

NORTH AMERICAN FAUNA.

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- No. 20. Revision of the Skunks of the Genus *Chincha* [*Mephitis*]. By Arthur H. Howell. Pp. 62, pls. 8. 1901-----[Out of print.]

(Continued on page 3 of cover.)



SMALL HAREM OF FUR SEAL (*CALLORHINUS ALASCANUS*).

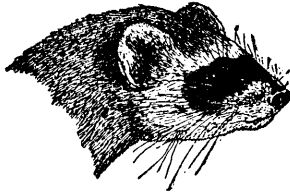
Only a few of the cows are present, the remainder having gone to sea to feed. Photograph by G. Dallas Hanna, summer, 1920, on Kitovi Rookery, St. Paul Island, Pribilof Islands, Alaska.

U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF BIOLOGICAL SURVEY

NORTH AMERICAN FAUNA

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A BIOLOGICAL SURVEY OF THE PRIBILOF ISLANDS, ALASKA

I. BIRDS AND MAMMALS

By EDWARD A. PREBLE, Assistant Biologist, Division of Biological
Investigations, and W. L. McATEE, In Charge Food Habits
Research; Bureau of Biological Survey

II. INSECTS, ARACHNIDS, AND CHILOPODS

By VARIOUS ENTOMOLOGISTS, With an Introduction
by W. L. McATEE, Biological Survey



WASHINGTON
GOVERNMENT PRINTING OFFICE
1923

LETTER OF TRANSMITTAL.

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF BIOLOGICAL SURVEY,
Washington, D. C., May 8, 1922.

SIR: I have the honor to transmit herewith, recommending that it be published as No. 46 in the series of the North American Fauna, a report on a biological survey of the Pribilof Islands, Bering Sea, Alaska, by Edward A. Preble, assistant biologist, and W. L. McAtee, in charge of food habits research, of this bureau, assisted by a number of specialists in entomology. This report treats of the birds and mammals of the group, together with the insects and related invertebrates, and the life-zone relationships of the region. The Pribilof Islands constitute a national reservation and are especially noteworthy as being the sole breeding place of the largest herds of fur seals in the world, which are the property of the United States Government and are managed by the Bureau of Fisheries of the Department of Commerce. Numbers of valuable blue foxes, which by selective breeding under normal conditions have been developed to a point of excellence nowhere else attained, are also found on the islands, as well as two herds of reindeer. The present report will be of great assistance to students and others interested in the natural history of Alaska.

Respectfully,

E. W. NELSON,
Chief of Bureau.

Hon. HENRY C. WALLACE,
Secretary of Agriculture.

CONTENTS.

	Page.
PART I. Birds and Mammals of the Pribilof Islands	1
Introduction. By Edward A. Preble.....	1
Life zone relationships. By Edward A. Preble.....	5
Birds. By Edward A. Preble and W. L. McAtee.....	10
Mammals. By Edward A. Preble.....	102
Bibliography. By Edward A. Preble.....	121
PART II. Insects, Arachnids, and Chilopods of the Pribilof Islands	129
Introduction. By W. L. McAtee.....	129
Apterygota. By W. L. McAtee.....	139
Orthoptera. By Morgan Hebard.....	140
Mallophaga. By G. F. Ferris.....	141
Anoplura. By W. L. McAtee.....	142
Homoptera. By Edith M. Patch.....	143
Heteroptera. By W. L. McAtee.....	145
Trichoptera. By Nathan Banks.....	146
Lepidoptera. By Wm. T. M. Forbes.....	147
Coleoptera. By H. F. Wickham.....	150
Mecoptera. By Nathan Banks.....	158
Diptera (Tipulidae and Rhyphidae). By Charles P. Alexander.....	159
Diptera (except Tipulidae, Rhyphidae, and Calliphoridae). By J. R. Malloch.....	170
Diptera (Calliphoridae). By W. R. Walton.....	228
Hymenoptera. By Henry L. Viereck.....	229
Arachnida. By Nathan Banks.....	237
Chilopoda. By Ralph V. Chamberlin.....	240
Index to Part I	245

A BIOLOGICAL SURVEY OF THE PRIBILOF ISLANDS, ALASKA.

Part I. BIRDS AND MAMMALS.

By EDWARD A. PREBLE, *Assistant Biologist, Division of Biological Investigations,*
and W. L. MCATEE, *In Charge Food Habits Research; Bureau of Biological*
Survey.

INTRODUCTION.

By EDWARD A. PREBLE.

THE ISLANDS.

The Pribilof Islands consist of five small islands situated in Bering Sea, in latitude 57° north and longitude 170° west, 200 miles from the nearest lands, being this distance north of the Aleutian Chain and approximately the same distance south of St. Matthew Islands. The largest and best known of the group are St. Paul and St. George, the former, about 13 miles long, with a coast line of 45 miles; and the latter, 12 miles long, with a coast line of 30 miles (Pls. II, III, and IV). The smaller islands are all close to St. Paul—Walrus, about 6 miles to the east; Otter, about 4 miles to the south; and Sealion Rock, a mere rock close to the south shore (Pl. III).

The group is of volcanic origin and the shore lines are mainly rocky, in many places precipitous (Pl. V). On St. Paul these rough stretches are interrupted by sandy beaches, which often extend for miles; on St. George, the beaches are few in number, and not extensive. Back from the shore the land usually rises, gradually sloping plateaus being surmounted by rocky or sandy eminences, in some cases the craters of extinct volcanoes. These hills are most numerous on St. Paul, where two attain elevations of 590 and 665 feet, respectively. The highest hill on St. George, Ulekhah, has an elevation of 945 feet.

The Pribilofs were discovered by Russian fur traders in 1786, while searching for the summer home of the hordes of fur seals which had been noted pushing northward each spring past the Aleutians. The islands were then uninhabited, but were at once colonized by Aleutian natives, planted there by the Russians to col-

lect the skins of the myriads of seals. In 1799 the islands passed into the hands of the Russian American Co., and there remained until 1867, when the United States purchased Alaska from Russia.

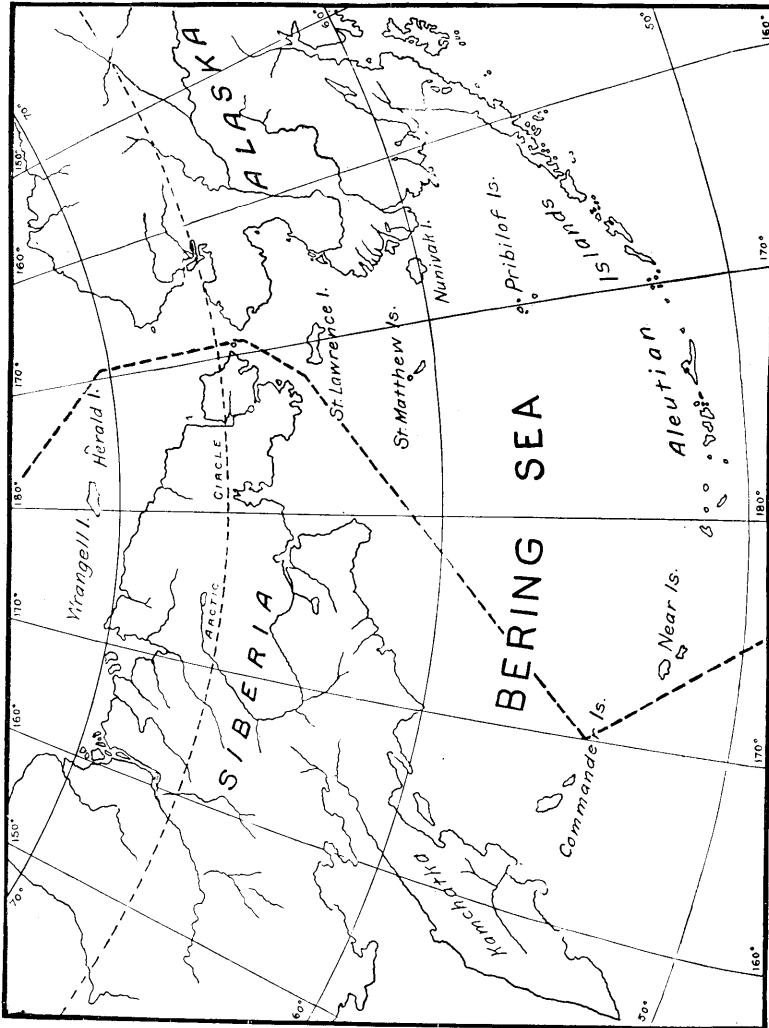
The Pribilof Islands now constitute a national reservation. In 1870 St. Paul and St. George Islands were made in effect a fur-seal reservation, under the administration of the Secretary of the Treasury. The remaining islands, Walrus and Otter, were set aside by Executive order as the Pribilof Bird Reservation in 1909, and in 1910 jurisdiction over the entire group was transferred to the Secretary of Commerce.

The three larger islands—St. Paul, St. George, and Otter—though supporting no tree growth, and only a few low shrubs, are thickly clothed with herbaceous vegetation, the moist summers inducing a luxuriance almost tropical. The list of plants includes many notable species, which, because of the peculiar summer climate, have a very long season of flowering. In consequence, large fields of arctic poppies, lupines, saxifrages, and other flowers of great beauty are found throughout the summer. Certain annuals attain so rank a growth as to add seriously to the labor of foot travel over the rougher areas.

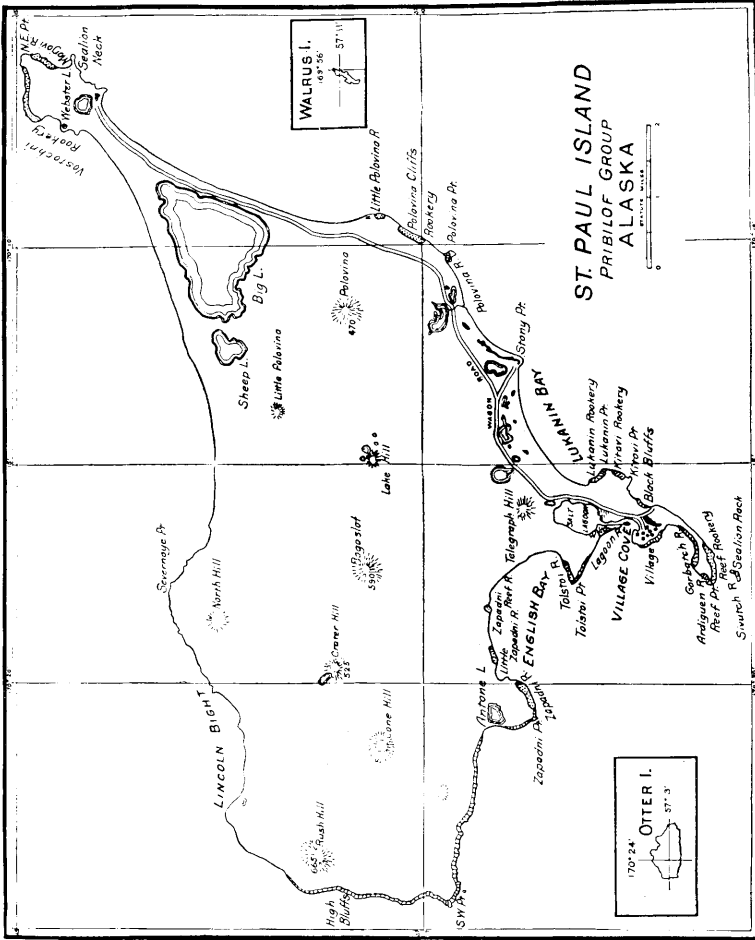
SCIENTIFIC OBSERVATIONS AND COLLECTIONS.

The teeming hordes of fur seals and the swarms of breeding sea birds seem to have interested the early inhabitants merely in a utilitarian way. It was not until 1840 that any work enumerating even the more conspicuous species of birds and mammals appeared. (See Veniaminof, 1840, in Bibliography.) William Palmer (1899, p. 360) summed up the history of the ornithological collections and observations made on the Pribilofs up to 1899, as follows:

Coinde in 1860 made a list of but nine species that were collected by an officer of the Russian Navy, Mr. Warneck, in 1852. The jealous care exercised by the Russians for the preservation of the seals prevented any outsiders from studying the avifauna, so that it was not until the islands passed under the control of this Government, and Mr. Elliott made his investigations, that any great effort was made to study the bird life. Dr. W. H. Dall had indeed in 1868 spent a short time at the islands and, together with the officers of his surveying vessel, had collected some specimens, one of which was described as new by Prof. S. F. Baird, but the first systematic investigation was made by Mr. Henry W. Elliott [in 1872 and 1873]. The result of this gentleman's work was a list of 40 species, based on copious notes and numerous specimens which were named and elaborated by Dr. Elliott Coues in Mr. Elliott's report for 1873 [=1874], and which was reprinted in 1875. Mr. Elliott made another more extensive elaboration in his monograph of the seal islands in 1882. Besides the above, various other Government expeditions which have visited the waters of Bering Sea for different reasons during the past 16 years have generally touched at the seal islands and given several naturalists opportunities for collecting and noting the bird life. Thus, Mr. L. M. Turner in 1878, Dr. T. H. Bean in 1880, Mr. E. W. Nelson in 1881, Lieut. J. E. Lutz in 1884,

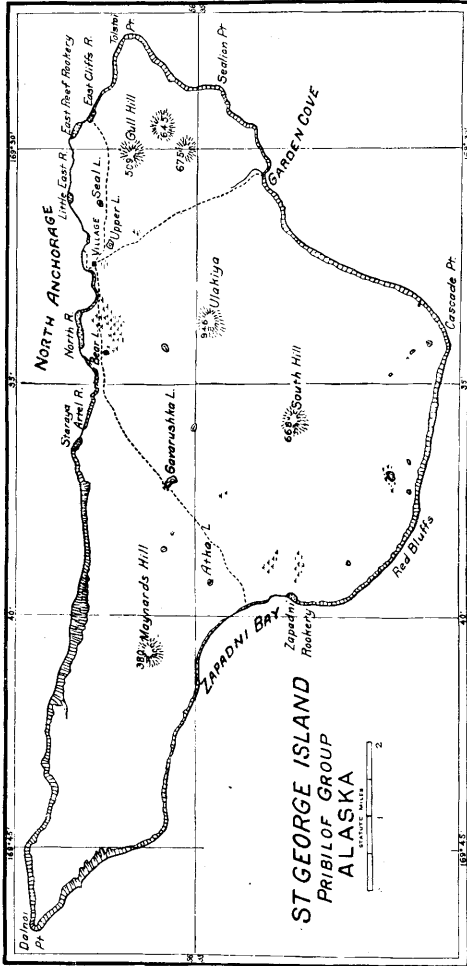


MAP OF BERING SEA, SHOWING POSITION OF PRIBILOF ISLANDS RELATIVE TO OTHER LANDS. Their central position accounts in part for the variety of their transient bird life.



ST. PAUL ISLAND, PRIBILOF ISLANDS, ALASKA.

The large extent of sandy beach affords many easy landing places.



ST. GEORGE ISLAND, PRIBILOF ISLANDS, ALASKA.

On this island the shore line is generally rocky and often precipitous, making landing difficult and hazardous.

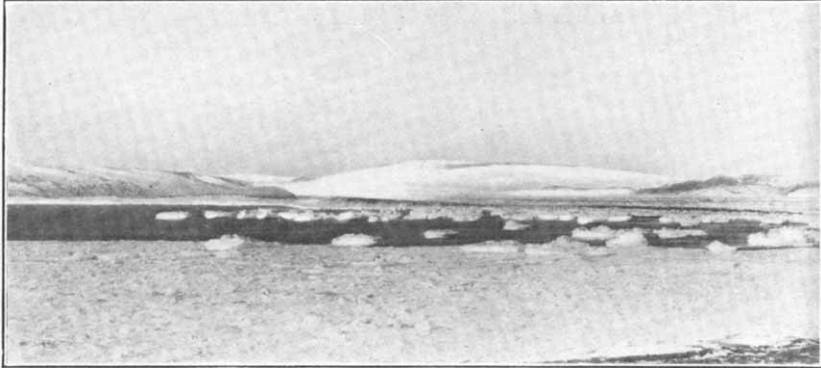


FIG. 1.—WINTER ON ST. PAUL ISLAND.

View looking toward head of lagoon from beach near Village Landing. Photograph by G. Dallas Hanna

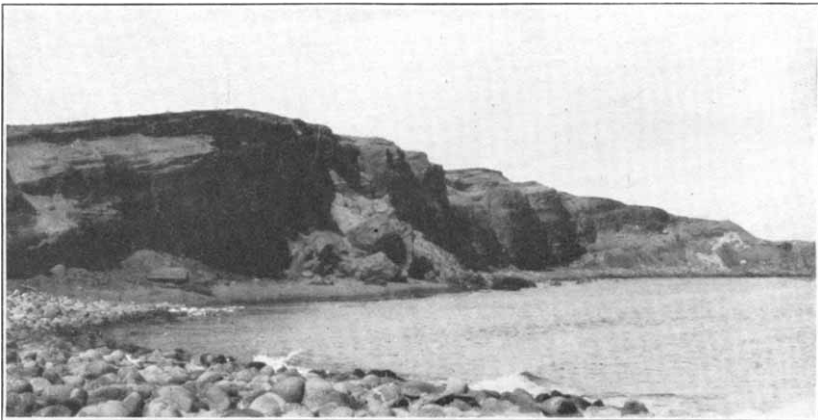


FIG. 2.—BLACK BLUFFS, NEAR VILLAGE, ST. PAUL ISLAND.

This is the most notable of the exposures of fossiliferous rock on the Pribilofs. Photograph by A. Christoffersen.



FIG. 3.—SURF-LASHED SHORE, ST. PAUL ISLAND.

In these seething waters the young seals play for hours. Photograph by A. Christoffersen.

Mr. C. H. Townsend in 1885 to 1896, myself in 1890, Messrs. F. W. True and D. W. Prentiss, jr., in 1895, Mr. F. A. Lucas in 1896-97 have spent from a day or two to several months on the islands.

Palmer spent the period from May 27 to August 11, 1890, on the Pribilofs, mainly on St. Paul. His time was spent largely in the study of the birds, but owing to regulations then in vogue regarding the use of firearms his opportunities for collecting specimens were somewhat restricted. His report, which is a painstaking and scholarly work, has remained the only completely annotated list of the birds of the group up to the present time.

In 1910, when the Pribilof Islands were placed in charge of the Bureau of Fisheries of the Department of Commerce, in furtherance of the policy to make a thorough study of the life of the islands, the breeding place of the fur seal, Dr. Walter L. Hahn was appointed naturalist. Evermann (1913, p. 15) thus refers to his work, and that of his successor:

Dr. Walter L. Hahn, at that time head of the department of biology in the State normal school at Springfield, S. Dak., was appointed naturalist in the summer of 1910. He arrived at St. Paul Island August 24 and immediately entered upon his duties with an energy and intelligence which could scarcely be excelled. His untimely death on May 31, 1911, from exposure in the ice-cold water of the village lagoon, resulting from the capsizing of a boat, was a severe loss to the fur-seal service and to biological science. During his few months on St. Paul Island, Doctor Hahn, from the voluminous notes and records which he left, appears to have been indefatigable in his field work and marvelously painstaking in recording his observations. His notes, typewritten up to noon of the very day of his death, record a vast number of new and important observations on the fur seals and blue foxes. They also teem with records of interesting observations on the birds and other animals of the islands.

Mr. Millard C. Marsh, pathologist of the Bureau of Fisheries, was appointed to the vacancy caused by the death of Doctor Hahn. He reached St. Paul Island August 23, 1911, and took up and continued with commendable industry and intelligence the work so ably begun by his predecessor.

As a result of this work Evermann (l. c.) was able to add 18 species of birds to the Pribilof list; four of these were for the first time added to the North American list. In addition, the present writer has been able, through the courtesy of the Bureau of Fisheries, to use the notes on occurrence of many species recorded by Hahn and Marsh. Copies of the notes in the St. Paul Island log relating to many species of birds and mammals, carefully transcribed by Hahn, and arranged under specific headings, have also been available.

Alvin G. Whitney, school-teacher on St. Paul Island from the summer of 1912 to the summer of 1914, made considerable collections of insects and shells and some other invertebrates, but his contributions to ornithology and mammalogy were small.

The next naturalist to work on the Pribilofs was G. Dallas Hanna. He arrived on St. Paul in July, 1913, and was transferred during the next month to St. George. Although his regular duties as school-

teacher and volunteer radio operator involved long hours, he found time to make notes and collections. In early August of 1914 he was transferred to St. Paul, where he remained (with the exception of two trips to St. George in the summer of 1915) until September, 1915, when he returned to the United States. During all this period he devoted most of his spare time to ornithology. In 1916, mainly as a result of his own work, he added 13 species to the Pribilof list in a paper published in *The Auk*.

In the meantime the visit of the writer and his colleagues, Wilfred H. Osgood, of the Field Museum, Chicago, Ill., and Prof. George H. Parker, of Harvard University, Cambridge, Mass., on a special investigation of the fur-seal herd in the summer of 1914, afforded an opportunity for further study of the fauna. It is needless to state that the extremely interesting wealth of bird life on these islands, then for the first time observed by the writer, determined him to prepare a fully annotated list of the birds, and this forms a part of the present report.

Mr. Hanna returned to St. Paul in June, 1916, and remained there (excepting short visits to St. George each summer and a residence there from October, 1916, to May, 1917) until September, 1918. As a result of the work done there, he was able to publish a paper adding 21 species of birds to the Pribilof list, 4 of which were new to North America. He later spent two summer seasons on the islands (June to September, 1919 and 1920) on seal work, and each season made additions to the list. In 1919 he published a list of all the birds known at that time to have occurred on the Pribilofs, 129 in number, in which the various species are classed as breeders, regular migrants, or transients, and the author first reporting the species from the group is indicated. In addition, he has published other papers of a general nature or relating to certain species, and he has very generously furnished the writer with numberless unpublished notes on the occurrence of birds and mammals, extending practically throughout his period of service on the islands. Without his records and those of Hahn, above referred to, the preparation of the present lists would scarcely be justified. Notes on a number of species of birds made by H. P. Adams on St. George Island in 1915, 1916, and 1917, have also been available. All such notes, when lacking citations, are understood to be hitherto unpublished.

The foregoing account has been written mainly from the standpoint of the ornithologist; since the birds are so abundant and so far outnumber the other vertebrates in species and individuals, it is natural that they should have received the greater share of attention. Practically all workers, however, have done some work on the mammals. In the bibliography (pp. 121-128), therefore, the titles are merged in one list; indeed, many articles refer to both groups.

LIFE ZONE RELATIONSHIPS.

By EDWARD A. PREBLE.

While the Pribilof group as regards its zoogeography is most closely related to the Arctic, there are many elements that forbid its unqualified reference to that zone. The small size of the islands, their distance from other lands, and probably to some extent the ocean currents have all been factors which helped to determine its present faunal and floral characteristics. The severe winds which sweep the islands have also had their influence. Other important contributing causes have been the original freedom of the islands from human habitation, and their rugged topography, combined with an abundant food supply, which have favored their selection as breeding stations for myriads of aquatic birds and a number of species of mammals. All these factors have combined to produce a fauna and flora peculiar in many respects.

MAMMALS.

Among land mammals we find only three species, all more or less peculiar to the group. Of these the foxes (*Alopex pribilofensis*) were probably originally brought to the islands by floating ice and have become slightly differentiated from the original mainland stock. The shrew (*Sorex pribilofensis*) and the lemming (*Lemmus nigripes*), peculiar to St. Paul and St. George Islands, respectively, have been so modified that their origin can not be determined. The fox and lemming, however, and perhaps the shrew, belong to groups which are essentially Arctic in distribution. All the other mammals, excepting those introduced by man, are aquatic and can not be discussed in terms applicable to the distribution of the others. The boundaries of their habitats are probably determined by the temperature of the water, acting to some extent directly, but more especially through their food supply. Of the strictly aquatic mammals, the bowhead whale (*Balaena mysticetus*), if correctly identified, is near the southern limit of its range; all the others, with the exception of the killer whale (*Orcinus rectipinna*), which visits the Arctic Ocean in summer, are near their northern limit.

In regard to the pinnipeds, less strictly aquatic, the Pribilofs are the meeting point of both southern and northern types. The Steller sea lion (*Eumetopias jubata*), Pribilof fur seal (*Callorhinus alascanus*), and Pribilof harbor seal (*Phoca richardii pribilofensis*) are at or near their northern limit; while the walrus (*Odobenus divergens*), ribbon seal (*Phoca fasciata*), and bearded seal (*Erignathus barbatus nauticus*) there approach their southern boundary.

The sea otter (*Latax lutris lutris*), now exterminated there, found about the Pribilofs one of its northernmost stations.

BIRDS.

In discussing the zonal relation of the group as reflected in its bird life it is advisable to deal only with species which regularly breed. These are as follows:

<i>Lunda cirrhata.</i>	<i>Fulmarus glacialis rodgersi.</i>
<i>Fratercula corniculata.</i>	<i>Phalacrocorax pelagicus robustus.</i>
<i>Phaleris psittacula.</i>	<i>Phalacrocorax urile.</i>
<i>Aethia cristatella.</i>	<i>Clangula hyemalis.</i>
<i>Aethia pusilla.</i>	<i>Lobipes lobatus.</i>
<i>Uria troille californica.</i>	<i>Arquatella maritima ptilocnemis.</i>
<i>Uria lomvia arra.</i>	<i>Leucosticte griseonucha.</i>
<i>Rissa tridactyla pollicaris.</i>	<i>Plectrophenax nivalis townsendi.</i>
<i>Rissa brevirostris.</i>	<i>Calcarius lapponicus alascensis.</i>
<i>Larus hyperboreus hyperboreus.</i>	<i>Nannus troglodytes alascensis.</i>
<i>Larus glaucescens.</i>	

Sixteen of these (excepting *Rissa brevirostris*, *Larus glaucescens*, *Phalacrocorax urile*, and *Nannus t. alascensis*) breed commonly on the St. Matthew group to the northward (a number of them still farther north, to and beyond Bering Strait), and one other, *Plectrophenax nivalis townsendi*, is represented there by a closely related species, *P. hyperboreus*. *Rissa brevirostris* reaches its northern limit on the Pribilofs, and *Larus glaucescens* in the northern part of Bering Sea. *Phalacrocorax urile* is a summer visitor from the Siberian coast, and *Nannus t. alascensis* is peculiar, but has close relatives on the Aleutian Islands. It will be noted that these are mainly sea birds, some of which nest as far south as California, but which, finding abundant food combined with convenient nesting sites on these northern islands, breed successfully there also regardless of the lower temperature. These, like the aquatic mammals, can not be regarded as coordinate in value with land vertebrates as regards zonal significance. *Clangula hyemalis* and *Lobipes lobatus*, which nest about fresh-water ponds, and *Arquatella m. ptilocnemis*, *Leucosticte griseonucha*, *Plectrophenax n. townsendi*, and *Calcarius l. alascensis*, are distinctly Arctic types.

It will thus be seen that both the mammalian and avian inhabitants of the Pribilofs, excluding those which can not legitimately be considered as furnishing criteria for the definition of life zones as currently considered, favor the reference of this group to some division of the Arctic Zone.

But while the aquatic species of mammals and birds must be considered from a standpoint different from that accorded those inhabiting the land, they can hardly be ignored in the consideration of a fauna of which they constitute an overwhelming majority. Palmer, indeed, our principal authority on Pribilof birds, considered

the breeding water-birds as mainly characterizing a zoogeographic area to which he accorded the rank of a subregion of the Holarctic—the Aleutican. This is practically the same as the Aleutian Faunal District of Nelson, extended to include the Pribilofs and other islands and the immediate coasts of Alaska and Siberia north to Bering Strait, and includes the insular and coastal portions of the Alaskan Province of the Holarctic region of Newton. (Dictionary of Birds, Part II, p. 331, 1893.)

PLANTS.

The botany of the Pribilofs has been carefully studied by James M. Macoun, who has published an annotated list of 184 species, including the vascular cryptogams. His paper includes a table, prepared in collaboration with Theodor Holm, one of our most eminent students of Arctic plants, which shows the distribution of the various species in other parts of the Arctic region. Regarding the phaenogams only, 172 species, we find that 141 species are found on the east coast of Bering Sea, and 126 on the west coast, while 101 grow on both coasts; 74 are found in Arctic America. Twenty-three are not known from either the east or west coasts of Bering Sea, and of these 23 only 6 are found in Arctic America; of the remaining 17 the majority are species which have been described from the Pribilofs, while the remainder are presumably found also on the Aleutians.¹ It will thus be seen, as might be expected, that the great majority of the Pribilof plants are arctic or subarctic species.

The phaenogams classed as Arctic by Macoun and Holm are the following:

Ranunculus tricophyllus Chaix.
Ranunculus hyperboreus Rottb.
Ranunculus pygmaeus Wahl.
Ranunculus reptans L.
Ranunculus eschscholtzii Schl.
Coptis trifolia Salisb.
Papaver radiculatum Rottb.
Draba hirta L.
Draba wahlenbergii Hartm.
Eutrema edwardsii R. Br.
Cochlearia officinalis L.
Cardamine bellidifolia L.
Cardamine pratensis L.
Silene acaulis L.
Lychmis apetala L.

