Article XXXIV. — THE HAIR SEALS (FAMILY PHOCIDÆ) OF THE NORTH PACIFIC OCEAN AND BERING SEA.

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Figs. 1–10.

CONTENTS.

Introduction.

Among the mammals collected by Mr. N. G. Buxton and Mr. W. Bogoras in northeastern Siberia, on the Jesup North Pacific Expedition, are specimens of three species of Hair Seals. An attempt to identify these has rendered necessary their comparison with such other material from northeastern Asia and northwestern North America as could be brought together, so that the present paper may be considered as a preliminary revision of the seals of the family Phocidæ known to occur in the North Pacific. Although the material available for examination is scanty, it is sufficient to show that the name *Phoca largha* Pallas, as recently misapplied, includes at least three species, the proper identification of which involves the consideration of difficult questions of synonymy.

In this connection it gives me pleasure to acknowledge my indebtedness to Mr. Gerrit S. Miller, Jr., Curator of Mammals in the U. S. National Museum, for kindly securing for me the

use of the material under his charge, consisting of specimens from the coast of Alaska, the Commander Islands, and the eastern coast of Kamschatka; and to Mr. Witmer Stone of the Academy of Natural Sciences of Philadelphia, and Dr. Horace Jayne, Director of the Wistar Institute of Anatomy and Biology of Philadelphia, for the large series of seal skulls collected by Mr. E. A. McIlhenny at Point Barrow; and to Mr. Outram Bangs, Curator of Mammals at the Museum of Comparative Zoölogy, Cambridge, Mass., for several skulls of special interest. I am also greatly indebted to Dr. L. Stejneger for field notes and measurements of the seals collected by him at the Commander Islands and on the coast of Kamschatka, without which and the specimens collected by him there would have been little basis for the present paper.

I must confess much disappointment in finding so little material available for the study of the seals of the Pacific coast of North America. Applications made to the three leading Natural History Museums of the Pacific coast for skulls of California seals resulted only in the information that these institutions had none in their collections. It was also a matter of surprise to find that the U. S. National Museum had so few skulls of seals from Alaska and the Pribilof and other Alaskan Islands, considering the large number of naturalists and collectors who have visited this region in its interests in recent years. The only material available for examination from south of Puget Sound consists of one skull and one mounted specimen from the Santa Barbara Islands.[1] There are two immature specimens (and some fragments of others) from the vicinity of Puget Sound, two skulls only from Alaska south of St. Michaels, a small series of quite young skulls from St. Michaels, and three from the Pribilof Islands. Furthermore, none of this material is identified as to sex. In animals which vary so greatly with age and sex as do the seals of the present group, the inadequacy of such material as I have been able to bring together, as regards both quantity and quality, for more than a superficial view of the field is readily

[1] As these pages are passing through the press I am in receipt, from Dr. C. Hart Merriam, Chief of the Biological Survey of the U. S. Department of Agriculture, of four skulls of *Phoca* from San Geronimo Island, Lower California, as noted below, p. 493.

apparent. It may, however, serve to direct attention to this neglected group of mammals, and possibly stimulate the gathering of material for the use of future investigators.

The case is hardly better when we turn to the seals of the eastern coast of North America. While the Harbor Seal of southern Greenland appears to differ, at least sub-specifically, from that of the coast of New England and New York, very little material bearing on the question can be obtained. Nor is there much for the comparison of the Harbor Seal of eastern North America with the Harbor Seal of Europe.

NOMENCLATURE.

The Generic Name Phoca.

First, as to the generic name *Phoca*. As shown by me many years ago (Hist. N. Am. Pinnipeds, 1880, pp. 417, 418, 558) the process of elimination, strictly enforced, would necessitate the restriction of the name *Phoca* to the *Phoca leonina* Linn. Linnæus in 1758 (Syst. Nat., 10th ed., pp. 37, 38) included four species in the genus *Phoca*, namely, (1) *Phoca ursina*, (2) *Phoca leonina*, (3) *Phoca rosmarus*, (4) *Phoca vitulina*. *Phoca rosmarus* was removed by Linnæus in 1776 to *Trichechus*, and *Otaria* was established in 1816 for the Eared Seals, leaving in *Phoca* at this date only *Phoca leonina* and *Phoca vitulina*. In 1826 *Phoca vitulina* was made by F. Cuvier the type of his genus *Calocephalus*, and *Phoca leonina*, in the same memoir, was made the type of his genus *Macrorhinus*, leaving nothing to represent the old Linnæan genus *Phoca*. *Calocephalus*, however, has precedence by eighteen pages over *Macrorhinus*. Besides this, *Macrorhinus* of F. Cuvier is preoccupied by *Macrorhinus* Latreille, 1825, for a genus of Coleoptera, and has had to give way to *Mirounga* Gray, 1827. When *Calocephalus* was established, only *Phoca leonina* was left to bear the restricted name *Phoca*. In view of all this, plainly set forth in 1880, when rules of nomenclature were less rigidly enforced than at present, I then pleaded for the retention of *Phoca* as the generic name of the Harbor Seal, as follows: "This, however, seems so contrary to the traditions

of *Phoca*, which from 1735 to the present day has been generally associated by the majority of writers with *vitulina* and its nearest allies, that it seems an act of violence to transfer it to what is logically its legitimate connection with *leonina*, thereby making *Macrorhinus* a synonym of the restricted genus *Phoca*. . . . In view of the tradition and usage of the case it seems best to waive the technicality here involved and suffer *Phoca* to retain its time-honored associations."

The only way, however, to retain *Phoca* for the *Phoca vitulina* group is to invoke Canon XXIII of the American Ornithologists' Union 'Code of Nomenclature,' which provides as follows: "If, however, the genus contains both exotic and non-exotic species,—from the standpoint of the original author,—and the generic term is one originally applied by the ancient Greeks or Romans, the process of elimination is to be restricted to the non-exotic species." As the Harbor Seal is, or was formerly, a common species in the Mediterranean, as well as on the western shores of Europe, and was the only seal really known, not only to the ancients but to the early natural-history writers, as Rondelet, Olaus Magnus, Gesner, and Aldrovandus, and down to about 1750, it meets the requirements of Canon XXIII as against its competitor, the *Phoca leonina* of Linnæus, which was practically first made known by Lord Anson in 1748.

Specific Names.

In case the Harbor Seal of eastern North America proves separable from true *Phoca vitulina* of Europe, as seems almost certain, an available name for the southern form is found in *Phoca concolor* Dekay (1842), based on New York examples of the light phase.

The nomenclature of the North Pacific species seems at first sight highly complicated, but a careful examination of the early names shows that they have very little basis and that most of them should be rejected as unidentifiable. The names to be here especially considered are, in the order of date, as follows: (1) *Phoca largha* Pallas, 1811; (2) *Phoca*

ochotensis Pallas, 1811; (3) *Phoca tigrina* Lesson, 1827; (4) *Phoca chorisi* Lesson, 1828; (5) *Phoca nummularis* Temminck, 1842; (6) *Halichœrus antarcticus* Peale, 1848; (7) *Halicyon richardii* Gray, 1864; (8) *Phoca pealii* Gill, 1866; (9) *Halicyon ? californica* Gray, 1886. Only five of these names —*Phoca largha* Pallas, *Phoca ochotensis* Pallas, *Halichœrus antarcticus* Peale, *Phoca nummularis* Temminck, and *Halicyon richardii* Gray — are entitled to serious consideration.

The *Phoca tigrina* of Lesson was based on the 'Phoque tigré,' figured by Kraschenninikow in his 'Histoire de Kamtschatka' as inhabiting the coast of Kamschatka, and may be either of three very distinct species of spotted seals now known to inhabit this coast, and is therefore unidentifiable.

The *Phoca chorisi* of Lesson, founded on a figure by Choris, published without any descriptive detail (Voy. Pittoresque, plate viii), of his 'Chien de mer de Détroit de Behring,' is likewise indeterminate.

Phoca pealii Gill is a synonym of *Halichœrus antarcticus* Peale, the latter being an avowed substitute for Peale's name.

Gray's *Halicyon ? californica*, based on the "Hair Seal, *Phoca jubata*" of Hutching (Scenes of Wonder and Curiosity in California, p. 189), has of course no standing.

Taking up the other names in chronological order, the first is the *Phoca largha* of Pallas, which has of late been revived for the large spotted seals of the North Pacific, and used, as the present material shows, for the designation of several quite distinct species. Pallas's *Phoca largha* is, however, unidentifiable and therefore not available for any of the species to which it has been applied. His description,[1] based on an imperfect skin, which lacked the head, is not diagnostic, there being no indication of the size of the animal, nor mention of any character that may not apply to any of the several species of spotted seals found along the coast of Kamschatka. He gives the Russian name as 'Nerpa,' and says that it is also called 'Largha' on the eastern coast of Kamschatka. According to Mr. Buxton's notes, the name Nerpa is applied,

[1] "P. capite — — — corpore supra nitide albente, maculis nigris ovalibus sparso." —Zoog. Rosso-Asiat., I, 1811, p. 133.

on the Siberian coast, to *Erignathus barbatus*, and the name Largha to the larger spotted seal of the same region.

The history of the use of the name *Phoca largha* Pallas is briefly as follows: In 1850 (Cat. Seals, p. 54) and later (Cat. Seals and Whales, 1870, p. 24) Dr. J. E. Gray identified it with Temminck's *Phoca nummularis*. It having been found that the spotted seals of the Pribilof and Commander Islands were not *Phoca vitulina*, Pallas's name *largha* has recently been applied to them, without, however, any discussion of its availability. It appears to have been first used in such a connection by Dr. L. Stejneger in 1896, in his report on 'The Russian Fur-seal Islands' (Bull. U. S. Fish. Comm., Vol. XVI, 1896, p. 21), where *Phoca largha* appears in a brief enumeration of the marine mammals occurring on the Commander Islands. When this report was republished two years later in Jordan's 'Report on the Fur Seals and the Fur-Seal Islands of the North Pacific' (Part IV, 1898, p. 30) a footnote was added, referring to the name *Phoca largha*, stating: "During 1896 there were killed 49 'Nerpi' on Bering Island and 22 on Copper Island," thus again connecting the name Nerpa with *Phoca largha*. Mr. F. W. True in 1899 (Jordan's Fur Seal Report, Part III, p. 351), in a paper on the 'Mammals of the Pribilof Islands,' tentatively used the name "*Phoca largha* Pallas ?" for "the hair seal found about the islands," apparently taking Dr. Merriam as his authority for its probable identification "with the *P. largha* of Pallas."

It is doubtless on this basis that the name was used, *passim*, in the same volume by Messrs. Stiles and Hassell in their memoir on the 'Internal Parasites of the Fur Seal,' in enumerating the hosts of the various species of parasites there described. The name has since been accepted in the same sense by Mr. Witmer Stone (Proc. Acad. Nat. Sci. Phila., 1901, p. 43); by Mr. D. G. Elliot (Synop. N. Am. Mamm., Dec., 1901, p. 363), and by Miller and Rehn (N. Am. Mamm., Dec., 1901, p. 194). The material now in hand and referred to respectively by Stejneger, Merriam, True, and Stone, shows that the name as used by these authors covers three very distinct species, as will be shown later in the present paper.

