It may also be remarked that the nasals are as wide behind as in front, extending toward their externo-posterior angles, and receive between their produced portions a triangular extension of the frontal bones.

This family, especially developed in the Pacific, is represented by several genera, which may be distinguished as follows:—

I. Palatal surface of maxillaries extending behind the teeth, and with its posterior processes very long. Bony palate extending nearly to the pterygoid processes and truncated or convex behind. OTARIA.\*

II. Palatal surface of maxillaries at middle not extending beyond the grinders, and with moderate lateral extensions. Bony palate very deeply emarginated.

a. Face high, boldly decurved and shorter than orbit. Molars  $\frac{6}{5}$ ; approximated, compressed, conic.

ARCTOCEPHALUS.†

b. Face produced, longer than orbit.

1. Molars  $\frac{5}{5}$ ; last upper far behind the inner margin of orbit. Posterior nares very high and narrow. Bony palate with a very narrow emargination, notched at suture. Forehead very thick and tumid, with a triangular flattened area. Postorbital processes quadrate. EUMETOPIAS.

2. Molars  $\frac{5}{5}$ ; approximated; last under zygomatic process; posterior nares wider than high behind. Bony palate with a continuous concave emargination behind. Forehead, depressed, with triangular postorbital processes. Occipital crest very high. ZALOPHUS.

3. Molars  $\frac{6}{5}$ ; lower more or less trilobate; last upper behind inner margin of zygomatic process. HALARCTUS.

## ROSMARIDÆ.

The Walrusses have a very robust body, and no external ears. The skull provided with "no postorbital processes; a distinct alisphenoid canal; mastoid process strong and salient; its surface continuous with the auditory bulla" (Turner). Incisors deciduous; the external on each side being alone retained in the gums. Canines extraordinarily

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\* *Otaria* is said by Dr. Gray, in his last enumeration of the family, to have "the palate very concave, decurved deeper with age, &c." I cannot understand such a statement with regard to the bony palate of *Otaria leonina*, and consequently describe the appearance of the bones as they appear to me.

† As I have known it to be suggested that the *A. monteriensis* and *A. Gilliespii* may be identical, it may be proper to state that the first is not found in the South, where the other species dwell, although the second may inhabit the same regions in the North. The differences between the three species are so great, that it may be almost a matter of surprise that they should not have been generically separated before. I have examined the complete skeleton and three skulls of adults of *A. monteriensis*; the skull of a very old male of *A. Gilliespii*; and skulls of five young specimens of *A. ursinus*, besides part of the skeleton.

developed as tusks. Molars in young  $\frac{5}{4}$ ; the fifth and fourth caducous. Anterior feet about as large as posterior, with the toes decreasing in a curved line, destitute of claws; the posterior feet with the five digits, scarcely increasing toward inner, all provided with claws. Scapula with the hinder margin nearly straight, and the spine a short distance from, and somewhat parallel with it.

\* One genus.

ROSMARUS.

### APPENDIX.

For the benefit of American naturalists, a list of the species of Seals inhabiting both coasts of North America, is here given. I may add that I have seen more or less numerous specimens of every species enumerated.

#### *Pinnipedes of Eastern North America.*

#### PHOCIDÆ.

#### PHOCINÆ.

1. *Phoca vitulina* Linnæus. Greenland to New York.
2. *Pagomys fœtidus* Gray. Greenland to Labrador.\*
3. *Pagophilus grœlandicus* Gray. Greenland to Gulf of St. Lawrence.
4. *Erignathus barbatus* Gill. Greenland to Gulf of St. Lawrence.
5. *Halichærus grypus* Nilsson.† Sable Island.

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\* The *Phoca fœtida* and *P. hispida* appear to simply represent conditions of a single species exhibiting a remarkable variation in dentition. An examination of numerous specimens, differing in the number of the cusps, forbids my considering such variations as constant and indicative of specific value. They surely cannot be generically separated as Dr. Gray has done.

† The American form of *Halichærus* differs somewhat from any of the three forms signalized by Hornschuch, but the names of that gentleman have not been regarded by others as the expression of valid species, and do not really appear to merit recognition. I have therefore, provisionally at least, identified the American type with the European, combining all the known forms of the genus under one specific name.

## CYSTOPHORINÆ.

6. *Cystophora cristata* Nilsson. Greenland to New York.

## ROSMARIDÆ.

7. *Rosmarus obesus* Gill ex Illiger. Greenland to Labrador; formerly to Nova Scotia.

*Pinnipedes of California, Oregon, &c.*

## PHOCIDÆ.

## PHOCINÆ.

1. *Phoca Richardi* Gill ex Gray. British Columbia, (southwards, to California?)
2. *Phoca Pealii* Gill. California and Oregon.

## CYSTOPHORINÆ.

3. *Macrorhinus angustirostris* Gill.\* California.

## OTARIIDÆ.

4. *Arctocephalus ursinus* F. Cuvier. Behring's Straits to Washington Territory.
5. *Eumetopias californianus* Gill.† California.
6. *Zalophus Gilliespii* Gill ex Macbain. South California.

## ROSMARIDÆ.

7. *Rosmarus obesus* Gill ex Illiger. Arctic Seas.

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\* *Macrorhinus angustirostris* is distinguished by its narrow snout, and the form of the palatine bones, &c. It will be described in the Proc. Chicago Acad. Nat. Sc.

† The *Eumetopias californianus* is identical with the *Otaria monteriensis* of Gray, and possibly also with *Otaria Stelleri* Muller.