Arenaria peplodes L.
Stellaria humifusa Rottb.
Stellaria longipes Goldie var. *laeta*
 Was.
Cerastium alpinum L.
Sagina linnaei Presl.
Sagina nivalis Fr.
Rubus chamaemorus L.
Rubus arcticus L.
Potentilla anserina L.
Comarum palustre L.
Potentilla emarginata Pursh.
Saxifraga hieracifolia Waldst. and Kit.
Saxifraga stellaris L. var. *comosa* Poir.
Saxifraga hirculus L.

¹ The late James M. Macoun, in 1914, informed me that a few species of Pribilof plants, evidently of Aleutian origin, were known by him to occur only near Southwest Point, St. Paul Island. Since Mr. Macoun on that occasion added several species to the list, which I do not now remember, and which are probably yet unpublished, the particular ones referred to by him can not be determined. A direct comparison of lists of the Pribilof and Aleutian species would be desirable in the present connection, but I have found no work giving a complete list of the plants of the latter region.

Chrysosplenium alternifolium L.
Parnassia kotzebuei Cham. and Schl.
Hippuris vulgaris L.
Epilobium spicatum Lam.
Selinum benthami Wat.
Valeriana capitata Pall.
Achillea millefolium L.
Chrysanthemum arcticum L.
Petasites frigida Fries.
Campanula uniflora L.
Pyrola minor L.
Armeria vulgaris Willd.
Veronica serpyllifolia L.
Pedicularis sudetica Willd.
Pedicularis lanata Willd.
Euphrasia officinalis L.
Gynandra stelleri Cham. and Schl.
Koenigia islandica L.
Polygonum viviparum L.
Polygonum bistorta L.
Oxyria reniformis Hook.
Rumex acetosella L.
Salix arctica Pall.

Salix reticulata L.
Empetrum nigrum L.
Lloydia serotina Reich.
Streptopus amplexifolius DC.
Juncus biglumis L.
Eriophorum polystachyon L.
Eriophorum vaginatum L.
Carex vulgaris Fries, and vars.
Carex membranopacta Bailey.
Carex rariflora Smith.
Carex saxatilis L.
Hierochloa pauciflora R. Br.
Alopecurus alpinus Smith.
Arctogrostis latifolia Griseb.
Calamagrostis purpurascens V.
Trisetum subspicatum Beauv.
Phippsia algida R. Br.
Arctophila effusa Lange.
Dupontia psilosantha Rupr.
Glyceria angustata Fries.
Festuca ovina L.
Elymus mollis Trin.

The following species of plants have been described as new from Pribilof specimens (some of these are not currently considered valid):

Papaver macounii Greene.
Nesodraba grandis Greene.
Cardamine umbellata Greene.
Cryosplenium beringianum Rose.
Primula macounii Greene.
Primula eximia Greene.
Polygonum macounii Small.

Salix rotundata Rydberg.
Salix cyclophylla Rydberg.
Carex pribilofensis Macoun.
Alopecurus howellii Vasey var. *merriami* Beal.
Elymus villosissimus Scribner.
Calamagrostis arctica Vasey.

ZOOGEOGRAPHY OF NEIGHBORING AREAS.

It is scarcely possible to discuss the zoogeographic aspects of the Pribilofs without considering also the neighboring Aleutian Peninsula and Islands. The latest treatment seems to be that of Osgood,² who has discussed the zoogeography of the Alaska Peninsula at some length, and while assigning the treeless part of that region to the unqualified Arctic Zone admits the possibility that a more extended study may show the terminal part of the peninsula and the adjoining islands to belong to a subdivision of the Arctic. The writer believes that recognition of such a subdivision is desirable, and would retain the name first applied to it by Nelson, the Aleutian Faunal District,³ considered as a subdivision of the Arctic Zone, and includ-

² A Biological Reconnaissance of the Base of the Alaska Peninsula: North American Fauna No. 24, pp. 21-25, 1904. I have also had the benefit of suggestions from Dr. Alexander Wetmore, who spent the summer of 1911 on the Aleutian Islands and the Peninsula.

³ Report on Nat. Hist. Collections made in Alaska, p. 26, 1887.

ing the western end of the Alaska Peninsula, the Aleutian Islands, and the Pribilofs. The St. Matthew group and perhaps other islands in Bering Sea might also best be included here.

It is evident, however, that this subdivision, and especially the Alaska Peninsula, by no means shares its characteristic fauna and flora exclusively or even principally with the Arctic proper. In the first place it should be borne in mind that although the summer temperatures alone on the Pribilofs and at Unalaska are sufficiently low to limit the growth of trees, absence of trees over large areas on the peninsula is evidently due in part to some other factor. There is little doubt that this contributing cause, as suggested by Osgood, is the severe wind which sweeps the region at all seasons. This, however, has not sufficed to prevent a luxuriant growth of alders and willows in the more sheltered parts of the peninsula beyond the line of tree growth, and these afford breeding sites for the following birds, which over most of their ranges are not considered to nest above the Hudsonian Zone:

Pica pica hudsonia.

Zonotrichia coronata.

Passerella iliaca unalascensis.

Melospiza melodia insignis.

Riparia riparia.

Dendroica aestiva rubiginosa.

Wilsonia pusilla pileolata.

Hylocichla ustulata swainsoni.

Hylocichla guttata guttata.

The dipper, or water ousel (*Cinclus mexicanus unicolor*), a bird nesting in the Canadian and Hudsonian zones, also breeds in this area.

Opposed to this list is the following, including birds which may be considered truly Arctic in their affinities, and most of which nest largely on the higher grounds:

Lagopus lagopus albus.

Lagopus rupestris nelsoni.

Calcarius lapponicus alascensis.

Leucosticte griseonucha.

Plectrophenax nivalis townsendi.

Acanthis hornemanni exilipes.

Anthus spinoletta rubescens.

The remainder of the breeding land birds of the Alaska Peninsula, all wide-ranging forms, may be classed as follows:

Falco peregrinus pealei. Breeding from Transition to Arctic Zones.

Corvus corax principalis. Breeding from Canadian to Arctic Zones.

Passerculus sandwichensis sandwichensis. Breeding regularly to Hudsonian Zone.

Archibuteo lagopus sancti-johannis. Breeding in Hudsonian and Arctic Zones.

Haliaeetus leucocephalus alascanus. Breeding from Canadian to Arctic Zones.

It seems evident, therefore, that while it may be desirable to include the terminal part of the Alaska Peninsula in the Aleutian Faunal District, a majority of its breeding land birds belong at least in part to zones below the Arctic.

BIRDS OF THE PRIBILOF ISLANDS, ALASKA.

By EDWARD A. PREBLE and W. L. MCATEE.

In the annotated list of birds of the Pribilofs, the portions of the accounts relating to distribution, migration, nesting, and general habits are by Edward A. Preble. The attempt has been made to collect all available data referring to the various species, with special reference to dates of arrival, nesting, departure, and occurrence in winter, and in most cases the notes are presented in the order here indicated. The circumstances under which the observations were made have been described in detail in the general introduction, and need not be here repeated.

BREEDING BIRDS.

Of the 137 species now known to have occurred on the Pribilofs, only 23 are known to breed; of these *Anas platyrhyncha platyrhyncha* and *Nettion carolinense* are rare. The list follows:

<i>Lunda cirrhata.</i>	<i>Phalacrocorax pelagicus robustus.</i>
<i>Fratercula corniculata.</i>	<i>Phalacrocorax urile.</i>
<i>Phaleris psittacula.</i>	<i>Anas platyrhyncha platyrhyncha.</i>
<i>Aethia cristatella.</i>	<i>Nettion carolinense.</i>
<i>Aethia pusilla.</i>	<i>Clangula hyemalis.</i>
<i>Uria troille californica.</i>	<i>Lobipes lobatus.</i>
<i>Uria lomvia arra.</i>	<i>Arquatella maritima ptilocnemis.</i>
<i>Rissa tridactyla pollicaris.</i>	<i>Leucosticte griseonucha.</i>
<i>Rissa brevirostris.</i>	<i>Plectrophenax nivalis townsendi.</i>
<i>Larus hyperboreus hyperboreus.</i>	<i>Calcarius lapponicus alascensis.</i>
<i>Larus glaucescens.</i>	<i>Nannus troglodytes alascensis.</i>
<i>Fulmarus glacialis rodgersi.</i>	

In addition, *Histrionicus histrionicus pacificus* is present in abundance all summer, but has not been found actually nesting. *Cephus columba* and *Larus schistisagus* also have been stated to breed, but on insufficient evidence.

REGULAR MIGRANTS.

Several of these, even some which breed abundantly, occur in greater numbers during migration. Examples are *Larus hyperboreus hyperboreus*, *Anas platyrhyncha platyrhyncha*, *Histrionicus histrionicus pacificus* and *Arquatella maritima ptilocnemis*. Sixteen others are known to be more or less regular migrants; these are the following:

<i>Xema sabini</i> . Spring and fall.	<i>Pisobia acuminata</i> . Mainly in fall.
<i>Sterna paradisaea</i> . Spring and fall.	<i>Pisobia maculata</i> . Mainly in fall.
<i>Dasfla acuta tzitzihoa</i> . Spring and fall.	<i>Limosa lapponica baueri</i> . Spring and fall.
<i>Somateria v-nigra</i> . Mainly in winter.	<i>Heteroscelus incanus incanus</i> . Spring and fall.
<i>Somateria spectabilis</i> . Mainly in winter.	<i>Pluvialis dominica fulva</i> . Spring and fall.
<i>Oidemia deglandi dixonii</i> . Mainly in winter.	<i>Arenaria interpres interpres</i> . Mainly in fall.
<i>Branta canadensis minima</i> . Spring and fall.	<i>Anthus spinoletta rubescens</i> . Mainly in fall.
<i>Philacte canagica</i> . Spring and fall.	
<i>Phalaropus fulicarius</i> . Spring and fall.	

OCCASIONAL VISITORS.

All the remaining species of the list are transients which have been detected once or in some cases a number of times. A considerable number of these, as more observations are afforded, will probably be transferred to the list of regular migrants. In addition to those migrants which occur mainly as winter visitors from farther north, the following, of less regular occurrence, have also been noted chiefly in winter.

<i>Colymbus auritus</i> .	<i>Arquatella maritima couesi</i> .
<i>Cephus columba</i> .	<i>Hicrofalco rusticolus sucer</i> .
<i>Polysticta stelleri</i> .	<i>Nyctea nyctea</i> .

VISITORS FROM EURASIA.

Those members of the avifauna which may fairly be classed as transients or accidental visitors number over 80 species. Of these the following are Eurasian, with general ranges as given; unless otherwise indicated specimens taken on the Pribilofs have proved to be the first records for North America:

- Mareca penelope*. Breeds in northern Eurasia from Scandinavia to Kamchatka, wintering to the southward.
- Eunetta falcata*. Occurs regularly in eastern Asia to Kamchatka, Korea, and Japan.
- Nettion crecca*. Of general distribution in northern Eurasia, breeding easterly to the eastern Aleutian Islands, where it was recorded previous to its capture on the Pribilofs.
- Fuligula fuligula*. Breeding in Eurasia eastward to Kamchatka, migrating in winter to northern Africa, India, China, and Japan.
- Aithya ferina*. Breeding in Eurasia east to Lake Baikal, wandering in migration and winter eastward to China and Japan.
- Glaucionetta clangula clangula*. Breeding generally throughout northern Eurasia.
- Limnocyptes gallinula*. Breeds in Eurasia east to the Kolyma River. In migration and winter occurs south to India and Burma, and occasionally to Japan and Formosa.

- Pisobia subminuta*. Breeds in eastern Siberia, Kamchatka, and the Commander and Kurile Islands. Migrates in winter as far as Australia and the Philippines.
- Rhyacophilus glareola*. Breeds in northern Eurasia eastward to Kamchatka and Bering Island, wintering south to Africa, southern Asia, Japan, and the Philippine Islands. Recorded previously from Alaska (Littlejohn, *The Condor*, vol. 6, p. 138, 1904, Sanak Island).
- Heteroscelus incanus brevipes*. Breeds in eastern Siberia and Kamchatka. Migrates southwardly to China, Japan, the Malay Peninsula, and Australia. Taken at least once on Bering Island in May.
- Philomachus pugnax*. Occurs in central Europe and Asia, eastward rarely to Japan and China, wintering in Africa and India. First record for western coast of North America, but has been taken many times in the eastern United States.
- Numenius tahitiensis*. Occurs on many of the Pacific islands, mainly in winter; has been taken several times in summer on the mainland of Alaska, once at least previous to its capture on the Pribilofs.
- Thalassoetus pelagicus*. Breeds in Kamchatka, and has been taken on Bering Island.
- Cryptoglaux funerea magna*. Described from the Kolyma River; probably of general range in northeastern Siberia.
- Cuculus canorus telephonus*. Breeds in Kamchatka, Manchuria, Japan, and China.
- Micropus pacificus*. Breeds in eastern Asia, including Kamchatka, Japan, and northern China. Has also been reported from the Commander Islands.
- Coccothraustes coccothraustes japonicus*. Occurs in Japan, Korea, northern China, and eastern Siberia.
- Fringilla montifringilla*. Breeds in northern Europe and Asia east to Kamchatka; in migration to southern Asia.
- Pinicola leucura kamtschathensis*. Breeds in Kamchatka.
- Anthus spinoletta japonicus*. Breeds in eastern Siberia and Kamchatka and the Kurile Islands; winters in Japan, China, and India.

In addition, *Pluvialis dominica fulva*, added to the list of North American species from the Pribilofs, has since been found to be the breeding bird of northern and western Alaska.

BIRDS DESCRIBED FROM THE PRIBILOFS.

Five valid forms have been described from Pribilof specimens, as follows:

- Rissa tridactyla pollicaris*. Ridgway, in Baird, Brewer, and Ridgway, *Water Birds of North America*, vol. 2, p. 202, 1884. Type from St. George Island. Ranges generally over the North Pacific.
- Arquatella maritima ptilocnemis*. Coues, in Elliott's Rept. Seal Islands of Alaska, 1874 (unpaged), p. 182, 1875. Type from St. George Island. Breeding on the Pribilof and St. Matthew Groups, and on St. Lawrence Island.
- Plectrophenax nivalis townsendi*. Ridgway, *Manual North American Birds*, p. 403, 1887. Type from Otter Island. The breeding form on the Pribilof, Aleutian, and Commander Islands.
- Calcarius lapponicus alascensis*. Ridgway, *The Auk*, vol. 15, p. 320, October, 1898. Type from St. Paul Island. The breeding form on the islands and mainland of northern and western Alaska.
- Nannus troglodytes alascensis*. Baird, *Trans. Chicago Acad. Sci.*, vol. 1, p. 315, 1869. Type from St. George Island. Confined to the Pribilof Group.

GENERAL OBSERVATIONS ON MIGRATION.

Although it seems very remarkable that so many species of birds otherwise known as regular breeders or migrants only on the neighboring coasts of Alaska or Asia have been taken on the comparatively small and distant Pribilofs, the fact that they have been detected is perhaps more to be wondered at than that they have reached there. During migration birds are often driven out to sea by winds of unusual velocity or become bewildered by fogs, while some habitually cross wide expanses of ocean. Such travelers, when weary and hungry, eagerly grasp the opportunity to seek the solid land. During the rather brief periods when the fogs lift, both the main islands are visible for a considerable distance. But the most potent factor in aiding the birds to find a landing place is probably the noisy herds of fur seals and sea lions.

During the seasons when most of the smaller birds are migrating the beaches are occupied by the thronging thousands, whose combined voices produce a clamor which can be heard above all other sounds of nature at a distance of several miles. So far reaching is this sound that it is frequently useful to navigators, helping them to locate the islands when driven from their course by winds and currents. There is no doubt that many storm-driven birds are thus guided to this haven, either to be put on record as rare visitors, or after resting again to try to traverse the storm-lashed pathway.

The fact that the Pribilofs have furnished so many additions to the list of North American birds, and that species from both North America and Asia continue to be taken there, has suggested comparison with Helgoland, the islet in the North Sea which has proved such a rich ornithological field. However, when we come to consider the characteristics of these two stations, and their data on migration, it is apparent that they have little common ground for comparison.

Although the Pribilofs and Helgoland are in nearly the same latitude, the climatic conditions and other phenomena affecting the avifauna are very different. Helgoland is so situated relative to Scandinavia, Germany, Russia, and the other parts of northern Europe as to lie directly in the migration pathway of vast numbers of birds which breed in those comparatively temperate lands, and which winter in southern Europe and in Africa. Furthermore, these hordes of regular migrants carry along with them many species, both northern and southern, which otherwise would not wander from their native haunts, and some of which have been detected while pausing on Helgoland. Other causes, apparently, have operated in the case of many species which are breeders in southern and eastern Asia and in North America.

The Pribilofs, on the other hand, lie in the midst of Bering Sea, in an environment essentially Arctic, and not on a migration route which is followed by any considerable number of birds, either those passing between their summer and winter homes in western America or those which habitually cross between America and Asia. Those which do use the islands as a stepping stone are certain waders and swimmers which nest in northwestern Alaska, and winter in the Aleutians, the Pacific Islands, or southeastern Asia. The more notable of this class are the following: *Philacte canagica*, *Limosa lapponica baueri*, *Heteroscelus incanus incanus*, *Pluvialis dominica fulva*, and *Arenaria interpres interpres*.

As regards land birds, however, it is a notable fact that none of the small species of birds which are essentially Asiatic, but which cross each summer to nest in Alaska (including *Budytes flavus alascensis* and *Acanthopneuste borealis*), have been detected on the Pribilofs.

A canvass of the list of birds which have been observed on Helgoland, leaving out those crag-nesting species which are influenced in their choice of homes by the presence of suitable cliffs and an abundant marine food supply, shows that about 283 species nest south of the limit of trees, while only 83, or less than 23 per cent of the total thus considered, are Arctic, nesting north of the tree limit. Applying the same test to Pribilof birds the proportion is exactly 50 per cent in each class. Helgoland has had the advantage of more intensive observations, continued over a much longer period, but since collections and observations in both places have been made indiscriminately it is unlikely that the relative numbers of species nesting above and below the limit of trees would be found to be materially different were the data more comparable in this regard.

It is evident, therefore, that the avifauna of the two places is radically different in character, since we have on Helgoland an overwhelming majority of non-Arctic species, many of which are wanderers from their regular homes in Africa, Asia, or America, while those found on the Pribilofs which may be classed as strays are in all cases natives of the neighboring coasts of Asia and America. Furthermore, those transient land birds which have been detected on the Pribilofs seem to have reached there largely by chance rather than by following any regular migration routes.

FOOD HABITS OF BIRDS.

The notes on food habits of each species and also the following general account of the food resources of Pribilof birds and of the circumstances attending the elaboration of the available data on the subject were prepared by W. L. McAtee:

All pertinent previous reports on Pribilof birds have been examined and remarks on bird food quoted from them when desirable. Field notes of various naturalists who have visited the islands also have been drawn upon and when used the source is acknowledged. The contents of 32 bird stomachs from the Pribilofs were reported on by Dr. S. D. Judd in William Palmer's "Avifauna of the Pribilof Islands" (1899, pp. 380-427). In some cases these stomachs have been reexamined; in others the original report has been referred to. For the present account a considerable collection of stomachs has been available for examination, largely due to the efforts of G. Dallas Hanna.^a

Features of the food habits of birds of the Pribilofs that seem of sufficient interest to merit special mention are the great diversity of organisms fed upon by some of the birds resorting to the kelp beds, and the unusual preponderance of two-winged flies in the diet of birds feeding on land. In both cases, the phenomenon mentioned undoubtedly is merely a reflection of relative availability of food items. It is well known that Diptera are the dominant insects of high latitudes, and collections made in connection with the present investigation emphasize this fact. They are the most numerous insects both in species and individuals and consequently contribute most voluminously to the subsistence of the chief predatory creatures of the region, namely, birds.

The kelp pastures are the richest sort of feeding places for omnivorous birds, and such species as the eider duck seem to draw on all the inhabitants of these beds for sustenance. Representatives of most of the main branches of the animal kingdom in addition to various kinds of algae are frequently found in single stomachs. The following brief list of the mixed contents of four Pacific eiders will illustrate how the whole range of food items is drawn upon by these birds: Plume-algae (2 species), kelp, hydroids (2 kinds), mussels (3 kinds), sea snails (7 species), marine worms (2 kinds), starfishes, sea urchins, amphipods (2 sorts), hermit crabs (2 species), barnacles, sea-squirt, and sculpin. To some it may be surprising that so varied an assemblage of marine organisms is available in

^a Most of the stomach contents were analyzed by W. L. McAtee, but numerous stomachs of certain groups of birds were examined by the following: Ira N. Gabrielson, finches; Charles C. Sperry, shorebirds; and Alexander Wetmore, grebes and shorebirds. Identifications of many items found in the stomachs were based on the collections of invertebrates reported upon in the appendix to the present paper, and to the determiners thereof is due much of the credit for details in the statements relating to bird food. In addition many other specimens were directly referred to specialists for identification. Those who cooperated in this way were: W. A. Setchell, algae; Agnes Chase and F. P. Metcalf, grass seeds; C. C. Nutting, hydroids; W. H. Dall and Paul Bartsch, mollusks; R. C. Osburn, bryozoans; A. H. Clark, starfishes, sea urchins, and ascidians; Mary J. Rathbun, crabs; W. L. Schmitt, other decapods; Clarence L. Shoemaker, amphipods; H. A. Pilsbry, barnacles; S. A. Rohwer, sawflies; Leon J. Cole, pycnogonids; and Alexander Wetmore, birds. To all of these grateful acknowledgment is made.

this far-northern region, and this, too, during the winter months as well as the summer. It would seem that these Boreal kelp beds rival in abundance and diversity of life the famed tide-pools of the Tropics. While the birds frequenting them must necessarily be of hardy races that can endure the cold and buffeting of the wintry gales of the Bering Sea, it is apparent that insufficient and monotonous diet decidedly is not a characteristic of this environment, one usually thought of as extremely rigorous.

Family COLYMBIDAE.

Colymbus holboellii (Reinhardt). HOLBOELL GREBE.

The Holboell grebe was first recorded from the islands by Coues (in Elliott, 1874, unpagged, and 1875, p. 201), who recorded the specimen as *Podiceps griseigena*. This specimen, still in the U. S. National Museum collection (No. 64302 im.), has been correctly identified as *Colymbus holboellii* by Nelson (1887, p. 35) and Palmer (1899, p. 383). It was taken by Elliott at St. George Island, June 22, 1873.

A second specimen (No. 237485, male, U. S. Nat. Mus.) was taken by G. Dallas Hanna at St. Paul Island, December 6, 1914. It was feeding in the surf off Kitovi Rookery when shot.

Food.—The stomach contents of the December specimen was composed of a few feathers, and food items as follows: Otoliths of 40 or more small fishes, further unidentified, 99 per cent; and numerous amphipods of the family Pontogeneidae, 1 per cent.

Colymbus auritus Linnaeus. HORNED GREBE.

The horned grebe was first recorded from the Pribilofs by G. Dallas Hanna, who obtained specimens from both St. Paul and St. George Islands in 1913 and 1914, as recorded by him (1916, p. 401). Following are the records of the several specimens: Female, shot in Cemetery Lake, St. George, October 13, 1913 (stomach contained a quantity of decayed vegetation from bottom of lake); female, in surf, St. George, December 19, 1913 (feet and bill slate color; eye, orange); male, November 30, 1914, Southwest Bay, St. Paul; one (sex not recorded), January 6, 1915, St. Paul. Mr. Hanna states that other single birds were seen in the surf about St. Paul on December 4 and 13, 1914, and in the Salt Lagoon on at least two occasions, and that the natives consider it quite common in winter. All the specimens above listed are in the collection of the U. S. National Museum.

Food.—The contents of the stomachs of the three last mentioned have been analyzed. As in the case of grebes collected elsewhere, the bird's own feathers are a prominent part of the stomach contents,

varying in the samples at hand from 5 to 98 per cent of the entire bulk. Ignoring these, the food in these three stomachs was composed of Crustacea, 75 per cent; marine worms (*Nereis*), 23.3 per cent; and fish, 1.7 per cent. The crustaceans were exclusively amphipods identified as *Chironesimus multiarticulatus* and *Pontogeneia* sp., of the family Pontogeneidae, and others of the families Calliopiidae, Metopidae, and Gammaridae.

Family GAVIIDAE.

Gavia adamsii (Gray). YELLOW-BILLED LOON.

The yellow-billed loon is a transient visitor, first recorded from the islands by C. H. Townsend, who says (1887, p. 98): "I saw a skin of the white-billed loon at the house of the United States Treasury agent on St. Pauls Island. It was killed there by a native in August, 1885." A second specimen was taken by M. C. Marsh on St. Paul, May 18, 1912, and is now in the Biological Survey collection. It is a male, and measured in the flesh: Length, 34 inches; extent, 61. The only other record refers to 10 individuals observed by G. Dallas Hanna off St. George Island, August 18, 1913.

Gavia viridigularis Dwight. GREEN-THROATED LOON.

The green-throated loon was first recorded by Coues in Elliott's Report (1874, unpagged, and 1875, p. 201) under the name *Colymbus arcticus*, from a bird found cast up nearly dead on the beach at Zapadni, St. George Island, June 22, 1873. This specimen, which is still in the collection of the U. S. National Museum (No. 64303, male), has been several times recorded under the name *arcticus*, and has played no small part in the claim of that species to be considered a North American bird. This specimen has been recently examined and found to be referable to the species lately described by Dr. Jonathan Dwight, *Gavia viridigularis* (Auk, 1918, p. 198), as, indeed, was intimated by Dwight in the introduction to his article (p. 196). Another of the two remaining specimens which have been referred to *G. arcticus* (No. 76004, U. S. Nat. Mus., St. Michael, Alaska, August 24, 1877, E. W. Nelson), is also plainly referable to *G. viridigularis*. Both these specimens have a decided green reflection on the dark areas of the throat, when viewed toward the light, while in *G. arcticus* and all its races these areas have a purplish reflection. As far as known *Gavia viridigularis* (type locality, Gichega, north-eastern Siberia) is confined to northeastern Siberia and extreme western Alaska.

Family ALCIDÆ.

Lunda cirrhata (Pallas). TUFTED PUFFIN.

The tufted puffin was first recorded specifically from the islands by Coinde (1860, p. 403), although Veniaminof in 1840 (quoted by

Elliott, 1874, unpagcd, and 1875, p. 242) mentions puffins as occurring and probably refers in part to the present species.

An abundant summer resident on the Pribilofs, breeding on all the five islands of the group. It arrives about the middle of May and the majority leave the islands by the last of August.

Elliott gives May 10 as about the time of its arrival; the earliest dates I have for recent years are as follows: St. Paul, March 5, 1911, specimen, perhaps wintered (Hahn); St. Paul, May 20, 1911, several seen (Hahn); St. Paul, May 20, 1912, specimen (Hahn); St. Paul, May 19, 1914, eight observed (Hanna); St. Paul, May 15, 1915, three seen, arrivals (Hanna); St. George, May 21, 1917 (Hanna).

The eggs are usually laid in burrows dug by the birds in turf soil at the edge of cliffs or on the summits of the smaller islands. Numbers nest in easily accessible locations on Walrus Island, Otter Island, and Sealion Rock, where they are safe from the foxes. On the other islands the birds nest among the rocks for protection. Dates for eggs are as follows: Otter Island, June 24, 27, 1884 (Lutz, 1889, p. 31); Sealion Rock, June 29, 1914, some fresh, but mostly heavily incubated (Preble); St. George, July 1, 1914 (Hanna); Walrus Island, July 7, 1911, eggs being incubated (Bent, 1919, p. 83); Otter Island, July 4, 1890; Walrus Island, August 7, 1890, slightly incubated (Palmer, 1899, p. 384). That many birds nest late in the summer is shown by the fact that, as elsewhere mentioned, Hahn observed many young birds taken from nests on Walrus Island as late as October 2.

The bulk of the individuals have left the islands before September. Later notable dates are as follows: St. Paul, early September, 1910, still common (Hahn); Walrus Island, October 2, 1910, about 40 young birds taken from nests by natives, adult and young specimens taken, numerous at sea (Hahn); St. Paul, December 8, 1910, one young bird found dead (Hahn); St. George, September 4, 1913, 150 observed (Hanna); St. George, September 15, 1913, 25 seen (Hanna); St. Paul, September 22, 1914, 75 seen (Hanna); St. Paul, December 6, 1914, 4 seen (Hanna); St. Paul, December 13, 1914, 10 seen (Hanna).

The following notes made by the collectors, and relating to fresh specimens, are of interest: No. 63, Hahn, female adult, St. Paul Island, March 5, 1911: Length, $15\frac{1}{2}$ inches; extent, $27\frac{3}{8}$; bill, deep orange on distal half; culmen and cutting edges washed with plumbeous; iris, pinkish; feet, pale flesh-color. No. 187, Marsh, female adult, St. Paul, May 20, 1912, length, $15\frac{1}{4}$ inches; extent, $27\frac{1}{4}$. No. 35, Hahn, Walrus Island, October 2, 1910 (young bird with much down remaining on neck and rump): Upper mandible, plumbeous; lower mandible, paler toward tip; eyelids, dusky; feet, dusky gray

above, with web sooty below. No. 36, Hahn, female adult, October 2, 1910, Walrus Island: Length, 15 inches; extent, 29; base of bill horn-color, tip deep orange; iris, yellow; feet, pale orange.

Fratercula corniculata (Naumann). HORNED PUFFIN.