Pallas's *Phoca ochotensis* (Zoog. Rosso-Asiat., I, 1811, p. 117) seems available for the larger spotted seal of the Okhotsk Sea, as will be shown later in treating of that species.

The next name requiring careful consideration is the *Phoca nummularis* Temminck (Fauna Japonica, Mamm. Marine, 1842, p. 3). He says: "Le troisième Phoque des parages septentrionaux de l'océan pacifique nous est connu d'après trois jeunes individus et d'après un nombre égal de peaux incomplètes d'individus adultes, tous rapportés du Japon par M.M. de Siebold et Bürger. C'est évidemment le deuxième Phoque de Steller, Descr. du Camtsch. p. 107, et l'espèce dont Pallas fait mention en traitant du Phoque commun, l. c. [Zoog. Rosso-Asiat., I,] p. 117, nota 2; puis le Phoque, figuré sans le moindre détail descriptif, dans le voyage de Choris, Pl. 8, sous le nom de Phoque du détroit de Behring; peut-être convient-il également de rapprocher de cette espèce inédite le *Phoca largha* de Pallas, ibid. p. 113, nº 43. Quoi qu'il en soit, nous avons cru devoir conférer à ce Phoque le nom qu'il porte, suivant Pallas, l. c. p. 117, chez les Russes, savoir celui de Phoque nummulaire, *Phoca nummularis*."

Temminck describes his six skins in detail, and comments upon their wide range of color-variation. He also describes the three imperfect skulls that accompanied the skins, and points out their resemblance to the skull of the "Phoque à croissant [*Phoca grœnlandica*], notamment par la configuration de la région interorbitaire, qui est, par devant, plus large que dans le crâne du Phoque annelé [*Phoca hispida*]. Quant au système dentaire, il n'offre pas la moindre disparité de celui du Phoque à croissant et du Phoque annelé." He concludes: "Ce Phoque est en quelque sorte intermédiaire entre le Phoque à croissant . . . et le Phoque annelé . . .; car il offre beaucoup d'analogie avec le premier par la configuration de son crâne, notamment par celle de la région interorbitaire ainsi que par celle de ses dents, tandis qu'il se rapproche davantage du second par son système de coloration."

Later the skull fragments described by Temminck were examined by J. E. Gray, who states (Proc. Zoöl. Soc. London, 1864, pp. 31, 32) that "they are nearly all from very young

specimens of nearly the same age." He compares these fragments with the corresponding parts in *Phoca fœtida* and says: "The general form and size of the face, and the form of the teeth, are very similar to those of a skull of *Pagomys fœtidus* of the same age." He adds that "the grinders" are "larger, thicker, and rather closer together, the central lobe of the grinders being considerably larger, thicker, and stronger, and all of the lobes of the grinders being more acute." Gray's comparative measurements of *Phoca fœtida* and *P. nummularis* show that the latter is very much smaller than *P. fœtida* and indicate a species much below the size of any species of *Phoca* known to me. The name *Phoca nummularis*, therefore, cannot apply to any of the species represented by the material here under consideration. All that we thus far know of *Phoca nummularis* points to a species very similar in coloration to *Phoca fœtida*, but smaller and with heavier dentition—features which may characterize a species of seal found in Japan, and still practically unknown, and certainly not known to occur elsewhere.

The next name in order of date is *Halichœrus antarcticus* Peale. As long since pointed out by Dr. Gill (Proc. Essex Inst., Vol. V, 1866, p. 4, footnote), "The *Halichœrus antarcticus* of Peale . . . is a typical species of *Phoca*"; and he adds that it "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 [Desolation Island], and as a change of name is desirable, I would propose that of *P. pealii*." I have examined this skull,[1] but cannot quite agree with Dr. Gill in his determination of the species. It is a rather young skull and apparently a female, but in one important particular it does not agree with the Harbor Seal occurring along the Pacific coast of the United States. Since, however, it does agree with the Atlantic coast form, the name must be synonymized with *Phoca vitulina*. Where the skull actually came

[1] See Hist. N. Amer. Pinnipeds, 1880, pp. 580, 581, figs. 44, 46.

from, and how it obtained its erroneous locality label, are mysteries that will probably never be solved. As shown by my figures of the specimen (*l. c.*, p. 580, fig. 45), the premaxillæ scarcely reach the nasals, instead of touching them for a greater or less distance, as in all of the Pacific coast specimens of the *Phoca vitulina* group available for examination (see *postea*, p. 471). We are thus fortunately able to avoid the use of the very objectionable name *antarcticus* for any of the North American species of *Phoca*.

The next name in order of date is the *Halicyon richardii* of Gray, 1864 (P. Z. S., 1864, pp. 28–31, figs. 1 and 4), based on specimens from "Fraser's River and Vancouver Island." Later (Cat. Seals and Whales, 1866, p. 301) these are said to consist of a skeleton from Fraser's River and a skull "obtained from the west coast of Vancouver's Island." Mr. J. W. Clark, however, says (P. Z. S., 1873, p. 336) that *Halicyon richardii* Gray was "described from a single skull from Vancouver Island." Which of the skulls is figured is not stated. The name is available for the Hair Seal of Vancouver Island and neighboring coasts, and is the first name unequivocally pertinent to any North Pacific seal of the *Phoca vitulina* group.

Sexual Differences in Dentition in Phoca vitulina.[1]

Figs. 1–4.

There are eleven skulls of Harbor Seals in the osteological collection of the American Museum of Natural History, of which ten have the sex indicated, the specimens having been received at the Museum in the flesh from various menageries, chiefly from the Central Park Menagerie and the Aquarium, New York City. They are all 'young adults,' from unknown localities, but presumably all are from the eastern coast of the United States and probably mostly from the coast of Maine. The sexed skulls embrace three males and seven

[1] In the absence of a series of authentic skulls of the true *Phoca vitulina* of Europe, the name is here used only tentatively for the so-called Harbor Seal of the Atlantic coast of North America. This seal certainly differs from any seals of the Pacific coast of North America, and in all probability is separable from the Harbor Seal of Europe. In case this proves to be as here conjectured, the name *Phoca concolor* Dekay, as said above, will be available for the seal of the eastern coast of the United States.

females. In addition to these are two skulls from the coast of Maine, sexed as male and female, received for examination from the U. S. National Museum, making 13 in all. This material shows that the toothrow in the females is fully as long as in the males, but that the individual teeth are very much heavier in the males, so that while in the females the teeth, except pm^2 and pm_3, stand in a straight line one behind the other, with little or no obliquity of insertion, in the males the teeth are so much larger that there is not room for them in a straight line, and the axis of insertion for two of the upper and three of the lower teeth (pm^{2-3} and pm_{2-4}) is more or less oblique to the axis of the jaw, the divergence in the two axes amounting in some cases to fully 45°.

Male. — In the male pm^1 is small and conical and generally has a more or less oblique insertion at the postero-inner base of the canine; pm^2 and pm^3 are much larger, subequal, and inserted obliquely to the axis of the toothrow, the angle being greater in pm^2 than in pm^3, and varying in different individuals; in pm^4 and m^1 the axis of insertion is usually parallel to the axis of the tooth row.

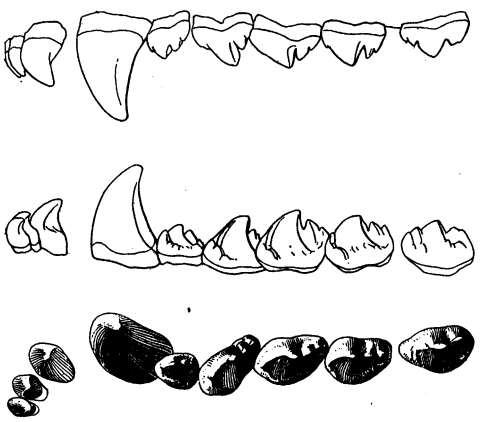

Fig. 1. *Phoca vitulina*, 'young adult' ♂. Am. Mus. No. 13969, probably from coast of Maine. Upper dentition, outside, inside, and crown views of teeth. Nat. size.

The upper teeth, except pm^1, are usually tricuspid, pm^2, pm^3, and pm^4 having a main cusp — high, pointed, and directed backward —and two accessory cusps behind it, the anterior cusp being either wholly suppressed or present as a rudiment. In pm^3 the posterior cusp is sometimes suppressed or so rudimentary that the tooth is practically bicuspid instead of tricuspid. The same exceptional con-

dition occurs less frequently in pm^2. The molar is tricuspid, but in a different way, there being an accessory cusp both before and behind the main cusp; the accessory cusps are subequally developed, but generally the posterior is larger than the anterior, which latter is sometimes quite obsolete.

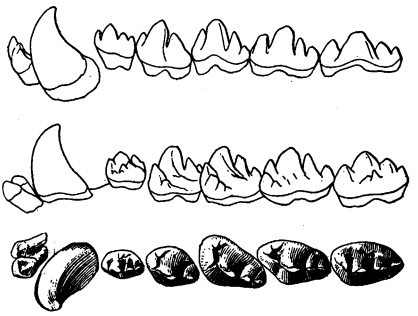

Fig. 2. *Phoca vitulina*, 'young adult' ♂. Am. Mus. No. 13969, probably from coast of Maine. Lower dentition, outside, inside, and crown views of teeth. Nat. size.

In the lower jaw the teeth are much heavier than in the upper jaw, more serrated, more crowded, and more given to the development of what may be termed adventitious cusps. Pm_{2-4} normally considerably overlap each other and have a very oblique insertion, pm^2 and pm_3 being set rather more obliquely than pm_4, the molar alone usually having the axis of insertion parallel to the axis of the tooth-row. The teeth are usually 4-cusped, but not infrequently 5-cusped, more rarely 6-cusped, there being a main, high-pointed cusp, with two well defined cusps behind it and one or two, and sometimes three, in front of it, the inner front border of the cingulum in heavy unworn teeth being often serrated with cusplets which increase in size toward the main cusp. The molar has normally four simple subequal cusps, the second or main one being the

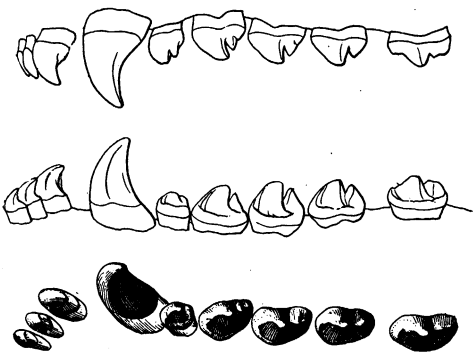

Fig. 3. *Phoca vitulina*, 'young adult' ♀. Am. Mus. No. 14442, probably from coast of Maine. Upper dentition, outside, inside, and crown views of teeth. Nat. size.

largest and the second posterior cusp the smallest; sometimes there are two points in front of the main cusp, making five in all; sometimes the last posterior cusp is obsolete or barely indicated, its development greatly varying in different specimens. In addition to the variations above noted in the number of cusps on the molar, a cusp, sometimes of considerable size, but usually rudimentary, is developed at the inner base of the main cusp, and in rare instances another, much smaller, at the base of the cusp next behind the main cusp.

Female. — The teeth are about one half smaller and less obliquely inserted than in the male, and often vary from the male dentition in the reduction of the cusps, both in size and number. The internal accessory cusps, so often seen in the male, seem to be uniformly absent.

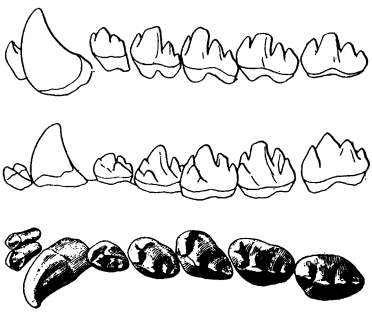

Fig. 4. *Phoca vitulina*, 'young adult' ♀. Am. Mus. No. 14442, probably from coast of Maine. Lower dentition, outside, inside, and crown views of teeth. Nat. size.

The teeth vary notably in the development of cusps in both sexes, as does also the size of the teeth. Some females have nearly as heavy dentition as some males, so that through the wide range of individual variation in this respect, one cannot be sure whether in skulls not marked for sex a skull with rather weak dentition is a heavy-toothed female or a light-toothed male.[1]

[1] Among the thirteen skulls here under consideration are three that differ strikingly from the rest of the series. Two of them were received from Messrs. Barnum and Bailey, and the other, at about the same date, from the Central Park Menagerie. These three skulls, sexed as female, uniformly differ from the others in having only three cusps instead of four on the lower molar. In one (No. 6366) there is a rudimentary second posterior cusp, about as large as a small pin point. This skull agrees with the only skull (No. 32) of known European origin available for examination, and I strongly suspect that these three aberrant skulls are also European, and that the animals were obtained through the well-known European dealer in menagerie specimens, Carl Hagenbeck. If this conjecture is correct, the difference in the form of the last molar will serve as a good distinguishing character between the females of the European and North American Atlantic coast Harbor Seals.

These same skulls differ from the other female skulls in lacking one cusp throughout both the upper and lower premolar-molar series, the upper premolars lacking the second posterior cusp, being bicuspid instead of tricuspid, while in the lower jaw there is a corresponding reduction in the number of cusps.

Comparison of the Atlantic and Pacific Forms of the Phoca vitulina Group.

The skulls of the *Phoca vitulina* group available for study from the coasts of the North Pacific and Bering Sea number 26. They include 1 from Santa Barbara Islands; 2 from Puget Sound; 1 from Yakutat Bay; 1 from Kenai, Alaska; 1 from Adakh Island, Aleutian Islands; 4 from St. Michaels. To these may be added 4 from Point Barrow; 3 from the Pribilof Islands; 4 from Bering Island; 2 from Avatcha Bay, Kamschatka; 5 from mouth of Gichiga River, Okhotsk Sea. The Point Barrow, Kamschatkan, and Okhotsk specimens, however, represent species quite distinct from those from the Pacific coast of North America. Hence the really available material for comparison with the Atlantic coast specimens consists of the skulls from the Pribilof Islands and St. Michaels, Alaska, and a few from more southern points on the Pacific coast. These are nearly all young, and not one is identified as to sex. The general appearance of the St. Michaels skulls seems to indicate that three of them are females and the other a male. These and the other Pacific coast skulls, compared with Atlantic coast skulls of closely corresponding ages, show the following resemblances and differences.

Cranial Differences. — In the Pacific coast skulls the premaxillæ ascend not only to the nasals but extend posteriorly so as to touch the sides of the nasals for about 8 to 10 mm.; in the Atlantic coast specimens the premaxillæ barely touch the nasals (in some cases do not quite reach them)—a distinction, according to Dr. True, first made known by Dr. Merriam.[1] This distinction appears to be constant in all the skulls I have examined from the Alaskan and Kamschatkan coasts, as compared with those of the Atlantic coast.

Dental Characters. — A careful comparison of the Alaska and Puget Sound skulls, tooth by tooth, with the Atlantic coast specimens, reveals no tangible differences between the

[1] *Cf.* True, in Jordan's 'Report on the Fur Seals and Fur-Seal Islands of the North Pacific Ocean,' Part III, 1899, p. 351. At a meeting of the Biological Society of Washington, held Jan. 30, 1897, Dr. Merriam is recorded (Proc. Biol. Soc. Wash. XI, 1897, p. viii) as having presented a communication on 'The Pribilof Island Hair Seal,' but the paper does not appear to have been published.

two series. In all of the Pacific coast skulls that have the general appearance of being female the lower molar has only three cusps, while all the skulls that are apparently male have four, as in the Atlantic coast form. Thus in No. 9480 (Nat. Mus.), from Kenai, No. 21476, from St. Michaels, and No. 6486 from Washington the lower molar has four cusps, as in male skulls from the Atlantic coast. The premolars are also all similar in the two series, except for the larger size of the teeth of the males, in both series. This is contrary to Dr. Merriam's discovery (as reported by Dr. True, *l. c.*), that: "In *P. vitulina* the lower premolar [=premolars ?] and molar have usually four cusps each, but in the Pribilof seal three." A large fully mature skull from the Pribilof Islands (Nat. Mus. No. 49550), apparently a female, and probably one of the skulls examined by Dr. Merriam, agrees with the supposed female skulls from St. Michaels. In another Pribilof skull, from St. George Island (Nat. Mus. No. 101330), also without indication of sex but apparently a male, the lower molar has four cusps, as in *Phoca vitulina.*

In a very old heavily ossified skull (Mus. Comp. Zoöl. No. 6157) from Santa Barbara Islands, evidently a male, the right lower molar has four cusps, and the left lower molar three, with the fourth distinctly indicated but very small.

In a series of four skulls from Bering Island, collected by Dr. Stejneger, unmarked as to sex, three of which are very old and the other quite immature, the lower molars in all of the old skulls are distinctly 4-cusped; in the young skull the left lower molar is just as distinctly 3-cusped, while the right lower molar is 4-cusped! (See Fig. 9, p. 490.) Also, in four skulls (received since the above was put in type) from San Geronimo Island, L. Cal., two of which are male and two female, the number of cusps on the lower molar varies in both sexes and also on the two sides of the same jaw from three to four.

The relative size and mode of implantation of the teeth in the jaws (both upper and lower) is the same in specimens from the west coast of North America as in those from the east coast, with the same great sexual difference in size, and in the position of the teeth in the jaw.

From the foregoing it is evident that the number of cusps, whether three or four, is in part a sexual character, and in part due to individual variation, and does not serve to distinguish Atlantic coast from Pacific coast specimens.

Supernumerary Teeth. — In addition to the tendency to the development of supernumerary or adventitious internal cusps on the last molar, and to individual variation in the number of what may be termed normal cusps, already noted, the frequency of supernumerary teeth in the seals of the *Phoca vitulina* type is a matter of interest. The series of 26 North Pacific and Bering Sea skulls contains 5 cases of supernumerary teeth, as follows:

No. 6970, Mus. Comp. Zoöl., Plover Bay, Siberia. Alveolus on left side for a supernumerary pm, in front of pm^1, apparently of nearly the normal size of pm^1.

No. 21312, Nat. Mus., Bering Island. A supernumerary incisor between i^1 and i^2 on the right side, nearly equalling in size the normal incisors.

No. 101330, Nat. Mus., St. George Island, Pribilof Islands. Supernumerary premolar on right side, between pm^3 and pm^4, about the size and shape of pm^1; on the left side a supernumerary tooth between pm^4 and the molar, also of about the size and shape of pm^1.

No. 82820, Nat. Mus., Coast of Maine. A supernumerary premolar in the lower jaw, *inside the tooth line* opposite pm_1 on the left side, larger than a normal pm_1, and in form a miniature pm_2.

No. 22, McIlhenny Collection (Acad. Nat. Sci. Phila.), Point Barrow, Alaska. A supernumerary tooth inside the tooth line on the right side, opposite pm^1, and about one third the size of a normal pm^1.

North Pacific Phocidæ.

1. **Erignathus barbatus** (*Fabricius*).

Bearded Seal.

Erignathus barbatus Murdoch, Rep. Point Barrow Exped. 1885, 95 (Point Barrow). — Nelson & True, Rep. Nat. Hist. Coll. Alaska, 1887,

259 (St. Michaels, Sledge Islands, Cape Prince of Wales, Alaska).—STONE, Proc. Acad. Nat. Sci. Phila., 1900, 43 (Point Barrow).

Siberian specimens do not appear to differ appreciably from Greenland examples, on comparison of series of six or eight skulls of each. Mr. Bogoras, however, informs me that the form occurring in the Okhotsk Sea is considerably smaller than that found along the northeastern coast of Siberia.

According to Mr. Nelson, the Bearded Seal is "rather common along the Alaskan coast of Bering Sea south to Bristol Bay." Murdoch states that it is not rare at Point Barrow, where it occurs at all seasons, but is most common in summer and autumn. On the Siberian side it ranges southward to the Okhotsk Sea, where several specimens were secured by Mr. Buxton for the American Museum. Mr. Bogoras obtained others from the Anadyr coast, northeastern Siberia.

2. **Histriophoca fasciata** (*Zimmerman*).

RIBBON SEAL.

Phoca dorsata PALLAS, Zoog. Rosso-Asiat. I, 1811, 112, part (Olotura, coast of Kamschatka = Olintorsk of modern maps). *Cf.* Nordquist, Vega-Exped. Vetensk. Iakt. II, 1883, pp. 110, 111.

Phoca (Histriophoca) fasciata TRUE, Amer. Nat. XVII, July, 1883, 798; Proc. U. S. Nat. Mus. VI, April, 1884, 417, 426, pll. xi–xiv, skull, osteological characters, and skeleton (Plover Bay, Siberia, and Cape Romanzoff, Alaska).

Histriophoca fasciata NORDENSKIÖLD, Voy. Vega, Engl. ed. 1882, 563 (fig. of animal), 565, 590 (St. Lawrence Island, Bering Sea).—MURDOCH, Rep. Point Barrow Exped., 1885, 97 (Point Barrow, rare).—TRUE, in Jordan's Rep. Fur Seals and Fur-Seal Islands, part iii, 1889, 351 (St. Paul Island, as a straggler).

Phoca fasciata NORDQUIST, Vega - Exped. Vetensk. Iakt. II, 1883, 107, figs. 16–18, skull, fig. 19, color pattern (Kamschatka).—NELSON & TRUE, Rep. Nat. Hist. Coll. Alaska, 1887, 261 (south to Cape Vancouver, Alaska).—STEJNEGER, Bull. U. S. Fish Comm., XVI, 1896, 21 (Commander Islands).

This species is restricted to the North Pacific, and appears to be rare on the Alaskan coast, and rather more common, but not numerous, on the coast of Siberia, occurring as far south, according to Von Schrenck, as the Okhotsk Sea. Pallas states that it was formerly found at the Kurile Islands.

Murdoch records it as of rare occurrence at Point Barrow, and True mentions the capture of a young female by sealers near St. Paul Island. Dall obtained specimens at Cape Romanzoff. Nelson gives its southern limit as "about the rocky shores of Nunevak Island and Cape Vancouver. Stray individuals may occur about the mouth of the Koskoquim River, but if so they are very rare."

(?) 3. **Phoca (Pagophilus) grœnlandica** (*Fabricius*).

HARP SEAL.

Phoca grœnlandica NORDQUIST, Vega-Exped. Vetensk. Iakt. II, 1883, 105 (ex *P. dorsata* Pallas). Reported as not seen east of White Island, off the Gulf of Obi.