Pl. VI, fig. 2.

The horned puffin is an abundant summer resident on the Pribilofs, arriving early in May and usually departing in early September. It seems to be more abundant than the tufted puffin. Puffins were listed by Veniaminof in 1840; among the species occurring on the islands he could hardly have failed to notice this conspicuous one (Trans. by Elliott, 1874, unpagged, and 1875, p. 242). First recorded specifically by Coues, in Elliott (l. c., p. 202).

Arrival notes in recent years are as follows: St. Paul, May 9, 1911, one shot (Hahn); St. George, May 19, 1914, May 9, 1915, 5 observed (Hanna); St. Paul, May 10, 1915, 10 observed (Hanna); St. George, May 21, 1917, observed (Hanna).

The bird nests on all of the five islands of the group, laying its single egg in a cavity among the rocks. The egg is white with obscure spotting about the larger end. Dates for eggs are as follows: St. George, July 4, 1873, Elliott (Palmer, 1899, p. 385); Otter Island, June 19, 20, 24, 26, 30, 1884 (Lutz, 1889, p. 31); St. George, July 1, 1914 (Hanna). The majority leave the islands by early September. Some definite later dates follow: St. Paul Island, September 1, 1910, 25 observed; September 7, 10; September 8, 6; September 9, 10; September 11, 3; October 2, many observed on Walrus Island but less numerous at sea than the tufted puffin; October 18, 1 shot on North Shore; October 19, observed; November 29, about 20 seen off Kitovi Rookery, St. Paul; December 6, specimen (all by Hahn). September 28, 1913, about 500 birds seen about Garden Cove, St. George Island, although most of the birds had then left the cliffs on the north side of the island (Hanna). St. Paul Island, September 22, 1914, 100 birds observed; December 6, 5 observed; December 13, 75 observed, and many found dead on the beach (Hanna).

The following notes were made from fresh specimens; Adult male, St. Paul Island, September 18, 1910, Hahn; length $13\frac{3}{4}$ inches; extent, 25; eyelids deep orange; eye tuft plumbeous; legs deep orange; bill lemon at base shading to deep orange at tip. Adult female, St. Paul Island, December 6, 1910, Hahn; length, 13 inches; extent, $24\frac{1}{4}$; bill dusky, feet pearl gray above, dusky below. Male, St. Paul Island, September 23, 1911, length, 13 inches; extent, $25\frac{1}{4}$; bill uniform light yellowish on all basal portions including collar of upper mandible, the rest or terminal third dark orange-red; the grooves darkened. No vermilion red on the bill; edge of eyelids bright red; angle of mouth lemon-yellow; legs and feet orange, deepest on webs; yellow on outer surface of tarsus and outer toes, and more or less on

all toes. Male, St. George Island, August 23, 1913, Hanna; bill waxy olive-green; light orange in corner of mouth; point of upper mandible dark orange; of lower, light orange; a dark patch at edge of each mandible near tip, darkest on posterior edge.

Food.—The stomach of a specimen collected December 6, 1910, was reported in field notes of W. L. Hahn to contain a few isopods and fragments apparently of seaweed.

Phaleris psittacula (Pallas). PAROQUET AUKLET Pl. VI, fig. 1.

The parouquet auklet, a beautiful and interesting species, the "Baillie Brushkie" of the Aleuts, is a rather common summer resident on the Pribilofs. It appears to have been first recorded from the islands by Veniaminof in 1840 under the name "white-breasted auk" (Trans. by Elliott, 1874, unpagcd, and 1875, p. 242).

Spring records follow: St. Paul Island, May 1 and 2, 1900 (common, notes from island log by Hahn); St. Paul Island, May 1, 1911, some taken by natives (Hahn); St. Paul Island, April 30, 1912 (specimen by Marsh); St. George Island, March 28, 1914, 8 observed; April 3, observed; April 8, 20 observed; April 19, begun lighting on cliffs; April 22, 20 observed (Hanna); April 24, 1915, 300 on Tolstoi Cliffs, St. Paul Island; April 27, 500 on Tolstoi Cliffs; May 4 and 9, abundant (Hanna).

It breeds on all the five islands of the group, most abundantly on St. George and St. Paul Islands, in large numbers on Otter Island, rather commonly at times on Walrus Island, and in small numbers even on Sea Lion Rock. Its single white egg, seemingly large for the bird, is usually laid beneath large bowlders or in practically inaccessible cavities in the cliffs; in some cases the egg is deposited in a burrow apparently excavated in the loose soil topping the volcanic cliffs. Dates for eggs follow: St. George Island, July 1, 1873; Walrus Island, June 13, 1890 (egg collection, U. S. Nat. Mus.); Otter Island, June 20, 23, 1884 (Lutz, 1889, p. 31); St. George Island, July 1, 1914 (Hanna); Pribilof Islands, June 8, July 7, July 16 (Bent, 1919, p. 120).

Autumn and winter dates follow: Elliott (1875, p. 205) states that they depart from the islands between August 20 and September 1, and this statement seems to be generally true. Later detailed observations are: St. Paul, 1910: August 30, specimen; August 31; September 7, one observed; October 2, several seen on way to Walrus Island; November 7, specimen (Hahn). St. George August 20, 1913, not seen later (Hanna). St. Paul, 1914: October 4, 4 observed; December 4, 20 seen; December 13, 200 seen, flocks abundant off-shore, many dead on beach (Hanna). St. Paul, February 18, 1915, large flocks just off-shore, Northeast Point (Hanna). St. George, February 6, 1917, 2 killed (Hanna).

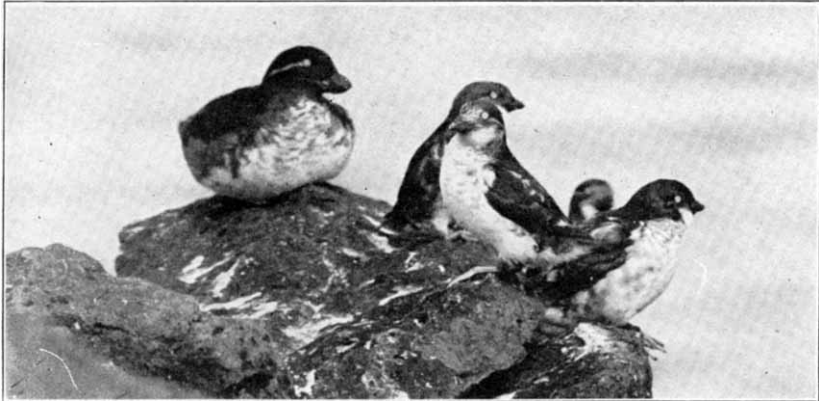


FIG. 1.—PAROQUET AUKLET (*PHALERIS PSITTACULA*) AND GROUP OF LEAST AUKLETS (*AETHIA PUSILLA*).

Many of the breeding birds associate closely. Photograph by G. Dallas Hanna, summer, 1920, on St. George Island.



FIG. 2.—HORNED PUFFIN (*FRATERCULA CORNICULATA*).

These interesting birds nest chiefly in clefts among the rocks. Photograph by G. Dallas Hanna, on St. George Island.



FIG. 3.—PACIFIC KITTIWAKE (*RISSA TRIDACTYLA POLLICARIS*) ON NESTING CLIFF.

This is the most abundant of the two species of kittiwakes. Photograph by G. Dallas Hanna, on St. George Island.

The species thus winters at sea in the vicinity of the islands, and thence southward to the latitude of Monterey Bay, Calif., and the Kurile Islands, Japan.

A female taken on St. Paul Island, May 20, 1911 (Hanna), measured in the flesh: Length, 10 inches, extent 21; the bill was blood orange in color; feet and tarsus, bluish in front, dusky behind. A male, taken April 30, 1912, measured: Length, $10\frac{3}{8}$ inches, extent, 21; bill, coral red, rostral shield darker. A female, same place and date, length, $9\frac{1}{4}$ inches, extent $20\frac{1}{2}$; bill coral red.

Food.—H. W. Elliott stated (1874, unpagcd, and 1875, p. 205) that the food of the parouquet auklet consists of amphipods and fish fry. He says further that "I have never seen one among the thousands that were around me when on the islands 'opening' the bivalve shells, such as mussels, etc., as stated by Professor Brandt." The suggestion of the latter author no doubt was a deduction from the shape of the bill of the parouquet auklet, but with little doubt is erroneous. The only stomach of this species available was collected at St. Matthews Island, July 12, 1916 (G. D. Hanna), and the content consisted entirely of remains of small Crustacea.

Aethia cristatella (Pallas). CRESTED AUKLET.

The crested auklet is a fairly common summer resident on the Pribilof Group, nesting on all the five islands excepting Sealion Rock. It usually comes on the cliffs in April or earlier, but this date is uncertain and difficult to determine, since large numbers pass the winter on the ocean in the vicinity and are likely to be seen in the surf at any time. It is called by the natives "Canooskie" (Little Captain). The species was first recorded from the islands by Veniaminof in 1840, under the name crested auk. (Trans. by Elliott, 1874, unpagcd, and 1875, p. 242.)

Available spring records of occurrence later than February are as follows: St. Paul Island, April 5, 1901, a few brought in; St. Paul, April 10, 1906, some shot (notes taken from island log by W. L. Hahn); April 30, 1911, 5 or 6 shot by natives at Tolstoi Point, St. Paul (Hahn); St. Paul, March 12, 16, 18, 1912, specimens (Marsh); St. George, April 8, 1914, thousands observed (Hanna); St. Paul, 1915—April 15, hundreds; April 18, many near shore; April 24, 40 seen; April 27, 30 seen; May 6, abundant (Hanna).

This species usually nests about the high cliffs, the single white egg being deposited in a deep and usually inaccessible recess; occasionally the birds lay in the depths of the boulder beaches. Eggs have been taken on the following dates: St. George Island, June 19, 20, and July 4, 1873; St. Paul Island, July 10, 1895 (collection U. S. Nat. Mus.); Otter Island, June 20, 22, 1884 (Lutz, 1889, p. 31); Walrus Island, June 16, 1910 (James Judge).

Notes on fall and winter occurrence follow: St. Paul Island, January 31, 1904, and December 6, 1909, numbers seen (notes from island log). St. George, vast numbers seen about end of November, 1905 (Chichester, 1908, p. 49). St. Paul, 1910—probably 5,000 seen at sea November 8, usually flying at great speed close to the water; many seen at sea November 9, 22, and 29, off St. Paul (Hahn). A great many flocks of hundreds each seen about 1 mile off St. George January 4, 1914 (Hanna). Hundreds of thousands seen off St. Paul December 13, 1914, and February 18 and March 5, 1915 (Hanna). Taken on St. George, October 18 and 29, 1915 (H. P. Adams). Abundant at edge of ice pack off St. George, January 25, 1917 (Hanna). Some killed at sea near St. Paul, February 8, 1918 (Hanna).

These flocks wintering at sea are observed well into the spring. Thus Hanna noted them off St. George Island March 21 and April 8, 1914.

On several occasions numbers of the birds have been found dead on the beaches, usually in the early summer. These may represent merely the normal mortality from the large flocks which winter in the vicinity.

G. Dallas Hanna, who has had exceptional opportunities for observing this species, thinks that great numbers of crested auklets move northward in winter from their principal breeding grounds south of Bering Sea, and that this accounts for the immense numbers sometimes seen at this season, when they are much more abundant than in summer. He states:

This species evidently winters not far to the south of the Pribilof Islands, since after a severe storm from this quarter in winter the birds are almost always seen in small numbers and occasionally in enormous flocks, as in February, 1915, off St. Paul, and January, 1917, off St. George. At these times the birds gather on the water as closely as they can sit, and on both of the above occasions some flocks of the birds covered as much as 5 acres. This is a conservative statement, as applied to the larger flocks, as the areas were carefully estimated. At the same time there were many smaller flocks in the vicinity. The presence of drift ice does not prevent them from appearing after a blow; they then gather in the open spaces in their customary manner. (MS. notes, 1920.)

The flesh measurements of a number of specimens, recorded by M. C. Marsh, range as follows: Length, 9 to $10\frac{1}{4}$ inches; extent, $18\frac{5}{8}$ to $19\frac{1}{8}$. No appreciable sexual difference in size is apparent. A male (No. 104, M. C. Marsh) taken on St. Paul Island December 5, 1911, measured: Length, 10 inches; extent, 19. Notes on the colors of the soft parts follow: Iris with a ring of pale green within yellow, finally bordered by a black circle on the edge of sclerotic; legs and feet pale bluish, blackish behind, the web dusky in front; bill plain brown, lighter underneath.

A summer female (No. 349, Hanna) taken on St. George August 22, 1913, had the bill lead color at the tip, brown at base; iris white; feet and toes slate; webs, black.

Food.—Seven well-filled stomachs of crested auklets from the Pribilofs contained only amphipods, identified as *Parathemisto oblivia* in five cases and as *Socarnea vahli* in one. Another nearly empty stomach contained only two bits of kelp. Six of the stomachs holding amphipods were collected in midwinter, and the following note by G. Dallas Hanna is of interest as indicating the depth to which the birds must descend at that season to secure their staple food:

On several occasions I have been on fishing parties out among these birds and twice we pulled up codfish which had in their stomachs in one case one, and in the other case two, birds of this species. As the cod is a bottom feeder it seems evident that the birds descend to 30 fathoms, the depth of the water at the localities concerned. I believe it is customary for most of the diving birds to feed on the bottom, because I have been unable to secure amphipods at intermediate depths in the winter time. In summer, however, the crustaceans come nearer the surface and are more easily secured.

Aethia pusilla (Pallas). LEAST AUKLET.

Pl. VI, fig. 1.

The least auklet, the "Choochkie" of the natives, is excessively abundant on the Pribilofs during the breeding season, being present in countless thousands, probably millions. Palmer estimated their numbers as equaling the sum of all the other species. They breed on all the islands, but most abundantly on St. George, where an immense colony occupies the base and slopes of a high hill, Ulekiah, which rises near the center of the island. Elsewhere they nest in the cliffs and boulder beaches throughout practically the entire coast line of the different islands. The species was first recorded from the islands by Coinde (1860, p. 403).

Apparently the birds resort to land only to breed. A few winter at sea about the Pribilofs, and these flocks are augmented in spring by the arrival of the myriads which have wintered to the southward. A few days after their appearance offshore they begin to alight on the cliffs and boulder beaches, and soon become abundant on their breeding grounds.

Since these birds form an important and welcome addition to the spring food supply of the natives, their arrival is eagerly awaited, and many notes on spring arrival have been recorded. The following, referring to St. Paul Island, were taken from the island log by W. L. Hahn: April 30, 1886, arrival; April 25, 1889, arrival; April 18, 1899, arrival; April 28, 1900, small numbers; May 1 and 2, common; April 24, 1901, arrival; April 25, numerous; April 18, 1902, arrival; April 23, 1903, arrival; April 13, 1904, arrival; April 19, 1906, seen at sea; May 2, 1908, arrival; April 26, 1909, arrival; May 10, 1910, first seen flying over the land. Notes during recent years

are: St. Paul Island, 1911—April 18, arrival; April 27, about 100 seen; April 28, first seen flying over land; May 9, many thousands (Hahn). St. George Island, 1914—April 8, about 250 seen, first date when observed in numbers, though a few had been about all winter; April 14, upwards of 10,000 seen, small numbers flying over land and large flocks along beach (Hanna). St. Paul Island, 1915—March 30, flocks flew along nesting ground; April 15, flocks near shore; April 24, 27, thousands; May 6, abundant (Hanna). St. George, 1916—April 16, seen at sea; April 25, seen on land; 1917—April 17, offshore; April 23, on rocks (H. P. Adams). St. Paul, 1918—April 10, near shore; April 14, large flocks over boulder beaches (Hanna).

Eggs are usually laid in June; dates of collection follow: Otter Island, June 14, 17, 1884 (Lutz, 1889, p. 31). St. George, May 28, 1890; St. Paul, June 5, 1890 (Palmer, 1899, p. 388). St. George, May 24, June 8, 1913, June 16, 1914 (eggs well incubated) (Hanna). St. Paul, July 2, 1914 (Preble). St. George, June 5, 1916, eggs secured (H. P. Adams).

After the close of the nesting season in July the species rapidly becomes scarce about the shores of the islands. Hahn's observations in 1910 show records as follows: August 30, about 300 seen; August 31, 50; September 1, 8; September 10, 1; September 11, 1; October 2, none seen on St. Paul for some time, but still numerous at sea. In 1913, on St. George Island, Hanna saw none about the land later than August 20. In 1914, on St. Paul, I noted them only in small numbers during August, observing a few, however, almost daily up to the time of my departure on August 30, these late lingerers being probably the late hatched birds. After my departure Hanna recorded 6 observed on October 4, 1,000 on December 4, and 500 on December 13. H. P. Adams, in 1916, saw the last about St. George on August 28, and observed it at sea March 26, 1917. Hanna saw one off St. George January 25, 1917.

Numerous specimens taken by Hahn and Marsh in 1911 and 1912 measured in the flesh: Length, $6\frac{5}{8}$ to $7\frac{1}{2}$ inches; extent, $12\frac{3}{4}$ to $13\frac{5}{16}$.

Food.—The only information we have on the food of the least auklet is H. W. Elliott's credible statement (1875, p. 209) that "they feed on water shrimps and sea fleas."

Synthliboramphus antiquus (Gmelin). ANCIENT MURRELET.

The ancient murrelet was first recorded from the Pribilofs by W. H. Dall (Dall and Bannister, 1869, p. 310), who recorded it as "common at St. George." No specimens were taken at that time, and no further particulars as to the basis of the record are available. The first specimen was taken by W. L. Hahn on St. Paul Island, November 7, 1910; this is now in the collection of the Biological Survey. It measured in the flesh: Length, 10 inches; extent, $16\frac{5}{8}$.

Hanna observed three at St. Paul on December 4, 1914, and took a specimen there on April 18, 1918; another specimen, a female, taken on St. George Island, May 12, 1916, was sent in by Dr. H. P. Adams. Both of these are now in the collection of the U. S. National Museum.

Food.—The stomach of the April specimen above mentioned contained remains of more than 800 amphipods (*Pontogeneia inermis*).

Brachyramphus marmoratus (Gmelin). MARBLED MURRELET.

The marbled murrelet was first recorded from the Pribilofs by Hanna (1919a, p. 176, and 1920a, p. 251), on the basis of a specimen taken by him on St. Paul Island January 13, 1918. It is now No. 255110 of the collection of the U. S. National Museum.

Food.—The stomach of this specimen was about half filled with ground-up amphipods. These constituted 100 per cent of the food, a bit of hydroid present being much less than 1 per cent.

Cepphus columba Pallas. PIGEON GUILLEMOT.

The pigeon guillemot was first recorded from the Pribilofs by Nelson, who states "they nest on the fur seal islands" (1887, p. 45). This statement was based on conjecture, from his having observed the birds under the cliffs of St. George Island. Palmer found the birds quite common, but very shy, on the ocean to the southward of Walrus Island, on June 13, 1890 (1899, p. 389).

Hanna has published the following note, based on his observation of the species (1916, p. 402):

This is a common winter resident, and by April 18, 1915, some had the black summer plumage almost complete though still slightly speckled with white. It is strange that this bird should not breed on the Pribilofs, since it is so abundant on the neighboring Aleutians. The last one seen in 1915 was on May 26. In winter it feeds along the surf line, is very tame, and utters a low, shrill whistle when observed. A male and a female were taken on each island. The species has been previously recorded from the islands, but apparently no specimens were secured prior to my work there.

His detailed notes taken on St. Paul Island, follow: 1914—December 2, 8 seen; December 9, 1; December 4, 6, and 13, about 200 seen each day. 1915—February 18, 200 seen at Northeast Point; April 6, 1; April 18, 12; May 10, 2; May 18, 2; May 26, 1.

According to his field catalogue, M. C. Marsh collected a male of this species on St. Paul Island, January 6, 1912, and made the following notes: Length, 13 inches; extent, 23. Legs and feet orange red in front, somewhat darker behind; tarsus black behind; claws black; mouth vermilion; iris brown.

Hanna, during 1913 to 1915, observed the species on a number of occasions, as follows: St. George Island, 1913—December 19 and 30. St. Paul Island, 1914, December 2, 8 seen; December 9, 1; December

4, 6, and 13, about 200 seen each day; 1915—February 18, about 200 seen at Northeast Point. During the same spring the species was noted as follows: April 6, 1; April 18, 12; May 10, 2; May 18, 2; May 26, 1. Single specimens, now in the U. S. National Museum, were collected by Hanna on the following dates; St. George Island, December 19 and 30, 1913; St. Paul Island, December 6, 1914; April 18, 1915. The specimen last mentioned has nearly finished acquiring the summer plumage, though the underparts are still speckled with white. H. P. Adams noted the species on St. George, February 4, 1917, and Hanna on January 24, 1917.

Food.—Of the seven stomachs of the pigeon guillemot from the Pribilof Islands only five were well-filled, and these contained the following food items: Amphipods, 56.8 per cent; hermit and spider crabs, 20.8 per cent; isopods, 17.2 per cent; fish, 4 per cent; kelp, 1 per cent; and univalves, 0.2 per cent. The amphipods were identified as *Allorchestes malleolus* and the isopods as *Idothea ochotensis*. The spider crab was *Lithodes brevipes*, and the hermit crabs include two species—*Haplogaster grebnitzkii* and *Dermaturus mandtii*. No fewer than 13 of the last-named species had been eaten by one bird. The fact that almost no univalve fragments were present in the stomachs of birds eating so many hermit crabs shows that the crabs are either pulled from the empty shells they use for homes or are caught while transferring from one shell to another, a thing they frequently do. The fish remains in the present series of stomachs were unidentified, and the miscellaneous items of small importance, mostly contained in a single nearly empty stomach, were remains of marine worms, a pycnogonid or sea spider, and bits of kelp.

***Uria troille californica* (H. Bryant). CALIFORNIA MURRE.**

The California murre is the less abundant of the two species breeding on the Pribilofs, occurring in some numbers among the nesting colonies of the Pallas murre in practically all the sites on the islands, excepting Sealion Rock, and in some cases occupying extensive areas to the exclusion of the larger species. It was first recorded from the Pribilofs by Elliott (1874, unpagged, and 1875, p. 210).

It is difficult to fix even the approximate date of spring arrival on the Pribilofs, since most observers have failed to distinguish the two species, and the case is further complicated by the fact that both species occur in some numbers during the winter. The birds usually begin perching on the cliffs, probably indicating an awakening breeding interest, in late April or early May.

The bird breeds on all the islands of the group excepting Sealion Rock (Hanna, 1920b, p. 175). Mr. Hanna states that on St. Paul this species nests principally at Southwest Point, and on the high

cliffs on the western side of the island, among the colonies of the more numerous Pallas murre, but that it is not found among the extensive murre rookeries on Reef or Kitovi; this is in agreement with my own observations as far as they extend. It nests in great numbers on Walrus Island, usually apart from the other species. This circumstance has caused different visitors, judging from hurried observation covering only parts of the rock, to believe that the murre rookeries there consisted mainly of one or the other species. Palmer, however, in 1890, made two trips to the rock, and noted the Pallas murre exclusively on the western and northern parts of the island, and the present species on its southeastern part. During my own visit there on July 16, 1914, I noted that the breeding colonies on the higher central part of the island were principally of the present species. Further detailed observations are needed to show the proportionate numbers and the breeding areas of the two species on Walrus Island, and these may vary in different years.

The first eggs are laid in early June, and owing to various causes eggs still being incubated may be found until near the end of July; at the time of our visit there on July 16, 1914, young birds and eggs seemed about equally numerous. Eggs were taken on Otter Island, June 13, 1884 (Lutz, 1889, p. 31).

The birds leave the breeding rookeries in late August but continue about the islands during the autumn and winter, being by far the more common of the two species at that season, and being called the winter arrie by the natives, many of whom think it is found only at that season. Winter specimens in the collections of the Biological Survey and U. S. National Museum include the following: St. George Island, male, December 21, 1913; male, December 30, 1913; St. Paul Island, December 6, 1914. The species seems usually to be seen only in small companies during the winter. However, on February 18, 1915, Hanna observed upwards of 1,000 about St. Paul. He also found the birds abundant at the edge of the ice-pack off St. George, January 25, 1917.

Food.—Eighteen stomachs of the California murre from the Pribilofs, mostly taken in winter, have been examined. Of these only 12 were well filled and the contents of these were almost exclusively amphipods. The kind most frequently identified was *Pontogeneia* sp.; *Anonyx nugax*, *Allorchestes ochotensis*, *Hyale* sp., *Jassa* sp., and *Metopa* sp. occurring in smaller numbers. One of the well-filled murre's stomachs contained remains of 20 or more marine worms of the family Nereidae, and two of them held isopods (*Idothea ochotensis*). The nearly empty stomachs, which experience has shown do not as a rule fairly represent normal food habits, yielded remains of small sculpins (Cottidae), bits of barnacles, mollusks (in-

cluding *Aegobuccinum oregonense*), and hydroids; and the following vegetable matter: Algae, and glumes of grasses (*Phleum alpinum* and *Festuca ovina* var. *violacea*).

Uria lomvia arra (Pallas). PALLAS MURRE.

The Pallas murre is a very abundant species, the more numerous of the two murre, and nests on all the islands of the Pribilof group. It was apparently first definitely recorded by Dall (Dall and Bannister, 1869, p. 309), though Veniaminof (Trans. by Elliott, 1874, unpagged, and 1875, p. 242), in referring to "arries" as occurring, referred, of course, to this species as well as to the California murre.

Since the species winters in small numbers about the Pribilofs it is impossible to give definitely its usual date of arrival or departure, especially since the two species are difficult to distinguish at a little distance. The following notes taken by Hanna in 1915 on St. Paul Island evidently refer to spring arrival of this species on the nesting cliffs: April 15, 150 killed by natives, hundreds reported on the cliffs at Southwest Point; April 26, 100 killed in same place; May 6, fairly common. On St. George, in 1917, Hanna noted the first of the season on April 20.

The Pallas murre is the more numerous of the two species on all the nesting rookeries. Egg laying begins in early June. James Judge (MS. report) states that two arrie eggs were found on Walrus Island on June 1, 1889, and that the birds had not begun to lay at the same place on June 8, 1904; on June 16, 1910, 932 fresh eggs were found at the same place; on June 21, 1909 (St. Paul Island log) about 6,000 eggs were obtained by the natives at the same place. (These notes may refer in part to the California murre.) Definitely identified eggs of the present species were taken as follows: St. George, June 27, July 1, 1873; St. Paul, July 31, 1890 (Catalogue eggs, U. S. Nat. Mus.); Otter Island, June 13, 30, 1884 (Lutz, 1889, p. 31); Walrus Island, June 13, 1890 (Palmer, 1889, p. 391); St. George, July 1, 1914 (18 eggs in collection U. S. Nat. Mus. selected from 100, to show variation in color, by G. Dallas Hanna).

By the end of August most of the birds have left the breeding rookeries; at this time many late-hatched young are deserted and soon perish, the desire of the mother to accompany the departing flocks evidently being stronger than the parental instinct. Hanna states that on August 31, 1913, most of the murre had gone, and that many young ones were falling from the cliffs.

A few are observed about the island during the autumn and winter; Hanna's notes for 1914 record 2 observed on October 4, 3 on December 4, and 3 dead ones seen December 13. As is the case with several others of the more abundant species, dead ones are frequently observed in large numbers. Notes taken from the St. Paul Island

log by W. L. Hahn include the following entries in the autumn of 1900: October 25, hundreds of sick young ones; November 2, hundreds of dead birds; November 10, at least 5,000 dead on the shores of the lagoon; November 24, both sides of Northeast Point covered with dead ones.

A female specimen taken by M. C. Marsh, February 5, 1912, measured in the flesh: Length, $15\frac{1}{2}$ inches; extent, $28\frac{1}{2}$; bill jet-black, excepting the border of light yellow at base of the upper mandible and the pale tip; legs and feet black posteriorly, dusky and dark yellow anteriorly.

Food.—If the relatively small number of stomachs available can be taken as a criterion, the food of the Pallas murre in the Pribilof region differs markedly from that of the California murre. Of six stomachs examined, four were well-filled, and the food in them consisted of fish remains, 48.75 per cent; flesh and mandibles of squids, 26.25 per cent; and crustaceans, 25 per cent. The nearly empty stomachs also contained fish and squid remains. The crustaceans which completely filled one stomach were shrimps identified as *Spirontocaris polaris*.

Family STERCORARIIDAE.

Coprotheres pomarinus (Temminck).⁴ POMARINE JAEGER.

The Pomarine jaeger is a somewhat rare visitor. It was first obtained by Elliott, who took a specimen on the uplands between Kaminista Lake and Polovina, on St. Paul (Elliott, 1874, unpagged, and 1875, p. 196). This is No. 62522, female adult, U. S. National Museum, June 23, 1872. Another specimen (No. 106857, male, June 16, 1885) was obtained and reported by C. H. Townsend (1887, p. 98).

Palmer (1899, p. 393) states: "During the summer of 1890 two were seen on St. George eating the carcass of a fur seal. One of these was killed and preserved by Mr. Ed. Lavender." The final disposition of this specimen is not known. Two specimens, a male and a female, were taken by H. J. Christoffers on St. Paul Island, June 10, 1916. These are now in the collection of the U. S. National Museum.

Stercorarius parasiticus (Linnaeus). PARASITIC JAEGER.