Phoca grœnlandica NELSON & TRUE, Rep. Nat. Hist. Coll. Alaska, 1887, 263 (Wrangle and Herald Islands).—STEJNEGER, Bull. U. S. Fish Comm. XVI, 1896, 21 (Commander Islands, on the authority of previous writers.)

I have never seen a specimen of this species from the North Pacific. It was recorded in early days by Steller and Pallas as occurring on the coast of Kamschatka. Mr. Nelson mentions "a skin of a young specimen" brought to him at St. Michaels, by a native, from Cape Prince of Wales. He also states: "During the cruise of the 'Corwin' in the summer of 1881 I was fortunate enough to add a little to the known distribution of the 'Saddle-back.' While cruising among the ice about Wrangel and Herald Islands several adults were seen, some of which were within a very short distance of the vessel. On August 12, in particular, while we were steaming through the pack off the shore of Wrangel Island, two of these seals were seen close alongside. One came up within twenty yards of us and gazed curiously at the vessel as it pushed against a slowly-yielding mass of ice. The chestnut brown of the animal's head was very conspicuous, and I called Captain Hooper's attention to it, whereupon he said that he had seen a number of these animals in the pack along this coast while there the previous year. This is good evidence that the Saddle-back is a regular and not uncommon summer resident of the ice-pack northwest of Bering Straits, and it probably winters there as well. South of Bering Straits its range

appears to coincide very closely with that of the Ribbon Seal, but it is very much less common."

As already said, I have never seen a specimen of *Phoca grœnlandica* from the North Pacific, nor from Bering Sea, nor can I find any record of a specimen taken in these waters except as recorded by Pallas, who refers, under his *Phoca dorsata*, to its occurrence "in mari Camtschatico praesertim circa Olutora observatur, indeque versus arcticum fretum passim habitat." As his *Phoca dorsata* has been currently synonymized with *Phoca grœnlandica* (as it obviously is in part), the Kamschatkan record has been accredited to *Phoca grœnlandica*. Temminck mentions having seen three skins obtained at "Sitka," but this locality is obviously erroneous.

In writing to Dr. Stejneger, while preparing this paper, I expressed doubt of the occurrence of *Phoca grœnlandica* in the North Pacific or adjacent arctic waters, and asked him to kindly inform me whether Nordquist recorded specimens taken there during the voyage of the 'Vega,' the report on the scientific results of this voyage not being then accessible to me.[1] Under date of November 7, 1902, he says: "His [Nordquist's] only authority for *Ph. grœnlandica* in Kamschatka is the assumption of its identity with Pallas's *Ph. dorsata*, and he adds (p. 106): 'In the Zoöl. Museum of the Academy of Sciences in St. Petersburg there are found a few skulls and skins under the name of *Phoca dorsata* with the statement that they are from Kamschatka. They belong without doubt to females and young males of *Phoca fasciata*. . . . For the present the occurrence of this species in the Pacific seems very improbable.' "

The vicinity of Wrangel Island is of course outside of the geographical limits of the present paper; but Mr. Nelson's observations are of special interest in this connection as extending the known range of *Phoca grœnlandica* far to the eastward of its previous recorded occurrence. Nordquist states that it was not observed on the 'Vega' Expedition east of White Island, near the mouth of the Gulf of Obi,

[1] Through the kindness of Dr. Stejneger I have been able, since this matter was put in type, to consult Nordquist's Report.

although the region to the eastward was traversed and the 'Vega' wintered off the northeast coast of Siberia.

Although there is no satisfactory evidence of the occurrence of *Phoca grœnlandica* in the North Pacific nor in Bering Sea, the species is included partly for the reason of its previous records from this region, and partly for the purpose of calling attention to the unsatisfactory evidence of its claim to a place in the list of North Pacific seals.

4. **Phoca (Pusa) hispida** (*Schreber*).[1]

RINGED SEAL.

Phoca fœtida NORDQUIST, Vega-Exped. Vetensk. Iakt. II, 1883, 104 (Bering Island).—MURDOCH, Rep. Point Barrow Exped. 1885, 95 (Point Barrow). — NELSON & TRUE, Rep. Nat. Hist. Coll. Alaska, 1887, 261 (Unalakleet and St. Michaels, Alaska). — STEJNEGER, Bull. U. S. Fish Comm. XVI, 1896, 21 (Commander Islands). — STONE, Proc. Acad. Nat. Sci. Phila. 1900, 44 (Point Barrow).

This species is abundantly represented in collections from Point Barrow, where it is reported by Murdoch as common at all seasons. Stone records 28 specimens (skulls) as collected there by the McIlhenny expedition. There are also specimens in the U. S. National Museum from St. Michaels, Alaska, and Plover Bay, Siberia, and Stejneger has recorded it from the Commander Islands. Specimens were collected for the American Museum by Mr. Buxton in the Okhotsk Sea, which differ in smaller size and weaker dentition from the Point Barrow specimens, and seem to represent a recognizable subspecies, described below. The Point Barrow specimens, collected by McIlhenny, which, through the kindness of the authorities of the Wistar Institute of Philadelphia, I have been able to examine, agree well with nearly as many Greenland (Davis Strait and Baffin Bay) specimens in the American Museum.

Phoca hispida presents a wide range of purely individual variation in the size and the structure of the teeth. The teeth vary in size in different specimens of the same sex from the same locality by fifty per cent, the teeth in some speci-

[1] *Phoca hispida* Schreber (pl. lxxxvi, 1775) has one year priority over *Phoca fœtida* Fabricius (O. F. Müller's Zool. Dan. Prod., p. viii, 1776).

mens being twice as heavy as in others. An equally noteworthy variation is seen in the number of cusps on the teeth of the premolar-molar series. In the upper teeth pm^1 has usually two cusps, but sometimes three. The other teeth have usually three cusps, but pm^2 and pm^3 have often only two, the anterior cusp being wholly suppressed; quite as often pm^2 or pm^3, or both, have four cusps, through the development of an anterior cusp and of two posterior cusps. Frequently the corresponding teeth on the two sides of the jaw vary in the number of cusps. While the difference is not sexual, extra cusps appear to be more frequently developed in the male than in the female.

In the lower teeth pm_1 and the molar usually have three cusps each, and pm $_{2-4}$ have usually four each. The lower molar is of special interest in comparison with the lower molar in *P. vitulina*, *P. richardii*, and *P. ochotensis*, in which the number of cusps varies from three to four. In *Phoca hispida* in about 33 per cent of the skulls the molar has four cusps, and in the other 66 per cent only three cusps. In about 12 per cent the molar on one side of the jaw has three cusps and on the opposite side four cusps. The difference is not sexual, since males and females occur in both series.

5. **Phoca (Pusa) hispida gichigensis,** subsp. nov.

OKHOTSK SEA RINGED SEAL.

Type, No. 18276, ♀, young adult, Gichiga, Okhotsk Sea, Oct. 12, 1900; N. G. Buxton, Jesup North Pacific Expedition.

Similar to *P. hispida*, but very much smaller, and with relatively weaker dentition.

This subspecies is represented by two skins and their skulls, both young females, taken at Gichiga, on the western coast of the Okhotsk Sea. One of the skulls is complete; the other consists of only the lower jaw and the rostral portion of the skull, including the complete dentition.

The external measurements of one of the specimens (No. 18277) are as follows: Total length, 770 mm.; tail, 90; hind foot, 190. The other specimen, of which apparently no measurements were taken, is somewhat larger.

The type skull measures as follows: Basal length, 139 mm.; greatest zygomatic breadth, 86; mastoid breadth, 92; front edge of intermaxillæ to pterygoid hamuli, 75; front border of incisors to posterior border of

molar, 42; front of intermaxillæ to meatus auditorius, 96; palatal length (on median line), 58; palato-maxillary suture to anterior border of foramen magnum, 86; palatal width between the molars, 27.5; length of upper premolar-molar series, 29; length of nasals, 35; breadth of nasals at middle, 5.5; least interorbital breadth, 7; length of brain-case, 65; greatest width of brain-case, 82; length of lower jaw, 86; length of lower premolar-molar series, 30.

The skins have lain saturated with oil for nearly two years, and doubtless the general color has thereby been more or less altered. The upper surface is now yellowish brown, the sides and back inconspicuously marbled with dark brown or blackish; the spots are irregular in size and shape, and are often confluent. The ventral surface is yellowish white, wholly unspotted.

The small spotted seal of Bering Sea has commonly been referred to *Phoca hispida*. I have had before me some 30 or more skulls from Bering Sea and adjacent waters (5 from St. Michaels, 1 from Unalakleet, 1 from Port Clarence, 1 from Point Barrow, and 3 from Plover Bay, Siberia) which present no tangible differences from a large series from Greenland. On the other hand, the two female skulls from Gichiga are notably smaller, with relatively much weaker dentition. A larger series from the Okhotsk Sea might bridge over the difference in size, but there are strongly marked differences in other features. Although there is a wide range of individual variation in size among female skulls of *Phoca hispida*, I find none in the large series now available for examination as small as the two Gichiga skulls, in which the length is 12 to 15 mm. shorter than in average specimens of *P. hispida*.

More important differences consist in the much weaker dentition, and in the relative length of the premaxillary portion of the palatal floor and the correlated differences in the length and shape of the anterior palatine foramina. The upper toothrow is about one-tenth shorter than in the smallest Greenland and Bering Sea examples, and the teeth themselves are more than correspondingly less robust than this difference would necessarily imply, the teeth being very narrow in their transverse breadth and hence far more delicate in general size and structure.

The anterior palatine foramina are relatively much shorter and broader than in *P. hispida*, with a quite different contour,

shown especially in the more shallow hollowing of their anterior portion. Their shortness is due to the shortness of the premaxillary portion of the palate, which is one-fifth shorter than in *P. hispida*. In view of these differences the Okhotsk Sea form seems well entitled to subspecific recognition.

6. **Phoca ochotensis** *Pallas.*

OKHOTSK SEAL.

Figs. 5–6.

Phoca ochotensis PALLAS, Zoog. Rosso-Asiat. I, 1811, 117 (Okhotsk Sea).

Type of present description, No. 18169, ♀ ad., mouth of Gichiga River, Okhotsk Sea, Aug. 17, 1901; N. G. Buxton, Jesup North Pacific Expedition.

General color above yellowish olive-brown, profusely marked with small, irregular, dark brown and blackish spots, most numerous and largest over the median area; below yellowish or ochraceous brown, with fewer and more sharply defined spots of black. Tail dark above and much spotted, lighter and unspotted on the sides and below. Upper surface of feet heavily spotted, the lower surface without spots. Whiskers white, crenulate for the basal third, the apical portion straight and smooth; longest whiskers 75–90 mm. in length. Nails dark brown or blackish, long and narrow. The digits of the manus recede in length from the 1st to the 5th, the front border of the manus being much less square than in *Phoca vitulina* and *P. stejnegeri*. There seems to be no sexual difference in color and very little in size.

Measurements. — Total length, 1470 mm.; tail, 130; hind foot, 265. Two other males and a female range in total length from 1340 (female) to 1470 (male) mm.