The parasitic jaeger was first added to the fauna of the islands by Elliott, who mentions seeing four or five individuals (1874, unpagged, and 1875, p. 197). A specimen taken by him, a female in the dark phase of coloration, collected June 15, 1872, is No. 62524, of the bird collection of the U. S. National Museum. This constituted

⁴ *Stercorarius pomarinus* of the A. O. U. check list, 1910.

the only record until 1914, when G. D. Hanna on September 24 took a dark male bird on St. Paul Island, now No. 237495, U. S. National Museum. Hanna observed another individual, also a dark-colored one, on June 14, 1915, on the same island.

Food.—The stomach of the September specimen taken by Hanna was filled with finely ground remains of small fishes. The grinding material it contained was three lumps of an old bryozoan colony.

Stercorarius longicaudus Vieillot. LONG-TAILED JAEGER.

Judging by the records the long-tailed jaeger is the most frequently observed of the three jaegers, and we may perhaps credit Veniaminof (Trans. by Elliott, 1874 unpagged, and 1875, p. 242) with first having observed it, since he records "jaegers" as one of the species occurring on the Pribilof Islands. Elliott took one June 13, 1872, which has been several times recorded, and is still in the collection of the U. S. National Museum. Though thus early noted, the species appears not to have been afterwards observed until recent years. Hanna shot one on St. George, May 23, 1914. This was a male which had a string about the right foot, showing previous capture. Later in the same summer Mr. Hanna and the writer observed a number on both islands. We saw it daily on St. George, July 12, 13, and 14, noting as many as 7 on the two latter dates, and taking a specimen on the 14th; I noted one near Kaminista Lake, St. Paul, on July 29. The next year, on May 27, Hanna took a specimen on St. Paul.

None of the jaegers are known to have bred on the Pribilofs nor to have remained through the breeding season, although the conditions there would seem to be favorable for nesting.

Food.—Five stomachs of the long-tailed jaeger collected on the Pribilof Islands are at hand, of which four are well filled, three of them with insects, and one with the remains of eggshell and an unhatched young of a deep-water duck (Fuligulinae). One of the stomachs containing insects held more than 90 individuals of 4 species. The most numerous species was the large gold and green ground beetle *Carabus truncaticollis*, of which one stomach contained 58, including one larva. Other ground beetles eaten were *Pterostichus pinguidineus*, *Pterostichus* sp., and *Amara brunnipennis*. One stomach contained 3 of the rather large yellow and brown moths (*Hyphoraia subnebulosa*), one a crane-fly (*Tipula* sp.) with eggs, one two flesh-flies (*Cynomyia hirta*) and 16 larvae of this or an allied species, and another a small parasitic wasp (*Amblyteles* sp.). A bit of fish bone was in one of the well-filled stomachs and a nearly empty stomach contained a single sawfly (*Amauronematus*, probably of the species *whitneyi*, described from material in the present collections).

Elliott (1874, unpagcd, and 1875, p. 198) states that two individuals seen by him on July 29, 1872, [on St. Paul] were apparently feeding upon insects, and upon a small black berry (*Empetrum nigrum*).

Family LARIDAE.

Pagophila alba (Gunnerus). IVORY GULL.

An ivory gull obtained by True and Prentiss in 1895 was first recorded by Palmer (1899, p. 395). Concerning it, Prentiss (1902, p. 99) says: "One was killed by the natives on St. Paul in February or March, 1895, and prepared by Mrs. Judge, from whom I obtained it. It was not previously known from the Islands." Other specimens were taken on St. George Island by A. H. Proctor on February 18, 1916, and by G. Dallas Hanna on March 27, 1917. All these specimens are in the collection of the U. S. National Museum.

Bissa tridactyla pollicaris Ridgway. PACIFIC KITTIWAKE. Pl. VI. fig. 3.

Bissa tridactylus pollicaris Ridgway, Water Birds North Amer., vol. 2, p. 202, 1884. (Type from St. George Island.)

The Pacific, or western black-legged, kittiwake is very abundant on the Pribilofs, nesting on the cliffs of all five islands of the group, and remaining in small numbers during the autumn and early winter. The species was first recorded from the islands by Coinde (1860, p. 401), and has been observed by all later students of the avifauna. It is eaten in large numbers by the natives.

The following notes on spring arrival are the only definite ones at hand: St. Paul Island, 1909, first reported April 20; hundreds May 1 (St. Paul Island log, fide Hahn). St. Paul Island, 1911, 2 seen, April 24; many shot, April 30 (Hahn). St. George Island, 1914, 2 seen April 8; 10 seen April 22 (Hanna). St. Paul Island, 1915, May 18, 40 killed at Northeast Point; May 28, abundant (Hanna). St. George, April 16, 1917 (Hanna).

The nests are built of grass and moss, with some mud, and are placed on small platforms on the faces of cliffs. The following dates will show the period of nesting: St. Paul, July 3, 1879; St. George, June 24, 1873 (catalogue eggs, U. S. Nat. Mus.). Otter Island, June 21, 1884, eggs taken (Lutz, 1889, p. 31). Palmer (1899, p. 396) gives the following pertinent data: St. George, May 28, 1890, a few nests, but no eggs; Walrus Island, June 8, 1889, two eggs collected by C. H. Townsend; St. Paul Island, August 2, 1890, most nests with young, but a few had a young one and an egg, or sometimes two or three eggs. In 1914, on St. George Island, Hanna noted that on July 1 the nests were being completed, and a few had eggs. During the same season, the writer found a few nests with eggs on Sealion Rock, on June 29, and saw many nests on Walrus Island on July 16,

and on Otter Island, July 27. Bent (1921, p. 49) gives 13 records for eggs on the Pribilofs from June 10 to July 7; of these, 7 records fell between June 25 and July 3.

Hahn recorded this species as common on St. Paul Island during September and October, 1910, and saw quite a number in November. He saw 12 on December 8, and noted it as numerous December 21 of the same year, and saw 6 individuals on January 4, 1911. Hanna, on St. Paul Island, during the autumn of 1914, observed the species as follows: September 14, 40; September 16, 10; September 20, 2; September 22, 100; October 4, 25; October 12, 3.

A female specimen taken by W. L. Hahn, August 31, 1910, measured in the flesh: Length, 15 $\frac{7}{8}$ inches; extent, 39.

Food.—Three stomachs of St. Paul specimens of the Pacific kittiwake (taken in July and August) have been examined but yield meager data on the food habits of the species. One, very well filled, contained fish flesh, with no bones, and therefore not identifiable, another held fragments of Crustacea, also unidentifiable, and the third only vegetable débris, evidently algae. A more valuable stomach content collected at St. Matthews Island, July 12, 1916, by G. Dallas Hanna, contained Crustacea exclusively: A spider crab, Lithodidae, 50 per cent; and isopods, including *Idothea ochotensis*, 50 per cent.

Regarding the kittiwakes Mr. Hanna says:

They both occasionally eat small fishes which come near the surface of the sea. At such times they dive down like a tern for their prey. They also eat the refuse from freshly cleaned fish which may be thrown into the sea, but I have never seen one eat carrion.

However, the record above of fish flesh without bones is very suggestive that carrion sometimes is eaten.

Rissa brevirostris (Bruch). RED-LEGGED KITTIWAKE.

The red-legged kittiwake, an exceedingly beautiful species, the "Goverooskie" of the natives, is much less abundant than its congener, but is nevertheless found in large numbers. It breeds on all the islands excepting Sealion Rock, and appears to leave the neighborhood of the Pribilofs in September, to remain until April. It is a favorite article of food of the natives, being more esteemed than the black-legged species. It was first credited to the islands by Coinde, who supposed it to be an undescribed species, and named it *Larus warnecki* (1860, p. 401).

Hahn noted that many were shot on St. Paul Island on April 30, 1911. All the rest of the available notes on spring arrival are by Hanna. On St. George Island, in 1914, he observed 4 on April 8, 50 on April 22, and upwards of 1,000 on May 6. His notes for 1915, on St. Paul Island, are as follows: April 18, 20 individuals observed; April

24, 6; April 26, 81 killed by natives at Southwest Point; May 4, 30 observed, abundant at Southwest Point; May 18, 100 observed at Northeast Point; May 28, abundant. In 1917, on St. George, he noted the first on April 22.

The red-legged kittiwake nests among the colonies of its more numerous relative. Prentiss (1902, p. 99) makes the following statement regarding its detailed distribution on St. Paul Island, from observations made in the summer of 1895:

The distribution of the red-leg on the island of St. Paul differs from that of the black-leg. Around the village and the southeast portion of the island the red-leg is comparatively rare, while at Half-way Point on the east side of the island, there is a marked increase in numbers. At the southwestern portion they form nearly one-half of the kittiwakes. * * * On the north side of St. Paul they were numerous, and also on the beach at Zapadnie.

Palmer (1899, p. 398) gives the measurements of eggs taken on St. George Island, by Elliott, June 25, 1872. Lutz (1889, p. 31) records an egg taken on Otter Island, June 29, 1884. The catalog of eggs in the U. S. National Museum notes eggs taken on St. Paul, July 15, 1895. Hanna took eggs on St. George Island, July 3, 1914. On August 31, he observed young still in the nest; on September 11, the young were all on the wing. This apparently was the signal for the departure of the species. On September 14, he records seeing 12 individuals; on the 16th, 4, and on the 22d, 10. These were the last seen that season. I find no winter records.

Food.—Fifteen stomachs of the red-legged kittiwake from St. George Island have been examined, eight of them being half or more full and seven nearly empty. Of the food in the former, 25 per cent consisted of squid remains, 37.5 per cent of fish, and 37.5 per cent of Crustacea. The Crustacea were small shrimplike forms, chiefly of the genus *Thysanöessa*, and were present to the number of several hundred in each of two stomachs. All of the nearly empty stomachs contained squid mandibles.

Larus hyperboreus hyperboreus Gunnerus. GLAUCOUS GULL.

The glaucous gull breeds in small numbers on the grassy summit of Walrus Island, among a large colony of glaucous-winged gulls, and during the summer season may occasionally be observed on the other larger islands. It is found in larger numbers during the fall, and Hanna (1917, p. 407) states that in winter it is the only large gull found on the Pribilofs, having replaced entirely the glaucous-winged gull with which it has been associated.

The species was first recorded by Palmer (1899, p. 395) under the name *Larus barrovianus*. A specimen taken by him there on June 13, 1890, has recently been referred by Oberholser, as a result of a critical study of the group, to the typical form (1918, p. 471).

On the occasion of my visit to Walrus Island on July 16, 1914, a few glaucous gulls, about 15 pairs, were found to be nesting on the extreme grassy summit of the island. At this time most of the nests contained well-grown young. No specimens were collected, and owing to the brief time we could stay on the island, no detailed study could be made of this or any particular species.

Hanna observed the glaucous gull on St. Paul Island, as follows: 1914, September 14, 1; September 16, 5; September 20, 1; October 12, 1; October 25, 20; November 27, 10; December 13, 4. 1915: February 18, 25; March 5, 2; March 18, 300; April 2, 1; April 24, 10; May 4, 30; May 28, 15.

The species evidently was common about St. George Island in the spring of 1917, since Hanna sent in the stomachs of nine birds taken on April 12.

Food.—Nine stomachs of glaucous gulls from St. George Island and one from St. Matthew Island, all well filled, were available for the present study. They reveal that this species shares the well-known propensity of gulls to feed largely on carrion. Fifty-eight per cent of the total food of these birds was fishes, the indications being that most if not all of them were found dead. Ten per cent of the food consisted of a large egg, perhaps of a duck, found in one stomach, another 10 per cent, approximately, of squid remains, a slightly larger amount of invertebrates including hydroids, mollusks, marine worms, and a crab, and a similar proportion of algae. The mollusks identified were the common blue mussel (*Mytilus edulis*), a sea slug (*Chiton* (?) *submarmorea*), and the crab was a hermit (*Dermaturus mandtii*).

Larus hyperboreus barrovianus Ridgway. POINT BARROW GULL.

A gull taken on St. Paul Island on June 21, 1890, has been referred by H. C. Oberholser (1918, p. 473) to this form, which is characterized as smaller, and having a darker mantle, than typical *L. hyperboreus*. This bird must have been a nonbreeding bird or a wanderer from some breeding colony. It was taken by William Palmer, but for some reason was not mentioned in his account of the birds of the Pribilofs. The specimen is still in the collection of the U. S. National Museum.

Larus glaucescens Naumann. GLAUCOUS-WINGED GULL.

The glaucous-winged gull is an abundant summer resident, breeding on Walrus Island, St. George Island, and Sealion Rock, and is also observed in winter, sometimes in considerable numbers. First recorded from the Pribilofs by Veniaminof in 1840 (Trans. by Elliott, 1874, unpagged, and 1875, p. 242), under the name of "chickee" (the native name), and noted by all subsequent observers.

Because of its wintering to some extent, the date of spring arrival is somewhat uncertain. The following dates of observation later than late March are available: St. George Island, 1914: March 28, 25 seen; May 6, 30 seen; April 14, 40 about stranded whale; April 22, 20. St. Paul Island, 1915: April 24, about 3,000 seen, appeared in numbers during the last few days; May 4, 20 seen; May 28, abundant.

The birds breed principally on Walrus Island, the foxes apparently preventing them from nesting on St. Paul Island and Otter Island, and on St. George except in a few places, as the birds prefer flat turfy situations for nesting. A few pairs breed on the summit of Sealion Rock, a small islet close to St. Paul. All through the breeding season the birds are common on St. Paul Island, feeding about the shores and numerous ponds, and apparently securing most of their nesting material there. On Walrus Island, in 1872, Elliott considered that 500 or 600 were nesting; in 1914 I estimated about 100 pairs. The eggs, usually 2 or 3 in number, are laid mainly in June. James Judge reported finding 359 eggs, all fresh, on Walrus Island, June 16, 1910. Palmer (1899, p. 394) on June 13, 1890, found some fresh eggs and many well incubated, while a few were already hatched. At the same place on July 16, 1914, I found many young, but only a few eggs, and those usually about to hatch.

A few fall and winter dates of observation follow: St. Paul Island, 1910, abundant during September and October; less so in November. December 8, 12 seen; December 21 numerous at sea; 1911, January 4, 3 seen; January 30, 6 (Hahn). St. George: 1913, September 4, 8 seen; September 15, about 20; October 9, 4; October 18, 50; November 11, a few along beach all the time; 1917, January 25, abundant (Hanna). M. C. March made the following notes on fresh specimens collected by him: St. Paul Island, October 16, 1911, female, length, $23\frac{3}{4}$ inches; extent, 53; basal half of bill whitish, scarcely tinged with flesh color; terminal part, black, excepting pale tip; legs and feet outwardly dirty brownish, paler on inner surface. Another female specimen, same place and date, measured: Length, 24 inches; extent, 52; iris purplish-silvery mottled; edges of eyelids pinkish; bill whitish and yellow, with a blotch of orange at angle; lower mandible yellow, deepest on curves; upper mandible lighter along straight edges of commissure and above nostrils; legs and feet faded pinkish.

Food.—William Palmer in his report on Pribilof birds (1899, p. 395) noted that the glaucous-winged gull feeds "on pretty much everything in the way of offal. Even the dead seals are devoured by them, and they vie with the foxes in their ability to search out and dispose of all animal matter." Results obtained in the present

investigation bear out this bird's reputation as a scavenger. Three of the four well-filled stomachs contained fish bones and flesh and eggs, undoubtedly carrion, which amounted to 41.25 per cent of the total food. A rib of a fur seal was the principal food taken by one bird; the bone was 6 inches long and extended from the throat to the stomach, where the lower end was undergoing digestion. One full and one nearly empty stomach contained exclusively remains of eggs and young of a bird of the auklet family. Miscellaneous contents were remains of univalve, sea urchin, crab, and algae.

Larus schistisagus Stejneger. SLATY-BACKED GULL.

The slaty-backed gull was included among the birds of the Pribilofs by Palmer, whose account (1899, p. 394) may be quoted in full:

Several of the natives informed me that a large black-backed gull, different from the following, bred sparingly on the cliffs of Otter Island, and that they rarely visited St. Paul. Daniel Webster, an old experienced sealer who had then spent 22 years on the islands, also told me that a large dark-backed gull was to be found in small numbers on the cliffs of St. George. On June 11, on St. Paul I saw three, and on June 12, another, which came in over the Reef from the direction of Otter Island. Several evenings after August 1 I noticed some large gulls flying slowly in from the Reef (on one evening I counted seven). The mantle was much darker than in *glaucescens*. They were probably this species, the status of which is very uncertain on the American side of Bering Sea.

Gulls observed by Hanna on two occasions were apparently of this species. On December 21, 1913, he saw about 25 large white-tailed gulls with slate-colored backs, off St. George Island; and on October 15, 1919, saw two dark-backed gulls, with black-tipped wings, and slightly smaller than the glaucous-winged gull, about the ship's anchorage off St. Paul Island. He has no evidence of the breeding of the species on Otter Island.

Rhodostethia rosea (Macgillivray). ROSY GULL.

A specimen of the beautiful rosy gull was shot by a native on a fresh-water lake on St. George Island May 25, 1911, and was preserved by A. H. Proctor. The specimen, which is now in the collection of the Biological Survey, was recorded by Evermann (1913, p. 17). A second specimen, a female, taken on St. George March 24, 1917, is now in the U. S. National Museum.

Xema sabinii (J. Sabine). SABINE GULL.

The Sabine gull appears to be of regular occurrence in early summer and in the autumn. It was first credited to the islands by Palmer (1899, p. 398), who mentions one seen on St. Paul Island by H. W. Elliott June 4, 1890, and one (perhaps the same individual) seen later about the lagoon by himself. He also lists a specimen

taken June 26, 1890, and refers to others taken during the summer of 1896, and one on St. George Island by D. W. Prentiss. Prentiss, referring to observations made in 1895, says (1902, p. 100): "I saw them occasionally on both St. Paul and St. George, and secured several."

W. L. Hahn, during the autumn of 1910, observed the species as follows on St. Paul Island: August 31, 1; September 1, 7; September 7, 2; September 8, 20; September 11, 20; October 2, 1. A specimen taken by him on September 8 measured in the flesh: Length, 13½ inches; extent, 30¾.

G. Dallas Hanna, on St. George Island, observed two individuals, collecting one, May 19, 1914, and on June 16 saw three. In the year following, on St. Paul Island, he saw one on May 26. Two specimens, an adult and an immature female, were collected by him on St. Paul Island, August 30, 1916. They are now in the collection of the U. S. National Museum.

Food.—One well-filled stomach and crop of the Sabine gull taken May 19, 1914, on St. George, gives evidence that this bird feeds upon insects on the wing and is skillful in the pursuit. The food contained in this stomach included the remains of 6 gold and green ground beetles (*Carabus truncaticollis*), 2 other ground beetles (*Pterostichus* sp.), and 1 water beetle, together 4 per cent; a great many caddisflies, 16 per cent; and numerous two-winged flies (37 *Borborus annulatus*, 5 *Leria fraterna*, 3 *Scatophaga dasythrix*, 1 *Hydrophorus innotatus*, and 27 or more others), 80 per cent. A nearly empty stomach taken at the same time contained remains of amphipods, and marine worms (Nereidae).

Sterna paradisaea Brunnich. ARCTIC TERN.

The arctic tern is apparently of regular occurrence about the Pribilofs during migration. It was first recorded from the group by Palmer (1899, p. 398) on the authority of F. A. Lucas, who saw two on St. Paul Island July 26, 1890, and of Daniel Webster, an old sealer, who described a tern claimed to be found every fall about St. George. Later observations have added to the records. Hahn observed eight on St. Paul Island August 30, 1910, and one on September 24. Hanna saw four feeding in the surf off St. George Island May 19, 1914, and collected one. During the following spring, on St. Paul, he observed the species as follows: May 9, two; May 11, four; May 15, one; May 26, one; June 30, one. Two female specimens, an adult and an immature, now in the collection of the U. S. National Museum, were taken by Hanna on St. Paul Island on August 28 and 30, 1916. He also took a specimen on St. George, August 5, 1920.

Food.—Only two stomachs of the arctic tern from the Pribilofs (May 19, 1914, and August 5, 1920) have been examined; one of them was practically filled with remains of small sculpins, the other with amphipods (46 or more *Pontogeneia* sp.). Both stomachs contained traces of univalves, in each case less than 1 per cent.

Family DIOMEDEIDAE.

Diomedea albatrus Pallas. SHORT-TAILED ALBATROSS.

The short-tailed albatross used to be of common occurrence about the Pribilof Islands according to the testimony of the natives. Veniaminof, writing in 1840 (Trans. by Elliott, 1874 unpagged, and 1875, p. 242) stated that the albatross "is frequently to be seen about the beaches." Elliott took a specimen August 12, 1873, and was informed by the natives that 20 years earlier the birds had been very abundant but had disappeared with the whalers. Palmer (1899, p. 381) obtained an immature bird on St. Paul on August 4, 1890, and observed five others on August 10, off the reefs of the same island.

I have no recent records, excepting that of a sternum picked up on the beach at St. Paul by Hanna.

Family PROCELLARIIDAE.

Fulmarus glacialis rogersi Cassin. RODGERS FULMAR.

The Rodgers fulmar is a rather common summer resident, but the greater number apparently leave the islands as soon as breeding is over. A few are seen during the autumn, but they are very rare later. The species lays its single egg on narrow shelves on steep cliffs on St. Paul, Otter, and St. George, by far the greater number on the last. It was first recorded from the Pribilofs by Dall, who procured a specimen on St. George (1869, p. 323).

The birds usually arrive in March or April; I have few definite dates. On St. George Island in 1914 Hanna, on March 21, recorded having seen large numbers during the two preceding days, "the first since January, when one was seen"; April 3, numbers reported at Zapadni; April 8, 30 observed; April 22, 20. In 1917 it was first seen at Zapadni on March 8. Hanna's notes for St. Paul are as follows: 1915—May 2, 200 reported at Southwest Point; May 4, hundreds; May 10, abundant. 1918—February 8, killed at sea near island; large numbers on high cliffs.

The following dates refer to nesting: Otter Island, June 10, 1872, St. George, June 10, 1873, eggs in U. S. National Museum, collected by Elliott. Otter Island, June 14, 1885, eggs taken by C. H. Townsend (Palmer, 1899, p. 382). St. George Island, July 1, 1914, eggs taken by Hanna. On August 4, 1914, we found nests with well grown

young on the cliffs near Zapadni, St. George. H. P. Adams secured eggs on St. George, June 4, 1916.

Hahn found fulmars common at sea between Walrus Island and St. Paul, October 2, 1910. Hanna saw a few on St. George Island, September 11, 1913, and two on September 28. On St. Paul, in 1915, he noted two on October 4.

A considerable number of birds in the sooty phase of plumage occur in the breeding colonies. Hanna thinks that on St. George Island about one-fifth are dark birds. He has preserved two specimens of the dark phase of this species, and states (1920a, p. 249): "These birds are often seen in the large colonies which breed on the Pribilofs. They seem to mate indiscriminately with light colored birds and in one case a slate-colored downy young was seen which had light-colored parents." On July 12, 1914, in a breeding colony near the village of St. George, I saw a light and a dark bird, apparently mates, presiding over a nest containing a young one.

Food.—Of 19 stomachs of the Rodgers fulmar collected on St. George Island, 18 were nearly empty, but whether empty or well-filled the entire food remains present were those of squids. In one case mandibles representing at least 13 squids were present. G. Dallas Hanna also recognized the importance of squids in the dietary of this bird and gives the following interesting account of another food habit of the species:

Some species of squid is eaten extensively and the eyes, which resemble pearls, are found in the stomachs and the beaks have also been secured. But the huge brown-rayed jellyfish found in Bering Sea also is eaten. In the tide rips and eddies about the Pribilofs this jellyfish is often brought to the surface of the water. Fulmars attack it voraciously when an opportunity is presented and if possible tear it to pieces. The birds then gather around in large numbers to enjoy the feast. It seems that the attacks of the birds finding the jellyfish are chiefly an endeavor to so injure the animal that it will be unable to dive to safety. I have seen as many as 50 birds in one small circle eating these jellyfish, and I have never seen anything else being captured or eaten although in the course of a day's fishing many thousands of the birds are seen cruising over the ocean.

Puffinus tenuirostris (Temminck). SLENDER-BILLED SHEARWATER.

Hanna (1919a, p. 176, and 1920a, p. 251) added the slender-billed shearwater to the Pribilof fauna, and writes as follows:

A female slender-billed shearwater was picked up on the beach of St. Paul Island on June 4, 1918. Another bird was seen shortly after, flying about 2 miles out at sea. Mr. C. E. Crompton told me that numerous individuals were in the vicinity of St. George Island at about the same time. (l. c., p. 251.)

This specimen is now No. 255111 of the bird collection of the U. S. National Museum.

Oceanodroma furcata (Gmelin). FORK-TAILED PETREL.

The fork-tailed petrel has been observed on a number of occasions about the Pribilofs during the summer, but is not known to breed. It was first recorded from the islands by Palmer (1899, p. 383) on the strength of an individual picked up on the beach of St. Paul by True and Prentiss in 1895, and another similarly taken by D'Arcy Thompson in August, 1897.

M. C. Marsh next observed the species, collecting specimens on St. Paul Island on March 6 and April 28, 1912. Hanna saw a gray petrel, which was probably this species, on St. George Island June 16, 1914, and on July 15 of the same year, while crossing from St. George to St. Paul, the writer observed a few individuals at sea. Hanna took a specimen, now in the U. S. National Museum, at Northeast Point, St. Paul Island, on April 24, 1915; it was the only one seen at the time. He observed another off St. George, May 4, 1917.

Marsh made the following notes from the fresh specimens: Male, St. Paul Island, March 6, 1912, length, $9\frac{1}{4}$ inches; extent, $18\frac{5}{8}$; bill, legs, and feet, black. St. Paul (sex not determined), April 28, 1912, length, $8\frac{1}{8}$ inches; extent, $18\frac{1}{2}$.

Food.—A single stomach of the forked-tailed petrel from the Pribilofs (St. Paul, April 24, 1915) has been examined and it was practically empty, containing only traces of fish bones.

Family PHALACROCORACIDAE.

Phalacrocorax pelagicus robustus Ridgway. VIOLET-GREEN CORMORANT.

The violet-green cormorant seems to have been first authoritatively credited to the Pribilofs by Baird, Brewer, and Ridgway (1884, vol. 2, p. 161), who say: "It is also said to be abundant at St. George's Island, in Behring's Sea, where Captain Smith obtained several examples." Although the bird was thus early recorded, its regular presence has been generally ignored by observers, and it remained for G. Dallas Hanna to discover that the bird is rather common and breeds in a number of places. He states (1916, p. 402) that it is common about the Pribilof Islands in winter, and that it is recognized as differing from the red-faced cormorant by the natives, who call it "sea shag."

We found it nesting on Sealion Rock in 1914 and at a number of places on both St. Paul and St. George Islands, and it is believed also to breed on Otter Island.

Hanna has collected a number of specimens which are in the U. S. National Museum (one is No. 255123, St. George, May 2, 1917) and has furnished the writer with the following dates of occurrence on

St. Paul Island: 1914—September 22, 2 observed; December 6, 3; December 8, 18 killed at Northeast Point by natives; December 13, 10. 1915—February 18, 10; March 5, 2; March 15, 25; March 18, 30; March 24, 3; May 6, 4 seen on Reef Cliffs; May 9, 4 seen on Southwest Point Cliffs; May 18, 2 seen at Northeast Point; these May records in all probability indicate birds settled on their nesting cliffs. Hanna also reports the species killed at sea near the island February 8, 1918.

Food.—This cormorant, like all its race, is a great lover of fish food, but investigation discloses it is by no means exclusively piscivorous. The contents of 21 well-filled stomachs from the Pribilofs were: Fishes, nearly 74 per cent, and Crustacea, about 26 per cent. The fishes were chiefly sculpins taken by 17 birds; the species identified were *Myoxocephalus* sp., *M. polyacanthocephalus*, and *Megalocottus laticeps*. Three of these violet-green cormorants had captured rock eels (*Pholis fasciatus*), in one case to the number of 20, which in bulk were equal to about three-quarters of a pint. All but three of the stomachs examined contained remains of shrimps of the genus *Spirontocaris*, and no fewer than 30 individual shrimps were taken from a single stomach. Both *Spirontocaris polaris* and *S. groenlandica* were identified, and specimens of the latter species $3\frac{1}{2}$ inches in length had been eaten. Four of the birds also had devoured hermit crabs, which were identified as *Dermaturus mandtii*, *Pagurus undosus*, and *Hapalogaster grebnitzkii*. Ten of the latter were present in a single stomach. The nearly empty stomachs also contained crustaceans and fish remains, and one well-filled stomach yielded a bit of sea lettuce, no doubt accidentally taken.

Phalacrocorax urile (Gmelin). RED-FACED CORMORANT.

The red-faced cormorant is a rather common breeder, nesting on all the islands of the group excepting Sealion Rock. It was probably first noted from the Pribilofs by Coinde (1860, p. 401). Owing to this bird having been confused with *P. p. robustus* in many cases there are numerous notes of occurrence at various seasons which can not with safety be used for either. In the present account, therefore, all doubtful notes have been ignored.

Apparently the bird does not winter unless in very small numbers. It usually arrives in late April or early May. Hanna's spring notes for 1915 on St. Paul Island are as follows: April 15, only one *P. urile* among 25 cormorants shot by the natives for food; April 24, 30 observed; May 9, 8 observed at Southwest Point; May 18, 6 seen; May 28, 8 seen at Northeast Point.