Skull. — The skull is long and narrow in proportion to its breadth, with the rostral portion greatly attenuated in comparison with any of its allies, perhaps most resembling in general outline that of *Phoca grœnlandica*. The audital bullæ are very large and greatly inflated, the portion forming the meatus auditorius much produced and sharply constricted from the bulla, as in *Phoca grœnlandica*. The premaxillæ are in contact with the nasals for a short distance, and the frontals extend further forward along the nasals then in *P. vitulina*. The dentition differs strikingly from that of any of the allied species, the teeth being intermediate in stoutness between those of *P. grœnlandica* and *P. vitulina*, stand in a straight line, and are separated by well-marked diastema. The upper premolar-molar series are all bicuspid; there is a high main cusp, with the point curved backward, and a small accessory cusp behind it; in front of the main cusp the cingulum is strongly beaded, with, in some specimens, an incipient cusp. There is a similar tendency to the

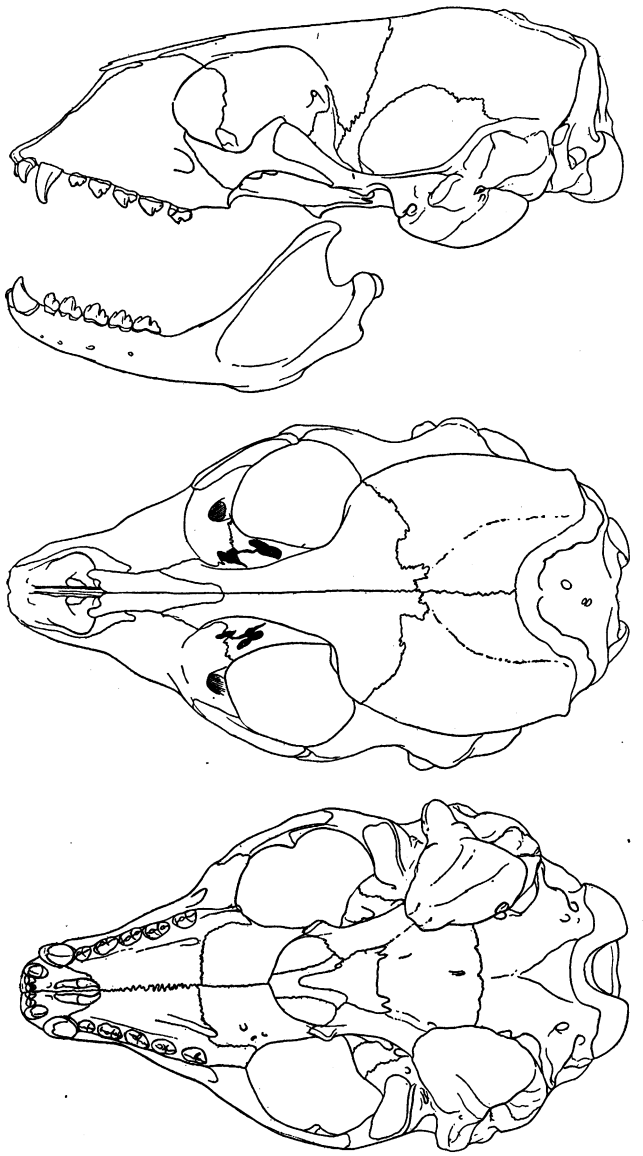

Fig. 5. *Phoca ochotensis.* Type of present description. Am. Mus. No. 18169, ♀ ad., Okhotsk Sea. Lateral, superior, and palatal views of skull. ⅔ nat. size.

development of a minute cusp behind the secondary cusp, especially on pm^3 and pm^4. The posterior three lower teeth are generally 4-cusped.

The same irregularity in the number of cusps, already mentioned as occuring in *Phoca vitulina* and *P. richardii*, is found in *P. ochotensis*. The lower molar, however, appears to be pretty uniformly 4-cusped, with quite frequently an 'adventitious' cusp at the postero-inner base of the main cusp.

The only complete skull is that of the type, an adult female, which measures as follows: Basal length, 200 mm.; greatest zygomatic breadth, 114; mastoid breadth, 117; front border of premaxillæ to pterygoid hamuli, 105; front-border of upper incisors to posterior border of upper molar, 67; front border of premaxillæ to meatus auditorius, 142; palatal length (along median line), 78; palato-maxillary suture to pterygoid hamuli, 44; palato-maxillary suture to interior border of foramen magnum, 130; palatal width between the molars, 42; length of upper toothrow, 45; length of nasals, 43; breadth of nasals at fronto-maxillary suture, 12; least interobital breadth, 14; length of brain-case, 85; greatest width of brain-case, 91; length of lower jaw, 129; lower toothrow, 46. The male skulls are imperfect; the parts preserved include the frontal portions, with the complete dentition, and indicate that the males are somewhat larger than the females, with rather heavier teeth.

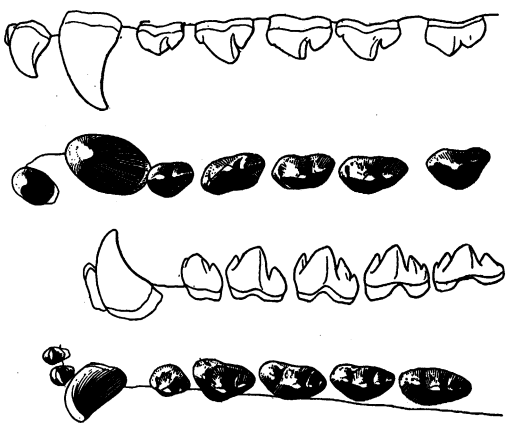

Fig. 6. *Phoca ochotensis.* Am. Mus. No. 18169. Outside and crown views of upper and lower teeth. Nat. size.

This species is represented by five specimens (skins and skulls), collected by Mr. N. G. Buxton on the Taiganose Peninsula, 20 miles south of the mouth of the Gichiga River, August 17 and 18, and September 4, 1901.

In cranial and dental characters *Phoca ochotensis* is intermediate between *Phoca vitulina* and *P. grœnlandica*, but is widely distinct from either. Subgenerically it is a *Phoca* and

not a *Pagophilus*, lacking the flattened frontal region, the square palatal border, and extensively ossified narial septum of the latter, while the dentition is considerably heavier. In general form the skull is much more elongated and relatively much narrower than in *Phoca vitulina*, with markedly weaker dentition.

Pallas gave the name *Phoca ochotensis* to a small spotted seal found in the Okhotsk Sea, which he says was especially abundant between "Tanisk" and "Ishiga" (= Tansk and Gichiga of modern maps). His long description is not especially diagnostic, but seems to point to the present species, particularly in his reference to its slenderer and more graceful form as compared with its congeners. His description of the under parts as "subtus maculis subquadratis sparsis, obsolete testaceis, sub collo crebrioribus," is characteristic of the present species in contradistinction to *Phoca hispida gichigensis*, the only other form of *Phoca* known from the Okhotsk Sea. A definite type locality is given by Pallas, at which the present specimens were taken, and which are therefore topotypes. His statement "auriculæ externæ minutæ nigricantes" might seem to indicate an eared seal, but the whole tenor of his description shows conclusively that his *Phoca ochotensis* is a species of *Phoca*.[1] Besides, a minute blackish rim around the ear opening is distinguishable in the present specimens, and in one is quite noticeable. It is doubtless this to which he refers in describing the ear.

7. **Phoca ochotensis macrodens,** subsp. nov.

SIBERIAN SEAL.

Phoca largha STONE, Proc. Acad. Nat. Sci. Phila. 1900, 43 (Point Barrow, Alaska). Not *Phoca largha* of Stejneger, True, and others as applied to specimens from Bering Island, Pribilof Islands, etc.

Type, No. 83447, U. S. Nat. Mus., young adult (♂), Avatcha Bay, Kamschatka, 1896; Dr. L. Stejneger.

Similar in dental and cranial characters to *Phoca ochotensis* but with much heavier dentition, and the teeth less separated, especially in the lower jaw. The external characters are not known.

Skull. — Similar in general conformation to that of *Phoca ochotensis*,

[1] That he knew the eared seals is shown by his description of his *Phoca leonina* (= *Eumetopias jubata* = *E. stelleri* auct.) and *Phoca nigra*, which latter is based primarily on a young fur seal from the Kurile Islands, recently named *Callorhinus kurilensis*, but which must apparently be called *Callotaria nigra*.

the rostral portion of the skull being similiarly narrow and elongated in comparison with the other species of *Phoca*. The type skull, which is apparently that of a 'young adult' male, measures as follows: Basal length, 205 mm.; greatest zygomatic breadth, 112; mastoid breadth, 117; front border of premaxillæ to pterygoid hamuli, 106; front border of upper incisors to posterior border of upper molar, 61; front border of premaxillæ to meatus auditorius, 143; palatal length (along median line), 78; palato-maxillary suture to pterygoid hamuli, 44; palato-maxillary suture to anterior border of foramen magnum, 128; palatal width between the molars, 39; length of upper toothrow, 43.5; length of nasals, 45; breadth of nasals at fronto-maxillary suture, 11; least interorbital breadth, 11; length of brain-case, 85; greatest width of brain-case, 93; length of lower jaw, 128; lower toothrow, 43. An adult skull, apparently female, is smaller, the principal dimensions being as follows: Basal length, 182; zygomatic breadth, 102; mastoid breadth, 106; front border of premaxillæ to pterygoid hamuli, 94; front border of premaxillæ to meatus auditorius, 128; palatal length (along median line), 70; palato-maxillary suture to foramen magnum, 115; palatal width between molars, 35; length of upper toothrow, 40; length of nasals, 37; width of nasals at fronto-maxillary suture, 9; length of lower jaw, 112; lower toothrow, 38.5.

This form ranges from the southeastern coast of Kamschatka north to Point Barrow, Alaska, and is represented by the following specimens, which are skulls only: Avatcha Bay, Kams., Nos. 83447 and 83448, U. S. Nat. Mus., apparently male and female, both adult but not old, collected by Dr. Stejneger in 1896; Plover Bay, Siberian side of Bering Strait, No. 6783, U. S. Nat. Mus. (formerly; now No. 6970, Mus. Comp. Zoölogy), collected by Col. Buckley; Point Barrow, Alaska, No. 16761, U. S. Nat. Mus., apparently ♀, collected by John Murdoch. Also three skulls, all collected by the E. A. McIlhenny Expedition (orig. Nos. 22 and 30, Acad. Nat. Sci., Philadelphia, and No. 5390, Wistar Institute, Philadelphia), and all labelled as female by the collector. Detailed measurements are given of all these skulls in the table on p. 497.

Phoca ochotensis macrodens differs from *P. ochotensis*, so far as the skulls are concerned, in the much greater size of the teeth, which, while the toothrow is of the same length in both, are much larger and stand closer together, leaving much smaller diastema between those of the upper jaw, while in the lower jaw they are in close contact, and sometimes crowded, so that pm_2 is generally, and pm_3 is sometimes inserted

obliquely to the axis of the toothrow. The mandibular series thus closely resembles the teeth of the more delicate females of *Phoca richardii* and *P. vitulina*.