The bird is an early breeder. Eggs were found on Otter Island May 22, and on Walrus Island on May 23, 1875 (notes from island log). Other dates for eggs include: Walrus Island, June 1, 1872,

eggs well incubated taken by Elliott; Walrus Island, June 13, 1890, eggs more or less advanced in incubation taken by Palmer (1899, p. 377). On the occasion of our own visit to Walrus Island on July 16, 1914, young about one-fourth grown were found.

The birds remain about the islands in small numbers throughout the autumn. Hanna's notes for 1914 on St. Paul Island are as follows: September 20, 2 observed; September 22, 1; October 4, 4; October 25, 2; November 16, 5; November 27, 6.

Palmer (1899, p. 373) has given a very full account of the species, especially of the nesting and the feather structure.

Food.—Five well-filled and one nearly empty stomach of the red-faced cormorant are at hand; the latter may be dismissed at once with the statement that it contained one mandible of a squid, the only trace of this type of animal in the series. The food in the other 5 stomachs consisted of fishes, 57.8 per cent; crustaceans, 41.4 per cent; and algae and hydroids, 0.8 per cent. The fishes included sculpins (*Gymnocephalus pistilliger*), rock eels (*Pholis* sp.), and an unidentified kind. The crustaceans were chiefly shrimps of the genus *Spirontocaris*; both *S. groenlandicus* and *S. polaris* were identified. No fewer than 66 of the latter species were present in one stomach. Hermit crabs (*Hapalogaster grebnitzkii*) were eaten also by one bird, and a spider crab (*Oregonia gracilis*) by another. Hydroids (*Abietinaria* sp.), sea lettuce, and plume algae (*Ptilota asplenoides*, and *Ptilota* sp.) were each found in a single stomach.

Family ANATIDAE.

Mergus merganser americanus Cassin. AMERICAN MERGANSER.

The earliest record of the American merganser is that of Dall (1873, p. 31), who stated that the bird winters on the Pribilofs. Palmer gives it as undoubtedly occurring during migrations and in winter, but gives no definite notes beyond referring to Dall's account. The first known specimen from the islands seems to have been taken on St. George Island, October 13, 1916, by Dr. H. P. Adams, and is now No. 253784, female, of the bird collection of the U. S. National Museum.

Mergus serrator Linnaeus. RED-BREADED MERGANSER.

The red-breasted merganser has been detected only a few times on the Pribilofs. It was first recorded from the group by Evermann (1913, p. 17), who listed a female specimen taken on St. Paul Island, December 16, 1910. Hahn, who prepared and sent in the specimen, states that it was shot on the lagoon by Doctor Morgan. It measured in the flesh: Length, 19½ inches; extent, 29.

Hanna states that he examined a specimen of this species which was shot by a native on St. George Island in the autumn of 1913.

Anas platyrhyncha platyrhyncha Linnaeus. MALLARD.

The mallard is a regular spring and autumn migrant on the Pribilofs. A few remain during the summer, and it has occasionally been known to breed. It was first added to the avifauna of the islands by Elliott, who recorded it from both islands (1874, unpagcd, and 1875, p. 190).

Palmer observed a few during the summer of 1890 (1899, p. 380). The following notes on occurrence in spring, taken from the St. Paul Island log by W. L. Hahn, are of interest: May 9, 1888, 1 shot; about April 10, 1903, 2 shot; May 15, 1905, observed; May 7, 1908, 2 killed (first for season); May 1, 1909, several seen. Hahn himself reported it in 1911 as follows: April 22, 3 seen; April 24, 2 seen; April 29, 4 seen; April 30, many reported.

On St. George Island, in 1914, Hanna noted the mallard as follows: April 22, 9 seen; May 19, 6 seen. On St. Paul Island, in 1915, he recorded the following observations: April 30, 5 seen; May 2, 8; May 4, 15; May 6, 4; May 9, 20; May 17, 4 (paired); May 27, 2. During more recent years he has a record of 4 seen on St. George April 14, 1917, and 7 on St. Paul May 16, 1919. H. P. Adams noted the bird on St. George September 26 and 27, 1915; April 16 and 19, 1916; and April 26, 1917. The following are all the data regarding breeding that I have secured. Elliott (1875, p. 190) states that a pair bred at Polovina, St. Paul Island, in 1872. Hanna furnishes the following notes: In 1917 a pair nested in a pond at Little Polovina, St. Paul. In 1918 a brood of 8 young was hatched in the pool above Ice-house Lake, St. Paul. These were killed, with the parents, before they were half grown. Hanna was told by W. C. Allis, who has wide experience on the islands, that it was formerly not a rare occurrence to see flocks of young mallards in the various ponds on the road to Northeast Point, and that they were eagerly hunted by the natives. While on the Pribilofs in the summer of 1914, I observed the mallard only once, recording a male seen at Kaminista Lake, St. Paul Island, on August 17.

The following dates of occurrence in autumn are available: St. Paul Island, several shot October 9, 11, and 15, 1902 (island log notes transcribed by Hahn). Hahn himself thus recorded the bird on St. Paul in the autumn of 1910: October 9, several shot at Northeast Point; October 11, 1 seen; October 14, 5; October 15, 20 seen in two flocks of 6 and 14, flying in direction of St. George Island, in evening; October 16, 3; October 19, 5; October 20, 4; October 23, 1; November 9, 3. On St. George Island, in 1913, Hanna saw 1 on September 28, and 10 on October 18; on St. Paul, in 1914, he saw 4 on November 20, and 2 on November 21. In 1916, on St. George, Hanna noted it as follows: October 26, still abundant; No-

vember 5, 5 seen; December 24, 1 killed. He also found it abundant there on April 28, 1917.

The only winter record is of a female taken by M. C. Marsh on St. Paul Island, January 1, 1912. The following notes are from the fresh specimen: Length, 21 inches; extent, $35\frac{1}{2}$; legs and feet, orange-red; bill, yellow, blotched with black; nail, black. A male taken by Hahn on St. Paul, November 9, 1910, measured: Length, $22\frac{1}{2}$ inches; extent, $35\frac{1}{4}$. A female taken at the same time measured: Length, $20\frac{1}{2}$ inches; extent, $33\frac{3}{4}$.

Food.—Univalves (*Littorina atkana*) constituted three-fourths of the food of two mallards collected in a salt lagoon on St. Paul Island, November 20, 1914, and unidentified vegetable matter, the other fourth. G. Dallas Hanna notes that they usually feed in fresh-water ponds and that they prey extensively on the larvae of blowflies. W. L. Hahn examined a gullet which was filled with larvae of Diptera and of caddisflies.

Chaulelasmus streperus (Linnaeus). GADWALL.

The gadwall has been taken on the Pribilofs on only two occasions. It was first added to the list by Evermann (1913, p. 17), who recorded a female specimen taken by M. C. Marsh on St. Paul Island, November 13, 1911. The following notes, taken by Marsh from the bird in the flesh, are from his field catalogue: Length, $18\frac{3}{8}$ inches; extent, $33\frac{5}{8}$; iris, brown; lower mandible, light yellow, tip, dark; upper mandible, darker yellow along sides, black at tip, and along culmen, shading into yellow on the sides; legs and toes, light yellow. dark at the joints; web, and toes below, black.

A second specimen, also a female, taken from a flock of three at Halfway Point, St. Paul Island, May 20, 1919, has been recorded by Hanna (1920b, p. 174).

Mareca penelope (Linnaeus). EUROPEAN WIDGEON.

The European widgeon was first ascribed to the Pribilofs by Coues (in Elliott 1874, unpagcd, and 1875, p. 190) on the strength of an adult male specimen taken on St. Paul Island, May 27, 1872, by Elliott, who also reported seeing a few others. A second specimen, also a male, taken by W. L. Hahn on St. Paul, April 30, 1911, was recorded by Evermann (1913, p. 17). Hahn's catalogue gives the flesh measurements of this bird as follows: Length, $19\frac{1}{4}$ inches; extent, 32. A third specimen, male, No. 242691, preserved by A. G. Whitney, is in the collection of the Biological Survey. It was taken by a native on Ice-house Lake, St. Paul, May 9, 1913. The following notes were made from the fresh specimen: Length, 17.7 inches; tip of upper mandible for one-half inch black, this color extending farther back on the edges; remainder of upper mandible slaty-blue,

lighter between nostrils; lower mandible black; feet and legs grayish, webs blackish. Parasites taken from this specimen proved to be *Trinoton luridum*, previously recorded from the same host.

Another, represented only by the head and feet, was taken by G. Dallas Hanna on St. Paul, May 1, 1918, and is now No. 255133 of the bird collection of the U. S. National Museum.

By the capture of this bird on the Pribilofs, the species was added to the North American fauna. It breeds in Eurasia from Scandinavia to Kamchatka, migrating southward in winter.

Eunetta falcata (Georgi). FALCATED TEAL.

The falcated teal, a beautiful crested species, was added to the avifauna of the Pribilofs by Hanna, who has recorded (1919a, p. 176, and 1920a, p. 250) a specimen secured by him on St. George Island, April 18, 1917. This specimen, which is a male in high plumage, is now No. 255131 of the bird collection of the U. S. National Museum. The species ranges normally in Asia east to Kamchatka, Korea, and Japan. The specimen mentioned is the first secured in North America.

Food.—The stomach of this rare straggler was about half filled with sea lettuce.

Nettion crecca (Linnaeus). EUROPEAN TEAL.

A male and female of the European teal, taken on St. Paul Island May 4, 1918, and recorded by G. Dallas Hanna (1919a, p. 176, and 1920a, p. 252), formed the first record for the Pribilofs. These are now Nos. 255127 and 255128 of the bird collection of the U. S. National Museum. Another specimen, a male, was taken on the same island September 20, 1919, and has also been put on record by Mr. Hanna (1920b, p. 174). It is in the collection of the California Academy of Sciences.

The species is of general distribution in northern Eurasia, and breeds regularly eastward to the eastern Aleutians, where it had been detected many years before its capture on the Pribilofs.

Nettion carolinense (Gmelin). GREEN-WINGED TEAL.

The exact status of the green-winged teal on the Pribilofs is uncertain owing to the great difficulty of distinguishing the female and young of this species from those of the European teal (*Nettion crecca*), even with the birds in hand. Teals were definitely ascertained to breed at Antone Lake, St. Paul Island, by Mr. Hanna and myself in the summer of 1914, and an adult female and her unfledged young one were taken. We failed to take or even see a male on this occasion, however, and the specimens we secured can not be certainly identified. Teals of one or both species also occur quite frequently in migration.

The present species was recorded from the Pribilofs by Palmer (1909, p. 380), who saw one on a pond on St. George Island, May 28, 1890. It was later killed by some one but was not secured for a specimen. The following notes on the occurrence of teal are given with the understanding that they may not be referable in all cases to the American species: St. Paul Island: May 15, 1905, seen on Polovina Lake (island log, note transcribed by Hahn); February 27, 1911, 1 killed on Lagoon Reef by a native, preserved by Hahn (now No. 270533, male, collection Biological Survey); May 21, 1911, 1 killed (reported to Hahn); July 29, 1914, 1 seen on Polovina Lake (Preble); August 22 (4), and 25 (1), 1914, (Preble and Hanna); October 17, 1914, 3 seen (Hanna); May 18, 1915, 1, Halfway Point (Hanna).

On St. George Island Hanna observed 3 teals on September 4, 1913, and 1 on May 19, 1914, and collected a fine male of the American form there on May 10, 1917. Another male was taken by him on St. Paul, May 26, 1919 (1920b, p. 174). These two last-mentioned specimens are in the collections of the U. S. National Museum, and of the California Academy of Sciences, respectively.

Food.—Two teals from Antone Lake, St. Paul (August 31, 1914, G. D. Hanna), identified as the green-winged, had been feeding on seeds and foliage of white water crowfoot (*Batrachium trichophyllum*) and a pondweed (*Potamogeton filiformis*), together with a few small Diptera.

Two other teals, not certainly identified as to species, collected at the same lake in the same month (August 22, 25, 1914) had taken the same things in somewhat different proportions, together with certain additional items. Water crowfoot made the bulk of the food of one of these birds, but a few seeds of pondweed and a sedge (*Carex* sp.) were present. The bird had eaten also beetles, flies, bivalved crustaceans (Ostracoda), and mollusks. The preponderant article of food of the second teal was rat-tailed larvae of a flower fly (Eristalinae), of which at least 16 had been taken. This bird had eaten also lesser quantities of beetles and Hymenoptera and of the seeds of sedge and water crowfoot.

Spatula clypeata (Linnaeus). SHOVELER.

The shoveler was added to the Pribilof list by Evermann (1913, p. 17), who recorded a male specimen taken by W. L. Hahn on St. Paul Island, May 24, 1911. The following notes are from Hahn's catalogue: Length, 19½ inches; extent, 30; legs and feet, pinkish-orange; bill, glossy black, except for slight yellow mottling below. This specimen is now in the Biological Survey collection.

The only other record seems to be that of a male bird observed by the writer near Northeast Point, St. Paul Island, June 27, 1914.

Dafla acuta tzitzihoa (Vieillot). PINTAIL.

Two male specimens of the pintail taken by M. C. Marsh on St. Paul Island, May 24, 1912, were recorded by Evermann (1913, p. 17). Marsh in his field catalogue gives the following notes from the fresh specimens: No. 178, male, length, $25\frac{1}{2}$ inches, extent, $35\frac{1}{2}$; iris, brown; bill, blue, with a broad black stripe down the middle and a narrow black stripe at base; upper mandible, black, edged forward; feet, gray above, webs darker. No. 179, male, length, $24\frac{1}{8}$ inches; extent, $34\frac{3}{4}$; colors of soft parts same as No. 178.

Hanna observed 9 individuals at Webster Lake, August 17, 1914, and obtained 1 (No. 237499, U. S. Nat. Mus.). He also noted 2 on St. Paul Island, May 27, and 2 on May 31, 1915. On St. George, in 1916, he noted it as still common on October 26. He considers that the bird is a common migrant.

Food.—The Pribilof Islands evidently do not afford the vegetable food which is most relished by the pintail in its continental range, for the six stomachs of this species collected there were filled entirely with animal food. Five of them contained only midge (*Chironomidae*) larvae and the other one caddis (*Trichoptera*) larvae and their cases. Mr. Hanna says that this species—

has never been seen feeding anywhere except in fresh-water ponds. They eat the larvae of blowflies from the seal carcasses extensively. These larvae wander from the decaying meat when the time comes for them to pupate and many of them are drowned in the fresh-water ponds.

Aristonetta valisineria (Wilson).⁵ CANVASBACK.

The famous canvasback was added to the Pribilof list by G. Dallas Hanna (1919a, p. 176, and 1920a, p. 252) on the strength of a fine adult male taken on St. George Island, May 18, 1917. It is now in the collection of the U. S. National Museum, No. 255149.

Food.—The stomach of this specimen contained only caddis larvae and cases.

Fulix marila (Linnaeus).⁶ SCAUP DUCK.

A male scaup duck taken by M. C. Marsh on St. Paul Island, April 27, 1912, was recorded by Evermann (1913, p. 17). Marsh in his field catalogue gives the following notes: Length, 18 inches; extent, $31\frac{3}{8}$; bill, pale blue; nail, black; iris, yellow. The species seems not to have been otherwise observed.

Fuligula fuligula (Linnaeus). TUFTED DUCK.

A female tufted duck collected on St. Paul Island, May 9, 1911, by W. L. Hahn, proved to be the first record for the Pribilofs, and

⁵ *Marila valisineria* of the A. O. U. check list, 1910.

⁶ *Marila marila* of the A. O. U. Check List, 1910.

also for North America. It was formally recorded by Evermann (1913, p. 17). The bird was accompanied by a male, which escaped. The species breeds regularly in northern Eurasia east to Kamchatka, and migrates to northern Africa, India, China, and Japan.

Food.—Evermann (l. c.) quotes from Hahn's field notes as follows: "the stomach was full of grass, cress (?), small seeds, and a few larvae."

Aithya ferina (Linnaeus). EUROPEAN POCHARD.

The European pochard was added to the avifauna of the Pribilofs and North America by Evermann (1913, p. 17), on the basis of a male specimen taken by M. C. Marsh on St. Paul Island, May 4, 1912. His catalogue records the following notes made from the fresh specimen: Length, 18 inches; extent, $30\frac{1}{2}$; iris, yellowish-red; base of bill, brownish-black, middle pale bluish, terminal band of jet black sharply demarcated from the bluish; legs and toes, pale, with much grayish, webs black. The specimen is now No. 239123 of the collection of the Biological Survey. The pochard breeds in northern Eurasia east to Lake Baikal, and in migration and in winter wanders eastward to China and Japan.

Glaucionetta clangula clangula (Linnaeus). EUROPEAN GOLDENEYE.

A female goldeneye (No. 237500, U. S. Nat. Mus.), taken by G. Dallas Hanna on St. Paul Island November 27, 1914, from a flock of four, proved to be the typical form, and hence constitutes a new record for North America. It was so reported by Mr. Hanna (1916, p. 400). The specimen was determined by Dr. H. C. Oberholser. This form breeds generally throughout northern Eurasia.

Other goldeneyes, assumed to belong to the present form, were observed by Mr. Hanna on St. Paul Island, some in the possession of native hunters, as follows: October 12, 1914, 4; October 25, 4; April 12, 1915, 5.

Food.—Three stomachs from St. Paul (October 12, 1914) have been examined and their contents were amphipods, 55 per cent; fish remains, 10 per cent; marine worms (Nereidae), 3.3 per cent; and seeds of pondweed (*Potamogeton* sp.), 31.7 per cent.

Glaucionetta clangula americana (Bonaparte). AMERICAN GOLDENEYE.

During recent years this goldeneye has been taken on both St. Paul and St. George Islands by G. Dallas Hanna, who has put the captures on record. He took a male specimen on St. George Island, May 6, 1917, and a female on St. Paul, January 31, 1918 (1919a, p. 176, and 1910a, p. 252).

Food.—The stomach of the specimen last mentioned was practically empty; however, the slight remains of food represented three

distinct phyla of animals, namely, Mollusca (*Modiolaria verrucosa*), barnacles, and sea urchins.

Charitonetta albeola (Linnaeus). BUFFLEHEAD.

The beautiful little bufflehead was first taken on the Pribilofs by G. Dallas Hanna, and was recorded by him (1916, p. 401). He observed it first on St. George Island, taking male specimens November 19, 1913, and May 19, 1914. In the spring of 1915 he observed others on St. Paul Island as follows: May 19, 2 seen at Halfway Point; May 26, 1 Northeast Point; May 28, 8 (paired) on Webster Lake.

Food.—Only animal food was present in the two bufflehead gizzards collected by Mr. Hanna on St. Paul, May 19, 1914, and January 29, 1918. One of the stomachs held only caddis larvae and cases, while the other contained ground-up amphipods, 80 per cent; 7 or more small bivalves (*Modiolaria verrucosa*), 18 per cent; and a bit of barnacle, 2 per cent.

Clangula hyemalis (Linnaeus). OLD-SQUAW.

The old-squaw is resident about the Pribilofs, being, however, much more abundant in winter than in summer. It breeds only on St. Paul, nesting about most of the shallow fresh-water ponds which are scattered over the island. It was first recorded from the group by Elliott (1874, unpagcd, and 1875, p. 191).

Since the species is abundant during the winter and spring, no dates of arrival can be cited; Hanna records the birds as pairing April 18, 1915, about which date they begin acquiring the summer plumage, and as being observed in pairs at various dates in May. Eggs were found June 12 and 17, 1890, by Palmer (1899, p. 378). The egg-laying period is long, since downy young not over two days old were taken August 17, 1897, by Snodgrass and Greely (Grinnell, 1901, p. 19), and the writer saw downy young on Antone Lake, August 25, 1914.

Many fall and winter dates are at hand, but in the case of so common a bird it seems unnecessary to give them in detail. They seem to indicate a gradual gain in numbers until the species is seen by hundreds or thousands during the winter and early spring.

A male, St. Paul Island, January 7, 1912, M. C. Marsh, measured: Length, 16½ inches; extent, 28½. Another male, St. Paul Island, February 5, 1912, M. C. Marsh: Length, 16 inches; extent, 28¾; iris brown; bill black with band of rose. Another male, St. Paul, March 27, 1912, M. C. Marsh: Length, 19 inches; extent, 28½; iris brown, basal half of bill jet-black, rest rose-pink except black nail; lower mandible same relative colors; legs and feet pale bluish, webs black. A female specimen, St. Paul Island, February 5, 1912, M. C. Marsh,

measured: Length, $15\frac{1}{2}$ inches; extent, 27; iris brown; feet pale bluish, darkly reticulated. Another female, same place and collector, February 23, 1912, measured: Length, $15\frac{1}{2}$ inches; extent, $27\frac{3}{8}$; bill dusky bluish except black nail, and black bordering the feathers at base of upper mandible and the nostrils; iris light brown; legs and toes in front very pale-bluish, black behind; webs black.

Food.—Fifteen well-filled and fourteen nearly empty stomachs of the old-squaw are available to illustrate its food habits at the Pribilof Islands. From the nature of the food it is evident that most of it was obtained in salt water, and in this connection a note on the habits of the species by Mr. Hanna is of interest. He says the old-squaw is—

much more abundant in winter than in summer. It breeds in the lowland fresh-water lakes where several sets of eggs have been collected. Parent birds have been seen flying from the sea to the nesting site which might indicate that food is secured in salt water at all seasons. In winter they feed just outside the surf lines, in the open spaces between the ice cakes, and in the Salt Lagoon when this is open.

The food composing the 15 normal stomach contents studied consisted of amphipods, 74.1 per cent; hermit crabs, 11.2 per cent; caddis larvae (the only fresh-water animals in the lot), 6.4 per cent; mollusks, 3 per cent; vegetable matter, 1.6 per cent; and numerous items of lesser importance. In 12 cases amphipods constituted the bulk of the food and were represented by very numerous individuals. The species identified were *Anonyx nugax*, *Bathymedon* (?) *obtusifrons*, *Caprella kincaidi*, *Gammarus pribilofensis*, *Hippomedon* sp., *Orchomenella minuta*, *Pontoporeia affinis*, and *Tmetonyx* sp. Other crustaceans eaten were the hermit crabs *Dermaturus mandtii* and *Hapalogaster grebnitzkii*, remains of 8 or more of the former and 6 or more of the latter were found (together) in one stomach. Barnacles had been eaten by 9 of the well-fed birds, and compose 1.2 per cent of the total food; only one species, *Balanus balanus*, was identified. Mollusks composing 3 per cent of the diet included both bivalves and univalves. Of the former the common blue mussel (*Mytilus edulis*) was found in 6 stomachs, *Saxicava arctica* in 3, *Modiolaria verrucosa* in 2, and *Musculus* sp. in 1. The univalves identified were *Margarites helicina*, *Littorina atkana*, and *Borcotrophon* sp. Remains of a sea slug (*Chiton*) occurred in one stomach. Among the other items of animal food were Foraminifera, hydroids (*Abietinaria* sp.), Bryozoa, nereid and tubicolous worms, sand dollars (*Echinarachnius parma*), and other sea urchins.

The vegetable food taken by these 15 old squaws comprised root-stocks and foliage of grass and sedge, seeds of sedge (*Carex* sp.) and lupine (*Lupinus nootkatensis*), and algae. The latter included kelp, plume algae (Ceramiaceae), and a filamentous alga (*Chaetomorpha melagonium*).

The 14 nearly empty stomachs contained chiefly the same items as the better-filled ones, those of most frequent occurrence being amphipods, barnacles, and mollusks. One additional item, namely starfish remains, was obtained from this series.

Histrionicus histrionicus pacificus Brooks. HARLEQUIN DUCK.

The harlequin is resident the entire year on the Pribilofs, being most common in spring and fall, fairly common in winter except when the pack ice is present, and found in small flocks throughout the summer. No absolute evidence of its breeding on the islands is at hand. It was first definitely recorded from the Pribilofs by Elliott (1874, unpagged, and 1875, p. 199).

Being abundant during all or most of the winter, it can not be said to arrive in spring. Hanna gives many instances of occurrence in spring and summer, from which the following may be given: St. Paul Island, 1915—March 5, 25; March 18, 6; April 24, 200; April 27, 50; May 4, 40; May 28, 10; July 19, several individuals seen which were molting and could not fly; have been abundant all summer. While on the islands in 1914 the writer saw flocks on the surf-washed rocks almost daily, both on St. Paul and St. George. The notes most nearly giving evidence of breeding that I have been able to find are these of Palmer, who says (1899, p. 379): "I was told that some young were killed on St. George during the summer [of 1890]." Hahn observed two pairs mating on St. Paul Island, April 24, 1911; these, however, may have bred elsewhere.

Numbers of specimens of both sexes are in the collection of the U. S. National Museum. The following notes from selected specimens from St. Paul Island are from the collectors' field catalogues; Male, November 18, 1910, W. L. Hahn; length, 18 inches; extent, $25\frac{1}{2}$; bill plumbeous at base, tipped with pale horn color; feet dusky. Male, December 7, 1911, M. C. Marsh; length, $16\frac{1}{2}$ inches; extent $24\frac{1}{2}$; bill dark olive, lighter underneath; tip of lower mandible rosy; tarsus and toes pale greenish, joints dark, webs black, obscure streaks of rose along inner surface of tarsus and middle and inner toes; hallux lobe black on outer surface. Male, February 23, 1911, M. C. Marsh; length, 17 inches; extent, $27\frac{3}{4}$; iris dark brown; bill pale bluish, darkened at base; nail lighter, legs and feet dark brown, webs black. Male, March 8, 1912, Marsh: Length, $16\frac{3}{8}$ inches; extent, $26\frac{3}{8}$; iris brown, bill dark leaden, rami below pale blue, membrane between black; legs and feet with slight pale bluish cast, darker at joints, webs black. Female, October 20, 1911, Marsh: Length, $14\frac{9}{16}$ inches; extent, 23; iris brown; bill leaden, lighter underneath; tarsus very pale yellowish in front, dark behind; toes pale yellow, the joints dark, web brownish black.

Food.—Mr. Hanna notes that harlequin ducks feed in the kelp beds and rest on the surf-washed rocks the year round, and it is evident from the contents of the 11 well-filled and 8 nearly empty stomachs of the species collected about the Pribilofs that the birds take full advantage of the great variety of invertebrate life to be found in these rich marine pastures. The bulk of their food is amphipods (51.4 per cent of the total contents of 11 stomachs), hermit crabs 25.1 per cent, and mollusks 19 per cent. Other items, though numerous, in every case fall short of 1 per cent of the total food. Amphipods, the greatest staple, are taken in large numbers, and a variety of species are captured. Identifications are: *Anonyx nugax*, *Gammarus pribilofensis*, *Hyale* sp., *Jassa marmorata*, *Metopa* sp., and *Orchomenella minuta*. The hermit crabs in all cases were *Dermaturus mandtii*, and 16 of these were represented in the stomach of one duck. Isopod crustaceans were found in one gizzard and barnacles in five. The mollusks included widely diverse members of the group, as sea slugs (*Chiton* sp., *Schizoplax* sp.), limpets, sea snails, and mussels. The univalves identified were *Littorina atkana*, *Margarites helicina*, and *Trichotropis insignis*, and the bivalves *Modiolaria verrucosa*, *Mytilus edulis*, and *Saxicava arctica*.

Among the animal food items of lesser importance are Foraminifera, hydroids (*Abietinaria* sp.), tubicolous and other (neriid) marine worms, sea spiders or pycnogonids (*Ammothea pribilofensis*), sea urchins, and sand dollars (*Echinarachnius parma*). Vegetable matter composed less than 1 per cent of the food of the harlequins here reported upon and all of it may have been taken accidentally. It included kelp, plume algae (*Ptilota pectinata*, and *P. asplenoides*), and other algae (*Pterosiphonia bipinnata*).

Scraps of food in the 8 nearly empty stomachs of harlequins were chiefly of the same items mentioned above, amphipods and barnacles (in part *Balanus balanus*) being of most frequent occurrence. Additional foods from these stomachs were bryozoans, the amphipod *Pontoporeia affinis*, and fish. W. L. Hahn examined a bird that had fed more extensively on isopods than any of those here reported upon, there being 45 of these animals entire in the gullet and stomach besides many fragments.

Polysticta stelleri (Pallas). STELLER EIDER.

The beautiful Steller eider is apparently a regular migrant, and early summer visitor, though the records are somewhat scattered and meager. Elliott shot 2 in June, 1872, from the Village Hill on St. Paul, and speaks of others shot off East Point, St. George, in the same year (1874, unpagged, and 1875, p. 192). Palmer saw several in company with harlequin ducks, from the Village Hill, St. Paul, and on June 14 shot 3 males from a flock of 4 in St. Paul Harbor.

Later he saw many others. The species was next detected by Marsh, who prepared 2 males which were shot by P. R. E. Hatton on the Lagoon, St. Paul Island, on April 23, 1912, and took another on May 9. These are in the collection of the Biological Survey. Hanna was the next observer to record it, taking a female specimen on St. Paul, October 25, 1914, and a male on March 21, 1915. He also observed 4 on St. Paul, April 18, 1915.

Individuals of this species, represented by stomachs sent in for examination, were later taken as follows: St. George, February 4 and April 12, 1917; St. Paul, December 6, 1918. The specimen taken February 4 is now No. 255125 of the U. S. National Museum collection.

Notes from Marsh's field catalogue, taken from the fresh specimens, are as follows: Male, St. Paul Island, April 23, 1912, length, 18½ inches; extent, 29⅞; iris dark brown; bill pale blue; legs and feet grayish brown. Another male, same place and date, measured: Length, 17½ inches; extent, 28. Notes on soft parts same as preceding. The specimen taken May 9, 1912, measured: Length, 17¼ inches; extent, 28¾.

Food.—The food of the Steller duck in the Pribilof region is known from the examination of two well-filled stomachs and one other. The content of the well-filled stomachs was some 60 per cent amphipods and the remainder chiefly mollusks. Amphipods identified were *Allorchestes* sp., and *Pontoporeia affinis*. The mollusks were chiefly univalves, *Neverita reclusiana* (25 or more in one stomach), *Melanella* sp., and *Cardium ciliatum* being identified. Minor items of food were a bit of a bivalved mollusk, and remains of marine worms (Nereidae), barnacle, sea urchin, and algae.

***Arctonetta fischeri* (Brandt). SPECTACLED EIDER.**

The spectacled eider was added to the Pribilof list by the capture of three female birds on January 13, 1918. These were taken by native hunters and secured by G. Dallas Hanna, who has put their capture on record (1919a, p. 176, and 1920a, p. 252). These specimens, two of which were preserved as skins and the other in formalin for anatomical study, are now in the collection of the U. S. National Museum.

Food.—Two stomach contents of the spectacled eider have been examined and were found to be composed of amphipods, about 90 per cent; mollusks, about 5 per cent; and various minor items. One species of amphipod was determined, namely, *Bathymedon obtusifrons*, and 4 of mollusks. The latter included the common blue mussel (*Mytilus edulis*); *Modiolaria verrucosa* and *Rochefortia* sp., bivalves; and *Lora* sp., univalve. Other articles of food in these two stomachs were: Foraminifera, Bryozoa, sea urchin, sand-dollar

(*Echinarachnius parma*), starfish, crab (*Erimacrus isenbeckii*), bones of a sculpin, and bits of kelp.

Somateria v-nigra Gray. PACIFIC EIDER.

The Pacific eider was first credited to the Pribilofs by Palmer (1899, p. 380), who gives it as a winter visitant, usually seen offshore. The first actual specimen seems to have been taken by Hahn (male, St. Paul Island, May 17, 1911). Marsh later collected female specimens at the same place on December 23, 1911, and January 8, 1912.

Hanna states that many are shot by the natives when the ice is around the islands. He notes eiders, probably the present species, on St. George Island, November 11, 1913, when 20 were seen about 100 feet offshore. Six others were seen at the same place March 28, 1914. Later notes, referring to birds certainly identified, are as follows: St. Paul Island, December 4, 1914, 10 observed; December 13, 10; January 10, about 100; February 18, about 5,000; March 5, about 300; April 15, 60; April 18, 20; April 24, 200; April 27, 50. H. P. Adams noted the species about St. George on February 10, 1916; and January 13, February 4, and March 25, 1917.

Notes from field catalogues follow: St. Paul Island, male, May 17, 1911, W. L. Hahn: Bill, deep orange; feet, orange. St. Paul Island, male, January 1, 1912, Marsh: Length, 24 $\frac{3}{4}$ inches; extent, 42 $\frac{3}{8}$; bill, orange, paler terminally; legs and feet, yellow. St. Paul Island, female, January 8, 1912, Marsh: Length, 23 $\frac{5}{8}$; extent, 39; iris, brown; basal portion of bill, gray; terminal, pale yellow; legs and feet, dusky yellowish; webs, darker.

Food.—Information obtained by examination of a collection of 44 well-filled and 3 other stomachs of the Pacific eider from the Pribilofs is sufficient to give a very good idea of the food of the species in that region during the months in which they were collected; namely, January, February, and March. A wide variety of organisms inhabiting the sea is represented in the food, ranging from algae and Foraminifera through the principal group of marine invertebrates to the Chordata, or backboneed animals, as ascidians and fishes. Many of the articles of diet are not fed upon to any great extent, and the favorites seem to be mollusks and crustaceans, according to the following schedule of the principal items: Mollusks, 41.2 per cent; crustaceans, 28.2 per cent; sea urchins, 9.45 per cent; starfishes, 7.34 per cent; and algae, 7.47 per cent. The mollusks included limpets, sea snails, mussels, and sea slugs. The kinds most frequently taken were common blue mussels (*Mytilus edulis*), found in 15 stomachs, and another species of bivalve (*Modiolaria verrucosa*), found in 11; in two cases hundreds of the latter shellfish had been eaten. Besides these, identifications made of mollusks of the

various groups were: *Acmaea* sp.; *Amphissa reticulata*, *Borcotrophon* (?) *multicostatus*, *Buccinum plectrum*, *Haloconcha* (?) *minor*, *H. reflexa*, *Littorina atkana*, *L. grandis*, *Margarites helicina*, *Natica clausa*, *Neverita recluziana*, *Nucella lima*, *Plicifusus spitzbergensis*, *Trichotropis insignis*, *Volutharpa ampullacea*, *Cardium ciliatum*, *Pecten islandicus*, *Saxicava arctica*, *Chiton marmoreus*, and *Chiton* sp.

The crustaceans eaten by Pacific eiders consisted of crabs, 13.06 per cent; amphipods, 12.4 per cent; shrimps, 1.5 per cent; and isopods, 1.3 per cent. The crabs captured were principally hermit crabs, and one species, *Dermaturus mandtii*, was found in 17 stomachs and to the number of 11 specimens in one of them. The other hermit crabs eaten were *Hapalogaster grebnitzkii*, *Pagurus dalli*, and *P. trigonochirus*. Spider crabs (*Oregonia gracilis*) were found in two stomachs, and remains of crabs of the family Xanthidae, a group not hitherto reported from the region, in one. The amphipods identified belonged to a number of species, among which *Gammarus pribilofensis* occurred most frequently, namely 5 times. The other forms determined were: *Allorchestes malleolus*, *Allorchestes* sp., *Amphithoe rubricata*, *Anonyx nugax*, *Atylus* sp., Calliopiidae, *Caprella kincaidi*, *Ischyrocerus* sp., *Metopa* sp., *Nebalia* sp., *Neopleustes assimilis*, *Neopleustes* sp., and *Pleustes panoplus*. The isopods eaten by Pacific eiders belong to the family Idotheidae, of which *Idothea ochotensis* was specifically identified. Thirty shrimps (*Spirontocaris polaris*) were found in one stomach and a few minute bivalved crustaceans (Ostracoda) in another.

Among birds thus far studied as to food habits, preying upon sea urchins and starfishes is unusual, but Pacific eiders in the Pribilof region form an exception to the rule in that more than a sixth of their food is made up of these animals. The sea urchins most frequently taken were the sand-dollars (*Echniarachnius parma*), but spheroidal urchins (*Strongylocentrus drobachiensis*) of the more ordinary type were not neglected. Sea urchins (9.45 per cent) were found in 19 stomachs, and starfishes (7.34 per cent) in 14; the latter in 5 cases were identified as *Leptasterias* sp.

Other articles of animal food forming more than 1 per cent of the diet were barnacles and worms. The former had been eaten by 14 birds, and only one species (*Balanus balanus*) was identified; the worms were of the family Nereidae in 8 cases, and tubicolous forms in two. While amounting to less than 1 per cent, other animals eaten by the Pacific eiders are of considerable interest because they are preyed upon by so few birds. Such are the hydroids, bryozoans, sea spiders, and ascidians. Hydroids not further identified were found in 9 stomachs, *Abietinaria* sp. in 8, *Sertularella* sp. in 4, and

Thuiaria sp. in 1. Bryozoans not further determined were observed in 10 gizzards, *Crisia* sp. in 3, *Cellepora surcularis* in 2, and *Menipea pribilofi* in 1. All of the sea spiders, found in 3 stomachs, belonged to a single species, *Ammothea pribilofensis*, and the ascidians or sea squirts, found in two gizzards, were identical; they were found to be *Boltenia ovifera*. Foraminifera, the only representatives of the Protozoa, or simplest animals identified, were obtained from 5 gizzards.

The percentage (7.47) of marine algae in the stomach contents of Pacific eiders is so high as to suggest that these plants are in part sought for, not all incidentally taken, as some of them, growing on hermit crabs and their shelly homes, undoubtedly are. Algae chiefly with this latter habit were plume algae (Ceramiaceae), identified as *Ptilota pectinata* in 6 cases, *P. asplenoides* in 4, and *Ptilota* sp. in 12. Coralline algae were found in one stomach, and a single seed of the rye grass (*Elymus villosissimus*) in another.

Somateria spectabilis (Linnaeus). KING EIDER.

The beautiful king eider, although it appears to be of regular occurrence nearly throughout the year, and is usually more or less abundant in winter, has only recently been included in the list, having been recorded by Evermann (1913, p. 17) from specimens taken by M. C. Marsh on St. Paul Island on February 4, and March 9, 1912. The species is present in small numbers throughout the summer, but has not been known to breed. In 1914 it was observed by the writer on several occasions as follows: St. Paul Island, July 19, 10 seen at Northeast Point; August 17, 1 at Northeast Point; August 24, 1. St. George Island, August 4, 1 seen at Zapadni. Hanna sent in for examination the stomachs of three shot on St. George Island, May 3, 1917.

I have no dates of occurrence in early fall; Hanna's notes for St. Paul Island, fall of 1914, follow: November 27, 2 seen; December 4, 75; December 13, 50.

The species is sometimes, perhaps usually, common about the islands in winter, especially when pack ice is present. On March 29, 1911, Hahn noted that between 150 and 200 eiders, nearly all of which were male king eiders, were shot on St. Paul. In 1915, on St. Paul, Hanna recorded the bird as follows: January 10, 15 seen; February 18, abundant; March 5, about 100 in the ice pack; April 6, 1; April 15, 40; April 18, 6 (near shore); April 24, 15; May 10, 14. H. P. Adams, on St. George, noted the bird on January 13, February 4, and March 23, 1917.

There are numerous specimens from St. Paul Island in the collection of the Biological Survey, mainly taken by W. L. Hahn and M. C. Marsh. From their catalogues the following data have been cop-

ied: Male, March 30, 1911, Hahn: length, 22 inches; extent, 34; bill reddish at base, shading to pale horn color at tip; caruncle deep lemon; toes pale lemon, webs blackish. Male, January 7, 1912, Marsh: Length, $22\frac{1}{4}$ inches; extent, $38\frac{1}{2}$; iris dark brown, processes of bill yellow, shading into yellow-red of bill, which is pale at tip; legs and feet yellow, dark at joints, webs blackish. Immature male, February 4, 1912, Marsh: Length, $21\frac{5}{8}$ inches, extent, $36\frac{3}{4}$; iris dark brown, processes of bill light yellow; bill mostly drab, nail darker; feet dingy yellowish, webs dark. Female, February 1, 1912, Marsh: Length, $19\frac{3}{4}$ inches, extent, 36; iris dark brown; bill dusky, pale below and about nail; feet dusky reticulated, on yellowish ground. Female, February 4, 1912, Marsh: Iris dark brown; processes of bill black, pale band back of nail, above and below; feet yellowish, dusky reticulated.

Food.—To illustrate the food habits of the king eider in the Pribilof area we have had for examination about the same number of stomachs as of the Pacific eider, namely, 44 well-filled ones and 9 others. The nature of the food also proves to be very similar, the principal items and their proportions being: Mollusks, 34.36 per cent; crustaceans, 28.2 per cent; sea urchins, 9.54 per cent; starfishes, 2.59 per cent; and algae, 9.88 per cent. The king eider takes fewer mollusks and a much lower percentage of starfishes than the Pacific eider, but makes up for these in part by greater consumption of barnacles and fishes. Mr. Hanna notes that this species can descend to the bottom in 30 fathoms of water, as evidenced by the fact that a bird killed just after coming to the surface of water of this depth had freshly swallowed mollusks in its gullet.

Like its congener, this eider draws its shellfish fare from diverse branches of the molluscan kingdom. Of the bivalves eaten the favorite was the common blue mussel (*Mytilus edulis*), which occurred in 21 stomachs, and next in preference was *Modiolaria verrucosa*, taken by 12 birds. Other bivalves eaten included the scallop (*Pecten islandicus*) and *Cardium ciliatum*, *Musculus* sp., *Mya intermedia*, *Rocheportia* sp., and *Saxicava arctica*. A single limpet (*Acmaea mitra*) was identified in the food, as also were numerous sea snails, of which *Plicifusus spitzbergensis*, found in 7 stomachs, was of most frequent occurrence. The others identified are: *Astyris* sp., *Borcotrophon* (?) *multicostatus*, *Buccinum fischerianum*, *Buccinum* sp., *Cerithiopsis* sp., *Littorina atkana*, *L. grandis*, *L. grönlandica*, *Littorina* sp., *Machaeroplax cinereus*, *Margarites helicina*, *Natica clausa*, *N. operculina*, *Neverita recluziana*, *Nucella lima*, *Trichotropis insignis*, and *T. nucellatus*. Sea slugs, as the creeping mollusks with segmented dorsal mail may be called, also were taken by the king eiders, and the following forms were identified: *Chiton marmoreus*, *Chiton* sp., and *Schizoplax brandtii*.

The crustaceans eaten by the king eiders studied consisted rather more of crabs and less of amphipods than in the case of the Pacific eider. Crabs were slightly more than a fifth of the total food, most of them being hermits. One species of this group, *Dermaturus mandtii*, was found in no fewer than 33 of the stomachs, 7 individuals being counted in one of them. Other hermit crabs identified were *Hapalogaster grebnitzkii*, *Pagurus trigonocheirus*, and *Pagurus* sp. Other crabs eaten were the spider crab (*Hyas coarctatus*), the mud crab (*Telmessus cheiragonus*), and crabs of the family Xanthidae. Amphipods were much less prominent in number and variety in stomachs of the king eider than in those of its relative, and only 3 forms were identified, namely, *Gammarus pribilofensis*, *Hyale* sp., and *Orchomenella minuta*. A few isopods were eaten, among which one species, *Synidotea nebulosa*, was determined; and also a few shrimps (*Spirontocaris polaris*).

Sea urchins, in this species, as well as in the Pacific eider, are a prominent element of the food. The kinds eaten are the same and they occurred in the following numbers of stomachs: Sea urchins not further identified, 19; *Echinarachnius parma*, 9; and *Strongylocentrus drobachiensis*, 2. Starfishes, for some reason comparatively neglected by this eider, were found in 6 stomachs and only in one case were identified as to genus (*Leptasterias*).

Of the lesser items of animal food, fishes and barnacles are the most important. The only fish remains at all classifiable were some sculpin bones. Three batches of eggs, not absolutely known to be those of fishes, were added to the undoubted fish remains, and make a percentage of the total food of 3.84 per cent. Barnacles (2.34 per cent) are next in importance, being found in 18 stomachs; a single species, *Balanus rostratus*, was identified.

Both tubicolous and nereid marine worms were eaten, the latter occurring in 20 stomachs; the percentage of worms in the food was 1.7 per cent. While some of them occurred in numerous gizzards, the remaining articles of animal food in no case amounted to as much as 1 per cent of the total subsistence. Hydroids not further identified were found in 13 stomachs, and also the following genera of this group, in the number of gizzards indicated: *Abietinaria* 8, *Sertularella* 4, and *Thuiaria* 3. Bryozoa similarly not further named, occurred in 16 gizzards; those identified were *Cellepora surcularis* in 2, and *Menipea pribilofi* and *Myriozoum subgracile* in 1 each, Sea spiders (*Pycnogonida*), found in 2 stomachs, a sea squirt (*Boltenia ovifera*) in 1, and Foraminifera in 5, complete the list of animal foods.

The vegetable food (9.88 per cent) consisted exclusively of algae. That not further identified, chiefly kelp or laminar algae, was found

in 19 stomachs. Plume algae (*Ptilota pectinata* in 17 stomachs, *P. asplenooides* in 15, and *Ptilota* sp. in 8) were a prominent article of diet, and two kinds of coralline algae (*Corallina* probably *aculeata* and *Amphiroa cretacea*) were each found in a single stomach.

Oidemia deglandi dixonii Brooks. PACIFIC WHITE-WINGED SCOTER.

During the past few years the Pacific white-winged scoter has come to be recognized as a more or less regular migrant and winter visitor. G. Dallas Hanna has put the species on record (1919a, p. 176), and later (1920a, p. 252) writes as follows:

Four specimens of the western white-winged scoter have been taken on the Pribilofs during the last three years. All were females but this is merely an accidental circumstance because males have been seen. The first specimen was secured on October 30, 1916, at St. George Island by the writer. The next was taken on November 15, 1916, at the same island by Dr. H. P. Adams, formerly physician of the U. S. Bureau of Fisheries. Another was secured at St. George Island on February 4, 1917, and one at St. Paul Island, February 8, 1918, both by the writer.

Hanna also noted the bird as abundant at the margin of the ice pack off St. George on January 25, 1917.

The species is of regular occurrence about the islands in winter. It has been seen on several occasions before any specimens were secured but was not recorded because positive specific identification could not be made.

The specimens above mentioned are all in the collection of the U. S. National Museum.

Food.—The stomachs of 2 white-winged scoters, 1 collected on St. George Island, February 4, 1917, and the other on St. Paul, February 8, 1918, have been examined and the food proved to be about equally divided between amphipods and bivalves. None of the former were identified, and the mussels were *Saxicava arctica* principally, with a trace of *Mytilus edulis*. Other items of food sparingly represented were sea urchin, bryozoan, and hydroid.

Chen hyperborea hyperborea Pallas. SNOW GOOSE.

The snow goose was added to the Pribilof list by G. Dallas Hanna (1919a, p. 176, and 1920a, p. 251), who obtained an individual shot by a native at Northeast Point, St. Paul Island, September 16, 1916. "Another bird was killed the following year on the same island but since it belonged clearly to the same species and time did not permit of its preparation it was not preserved" (l. c., p. 251).

The specimen from Northeast Point is now in the collection of the U. S. National Museum, and the head of one shot on St. George by Mr. Hanna is in the Biological Survey collection.

Anser albifrons albifrons (Scopoli). WHITE-FRONTED GOOSE.

The white-fronted goose was first noted from the islands by Palmer, who saw 2 on a small pond near the village on St. Paul Island, June 11, 1890. Two others were seen by him later (1899, p. 380). The only other records seem to be those of G. Dallas Hanna, who saw 1 individual at Garden Cove, St. George Island, September 28, 1913, and 2 individuals at Halfway Point, St. Paul Island, on May 18, 1915.

Food.—The contents of two stomachs of the white-fronted goose collected on St. George Island in May have been studied and found to consist of leaves of grass, 99 per cent; and those of saxifrage and chickweed, 1 per cent.

Branta canadensis hutchinsi (Richardson). HUTCHINS GOOSE.

So far as known to the writer the Hutchins goose has been detected only once on the Pribilofs, by G. Dallas Hanna. He has reported the occurrence (1919a, p. 176, and 1920a, p. 251) :

A female of this subspecies was shot and preserved on St. Paul Island, May 12, 1918. It is considerably larger than the cackling goose which ordinarily comes to the islands each spring and fall, and unlike the latter form there is no sharp demarcation in the coloration of the under parts (p. 251).

The specimen above mentioned is now No. 255152 of the bird collection of the U. S. National Museum.

Branta canadensis minima Ridgway. CACKLING GOOSE.

Elliott secured a specimen of the cackling goose (62526, male adult, U. S. Nat. Mus.) on St. Paul Island, May 14, 1872. This specimen was listed by Palmer, who also (1899, p. 381) records individuals observed on St. Paul on June 25 and June 28, 1890. Palmer (l. c.) and Hanna (1919b, p. 106) consider the bird a regular migrant.

Hahn reported geese of this type, assumed to be referable to the present race, on St. Paul Island, as follows: September 15, 1910, 5; September 24, 1; October 2, 8; May 30, 1911, 1. Hanna reported this race as follows: St. Paul, 1915: May 14, 8 flew over village; May 16, 4 observed; May 18, 6 in pairs, 2 killed, Halfway Point.

Branta nigricans (Lawrence). BLACK BRANT.

The black brant was first recorded from the Pribilofs by Dall (1874, p. 275), who says, in connection with the occurrence of the bird on the western Aleutians: "It has also been reported as a casual visitor at the Pribiloff Islands."

Specimens were first collected by Hanna, and recorded by him (1916, p. 401). His first one, a male, was taken at Bear Lake, St. George Island, September 28, 1913, and is now No. 242535 of the U. S. National Museum collection. Another individual was seen

at this time. He states (l. c.) that small flocks and single birds seem to occur each spring and fall, and he considers that this species is more common than any other goose excepting the emperor. During the following year, on St. Paul Island, Hanna observed the species, as follows: September 17, 5 seen, 1 secured; September 20, 2 seen; October 8, 2; October 25, 4 at Northeast Point.

Notes taken from the St. Paul Island log by W. L. Hahn, referring to black geese, undoubtedly relate to this species. These notes record 5 individuals shot from a flock on October 7, 1902; and 10 shot April 18, 1905.

Food.—The contents of a single stomach of the black brant collected at St. Paul Island on September 17, 1914, consisted exclusively of a filamentous alga (*Chaetomorpha canabana*).

Philacte canagica (Sevastianoff). EMPEROR GOOSE.

The beautiful emperor goose seems to be of regular occurrence in spring and fall on both the larger islands. It was first recorded by Elliott, who witnessed the capture of an entire flock, which landed so exhausted that the natives were able to take them by hand (1874, unpagcd, and 1875, p. 189).

Townsend (1887, p. 99) speaks of 3 or 4 seen on St. Paul Island in September [1885]; Palmer records 1 killed on St. George Island, July 16, 1890. Hahn found notes in the St. Paul log recording the shooting of 1 on November 29, 1904, and 2 on September 24, 1908; and Hahn himself reports 2 seen on St. Paul Island May 10, 1911.

Hanna has made the most extensive observations, as follows: St. George Island, 1913, December 21, 4 seen; 1914, April 8, 3 seen; April 22, 8; May 19, 8 seen, 2 shot, not skinned owing to scarcity of food among the natives, head and feet saved; 1917, May 10, 2 shot. St. Paul Island, 1914, September 14, 6; September 16, 20; September 20, 2; September 22, 2; October 31, 15; November 4, 1 (specimen); November 26, 3; 1915, March 20, 5; May 18 (2, in village cove); June 14, 7 pairs; June 16, 4 pairs. H. P. Adams, on St. George, noted the bird on September 22 and 26, 1915, and April 26 and 28, 1917.

Food.—H. W. Elliott has reported the food of the emperor goose to consist of *Mytilus edulis* and other shellfish (1874, unpagcd, and 1875, p. 190). Such food habits would be a radical departure from the standard vegetarianism of geese in general, and there is no direct evidence that they exist. Reliable evidence points to the emperor goose sharing the plant-feeding proclivities of its allies as the entire food of 5 birds of this species collected on the Pribilofs was marine algae of the type known as sea lettuce, identified in one case as *Dilsea integra*.

Olor columbianus (Ord). WHISTLING SWAN.

The whistling swan was first recorded by Palmer, who says (1899, p. 381):

Several were seen on St. George in the fall of 1889 and three rested on the shore at Halfway Point, on St. Paul, during the same autumn.

Hahn took the following from the St. Paul Island log: October 9, 1888, 1 killed; May 15, 1903, 1 shot; October, 1909, 2 shot; weight, 8½ and 9 pounds, respectively. Hahn himself recorded 1 seen by a native, October 2, 1910; and 2 reported May 7, 1911.

Hanna (1916, p. 402) has recorded 1 shot by a native on a high hill on St. George Island, October 10, 1913. Its measurements, reduced to millimeters, were as follows: Length, 1,151 mm.; extent, 1,780 mm. The head and foot of this one were saved as a specimen. H. P. Adams records the bird on St. George as follows: October 16, 1915, noted; October 17, 1915, 1 killed.

Family GRUIDAE.

Megalornis canadensis (Linnaeus.)^{*} LITTLE BROWN CRANE.

The little brown crane, which has several times been observed in early summer, was added to the Pribilof list by Townsend (1887, p. 99). He says:

While at St. Paul Island [summer, 1885] some natives came to me and reported having seen a large long-legged bird wading in a shallow pond near the village, and gave me a large feather which the bird dropped in its flight.

Palmer's original notes follow:

Jake, a well-known Aleut sealer, told me on June 28 [1890], that he had seen 3 cranes that morning north of Kaminista Lake. Going there, I found 5, but they were very wild. They remained in the neighborhood until after August 1, as I saw them frequently picking up insects on the tundra. One was caught in a trap near the village in June, 1888 (1899, p. 398).

According to the St. Paul Island log (notes transcribed by Hahn), two "blue cranes" were seen on the tundra September 13 and 14, 1908. These birds were almost certainly the present species.

Hanna observed 3 cranes at Big Lake, St. Paul Island, on May 12, 1915, and 1 on the tundra near Rocky Point Lake on June 26. In May, 1919, he took the first specimens, which he recorded as follows (1920b, p. 174):

Two little brown cranes (*Grus canadensis*) were collected on St. Paul Island in May, 1919. This species occurs in small numbers regularly during migrations but the birds are rarely shot. The previous record was based on a single feather picked up on the tundra.

Food.—William Palmer stated (1899, p. 398) that he saw little brown cranes picking up insects on the tundra of the Pribilofs, and

^{*} *Grus canadensis* of the A. O. U. Check List, 1910.

G. Dallas Hanna notes that the two specimens collected by him on St. Paul Island had their crops filled almost to the bursting point with blowfly larvae from the seal-killing fields.

Family PHALAROPODIDAE.

Phalaropus fulicarius (Linnaeus). RED PHALAROPE.

The red phalarope is an abundant northward migrant in early summer and again appears on its return late in summer. It is occasionally seen in midsummer, but has not been found breeding on the islands.

The earliest spring dates are from specimens taken by M. C. Marsh on St. Paul Island, May 16 and 31, 1912, and by Hanna on St. George May 19 and 23, 1914, and the latter's note of May 26, 1915, when he saw large flocks crossing between St. Paul and Otter Islands. Palmer collected several about Polovina, St. Paul Island, between June 10 and July 17, 1890, but thought that they did not breed. Hanna observed 2 at Halfway Point, St. Paul, June 20, 1915, and a pair each on St. Paul and St. George throughout the summer of 1919, but found no evidence of nesting.

Fall migrants begin to appear in mid-July. Palmer noted the first fall arrivals on July 17, 1890, I saw the first one on St. George July 14, 1914, and on July 16 found hundreds on the water about Walrus Island. These were largely still in breeding plumage. From that date until we left the Pribilofs, the last of August, I frequently observed the birds, usually in small numbers but sometimes in large flocks.

During the autumn the birds continue to be observed until quite late. Hahn's notes for St. Paul for 1910 follow: August 30, about 100 seen; a few to September 7; September 8, about 1,000; September 9, about 200; September 11, about 200; September 12, about 50; September 15 to 19, a few; October 2, many seen on way to Walrus Island; October 15, 1; October 19, 3; October 20, 2. On January 18, 1911, Hahn saw one on the water off Tolstoi Point, St. Paul. Hanna on St. George records the following observations in 1913: September 5, 4; September 15, 25; October 9, about 100, some in surf but mostly in fresh-water ponds; October 18, 12. His notes for St. Paul, 1914, follow: September 20, 1; October 25, 1 taken at Webster Lake; November 4, 1 in surf at village landing. Specimens taken on St. Paul by Hahn and Marsh, in 1910, 1911, and 1912, measured in the flesh as follows: Males, length $7\frac{3}{4}$ to $8\frac{1}{2}$ inches; extent, $15\frac{3}{8}$ to $15\frac{7}{8}$. Females, length, 9 to $9\frac{1}{8}$; extent, $16\frac{1}{4}$ to 17.

Food.—The red phalarope, one of the swimming snipe, is represented in the present collection by 53 well-filled and 2 nearly empty stomachs. While the phalaropes habitually alight and feed in water, it is evident from analyses of the contents of these stomachs that they

feed also on land, where they must obtain most of the flies and beetles they eat. The principal food items found in the 53 stomachs were: Crustaceans, 38.29 per cent; flies, 21.69 per cent; fishes, 18.18 per cent; caddisflies, 10.15 per cent; and beetles, 9.86 per cent.

Of the crustaceans eaten, 30.45 per cent of the total of 38.29 per cent were identified as amphipods and probably part of the unidentified belonged to the same group. Amphipods were found in 22 stomachs, but could be determined to the species in only 2 cases, these being *Gammarus pribilofensis* and *Pontogeneia inermis*. Another group of crustaceans, while contributing only a trace to the food of the red phalarope, is of considerable interest as an item of avian diet, because its members are so small, bordering on microscopic size. These are the water fleas (Daphniidae), which, as ordinarily seen by human observers, appear like dancing motes in waters pierced by the sunbeams in which they love to gather. The contribution of these little animals to the food of the phalarope is their egg cases (ephippia), each a twin sac inclosing the two relatively large black eggs. These were found in 6 stomachs, no fewer than 50 of them being taken from one stomach, and in this single instance they amounted to 5 per cent of the contents.