In this connection the Plover Bay skull is to me of special interest. It is a large and apparently very old male, which in 1880 (Hist. N. Am. Pinnipeds, pp. 572 and 579) I referred provisionally to *Phoca vitulina*, with the following comment: "My attention has been forcibly drawn to this matter [sexual variation] by a skull (No. 6783, Nat. Mus.) from Plover Bay (Siberian Coast of Behring's Straits), which I at first referred unhesitatingly to *Phoca vitulina*, when examined in connection with a large series from both the Atlantic and Pacific coasts of America, but later, when compared again with a smaller series, I thought it might represent a form closely allied to, but still specifically distinct from, *P. vitulina*—probably the so-called *Phoca 'nummularis.'* On collating it again with the full series first examined it seemed undoubtedly to be only an old female of *P. vitulina*. Aside from the slighter and more delicate structure of the skull, the most notable differences are the smaller, normally implanted, and even slightly spaced molar teeth, the narrowness of the facial portion of the skull, and the corresponding narrowness of the lower jaw and absence of the abrupt outward curvature of the rami at the last molar . . ." (*l. c.*, p. 572). This extract is here quoted as showing the chief points of difference between *Phoca vitulina* and *Phoca ochotensis* and its subspecies *macrodens*. This Plover Bay skull I now regard as an old male *P. ochotensis macrodens*, instead of a female *Phoca 'vitulina'* with exceptionally weak dentition and delicately developed skull. In other words, as regards dentition, there is a resemblance in the size and position of the teeth between males of *P. ochotensis* and females of *P. vitulina*.

8. **Phoca stejnegeri**, sp. nov.

BERING ISLAND SEAL.

Figs. 7–10.

Phoca largha STEJNEGER, Bull. U. S. Fish Comm. XVI, 1896, 21 (Commander Islands). No description. Not *Phoca largha* Pallas, sp. indet.

Type, Nat. Mus. No. 21310, ♂ ad., skull, Bering Island, April 16, 1883; Dr. L. Stejneger.

Similar in general features to *Phoca vitulina*, but much larger, and differing essentially in cranial and dental characters.

Light Phase. — Above deep straw yellow, profusely marked with very small sharply defined black spots, most numerous on the back, from the nose to the tail; ventral surface more sparsely spotted and general color deeper yellow. Whiskers yellowish brown, perhaps from staining, flattened, nodular for the basal half, the apical portion smooth, the longest about 90–100 mm. in length. Nails brownish black, rather short and stout. Those on the anterior digits range in length from 27 mm. on the 5th to 37 on the 1st; on the posterior digits the nails are too imperfect for measurement. The fore flippers are rather truncated, being less pointed than in *P. ochotensis*, the end of the 5th reaching to within 25–30 mm. of the end of the 1st, as against 50 mm. in *P. ochotensis*.

Dark Phase. — General ground color as in the light phase, but almost obliterated by the profuseness of the dark spots, which occupy about four fifths of the dorsal surface and rather more than one half of the ventral surface. Over the median third of the dorsal region the spots are more or less confluent, and are separated, when distinct, by very narrow, irregular spots and bands of the ground color; on the sides and below the spots are more separated and occupy only about one half of the general surface. On the limbs the dark markings form large patches, interspersed with much smaller areas of the ground color. Although the dark specimen (No. 114652, Tchipunski Bay, southeastern coast of Kamschatka) is a female, the difference is obviously not sexual, as one of the light specimens is also a female.

Young. — A young specimen (No. $\frac{13987}{18013}$, Bering Island), about one fourth grown (830 mm. long), has the ground color lighter than in the light phase of the adults — above yellowish gray profusely spotted with dusky, below pale yellow sparsely marked with dusky spots and blotches. The dark markings are more or less veiled with the lighter ground color and hence less sharply defined and grayish black rather than black, as in the adults. This specimen, though only a few weeks old, is about the size of a full-grown female *Phoca hispida*. The permanent dentition had barely cut the gums.

A fœtal specimen (No. 13990, ♂, Bering Island, March 12, 1883), about 640 mm. long, has the general color pale yellow (white in life ?), with a narrow dorsal brownish band, darkest on the head, lower part of back, and tail; upper surface of fore flippers dusky brown; hind flippers dusky grayish brown on both surfaces, less dark than upper surface of fore flippers.

External Measurements. — The principal external measurements, taken in the flesh by Dr. Stejneger, of four specimens killed on Bering Island and neighboring points on the Kamschatkan coast, are as follows:

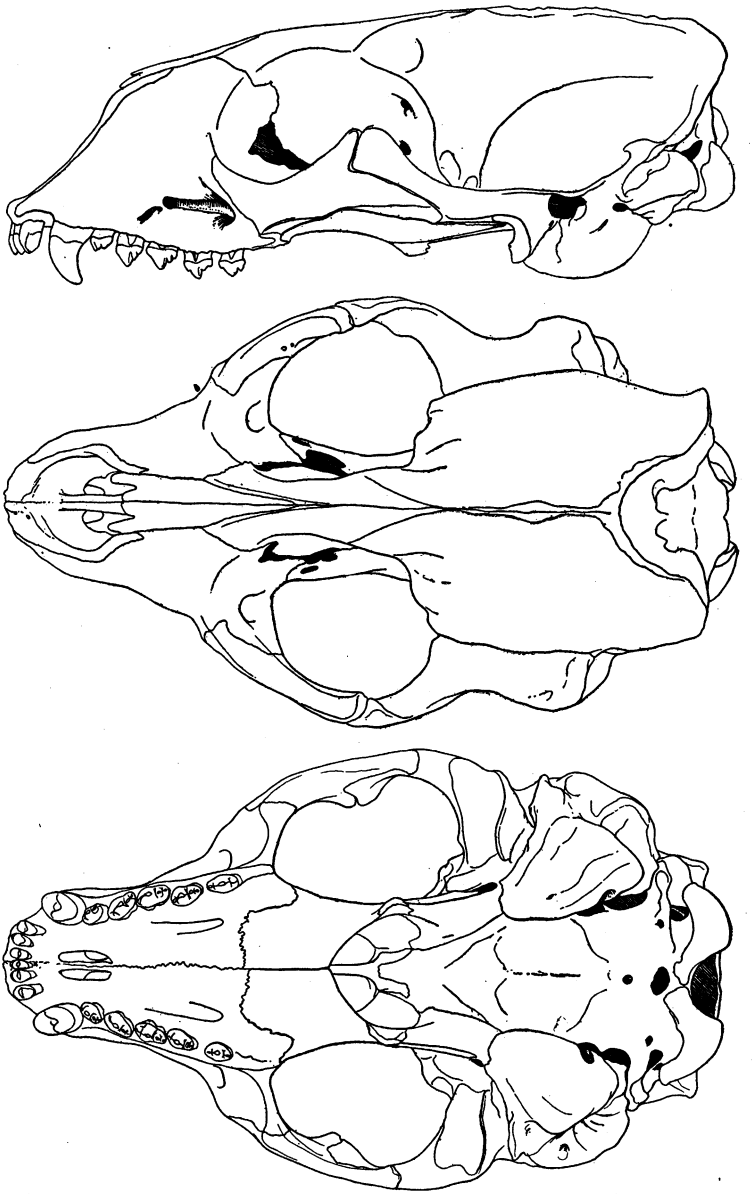

Fig. 7. *Phoca stejnegeri.* Type: No. 21310 U. S. Nat. Mus., old ♂, Bering Island. Lateral, superior, and palatal views of skull. ⅔ nat. size.

Orig. No. (Dr. Stejneger)	Nat. Mus. No.	Sex.	Length		Tail.	Hind foot.
			Nose to end of tail.	Nose to end of hind flipper.		
2609	13986/38012, Staritshkof Is., Kams.	♂ juv.	1545	1760	140	335
2610	13985/38011, Avatcha Bay, Kams.	♂ juv.	1665	1880	145	350
2767	114652, Tchipunski Bay, Kams.	♀ juv.	1680	1870	135	330
2579	13988/38014, Petropaulski, Kams.	♀ ad.	1850	2190	120	340

Skull. — The skull is fully twice as large as that of *Phoca vitulina*, from which it differs mainly, so far as general features are concerned, in its massiveness. The teeth are essentially the same as in the *P. vitulina* group (*Phoca* restr.), in which the dentition differs from that of the *Pusa* and *Pagophilus* groups in the large size of the crowded and more or less obliquely implanted teeth, the teeth in both *Pusa* and *Pagophilus* being small, placed in a straight line and separated by broad diastema. *P. stejnegeri* agrees with all of the other known Pacific and Bering Sea seals of the genus *Phoca* in the posterior extension of the premaxillæ to the side of the nasals, but differs from them in the possession of a groove in front of the infraorbital foramen for the maxillary nerve, which runs forward from the infraorbital foramen to a point opposite the middle of pm^3. As this deep, strongly defined groove is present in all of the four skulls of *P. stejnegeri* available for examination, and is uniformly absent from some thirty or more skulls of *P. vitulina*, *P. richardii*, and *P. ochotensis*, it appears to be a character of some weight.

Dentition. — Another feature of importance is found in the character of the teeth, the superior premolars 2-4 being 4-cusped in the type skull, and apparently so in the two other adults, in which, however, the teeth are too much worn for satisfactory examination. In the young (female?) skull (No. 21311), these teeth have the same conformation as in *P. vitulina*.[1] In the lower jaw pm_{2-4} are strongly 4-cusped, as is also the molar in two of the three adult skulls; in the third the molar on both sides of the jaw has been lost. In the lower jaw of the young skull pm_{2-4} on both sides, and the molar on the right side, are distinctly 4-cusped, but the molar on the left side has only three cusps. In other words, *P. stejnegeri* seems to be separable from the *P. vitulina* group by the quadricuspid instead of tricuspid superior molariform teeth.

The premolars have the same oblique position as in *P. vitulina*, varying greatly, however, in this respect with the individual. In the three adult skulls from Bering Island only pm^2 is obliquely implanted, but in

[1] The crowns of the teeth in the skulls Nos. 38011–38013 and No. 114652 have crumbled away, and these skulls therefore throw no light on the number of cusps and form of the teeth.

the young skull both pm^2 and pm^3 are set obliquely. In another very young skull (No. 38013) from Bering Island, pm^2 is strongly oblique and pm^3 is slightly oblique. In No. 114652, a young female, pm^2 on the left side is oblique, but the corresponding tooth on the right side, and all of the other premolars on both sides stand in a straight line. In No. 38011, a young adult male, from Avatcha Bay, all the upper premolars are set obliquely, while in No. 38012, also a young adult male, only pm^2, on both sides, is set obliquely, all the other teeth standing parallel to the axis of the toothrow. In No. 38014, a female from Petropaulski, all of the teeth in both jaws are set in straight lines. Thus in the maxillary series pm^2 is always strongly oblique to the toothrow, and pm^2 more or less so in male skulls, while only pm^2, and this apparently rarely, is placed obliquely in the female.