Two-winged flies (Diptera) and their larvae and pupae were found in more than half of the gizzards examined and constituted 21.69 per cent of the total food. The kinds most frequently taken were members of the dung-fly family (Scatophagidae) and the adults and larvae of midges (Chironomidae). Seventy of these larvae were found in a single stomach. The determinations of flies, other than as just mentioned, were: Anthomyiidae, blowflies (Muscidae), dung-flies (*Scatophaga crinita*, *S. dasythrix*, and *Scatophaga* sp.), soldier-flies (Stratiomyidae), and crane-flies (Tipulidae).

Fishes were the next most important element of the food of the red phalarope, being found in 15 stomachs and composing 18.18 per cent of the total subsistence. All taken were small sculpins (Cottidae). Caddisflies and their larvae were taken by 14 birds and formed 10.15 per cent of the food. These live in fresh water and the larvae construct cases of a variety of materials in which they pass the immature stages.

The only remaining item of any importance in the diet of this species is beetles (9.86 per cent). Ground beetles of the genus *Pterostichus* were taken more frequently than any other kind, occurring in 11 stomachs. Another beetle (*Amara* sp.) of the same family was identified, and in addition the following: Rove beetles, including *Atheta* sp., *Hadrotus* sp., and *Olophrum fuscum*; diving water beetles, including *Ilybius angustior*; and *Aegialites californi-*

cus, a beetle of a peculiar family having a few species along our western coast.

Hymenoptera, mostly small parasitic wasps (*Plesignathus* sp.), the only other insects eaten, were found in 5 stomachs and spiders in 1. Mollusks were taken by two birds and marine worms (*Nereidae*) by one.

Vegetable matter constituted less than half of 1 per cent of the contents of the 53 stomachs of red phalaropes examined, and is to be considered as an accidental rather than genuine article of food. It consisted entirely of seeds, of which those of violet (*Viola* sp.) were found in 5 stomachs, sedge (*Carex* sp.) in 2, and the following in 1 each: Crowberry (*Empetrum nigrum*), lousewort (*Pedicularis* sp.), and bog bean (*Menyanthes trifoliata*).

Lobipes lobatus (Linnaeus). NORTHERN PHALAROPE.

The northern phalarope is apparently a fairly abundant migrant on the Pribilofs, although I have no definite information on this point. It breeds in small numbers on both St. George and St. Paul.

Elliott first recorded the bird (1874, unpagged, and 1875, p. 181) and took downy young on St. George in 1873. Palmer found the birds nesting near Rocky Point, St. Paul, July 2, 1890, also collecting newly hatched young. I observed several, apparently nesting, near the latter locality on June 27, 1914. Hanna saw four pairs near the same place on June 14, 1915. The earliest spring date is of a specimen taken by Hanna on St. George, May 23, 1914. The latest dates are also represented by specimens: August 15, 1914, St. Paul, Hanna; and August 17, 1897, St. Paul, Greely and Snodgrass.

A female specimen collected by Marsh on St. Paul Island, June 1, 1912, measured in the flesh: Length, $7\frac{3}{4}$ inches; extent, $14\frac{1}{8}$.

Family SCOLOPACIDAE.

Limnocyptes gallinula (Linnaeus). EUROPEAN JACKSNIFE.

The only record of the European jacksnipe as an inhabitant of the Pribilofs is based on a specimen taken by G. Dallas Hanna and recorded by him (1920b, p. 173) as follows:

Some time during the spring of 1919, probably in April, a native on St. Paul Island secured one of these birds and very kindly kept the skin for me until my arrival. The identification was made by Mr. Joseph Mailliard, of the California Academy of Sciences. This is a new record for the Pribilof Islands and for North America.

The specimen is deposited in the collection of the California Academy of Sciences. The species breeds generally in northern Eurasia east to the Kolyma River, and occurs in migration and in winter south to India and Burma, and occasionally to Japan and Formosa.

Limnodromus griseus scolopaceus (Say). LONG-BILLED DOWITCHER.

A female specimen of the long-billed dowitcher taken on St. Paul Island, September 18, 1919, by G. Dallas Hanna, and recorded by him (1920b, p. 173) constitutes the first record for the Pribilofs.

Later Mr. Hanna took 2 additional specimens, a male and a female, at Northeast Point, St. Paul Island, August 29, 1920. These are recorded by Mailliard and Hanna (1921, p. 95). All these specimens are in the collection of the California Academy of Sciences.

Food.—Two stomachs, of the two specimens last mentioned from St. Paul Island, have been examined and their contents were almost exclusively the larvae of midges (Chironomidae), of which there were more than 75 in one gizzard and more than 100 in the other. Vegetable débris, amounting to 3 per cent by bulk of the stomach contents, also was present, and it probably was picked up incidentally with the midge larvae. Included in the vegetable matter were seeds of bottle brush (*Hippuris vulgaris*), sedge (*Carex* sp.), and water chickweed (*Montia fontana*).

Arquatella maritima couesi Ridgway. ALEUTIAN SANDPIPER.

The Aleutian sandpiper, which breeds mainly on the Alaska Peninsula, visits the Pribilofs in the autumn and lingers in small parties about the icy shores until winter. It has also been observed early in spring, sometimes about the pack ice. It was first ascribed to the islands by Seale (1898, p. 139), from specimens taken on St. Paul Island in the late summer of 1897 by R. E. Snodgrass and A. W. Greely. There is reason to believe, however, that this record is based on mis-identified specimens. These are now supposed to be in the collection of Leland Stanford University. At the request of the writer, Dr. Walter K. Fisher kindly attempted to look up the pertinent specimens but was able to find only one which could reasonably be supposed to be in part the basis of the record. This specimen (No. 3498, an immature female, labeled *T. couesi*, taken July 25, 1897) he kindly forwarded for examination. This proved to be an undoubted example of the breeding species *A. m. ptilocnemis*, and is in the usual plumage of the immature bird at this season. It is possible that later research will bring to light other specimens of the Snodgrass-Greely collection which are actually referable to *A. m. couesi*, but the writer is rather inclined to the belief that they will all prove to be the breeding form, which gathers abundantly on the beaches in late summer, and includes many small specimens which, without close examination, might be considered to be the Aleutian form.

However this may be, the species has been definitely added to the list by Hanna, who took specimens on St. Paul Island in the autumn

**Macrorhamphus g. scolopaceus* of the A. O. U. check list, 1910.

of 1914 and in the spring following. His notes of occurrence are as follows: 1914, September 16, 4 observed (1 taken now in the collection of the Biological Survey); October 17, 1 taken (female No. 237527, U. S. Nat. Mus.); October 25, 4 seen at Northeast Point; November 16, 8 seen; November 27, 4 seen at Lukanin beach, 2 taken (males, Nos. 237525 and 237526, U. S. Nat. Mus.). 1915, March 5, 1 seen in pack ice; April 24, 1 taken at Northeast Point (No. 237524, U. S. Nat. Mus.). This last specimen has begun to acquire the reddish summer feathering on the back and the sides of the breast.

Mailliard and Hanna (1921, p. 94) have recently recorded a specimen, not sexed, taken on St. George Island, February 12, 1917. This is in the collection of the California Academy of Sciences.

Arquatella maritima ptilocnemis (Coues). PRIBILOF SANDPIPER.

Tringa ptilocnemis Coues, in Elliott, Report Seal Islands, Alaska, 1874, unpagged; 1875, reprint, p. 182 (type from St. George Island).

The Pribilof sandpiper breeds in some numbers on both St. Paul and St. George. It is absent from the Pribilofs during the colder months, leaving in October, and returning in middle or late April.

Veniaminof in 1840 (Trans. by Elliott, 1874 unpagged, and 1875, p. 242) listed "a few kinds of *Tringa*" as occurring on the Pribilofs, and may reasonably be supposed to have observed the only species of the group which breeds; the species, however, was first definitely recorded by Dall, who obtained a specimen on St. George and listed it under the name *Tringa maritima* (1869, p. 291). Later both Dall and Coues listed the species as *Tringa crassirostris*, but Coues, assured of its novelty, in a footnote (in Elliott, 1874, not paged, p. 182 of 1875 reprint) gave it the specific name it now bears. About the same time, Harting (1874, p. 243) bestowed upon it another name, *Tringa gracilis*.

Hanna in 1914 saw seven individuals at Zapadni, St. George Island, on April 14. His records of observations on St. Paul in the spring of 1915 are as follows: April 24, about 50 seen in flocks; a male taken on this date had nearly finished acquiring the breeding plumage, but still retained a few traces of the winter feathering; April 26, about 50 (in flocks); May 2, about 30 (pairing); May 4, 18 (about all paired); May 9, 20 (about all paired); May 18, 12 (in pairs); May 28, 8 (in pairs).

This sandpiper nests on the higher lichen-covered parts of both St. George and St. Paul, and as far as known, on only one other group—St. Matthew. The first eggs known, a set of 4, were taken by H. W. Elliott and G. R. Adams on St. George, June 19, 1873. Another set of 4 was taken by True and Prentiss on St. Paul, July 6, 1895. More recently a number of sets have been taken on St.

George Island by G. Dallas Hanna and others, and Mr. Hanna (1921a, pp. 50-57) has published a very full and interesting account of the nesting of the species, with description and measurements of the eggs, and the present place of depository of the 23 sets of which he has knowledge.

The experience of the writer is limited to a few observations made on the two main islands of the group in the summer of 1914. A few pairs attending young were found on the breeding grounds near the Polovina Lakes, St. Paul, on June 28, and adults and downy young were collected. Both sexes had been brooding as shown by the bare spots on the sides of the abdomen. They were still lingering about their breeding grounds here on July 20, and perhaps later. About August 9 the birds began to be common about the beaches, the flocks there apparently being in excess of the number breeding on the islands, and in all probability, therefore, comprised in part of migrants from other breeding stations. They continued to be abundant until my departure the last of August. A young female bird taken August 28 still retained some of the down of the juvenal plumage on the postauricular region. During our brief visits in mid-July and early August to St. George Island, where the bird breeds more abundantly, many were observed, on the former occasion near their breeding grounds, and in early August mainly about the beaches.

About the middle of July, when the earlier nesting birds are freed from family cares, they begin to resort to the beaches to feed, and at night gather in flocks to roost on some favorite rocky point. Later the young join the adults and the flocks increase in size through August.

The majority of the birds leave by mid-September. Hahn in 1910 observed a few on St. Paul during September and early October; his latest date is October 20. Hanna in 1913 noted the species on St. George as follows: August 30, 20 seen; September 4, 20; September 11, 500; September 15, about 75; September 28, 4. Hanna's notes for St. Paul, autumn of 1914, are as follows: September 14, large flocks going south; September 16, about 500 individuals seen, the majority have gone; September 20, about 200; September 22, about 30; October 4, 20; October 17, 10.

The species winters as far as known on the mainland of southeastern Alaska and has not been observed on the Pribilofs later than the dates above noted, being replaced at that season, in a measure, by the Aleutian sandpiper, as detailed in the account of that species.

Males taken by Hahn and Marsh measured in the flesh: Length, 8 to $9\frac{1}{8}$ inches; extent, 16 to $16\frac{3}{16}$; females, length, $9\frac{5}{8}$ to $10\frac{1}{8}$; extent, $16\frac{3}{4}$ to $17\frac{1}{8}$. A female taken on St. Paul, October 19, 1910, by Hahn,

had the bill horn color at base, dusky at tip; feet dusky greenish, tarsus horn color.

Food.—More stomachs of the Pribilof sandpiper have been available for examination than of any other species, the total being 198, of which 6 were nearly empty (and consequently excluded from computations, the results of which are here cited). The articles of food composing more than 1 per cent of the total were: Mollusks, 32.63 per cent; crustaceans, 29.15 per cent; flies (Diptera), 23.49 per cent; beetles, 10.29 per cent; marine worms, 1.27 per cent; and vegetable matter, chiefly algae, 1.21 per cent.

The molluscan food, although the largest single item, was little varied, consisting chiefly of univalves, and these mostly of the genus *Littorina*. Unidentified species of this genus were found in 33 stomachs, and *L. sitchana* in 53. Several stomachs held large numbers of this species, the maximum count being 205. One other univalve (*Neritina sitchana*) was determined among the food, and 3 kinds of bivalves, namely, *Pisidium hannai* in 1 stomach, blue mussels (*Mytilus edulis*) in 14, and *Modiolus modiolus* in 7. One of these stomachs yielded 40 of the last-named species.

Like the molluscan food of the Pribilof sandpiper, the crustacean also was very uniform, being almost entirely amphipods. Unidentified amphipods were found in 43 stomachs, *Gammarus pribilofensis* in 20, *Gammarus* sp. in 9, and *Orchestia* sp. in 1. Isopods, named as *Idothea* (?) *ochotensis*, occurred in 2 gizzards, and eggs of water fleas (Daphniidae) in 1.

The third item in rank among the food staples of this sandpiper, two-winged flies (Diptera, 23.49 per cent), includes larvae, pupae, and adults of a variety of forms. Crane-flies (Tipulidae, *Tipula* sp.), either the larvae or adults, the latter often with eggs, were most frequently identified, and various members of the dung-fly family (Scatophagidae) next. Flies of the latter group determined were: *Scatophaga crinita*, *S. furcata*, *Leria fraterna*, and *L. leucostoma*. Blowflies, so numerous on the Pribilofs when large numbers of rotting seal carcasses are present, were eaten by 12 of the birds. As many as 23 of one of these flies (*Calliphora vomitoria*) were found in a single stomach, and no fewer than 112 larvae of blowflies in another. Kelp-flies (*Coelopa eximia*, *Coelopa* sp., and *Fucellia* sp.) occurred in 10 stomachs.

Beetles, last of the major elements of the Pribilof sandpipers' food, 10.29 per cent in all, were a varied lot. Ground beetles were distinctly the favorites, those of the genus *Pterostichus* being found in 33 stomachs, and in numbers as great as 21, 25, and 31 in three instances. Larvae as well as adult beetles of this family were eaten, and the following forms in addition to the genus already mentioned

were determined: *Amara brunnipennis*, *Amara* sp., and *Patrobis septentrionis*. A small species of the burying beetle family (Silphidae), by name *Lyrosoma opaca*, was eaten by 3 birds, unidentified rove beetles (Staphylinidae) by 7, and others of the latter family as follows: *Atheta* sp., 1; *Tachinus apterus*, 1; *Tachinus* sp., 8; and *Olophrum fuscum*, 2. One of the moss beetles (*Byrrhus fasciatus*) was found in 3 stomachs, a click beetle (*Hypnoidus musculus*) in 2, a leaf beetle (*Chrysomela subsulcata*) in 2, the beach beetle (*Aegialites californicus*) in 3, and a weevil (*Lophalophus inquinatus*) in 3.

Of the remaining insects in the dietary of this bird, caddis larvae were found in 4 stomachs, a plant bug (*Irbisia sericans*) in 1, a moth in 1, caterpillars in 2, and Hymenoptera in several. Identified forms of the last group were all parasitic wasps, representing the following genera: *Gelis*, *Seleucus*, *Bathymetis*, *Stiboscopus*, *Phygadeuon*, and *Amblyteles*.

Mites were found in 1 stomach examined and spiders in 5. Marine worms, chiefly of the family Nereidae, composed 1.27 per cent of the food, and as many as 38 individuals were represented in a single stomach. A sculpin (*Myoxocephalus* sp.) was eaten by 1 of the birds studied. It is of interest to note that material, no doubt taken for grinding purposes, included in a few cases bits of bone, and in one instance a molar tooth of the lemming (*Lemmus nigripes*).

Vegetable matter, 1.21 per cent of the total food of the species, consisted chiefly of algae, including kelp and plume algae (*Ptilota* sp.). Bits of moss also were eaten and a few seeds of the following plants: Grass, lupine (*Lupinus nootkatensis*), violet (*Viola langsdorffii*), crowberry (*Empetrum nigrum*), and bottle brush (*Hippuris vulgaris*).

Pisobia acuminata (Horsfield). SHARP-TAILED SANDPIPER.

The sharp-tailed sandpiper was first recorded from the Pribilofs by Seale (1898, p. 139) on the basis of a specimen taken by R. E. Snodgrass and A. W. Greely on St. Paul Island August 19, 1897. (Grinnell (1901, p. 20) gives the date of what is apparently the same specimen as August 17.) Bishop, touching at St. George on October 3, 1899, saw about a dozen and took 3 (1900, p. 66). The bird has since been found to be a regular fall migrant and is sometimes abundant. Hahn recorded it in small numbers on September 7 and 24, October 11 and 20, and November 9, 1910. A male taken by Hahn on St. Paul on October 8 is in the collection of the Biological Survey.

Hanna, in 1913, took specimens on St. George on August 30, September 5 and 6, and October 18. In 1914, on St. Paul, he observed a few on August 29, September 14 and 20, and 1 on Octo-

ber 12. The same observer noted the species in large flocks, together with the pectoral sandpiper, on the seal-killing fields of St. Paul during the early autumn of 1919.

Two males taken by Marsh October 11, 1911, measured, respectively: Length, $9\frac{3}{8}$ and $8\frac{3}{4}$ inches; extent, $17\frac{1}{2}$ and 17. Females taken by Hahn measured as follows: Length, 8 inches; extent, $14\frac{3}{4}$ and $15\frac{1}{4}$.

Food.—Eight well-filled and 1 nearly empty stomach of the sharp-tailed sandpiper are available to illustrate the food habits. This number is too small to furnish reliable results, and too great dependence must not be placed in data as to the relative ranks of food items as here stated. The percentages found for the limited material, then, are flies (Diptera), 39.1 per cent; crustaceans, 18.1 per cent; mollusks, 14.2 per cent; caddisflies, 11.8 per cent; beetles, 8.8 per cent; Hymenoptera, 1.8 per cent; and vegetable matter, 3.9 per cent.

Mr. Hanna notes that flocks of this species frequent the seal-killing fields feeding on fly maggots, a statement receiving confirmation from stomach analysis. Blowflies (*Calliphora vomitoria*) were found in two stomachs and larvae of this or an allied species in another. Thirty-three rat-tailed larvae of flower flies (Syrphidae; Eristalinae), and those of crane flies (Tipulidae), and midges (Chironomidae) in 1 each.

Both caddis larvae and adults were eaten, and of the latter *Chilostigma praeteritum* was identified. Among the beetles, ground beetles are well represented by *Pterostichus* in 2 stomachs and the large gold and green beetle (*Carabus truncaticollis*) in 1. Other species of beetles eaten, each by 1 bird, except a weevil (*Lophalophus inquinatus*) by 2, were: A predacious diving beetle (*Hydroporus* sp.), rove beetle (*Tachinus* sp.), moss beetle (*Byrrhus fasciatus*), click beetle (*Hypnoidus musculus*), stores beetle (*Ptinus fur*), and a leaf beetle (*Chrysomela subsulcata*).

The few remaining insects found in stomachs of the sharp-tailed sandpiper were parasitic wasps (*Gelis* sp., and *Polyrhembia* sp.) and a plant bug (*Irbisia sericans*). Spiders were found in 1 stomach and amphipods in 2, these comprising the bulk of the crustaceans eaten. The vegetable matter in the stomachs consisted of plant fibers, further unidentified, which were probably taken accidentally.

Pisobia maculata (Vieillot). PECTORAL SANDPIPER.

The pectoral sandpiper is a migrant on the Pribilofs, evidently occurring mainly in early autumn, though the first record relates to June specimens. Palmer (1899, p. 404) obtained 2 specimens on St. Paul, June 12, 1890. The next instance of its capture seems to have been recorded by Bishop (1900, p. 66), who mentions a specimen shot on St. George Island by W. H. Osgood, October 3, 1899. Hahn took

specimens on St. Paul on September 11 and October 8, 1910; and Marsh collected the species on the same island on October 11, 1911, and May 30, 1912.

While on St. Paul Island in the summer of 1914 the writer first noted this species on August 17, when four were observed at Northeast Point; subsequent records, made near the village, follow: August 23, 7 observed; August 24, 30; August 25, 6; August 28, common; August 29, abundant. Following my departure on August 30, G. Dallas Hanna noted it: September 14, 18; September 16, 12; September 20, about 50.

Notes taken from the field catalogues follow: Male, St. Paul Island, October 8, 1910, W. L. Hahn: length, $8\frac{3}{4}$ inches; extent, $16\frac{1}{4}$; bill, horn color at base, dusky on terminal half; feet, greenish-yellow. Female, St. Paul Island, September 11, 1910, Hahn: length, $8\frac{3}{4}$ inches; extent, 17. Male, St. Paul, May 30, 1912, M. C. Marsh: length, $9\frac{3}{8}$ inches; extent, $17\frac{5}{8}$; legs and feet, yellowish-red; bill, black.

Food.—Included in the present study are 23 stomachs of this species, of which 2 collected long ago were imperfectly examined and are not available for reexamination. The food proportions here given, therefore, are based on the contents of 21 well-filled gizzards. The principal elements of the food are: Flies (Diptera), 54.5 per cent; amphipods, 22.3 per cent; vegetable matter, chiefly algae, 10.5 per cent; beetles, 8 per cent; Hymenoptera, 2.1 per cent; and bugs (Hemiptera), 1.3 per cent.

The Diptera eaten were almost exclusively larvae of crane-flies (Tipulidae; *Tipula* sp.), of which no fewer than 123 were in a single stomach among the 16 in which such larvae occurred. Kelp-flies (*Coelopa* sp.) were found in 2 stomachs. The beetles eaten were mostly ground beetles and their larvae, of which the following kinds were identified: *Amara brunnipennis*, *A. glacialis*, *Amara* sp., and *Pterostichus* sp. Other beetles eaten included a predacious diving beetle (*Hydroporus* sp.), rove beetles (*Quedius hyperboreus*, and *Hadrotus* sp.), and weevils (*Lophalophus inquinatus*). The Hymenoptera consumed were small parasitic wasps (*Amblyteles* sp. and *Campoplex* sp.), and the Hemiptera, the plant bug (*Irbisia sericans*). The only other insects eaten were caddis larvae. Mites and spiders were found in 3 stomachs each, and amphipods, the only crustaceans eaten, in 5.

The vegetable food, while largely algae, included also a few seeds of grass, lupine (*Lupinus nootkatensis*), and violet (*Viola langsdorffii*).

Pisobia bairdi (Coues). BAIRD SANDPIPER.

The Baird sandpiper was added to the Pribilof list by Hanna (1916, p. 401), who took 3 specimens at Kaminista Lake, St. Paul

Island, August 31, 1914. Mailliard and Hanna (1921, p. 95) have recently put on record 2 specimens taken at Northeast Point, St. Paul Island, August 12, 1920.

Food.—The food secured by Baird sandpipers on the Pribilofs is known only from the contents of three stomachs taken August 31, 1914. They contained amphipods (partly *Gammarus* sp.), 73.6 per cent; algae, 11.6 per cent; beetles, 10.3 per cent; and a fly larva, 1 per cent. The beetles were ground beetles (*Pterostichus* sp. and *Patrobis septentrionis*), and a weevil (*Lophalophus inquinatus*).

Pisobia minutilla (Vieillot). LEAST SANDPIPER.

The first specimen of the least sandpiper known to have been taken on the Pribilofs was a female shot by Wilfred H. Osgood, at Kaminista Lake, St. Paul Island, August 29, 1914. It is now in the collection of the Biological Survey, and has been recorded by G. Dallas Hanna (1916, p. 401). Hanna also observed 2 on September 14 of the same year, and 1 on July 13, 1915, also on St. Paul. A second specimen, taken by Hanna at Northeast Point on St. Paul Island, August 27, 1920, has been recorded by Mailliard and Hanna (1921, p. 95).

Food.—The stomachs of the 2 specimens above mentioned were examined. One of them contained amphipods exclusively, and the other the following items: 23 seeds of bottle brush (*Hippuris vulgaris*), 50 per cent; bits of hydroid stems, 40 per cent; and chitin from the blue mussel (*Mytilus edulis*), 10 per cent.

Pisobia subminuta (Middendorff).¹⁰ LONG-TOED STINT.

The specimen of the long-toed stint taken by Townsend in 1885, which added a new species to the North American list, still remains the only record for the Pribilofs. The occurrence was first put on record by Ridgway (1886, p. 275). Concerning the taking of the bird, Townsend says (1887, p. 100):

By the capture of this Asiatic bird on Otter Island, Alaska, where I shot an adult female, in breeding plumage, on June 8, 1885, a species is added to the fauna of North America. It was feeding in a shallow salt-water pond, with other *Tringa*, which I supposed to be *Actodromas*.

The long-toed stint breeds in Kamchatka and other parts of eastern Siberia, including the Commander and Kurile Islands. In winter it occurs as far south as Australia and the Philippines.

Pelidna alpina sakhalina (Vieillot). RED-BACKED SANDPIPER.

The American dunlin was first observed on the Pribilofs by L. B. Bishop October 3, 1899, when during a short visit to St. George Island he observed a few (1900, p. 67). The first specimen, a male,

¹⁰ *Pisobia damacensis* of the A. O. U. Check List, 1910.

was taken by Hahn October 30, 1910, and recorded by Evermann (1913, p. 17). It measured: Length, $7\frac{1}{2}$ inches; extent, 14. It is now in the collection of the Biological Survey.

A second specimen, shot by Doctor Hunter on St. Paul Island, September 3, 1914, was preserved by Hanna, and is now in the U. S. National Museum collection. The reddish brown of the scapulars and tertials is nearly replaced by the gray of the winter plumage; sides of breast with small rounded black blotches. Another individual was observed at the same time.

Food.—The single available stomach of the red-backed sandpiper (St. Paul, September 3, 1914) was entirely filled with amphipods.

Ereunetes pusillus (Linnaeus). SEMIPALMATED SANDPIPER.

A female semipalmated sandpiper taken by Palmer on St. Paul Island, June 12, 1890, remains the only record for the Pribilofs. This specimen, which was recorded by Palmer (1899, p. 405), was in company with two pectoral sandpipers, evidently just arrived from the south.

Food.—The stomach of this specimen was found to contain remains of the beach beetle (*Aegialites californicus*), 10 per cent; fragments of small flies (Diptera), 85 per cent; and two seeds (not identified), 5 per cent.

Limosa lapponica baueri (Naumann). PACIFIC GODWIT.

The Pacific godwit seems to be of regular occurrence in spring and fall. It was first recorded by Elliott who observed it in flocks of a dozen to 50 (1874 unpagged, and 1875, p. 187). Subsequent records of occurrence are few. Palmer took specimens on Walrus Island, June 13, and on St. Paul, July 7, 1890. Marsh collected a male on St. Paul, June 12, 1912; it measured: Length, $15\frac{1}{2}$ inches; extent, $27\frac{3}{4}$. Hanna collected an adult female on St. George, September 7, 1913. In 1915, on St. Paul, he observed the bird as follows: May 20, 4 seen, 1 taken; May 26, 14; May 27, 30; May 28, 50 seen at Northeast Point.

Food.—Six stomachs of Pacific godwits collected on St. Paul and Walrus Islands by William Palmer in 1890 have been reexamined. Dr. S. D. Judd's analysis of their contents was published by Palmer (1899, pp. 405, 406), but the present report is an improvement in some respects over the original. The items of the food in rank by bulk, are flies (Diptera), 76.6 per cent; beetles, 17 per cent; mollusks, 3.6 per cent; marine worms (Nereidae), 1.3 per cent; and vegetable matter, 1 per cent. The fly remains were very largely midge (chironomid) larvae, but included also a few dung-flies (*Scatophaga* sp.). The beetles included as the principal item 450 or more beach beetles (*Aegialites californicus*), which made up 85 per cent of the contents of one stomach; and as lesser items, ground beetles

(*Pterostichus* sp. and *Amara brunnipennis*), rove beetle (*Tachinus* sp.), and a weevil (*Lophalophus inquinatus*). A caddisfly was the only other insect eaten. The mention of tiger beetles by Judd must be set down as a misidentification, based no doubt on the jaws of marine worms (Nereidae) which one of the stomachs contained. All of the mollusks eaten by the godwits were of a single species of univalve, *Littorina sitchana*.

The vegetable matter consisted of unidentified fibers and a few leguminous seeds, probably accidentally taken.

Totanus melanoleucus (Gmelin). GREATER YELLOW-LEGS.

A greater yellow-legs taken at Kaminista Lake, St. Paul Island, in 1897, by R. E. Snodgrass and A. W. Greely, was at last accounts in the collection of Leland Stanford University. Alvin Seale, who first recorded it (1898, p. 139), gives the date as August 23. Grinnell, reporting on the same collection (1901, p. 20), gives the date as August 17. However, Walter K. Fisher, in response to my request, kindly looked up the specimen and tells me that the label bears the date August 29, 1897. These details are given lest it be supposed that there are several specimens; there is apparently only one involved.

Hanna reports seeing one at close range on St. George on May 28, 1917, and another on St. Paul, June 10, 1919.

Totanus flavipes (Gmelin). LESSER YELLOW-LEGS.

Palmer saw a lesser yellow-legs among a flock of godwits, June 11, 1890, but failed to secure it (1899, p. 407). Hanna took a female specimen, now in the collection of the U. S. National Museum, on St. George Island, October 18, 1913, and has recorded it (1916, p. 402). These seem to be the only records.

Rhyacophilus glareola (Linnaeus). WOOD SANDPIPER.

A specimen of the wood sandpiper was taken on St. George Island May 19, 1914, by G. Dallas Hanna. This specimen, which was partially demolished by a blue fox and now consists only of the wings and one foot, is now in the collection of the Biological Survey, and has been recorded by Mr. Hanna (1916, p. 401).