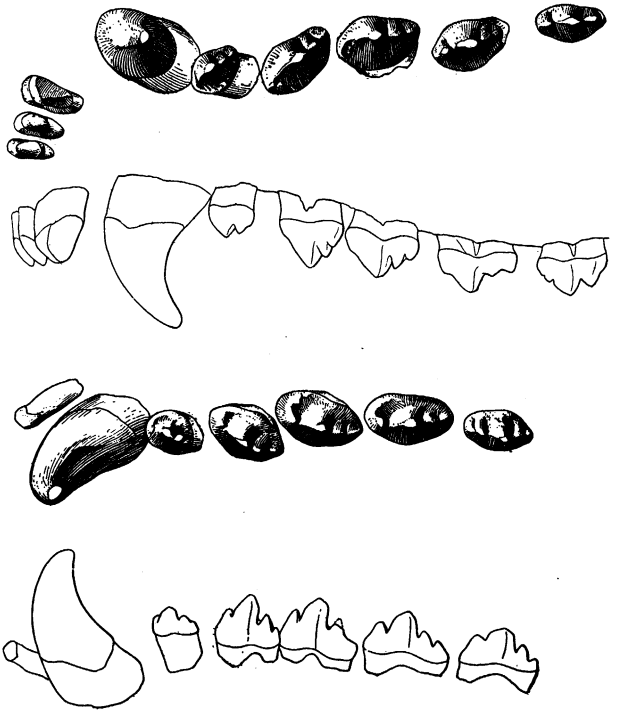

Fig. 8. *Phoca stejnegeri.* Type: U. S. Nat. Mus. No. 21310, old male. Crown and outside views of upper and lower teeth. Nat. size.

In the lower toothrow pm_2 and pm_3 and sometimes pm_4 have a position strongly oblique to the axis of the toothrow in both sexes, especially

pm_2 and pm_3, but the amount of obliquity is rather less in the female, and in one specimen (No. 38014) all of the lower premolars stand parallel to the axis of the toothrow.

Fig. 9. *Phoca stejnegeri*, very young ♀(?). U. S. Nat. Mus. No. 21311. Bering Island. Lower molars; the right lower molar in this specimen has four cusps, the left only three. Nat. size.

Measurements (type skull).—Basal length, 248 mm.; greatest zyogmatic breadth, 150; mastoid breadth, 139; front border of premaxillæ to pterygoid hamuli, 134; front border of upper incisors to posterior border of upper molar, 80; front border of premaxillæ to meatus auditorius, 235; palatal length (along median line), 103; palato-maxillary suture to pterygoid hamuli, 49; palato-maxillary suture to anterior border of foramen magnum, 148; palatal width between the molars, 50; length of upper toothrow, 52; length of nasals, 61; breadth of nasals at fronto-maxillary suture, 15; least interorbital breadth, 17; length of brain case, 91; greatest width of brain case, 100; length of upper jaw, 158; length of lower toothrow, 50.

Five additional skulls are available for measurement as regards the principal dimensions which, with the corresponding measurements of the type, may be tabulated as follows:

Nat. Mus. No.	Sex and age.	Locality.	Basal length.	Zygomatic breadth	Mastoid breadth
21310[1]	♂ very old.	Bering Island.....	248	150	139
21311	juv.	" "	190	118	118
21312	very old.	" "	225	145	127
21335	♀ ? very old.	" "	222	118	——
38012	♂ juv.	Staritshof Isl., Kams.....	230	126	137
38011	♂ "	Avatcha Bay, Kams.....	228	137	136

The skulls of Nos. 38011 and 38012 have not been cleaned, and the teeth have suffered much injury from long immersion (with the skins) in a preservative solution, but it is evident that both specimens are merely 'young adults' which had not attained their full size.

Phoca stejnegeri is a member of the *P. vitulina* group, from other forms of which it differs by its much larger size (see fig. 10, p. 494, for relative size of bullæ), and in certain well-marked characters of the skull and teeth, as already detailed. It is doubtless as variable in coloration as is *Phoca richardii* and *P. vitulina*[2], at least in some of its phases.

[1] Type.

[2] On the color variations of *Phoca vitulina cf.* Allen, Hist. N. Am. Pinnipeds, 1880, pp. 562–564.

This very distinct species is represented by four skulls from Bering Island, one of which is labeled male, but the sex of the others is not designated. Three of the skulls are very old and massive, especially the one marked male, and the other is very young, probably a yearling. In addition to these four skulls there are six skins, five of which have skulls, representing four 'young adults' (two males and two females), a fœtal specimen (without skull), and a young specimen, probably a month to six weeks old. The skins, with their skulls, have lain for eighteen years in a vat of preservative fluid (Hornaday solution); the skins on being removed from 'pickle' and prepared for examination are in fair condition, though possibly the ground color is a little discolored from staining; the skulls, however, have greatly deteriorated from the action of the solution, the bones having become softened from loss of calcareous matter, and the teeth have mostly crumbled off down to the alveoli. There is enough left of them to show their manner of insertion, and two of the skulls are susceptible of measurement as regards their general proportions; the other three are imperfect, only the rostral portion and the lower jaws being preserved. The two young specimens are from Bering Island, the adults from localities on the neighboring coast of Kamschatka,—one each being from Petropaulski, Staritshof Island, and Avatcha and Tchipunski Bays. They were all collected by Dr. Leonhard Stejneger in 1883, and of the specimens represented by skins, detailed measurements were taken by him from the fresh specimens, and form a part of the material of the present investigation. It therefore gives me great pleasure to connect his name with this fine large seal, as a slight recognition of his invaluable contributions to the natural history of the Commander Islands and neighboring regions.

9. **Phoca richardii** *Gray.*

PACIFIC HARBOR SEAL.

Halicyon richardii GRAY, P. Z. S. 1864, 28, fig. 1, skull (Vancouver Island); Cat. Seals and Whales, 1866, 30, fig. 9; Hand-list Seals and Whales, 1874, 4. — GILL, Proc. Essex Inst., V, 1866, 13 (ex Gray).

[*Phoca*] *richardsi* SCLATER, P. Z. S. 1873, 556, footnote (emendation of name).—ALLEN, Bull. Am. Mus. Nat. Hist. XVI, 1902, 225 (Alaska Peninsula).

Phoca pealii GILL, Proc. Essex Inst. V, 1866, 13 ("California and Oregon"). Not *Phoca pealii* Gill, *ibid.*, p. 4, footnote = *Halichœrus antarcticus* Peale.

Phoca pealii? SCAMMON, Marine Mamm. 1874, 164, pl. xxii, animal.

Phoca vitulina CLARK, P. Z. S. 1873, 556 (on Gray's type specimen of *Halicyon richardii*).—ALLEN, Hist. N. Am. Pinnipeds, 1880, 559, in part (Pacific Coast references only). — ELLIOTT, Seal Islands of Alaska, 1882, 28, pl. iv, in part (Pribilof Islands). — NELSON & TRUE, Rep. Nat. Hist. Coll. Alaska, 1887, 264, in part (St. Michaels, mainly).

Phoca vitulina var. *largha* NORDQUIST, Vega-Exped. Vetensk. Iakt. II, 1883, 102 (reference to skulls from Unalashka in the St. Petersburg Zoölogical Museum).

Phoca largha? TRUE, in Jordan's Rep. Fur-Seal Islands, Part III, 1899, 351 (Pribilof Islands).

The only specimens available for examination from anywhere near the type locality are two skulls from Puget Sound (Nat. Mus. Nos. 6535 and 6159), one of them badly broken, and another (Nat. Mus. No. 6486) from "Washington Territory," the two latter quite young, and all unmarked as to sex. Judging by the size and shape of the teeth the two young specimens are both females, and agree closely in every respect with specimens from the New England coast of corresponding age and known to be females, except in the single character of the greater posterior extension of the premaxillæ so as to touch the nasals.

Another skull from Yakutat Bay, Alaska (Nat. Mus. No. 98139), slightly older and unmarked for sex, is also similar; the dentition is weak but the lower molar is distinctly 4-cusped. A young skull from Kenai, Alaska (Nat. Mus. No. 9480) is like the two skulls from the Puget Sound region. Another skull from Adakh Island, Alaska (Nat. Mus. No. 14399), is very young and probably a male, pm2 and pm3, both above and below, being set very obliquely, and the lower molar being strongly 4-cusped.

Next in geographical sequence are four very young skulls from St. Michaels, Alaska (Nat. Mus. Nos. 21474–21477). Three of them appear to be females, the dentition being light

and the lower molar 3-cusped. The fourth (No. 21476) has the teeth heavier, much more crowded, and the lower molar is 4-cusped.

There is nothing to suggest, in view of the normal variability of the skulls and teeth in this and allied groups of seals, that the above enumerated ten skulls are not all referable to the same species. They are all 'young adults,' except the broken Puget Sound skull and the Yakutat specimen, which are adult, but not old.

In addition to the above are three skulls from the Pribilof Islands (Nat. Mus. Nos. 15276, 49550, 101330). The latter is much the younger and seems to be a female, on the basis of its light structure, small and non-obliquely set teeth, but the lower molar is strongly 4-cusped, a feature more commonly found in the male. Skull No. 49550 is larger and also much older, with the teeth heavier and more crowded, and the lower molar is tricuspid. No. 15276 is a very old skull (without lower jaw), and the teeth are very much worn, little but the roots being left. Its general appearance indicates it to be an extremely old male. The teeth, however, all stand in a straight line.

No. 6157 (Mus. Comp. Zoöl.), from Santa Barbara Islands, California, is an exceedingly old, heavily ossified skull, almost beyond question male. The teeth are exceedingly heavy and very little worn; pm2 and pm3 are very obliquely set in both jaws; the lower molar is distinctly 4-cusped on the left side and indistinctly so on the right side. Compared with No. 15276 from Pribilof Islands, it is more heavily ossified, the teeth are much larger, and pm2 and pm3 much more obliquely set; the teeth are not much worn, while in the Pribilof skull they are exceedingly worn.

As these pages are passing through the press I have received from Dr. C. Hart Merriam, Chief of the Biological Survey of the U. S. Department of Agriculture, four adult skulls—two male and two female—of *Phoca* collected at San Geronimo Island, off northern Lower California, by Mr. A. W. Anthony, in September, 1896, for the Biological Survey. These skulls agree closely with the Santa Barbara skull above

described in their large size and heavy dentition in comparison with true *Phoca richardii* from further north, and with the Pribilof Islands skulls. They present no other very appreciable differences than greater massiveness in general structure and dentition. The lower molar is 3-cusped in both rami of one of the males, and faintly 4-cusped on the left side and 3-cusped on the right side in the other; in one of the females the lower molar is 4-cusped in both rami, and in the other 4-cusped on the right side and 3-cusped on the left side—showing, if further evidence were needed, that the variation in the number of cusps in the lower molar is a feature merely of individual variation and not a sexual, and much less a specific character.

Phoca richardii differs from *Phoca vitulina* from the east coast (= *P. concolor* Dekay) of North America only in the slightly greater posterior prolongation of the premaxillæ, giving them a slightly more extended contact with the nasals; this feature, while somewhat variable, will suffice to distinguish the two forms at a glance. In the general conformation of the skull and in dentition the two forms are indistinguishable.

Phoca richardii differs from *Phoca stejnegeri* through the much smaller size and much less massive character of the skull, as shown in the table of measurements (p. 498), where, in a note to the table, attention is called to strictly comparable specimens of the two forms. The auditory bullæ, for example, in No. 21311, from Bering Island, a very young skull with all the sutures open, are twice the size of the auditory bullæ in No. 15276, from the Pribilof Islands, a very old skull with the crowns of the teeth almost wholly worn away. *Phoca ochotensis* has a skull so much slighter in structure and so different in proportions and dentition from *P. richardii* that no comparison of the two is necessary.

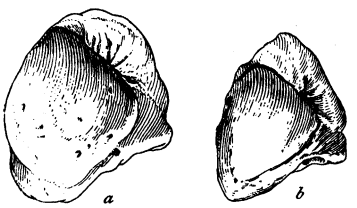

Fig. 10. Comparative views of right audital bulla of *Phoca stejnegeri* and *Phoca richardii*. *a*, *P. stejnegeri*, U. S. Nat. Mus. No. 21311, young female (?), probably less than a year old; *b*, *P. richardii*, U. S. Nat. Mus. No. 6486, a 'young adult' female.

10. **Phoca richardii pribilofensis,** subsp. nov.

PRIBILOF HARBOR SEAL.

Phoca largha ? TRUE, in Jordan's Rep. Fur-seal Islands, Part III, 1899, 351 (Pribilof Islands).

Type, Nat. Mus. No. 49550, ♀ (?) ad., Pribilof Islands, Alaska; C. H. Townsend.

The material now at hand affords a rather meager basis for separating the *Phoca richardii* group into subspecies, although its range extends from northern Lower California to the Pribilof Islands. Old skulls, comparable as to age, from the extreme points differ notably in the size of the teeth. As far as the present material goes the dentition appears to be decidedly and uniformly weaker in Alaska specimens than in those from the Puget Sound region, the type locality of *Phoca richardii*, and the northern form may without doubt be properly recognized subspecifically, on the basis especially of the Pribilof Island skulls.

An adult female skin (Nat. Mus. No. 82223), from St. Paul Island, collected by Mr. C. H. Townsend, has the under surface pale ochraceous, varied with paler streaks, and blotched rather indistinctly with dusky, the spots blacker and more distinct on the throat and sides of the neck; sides paler and more heavily and sharply blotched with blackish. The general color of the dorsal surface is silvery yellowish white, profusely marked with dark brown and blackish, the spots confluent over much of the median dorsal area, especially from the top of the head posteriorly to the middle of the back, over which extensive area the general color is blackish. This coloration, however, is not distinctive, as I have seen quite similar specimens from the Santa Barbara Islands.

11. **Phoca richardii geronimensis,** subsp. nov.

SAN GERONIMO HARBOR SEAL.

Type, U. S. Nat. Mus. No. 81520, ♂ ad., San Geronimo Island, Lower California, Sept. 13, 1896; A. W. Anthony.

The Lower California and Santa Barbara Islands form, so far as at present represented, is larger than the Pribilof

Island seal, with the dentition heavier than even that of Puget Sound specimens. In the material now in hand it is represented by a single skull (Mus. Comp. Zoöl. No. 6157), and a stuffed specimen (in the American museum), mounted with the mouth open, displaying the teeth, and by the four San Geronimo Island skulls. That these represent a well-marked subspecies there can be little doubt, characterized by large size and heavy dentition.

The table of measurements of 12 skulls of *Phoca 'vitulina'* (p. 499) from the eastern coast of North America is added for comparison with the Pacific Coast and Bering Sea skulls, from which it will be seen how closely the Atlantic coast skulls parallel those of the *Phoca richardii* group in general size and proportions, and also in details. The large size of the few Greenland specimens is also noteworthy in comparison with those from the New England coast. The first five given in the table are strictly comparable as to age. Most of the New England skulls, however, are young adults. Much more material will doubtless soon be available from the Atlantic coast, when it will be possible to study more satisfactorily this group of Harbor Seals.

MEASUREMENTS OF SKULLS OF *PHOCA OCHOTENSIS*, AND *P. O. MACRODENS*.

	Mus. No.	Sex and Age.	Locality.	Basal length.	Zygom. breadth.	Mastoid breadth.	Front bord. of premax. to pterygs. hamuli.	Front border incisors to post. border molar.	Front bord. premax. to meatus audit.	Palatal length on median line.	Palato-max. suture to foramen mag.	Palatal width between molars.	Length of upper tooth-row.	Length of nasals.	Least interorbital breadth.	Length of brain-case.	Greatest width of brain-case.	Length of lower jaw.	Length of lower toothrow.
Phoca ochotensis	18169 A[1]	♀ ad.!	Okhotsk Sea	200	114	117	105	67	142	78	130	42	45	43	9	85	91	129	—
	18172 A	♂ juv.!	"	—	—	—	100	—	—	75	—	38	43	40	9	—	—	122	40
	18170 A	♂ juv.!	"	—	—	—	—	59	—	—	—	—	44	—	—	—	—	129	43
P. o. macrodens.	83447 N[2]	♂ yg. ad.	Avatcha Bay	205	112	117	106	61	143	78	128	39	43.5	45	11	85	93	128	43
	83448 N	♀ ad.	"	182	102	106	94	57	128	70	115	35	40	37	11	76	86	112	38.5
	6783 N	♂ ad.	Plover Bay, Siberia	213	108	123	106	67	143	78	130	41	46	47	11	85	96	—	—
	10761 N	♂ ad.	Point Barrow, Alaska	195	109	117	104	61	140	81	124	36	43	41	11	79	86	—	—
	5390 N	ad.	"	—	115	—	—	—	—	84	—	44	45	46	12	—	—	134	43
	22 P	ad.!	"	183	105	—	93	58	128	71	115	36	42	41	10.5	81	93	108	40
	30 P	ad.!	"	198	100	106	90	56	123	68	113	35	39	38	11	73	88	111	38.5

[1] Type of present description of *Phoca ochotensis*.

[2] Type of *Phoca ochotensis macrodens*.

A = Am. Mus. Nat. Hist. N = Nat. Mus. P. = Acad. Nat. Sci. Phila

MEASUREMENTS OF SKULLS OF *PHOCA RICHARDII* AND *P. STEJNEGERI*.

	Nat. Mus. Mus. No.	Sex and Age.	Locality.	Basal length.	Zygomatic breadth.	Mastoid breadth.	Front border of premax. to pteryg. hamuli.	Front border of incisors to post. border molar.	Front border of premax. to meatus audit.	Palatal length on median line.	Palato-max. suture to foramen mag.	Breadth of rostrum at canines.	Palatal width between molars.	Length of upper tooth-row.	Length of nasals.	Least interorbital breadth.	Length of brain-case.	Greatest width of brain-case.	Length of lower jaw.	Length of lower tooth-row.
Phoca richardii	15276	♂ ? veryold	Pribilof Islands	214	136	127	113	65	157	74	124	41	46	45	56	14	84	94	—	—
	49550[1]	♀ ? ad.	" "	203	123	123	110	65	143	81	118	40	47	45	47	14.5	80	94	131	44.5
	101330	♀ ? yg. ad.	" "	188	107	112	95	61	132	72	115	32	42	44.5	43	14	77	90	107	43.5
	98139	♀ ? ad.	Yakutat Bay, Alaska	193	107	113	98	62	135	73	115	33	43	44	43	10	75	89	121	41
	14399	yg.	Adakh Island, "	160	95	101	79	50	99	61	93	31	35	38.3	38	14	73	85	96	40
	6486	yg.	Washington	167	98	105	84	59	117	63	102	33	38	40	36	12	72	85	—	—
	61576	♂ ? old.	Santa Barbara Island	225	142	130	119	71	167	95	134	45.5	46	43	57	15	81	96	143	44
	81520[2]	♂ ad.	San Geronimo Is., L. Cal.	225	134	131	119	68	145	91	135	48	47	55	15	82	95	44	143	46.5
	81515	♂ ad.	" " "	—	140	—	122	69	—	92	—	46	45.5	—	—	—	—	49	146	45
	81518	♀ ad.	" " "	193	121	120	105	59	139	77	120	42	45	49	12	79	92	37	122	39.5
	81517	♀ ad.	" " "	—	126	—	106	62	145	81	—	41	42	50	10	—	—	36	127	41.5
Phoca stejnegeri	21310[3]	♂ old.	Bering Island	250	149	139	136	85	185	103	149	51	51	53	62	17	90	97	167	50
	21312	♂ ? "	" "	223	145	125	116	77	168	84	134	48	53	48	—	15	84	88	149	—
	21335	♀ ? "	" "	223	—	—	118	74	167	90	132	43	47	48	51	15	83	—	145	46
	21311	yg.	" "	190	110	117	—	65	127	81	110	36.5	43	44.3	43	14.5	79	92	116	44

[1] Type of *Phoca richardii pribilofensis*.

[2] Type of *Phoca richardii geronimensis*.

[3] Type of *Phoca stejnegeri*.

NOTE.—Nos. 15276 and 21310, 14399 and 21311 are strictly comparable as to age and probably are of the same sex. The first two are very old, and the last two are very young, apparently not more than five or six months old.

MEASUREMENTS OF SKULLS OF *PHOCA 'VITULINA.'*

Mus. No.	Sex and Age.	Locality.	Basal length.	Zygomatic breadth.	Mastoid breadth.	Front border of premax. to pterygoid hamuli.	Front border of incisors to post. border of molar.	Front border of premax. to meatus audit.	Palatal length on median line.	Palato-max. suture to foram. mag.	Palatal width between molars.	Length of upper tooth-row.	Length of nasals.	Least interorb. breadth.	Length of brain-case.	Width of brain-case.	Breadth of rostrum at canines.	Length of lower jaw.	Length of lower tooth-row.
100 A	♂ ? very old.	Greenland	235	147	129	126	72	170	95	137	48	48	65	13	85	98	51	154	46
4713 N	♂ ? " "	Sable Island, N. S.	225	137	124	121	67	161	86	133	45	—	64	13	84	97	41	144	43
3034 N	♂ ? " "	"	223	144	125	124	73	161	88	131	47	49	67	12.5	85	99	45		
102 A	♂ ? " "	Provincetown, Mass.	216	128	121	110	62	141	79	119	47	45	58	14	83	97	40	134	43
5144 C	♂ " "	Beverly, Mass.	217	139	127	117	75	163	80	—	—	—	60	15	82	92	45	135	—
3506 N	♂ yg.	Greenland	170	99	105	86	53	115	62	—	36	38.5	41	12	77	88	—	105	38.5
10137 A	♀ ?	Holsteinberg, Greenland	174	103	109	88	57	117	68	104	38.5	40	42	10	77	91	31.5	111	37.5
82820 N	♂ juv.	Maine	166	102	105	87	58	120	69	96	39	40	48	14	75	87	31.5	106	39.5
82821 N	♂ "	"	169	98	104	87	56	119	67	96.5	36	41	43	11.3	72	87	31	106	40
15900 A	♀ "	"	177	100	106.5	94	58	129	73	105	36	40	45	12	75	88	31.5	112	40
14442 A	♂ "	"	171	99	107	88	55	123	65	102	38	37.5	48	12	77	87	30	111	37
6271 A	♂ "	"	168	99	103	87	56	120	65	98	38	40	46	14	73	86	34	106	40

A = Am. Mus. Nat. Hist. N = Nat. Mus. C = Mus. Comp. Zoöl.

INDEX TO VOLUME XVI.

[New names of genera, species, and subspecies are printed in **heavy-faced type.**]

ERRATA.

Page 20, line 16, for schaphiotus read scaphiotus.
" 77, second footnote, for Hrdlikča read Hrdlička.
" 164, line 16, for *tajacu-angularis* read *tajacu-angulatus*.
" 197, line 9 from bottom, for **rostratum** read **rostratus.**
" 244, line 11 from bottom, for **hudsonius** read **hudsonicus.**
" 383, insert plate heading at top of page, as follows:
BULLETIN A. M. N. H. VOL. XVI, PLATE LII.