The wood sandpiper breeds in northern Eurasia east to Kamchatka and Bering Island, and winters in northern Africa, southern Asia, Japan, and the Philippines. It had been taken once in Alaska previous to its capture on the Pribilofs.

Heteroscelus incanus incanus (Gmelin).¹¹ WANDERING TATTLER.

The wandering tattler is a rather common migrant in early and late summer, the outward spring and return fall movements being

¹¹ *Heteractitis incanus* of the A. O. U. Check List, 1910.

separated by only a short interval. The species was first recorded from the islands by Elliott (1874, unpagged, and 1875, p. 187). The available dates of occurrence, divided as nearly as may be into spring and fall records, are as follows: St. Paul Island, May 27, 1872, specimen (Elliott). Otter Island, June 8, 1885, specimen (Townsend). St. Paul Island, May 22, 1911, 1 seen; May 29, 1 seen; May 30, 2 seen (Hahn). St. Paul Island, May 31, 1915, 1 seen (Hanna). The earliest record marking the return movement is that of Hanna, who saw one on St. Paul Island, July 7, 1915. Palmer observed it on St. Paul July 10, 1890, and took specimens there on July 29 and 31. Hahn did not begin his observations on St. Paul in 1910 until about the 1st of September; his notes on this species are as follows: September 2, 2; September 4, 2; September 7, 3; September 8, 6; September 9, 3; September 11, 10; September 18, 3; October 4, 1. Hanna, on St. George, observed 4 singly on August 24, 1913, and collected 1.

During the late summer of 1914 the writer did not observe this species until July 27, when one was seen on Otter Island. On St. Paul a few were seen between Northeast Point and the village on July 29, and subsequently as follows: August 15, 1; August 16, 1; August 23, 2; August 25, 1; August 28, 4; August 29, 3. One was also observed on St. George on August 5. Following my departure from the Pribilofs G. Dallas Hanna recorded the species on St. Paul on the following dates: September 14, 8; September 16, 10; September 20, 3; September 22, 2. Hanna informs me he took specimens on St. Paul Island on August 18 and 27, 1920.

Food.—The six stomachs of wandering tattlers examined yielded quite a variety of food items of which those in excess of 1 per cent of the total, are: Flies (Diptera), 46.1 per cent; caddisflies, 30.6 per cent; amphipods, 16 per cent; mollusks, 3.6 per cent; and beetles, 1.1 per cent. One stomach was filled with blowflies (*Calliphora vomitoria*), another nearly so with dung-flies (*Scatophaga crinita*), and a third in like measure with kelp-flies (*Coelopa frigida*), and crane-fly larvae. Two of the stomachs were nearly full of caddisfly larvae. Amphipods (including *Gammarus* sp.) occurred in three of the gizzards but in quantity only in one. The mollusks eaten by two birds were univalves of the genus *Littorina*, 23 in one of the stomachs being *L. sitchana*. The only beetle was the large gold and green ground beetle (*Carabus truncaticollis*) and the only other insects were small parasitic wasps (*Polyrhembia* sp.). Concluding the enumeration of food items, one stomach contained a few bones of a small fish and another a little vegetable débris.

Heteroscelus incanus brevipes (Vieillot). POLYNESIAN TATTLER.

The Polynesian tattler has been taken on three occasions on the Pribilofs, the only North American locality. G. Dallas Hanna

first recorded it (1919a, p. 176, and 1920a, p. 250) and (l. c., p. 250) elaborates the circumstances as follows:

The history of the Polynesian tattler in North America dates back to October 4, 1911, when a female was secured on St. Paul Island by Mr. M. C. Marsh, then the naturalist of the fur-seal service. The specimen was placed in the National Museum collection without being detected as differing from the wandering tattler. It was discovered by Dr. H. C. Oberholser while he was verifying the identification of a second specimen of the same species, a female collected on St. Paul Island, September 2, 1917, by the writer. Owing to the difficulty of distinguishing the tattlers it may be that the Asiatic form comes across Bering Sea more frequently than the records would indicate.

A third specimen was taken later by Mr. Hanna, and is referred to as follows (1920b, p. 174):

A female Polynesian tattler (*Heteractitis brevipes*) was secured on St. Paul Island on September 17, 1919, near Kitovi Rookery. It makes the third specimen taken in North America. I had an opportunity to observe this bird for a while with two wandering tattlers in view at the time. The actions of the two species were practically the same. They feed very close to the sea on rocky shores and when disturbed fly lazily rarely more than 100 yards. The wandering tattlers on this occasion appeared perceptibly larger than the Polynesian, and the notes of the two were different. The latter uttered an irregular screech not of the same intensity or pitch, whereas the former gave its usual call, a series of 6 to 10 individual notes uttered in the same pitch and rapid succession but each of shortening duration.

The Polynesian tattler breeds in eastern Siberia, including Kamchatka, and moves southward in winter to China, Japan, the Malay Peninsula, and Australia. It has also been taken on Bering Island in the spring migration.

Philomachus pugnax (Linnaeus).¹² RUFF.

An immature female ruff taken by W. L. Hahn on St. Paul Island, September 7, 1910, formed the basis for Evermann's account, crediting the species to the Pribilofs (1913, p. 18). This specimen, which is now No. 239169 of the collection of the Biological Survey, is the first one taken on the western coast of North America. Hahn's field catalogue shows that it measured in the flesh: Length, 11 $\frac{3}{8}$ inches; extent, 23 $\frac{1}{4}$.

The ruff is of wide distribution in central Eurasia, occurring eastward rarely to Japan and China, and in winter moving southward to Africa and India.

Numenius hudsonicus Latham. HUDSONIAN CURLEW.

The Hudsonian curlew has been recorded a few times from the islands on what appears to be excellent authority, but no specimens have been taken. It was first added to the list by Palmer, who recorded one seen at close range on St. Paul Island by F. A. Lucas,

¹² *Machetes pugnax* of the A. O. U. Check List, 1910.

July 16, 1897. The St. Paul Island log, under date of May 27, 1903, refers to "curlew" as having been "here last few days" (notes taken by Hahn). Hahn himself noted the bird as follows: August 29, 1910, 1 seen; September 2, 1 seen flying over pond; September 25, 1 seen flying over lagoon.

While on St. Paul Island in 1914 the writer saw 2 curlews, which seemed to be of this species, flying over the shallow ponds near the village of St. Paul. On May 18, 1915, G. Dallas Hanna observed 6 individuals on St. Paul.

Numenius borealis (J. R. Forster). **ESKIMO CURLEW.**

The Eskimo curlew was first recorded by Coues (in Elliott, 1874, unpagged; 1875, p. 189). He says:

A single specimen only of the Esquimaux curlew was taken by Mr. Elliott on St. Paul's Island, June, 1872. None other than this one was seen by him.

Palmer lists the specimen as No. 62448, adult male, May 26, 1872. This specimen is still, and will probably remain, the only record for the Pribilofs.

Numenius tahitiensis (Gmelin). **BRISTLE-THIGHED CURLEW.**

The bristle-thighed curlew, which had previously been taken on the mainland of northern Alaska, was added to the Pribilof list by G. Dallas Hanna, a specimen having been taken by him on St. George Island, May 26, 1917, and recorded by the collector (1919a, p. 176, and 1920a, p. 252). This specimen is now No. 255154 of the bird collection of the U. S. National Museum. The species winters on Hawaii and other islands of the south Pacific.

Family **CHARADRIIDAE.**

Pluvialis dominica fulva (Gmelin).¹⁴ **PACIFIC GOLDEN PLOVER.**

The western race of the golden plover visits the Pribilofs regularly in spring and fall, still in fair numbers, although it is probably much less common than formerly. It was first recorded from the group by Coinde (1860, p. 400), who considered it identical with European specimens. Elliott (1874, unpagged, and 1875, p. 180) observed it as a spring and fall migrant, and the single specimen preserved by him was identified by Coues as *Charadrius fulvus*.

Coinde's specimens taken by Warneck seem to have been unusually early visitors; they were taken on St. Paul April 18 and 20, 1852. Elliott's specimen was collected on St. Paul May 1, 1873. Palmer (1899, p. 408) took a single specimen, the only one he saw, on St. Paul June 12, 1890. Hahn took 1 on May 7, 1911. Hanna's earliest date for 1915 is May 9, when the natives reported seeing 12 at Halfway Point, St. Paul; he noted 8 on May 17, and 1 on May 28. These are all the spring dates available to the writer.

¹⁴ *Charadrius dominicus fulvus* of the A. O. U. Check List, 1910.

Dates of arrival in the autumn are more common. From the St. Paul Island log Hahn extracted the following notes: October 10, 1897, several killed; October 19, 1901, many came. Hahn himself, in 1910, observed the species on St. Paul as follows: September 3, 6; September 4, 1; September 7, 3; September 11, 5; October 3, 1; October 11, 4; October 18, 2; October 19, 6; October 20, 6; October 23, 2; October 24, 2. Hanna, on St. George, noted the species in the autumn of 1913 as follows: September 4, 2 seen; September 7, 15 seen on high tundra, 1 taken; September 28, 4; October 9, 4; October 18, 8 on uplands. He also noted 4 on St. George on November 5, 1916.

My own dates for St. Paul Island in 1914 seem to be the earliest fall records available: August 7, 1 observed; August 10, small flock; August 15, 3; August 17, 4 at Northeast Point; August 24, 2. Continuing observations after my departure, Hanna noted the bird as follows: September 3, 4 seen, 1 with black belly; September 14, 6; September 20, 30; October 4, 3; October 25, 2 at Northeast Point.

Food.—Elliott and Hanna both note that Pacific golden plovers frequent the seal-killing grounds on the Pribilofs and feed extensively upon the blowfly maggots there. However, in the two stomachs available for examination (St. Paul, June 12, 1890, Palmer; and September 3, 1914, Hanna) none of these larvae were found, their food contents consisting of beetles, 72.5 per cent; flies, 22.5 per cent; Hymenoptera, 4 per cent; and seeds of crowberry (*Empetrum nigrum*), 1 per cent. The beetles were chiefly ground beetles (*Pterostichus* sp., *Amara* sp., and *Carabus truncaticollis*), but rove beetles (Staphylinidae) and leaf beetles (*Chrysomela subsulcata*) also were eaten. The flies devoured were chiefly crane-fly larvae (Tipulidae), and the Hymenoptera were partly a new species of parasitic wasp (*Amblyteles alpestriformis*) and partly unidentified. Hahn noted several chrysomelid beetles and some dry grass blades in a stomach examined by him.

Charadrius semipalmatus Bonaparte. SEMIPALMATED PLOVER.

The semipalmated plover is known only from a specimen taken from a small flock at Northeast Point, St. Paul Island, July 6, 1895, by D. W. Prentiss, jr., and first published by Palmer (1889, p. 408). Prentiss later (1902, p. 102) gives the following details regarding its capture:

Saw a number on the sands at Northeast Point, on July 6, and as I only had my beanshooter, I failed to get more than one, which was a poor specimen. This is an addition to the avifauna of the Islands.

The specimen is now No. 153543, adult female, of the bird collection of the U. S. National Museum.

Arenaria interpres interpres (Linnaeus). PACIFIC TURNSTONE.

The Pacific race of the turnstone, first recorded from the Pribilofs by Coinde (1860, p. 400), occurs only as a migrant, mainly in fall, when it stops for rest and food before starting on its long journey to its wintering grounds.

I have only two dates of occurrence which may be classed as spring migration. Hahn took a specimen May 24, 1911. It measured in the flesh: Length, $9\frac{1}{2}$ inches; extent, $19\frac{1}{4}$. The other, taken by M. C. Marsh May 30, 1912, measured: Length, $9\frac{1}{8}$ inches; extent, $18\frac{3}{8}$; the legs and feet were orange red. These specimens are in the collection of the Biological Survey.

The first fall arrivals come some time in July; the earliest date I find is July 2, 1895 (Prentiss, 1902, p. 102). Hahn, reaching St. Paul in late August, 1910, found the bird abundant. His notes for the remainder of the autumn follow: September 1 to 15, still common, flock seen leaving September 10; September 15 to 30, less common, flock seen on September 24; October 2, some on Walrus Island; October 3, 7; October 4, 9; October 5, 3; October 6, 2; October 18, 5; October 19, 1; October 20, 2 (single ones). Hanna, making observations on St. George in 1913, noted the species as follows: August 30, 4 seen; September 4, 2; September 5, 4; September 15, 15.

My notes for St. Paul in 1914, are the most complete available; they follow: July 11, first observed, abundant, and remained so until the 17th; common July 18, 19, 20, 21, 24, 25; abundant July 28 to 30; common August 3, 4, 7; abundant August 9, and from August 21 to 30. Continuing observations after my departure, Hanna noted the bird as follows: September 14, large flocks; September 16, about 500 observed; September 20, about 50; September 22, 5; October 12, 2; October 4, 6; October 17, 8; October 25, 3 at Northeast Point; October 24, 6 (all with sore feet).

Food.—As in the case of the Pacific golden plover, Elliott and Hanna both assert that turnstones feed almost exclusively on maggots in the seal-killing fields during their stay on the Pribilof Islands.¹⁴ The 12 well-filled stomachs of the bird from the islands do not bear out such far-reaching statements, but these larvae did compose most of the contents of one stomach. The food items of the 12 birds collected were found to be two-winged flies (Diptera), 50.83 per cent; caddis larvae, 16.25 per cent; beetles, 12.5 per cent; amphipods, 11.66 per cent; mollusks, 8.33 per cent; and seeds of crowberry (*Empetrum nigrum*), a few in one stomach, amounting to less than 1 per cent of the total food. Besides the blowfly larvae

¹⁴ Mr. Hanna attributes (1921, p. 57) the same habit to phalaropes, and pectoral and sharp-tailed sandpipers also.

previously mentioned, the dipterous food included larvae of crane flies (numbering 82 and 110 in two instances), remains of dung flies (Scatophagidae), and other fly larvae and pupae. The beetles consumed were chiefly ground beetles, those identified being *Pterostichus* sp., *Amara brunnipennis*, *Amara* sp., and *Carabus truncatocollis*. A rove beetle (*Tachinus* sp.) and a click beetle also were found in the stomachs. The remains of mollusks in the diet were especially interesting, consisting of more than 400 operculi of univalves, apparently of a single species, which completely filled one gizzard. These objects, each of which forms a door closely fitting the aperture of the shell when the snail withdraws into its retreat, were chitinous in the present instance, and evidently had strongly resisted digestion; it is probable they would have been ejected in mass had the bird lived. Alvin G. Whitney in a field note states that turnstones searched over the whole mud bottom of a large pond for the ruby-red midge (chironomid) larvae, which were abundant there.

Family HAEMATOPODIDAE.

Haematopus bachmani Audubon. BLACK OYSTER-CATCHER.

A specimen of the black oyster-catcher was taken on St. George Island January 12, 1917, and was preserved and recorded by G. Dallas Hanna (1919a, p. 176, and 1920a, p. 253). It constitutes the first record for the Pribilofs and is now No. 255153 of the bird collection of the Biological Survey. Hanna comments as follows:

There is good reason to suspect that this species has been shot on St. George Island before. One native told me he had given a bird like it to a Doctor Mills several years earlier but that it had spoiled before being prepared as a specimen (l. c., p. 253).

However, a specimen (No. 241645) taken by H. C. Mills on St. George Island, in the spring of 1913, is in the Biological Survey collection.

Family ACCIPITRIDAE.

Archibuteo lagopus sancti-johannis (Gmelin). AMERICAN ROUGH-LEGGED HAWK.

The American race of the rough-legged hawk was added to the Pribilof list by G. Dallas Hanna (1919a, p. 176, and 1920a, p. 253). His account (l. c., p. 253), in part, follows:

One specimen, unsexed, was secured on St. George Island in the fall of 1917 by Mr. C. E. Crompton, of the U. S. Bureau of Fisheries. He has kindly consented to the record being included in this list.

This specimen is now No. 255159 of the bird collection of the U. S. National Museum.

Thalassoaetus pelagicus (Pallas). KAMCHATKAN SEA EAGLE.

G. Dallas Hanna has put on record the capture of a Kamchatkan sea eagle on St. Paul, thereby adding it to the Pribilof and to the North American list (1919a, p. 176, and 1920a, p. 250). His account (l. c., p. 250), in part, follows:

A bird of this species was shot and wounded on St. Paul Island, December 15, 1917, but fell into the sea. Five days later it was picked up on the beach in badly decomposed condition. Enough of the specimen could be saved, however, to enable the identification to be made in the National Museum.

The incomplete skeleton is in the collection of the above institution. The species breeds in Kamchatka, and has been taken on Bering Island.

Haliaeetus leucocephalus alascanus C. H. TOWNSEND. NORTHERN BALD EAGLE.

The status of the bald eagle in the Pribilof avifauna is somewhat doubtful, since no specimens have been taken. Palmer first recorded it, having exhibited an Unalaska specimen, which was recognized by the St. Paul natives as being occasionally seen about the islands.

According to the St. Paul Island log (notes extracted by Hahn) eagles were seen on April 29, 1907, and October 16, 1908. A large bird, evidently an eagle, was reported to Hanna as having been seen on St. George, December 21, 1913. These notes probably, though of course not certainly, refer to the common Alaska species.

Family FALCONIDAE.

Hierofalco rusticolus sacer (J. R. Forster). AMERICAN GYRFALCON.

The gyrfalcon is a more or less regular visitor to the Pribilofs. It was first credited to the group by Coues (in Elliott, 1874, unpagged, and 1875, p. 179) from a specimen in the collection from St. Paul Island, taken in March, 1873. The same specimen was referred to by Elliott in his subsequent accounts of the ornithology of the group. On September 24, 1880, a female specimen was taken while trying to alight on a Coast Survey vessel in Bering Sea, 60 miles east south-east of St. George Island. This was recorded by Bean (1882, p. 161). The two specimens above noted formed the sole basis for Palmer's account of the bird on the Pribilofs (1899, p. 418).

No other gyrfalcons seem to have been taken on the Pribilofs until the autumn of 1913, when G. Dallas Hanna took a female specimen on St. George Island, November 29. It had been noted on the cliffs along the shore for about a month. During the autumn of 1914, on St. Paul, he observed a few others, as follows: September 14, 1; September 20, 1; October 14, 1 (taken); October 25, 3; November 20, 1. Another individual was shot on St. George Island during the winter of 1915-16. During the following winter, 1916-17, St. George

Island was visited by so many gyrfalcons that the local wren (*Nannus alascensis*) and the rosy finch (*Leucosticte griseoucha*) were nearly extirpated. On November 30, 6 were seen, 3 of which were killed.

By offering a reward Hanna was able to secure a series of 13 specimens altogether. Six of these, taken during December, 1916, and January and February, 1917, are in the U. S. National Museum. These are mainly immature birds, but at least one in adult plumage is included in the series. Mr. Hanna was told that the birds were also unusually common on St. Paul Island during the same winter, but their destructive habits seem not to have resulted so disastrously to the smaller resident birds of St. Paul as was the case on St. George. Although all the available Pribilof specimens have been examined by the writer, his studies have not progressed far enough to permit a decision as to the form represented there. These birds are all, of course, migrants from some other region, but whether from North America or from Asia can not be determined without a more exhaustive study than is justified in the present connection. The subspecific designation above used is therefore employed only tentatively. It is believed, however, that only one form inhabits northwestern North America, to which the name *Falco sacer* (Forster, Phil. Trans., vol. 62, pp. 383, 423, 1772) appears to be applicable.

Food.—G. Dallas Hanna states in field notes that the stomach of the bird killed on St. George Island, November 29, 1913, contained feathers of a rosy finch (*Leucosticte griseonucha*), and that three birds shot there on November 30, 1916, had eaten snow buntings and rosy finches.

Falco peregrinus anatum Bonaparte. DUCK HAWK.

Palmer added the duck hawk to the Pribilof list (1899, p. 419). In the summer of 1890, on St. Paul, he "dug the remains of one from a sand dune; it had been killed the previous December." Hahn found a note on this species in the St. Paul Island log under date of December 14, 1904: "One shot but lost." The writer saw a duck hawk about the cliffs on Tolstoi, St. Paul, June 26, 1914; it was not identifiable subspecifically.

Falco peregrinus pealei Ridgway. PEALE FALCON.

This form of the duck hawk was added to the Pribilof list by Hanna, who took a female specimen on St. George Island, March 12, 1914, and has put the capture on record (1916, p. 401). The specimen is now No. 242571 of the Biological Survey collection. According to a manuscript report in the Biological Survey, H. P. Adams noted one on St. George Island, January 13, 1917.

Family STRIGIDAE.

Asio flammeus Pontoppidan. SHORT-EARED OWL.

The short-eared owl was added to the Pribilof list by Palmer (1899, p. 419) on the basis of one seen by him near the village of St. Paul, June 17, 1890. The natives reported seeing the species every winter.

W. L. Hahn took a specimen on St. Paul Island, November 8, 1910, which is now in the collection of the Biological Survey. It measured in the flesh: Length, 14 inches; extent, 39 $\frac{3}{4}$. A second specimen, also in the Survey collection, was taken by Hanna on St. George, February 28, 1914.

Food.—William Palmer noted that the bird under observation by him "often visited the same place during the night or early in the morning to feed upon the least auklets which were breeding in the vicinity" and, he adds:

I often found on the moss a round patch of feathers which showed the fate of a Choochkie. A few are seen every winter by the natives, but they all agree that hawks and owls are more abundant on St. George, owing to the presence of numerous lemmings, which are entirely absent from St. Paul.

W. L. Hahn reports that the stomach of the specimen collected by him contained three shrews (*Sorex pribilofensis*).

Cryptoglaux funerea magna Buturlin. BUTURLIN HAWK OWL.

A female hawk owl taken by W. L. Hahn, on St. Paul Island, January 26, 1911, was recorded by Evermann (1913, p. 18) under the name *Cryptoglaux funerea funerea* and was considered a new record for the Pribilofs and for North America. The specimen, which is in the collection of the Biological Survey, has recently been examined by Dr. H. C. Oberholser, in the light of additional material, and found to be referable to *C. f. magna*, described by Buturlin from the Kolyma River, Siberia, and has been recorded by him (1922, p. 73). *C. f. magna* thus replaces *C. f. funerea* as a Pribilof and a North American bird.

According to Hahn's field catalogue this specimen measured in the flesh: Length, 10 $\frac{1}{4}$ inches; extent, 23 $\frac{1}{2}$. Its stomach was empty save for a few hairs.

Cryptoglaux funerea richardsoni Bonaparte. RICHARDSON OWL.

Evermann added the Richardson owl to the Pribilof list on the basis of a male specimen taken by M. C. Marsh on St. Paul Island, February 2, 1912 (1913, p. 18). The field catalogues give the following notes taken from the fresh specimen: Length, 9 $\frac{3}{4}$ inches; extent, 22; iris, yellow; cere, blackish behind, pale forwards; bill, pale along culmen and gonys, the rest black; soles, light yellowish; claws, black.

Notes taken from the St. Paul Island log by Hahn record the capture of an owl, which from the detailed description could be no other than this species, on March 20, 1905; another was shot on May 22, and one was seen on May 23, of the same year.

Food.—The stomach of the specimen collected by Marsh, February 2, 1912, contained bones and fur of the house mouse.

Nyctea nyctea (Linnaeus). SNOWY OWL.

The boreal snowy owl is rather frequently observed on both St. Paul and St. George during the fall and winter months. On a few occasions it has been observed in summer, but it has never been found to breed. It was first recorded from the Pribilofs by Elliott (1881, p. 136), who states that it was occasionally taken on either island, but that he saw none.

The following are the definite records of occurrence that have come to the attention of the writer: Palmer took 1 on St. Paul on June 13, 1890, and states that 1 was shot on St. George on June 10 of the same year. He is also authority for the statement that 7 individuals were shot by one of the Treasury agents during the winter of 1884–85 (island not stated), and that F. A. Lucas saw 3 during the summer of 1896. W. L. Hahn found records in the St. Paul Island log to the effect that 2 were seen December 4, 1904, and that 1 was shot March 5, 1905. Hahn himself noted the species on St. Paul as follows: November 5, 1910, 1 taken near Cove salthouse; November 8, 1 seen near Polovina; November 9, 2 seen, 1 shot; January 18, 1911, 1 seen at Black Bluffs. M. C. Marsh took specimens on the same island on November 20 and December 10, 1911. Hanna, collecting on St. George in the fall of 1913, noted the birds as follows: September 4, 1 seen; September 28, 1 seen at Garden Cove; October 9, 1 seen; December 21, 1 seen; he saw another on St. George, July 20, 1914. On St. Paul, in 1915, Hanna took a specimen, now in the U. S. National Museum, on February 7, and later observed the species as follows: April 4, 1; April 16, 1 (pursuing crested auklets); May 18, 2 seen on Hutchinson Hill. On St. George, he saw 1 on November 5, 1916.

The field catalogues show the following measurements of specimens taken on St. Paul: Female, November 5, 1910, Hahn, length, 25 inches, extent, 63½; male, November 20, 1911, Marsh, length, 23, extent, 57; male, December 10, 1911, length, 21½; extent, 55½.

Food.—G. Dallas Hanna states in a field note that an owl of this species has been known to snatch from the water an old-squaw duck which had been shot by a hunter. Usually, however, these owls remain on the highlands and apparently feed on the birds found there. No evidence has been seen that they feed on the St. George lem-

mings. Two stomachs of the snowy owl, both from St. Paul (June 13, 1890, Palmer; and February 7, 1915, Hanna) have been examined, one of which contained remains of the least auklet (*Aethia pusilla*) and the other a Pribilof shrew (*Sorex pribilofensis*).

W. L. Hahn examined one stomach which contained feathers of the burgomaster gull; and Marsh, two, each of which held three house mice (*Mus musculus*).

Family CUCULIDAE.

Cuculus canorus telephonus Heine. KAMCHATKAN CUCKOO.

A Kamchatkan cuckoo taken by William Palmer at Northeast Point, St. Paul Island, July 4, 1890, the capture of which is detailed by him (1899, p. 419), was the first taken in North America and remains the only record for the Pribilofs. It breeds in Kamchatka, Manchuria, Japan, and China.

Food.—Palmer states (l. c. p. 420) that the stomach of this bird, which was examined by Dr. S. D. Judd, contained more than 100 crane flies, many of them females full of eggs.

Family PICIDAE.

Colaptes auratus luteus Bangs. NORTHERN FLICKER.

A specimen of the northern flicker, obtained by James Judge on St. George Island in the autumn of 1904 (a short time previous to October 5), was sent to the United States National Museum. It was recorded by A. H. Clark (1910, p. 60) and is catalogued as No. 191769 of the bird collection.

Family MICROPODIDAE.

Micropus pacificus (Latham). JAPANESE SWIFT.

A female specimen of the Japanese swift was taken by G. Dallas Hanna on St. George Island August 1, 1920. It was flying about over the tundra and along the cliffs. The occurrence has been recorded by Mailliard and Hanna (1921, p. 93), and the specimen is deposited in the Museum of the California Academy of Sciences.

The Japanese swift breeds over a considerable part of eastern Asia, including Kamchatka, Japan, and northern China and has been reported from the Commander Islands.

Food.—The stomach of this bird contained remains of numerous dung flies (*Scatophaga crinita*) and of a few other Diptera.

Family CORVIDAE.

Corvus corax principalis Ridgway. NORTHERN RAVEN.

The raven has only recently been observed in its natural state on the Pribilofs. Elliott (1874, unpagcd, and 1875, p. 178) is authority

for the statement that the species was several times introduced by the Russians, but that none of the birds remained.

Dall, in an account of the birds of the western Aleutians (1874, p. 274), states that a few young ones were taken to St. Paul in the spring [of 1873] in the hope that they might be of use in devouring the remains of seals killed there, "which cause a very offensive odor during the hunting season."

G. Dallas Hanna has recently recorded (1920b, p. 174) the occurrence of the species on St. Paul as follows:

During January, 1919, heavy ice surrounded St. Paul Island, but the natives were able to get out from shore in their boats in the open leads for the excellent duck shooting. On one of these occasions three ravens were seen near Sea Lion Rock. One was shot and wounded but could not be secured. * * * identification could hardly be mistaken. The occurrence was confirmed by several reliable men to whom the species was well known when they were in Unalaska. So in this case it seems worth while to make the record without the specimen.

Family ICTERIDAE.

Euphagus carolinus (Müller). RUSTY BLACKBIRD.

A specimen of the rusty blackbird taken near the lake at Northeast Point, St. Paul Island, October 20, 1911, by M. C. Marsh, proved to be the first noted from the Pribilofs, and was recorded by Evermann (1913, p. 18.) According to field catalogue this bird measured in the flesh: Length, $9\frac{9}{16}$ inches; extent, $14\frac{1}{8}$.

A second specimen, taken on St. Paul in the autumn of 1915 and presented by George Haley to Hanna, was sent to the Biological Survey. It is now catalogued as No. 242573.

Family FRINGILLIDAE.

Coccothraustes coccothraustes japonicus (Temminck and Schlegel). JAPANESE HAWFINCH.

Evermann's account (1913, p. 18) of a male specimen of the Japanese hawfinch taken by M. C. Marsh near the village, St. Paul Island, November 1, 1911, added this species to the Pribilof and to the North American lists. The following notes, taken from Marsh's field catalogue, were made from the fresh specimen: Iris pale; lower mandible pale, the upper rather bronzed, its base paler; culmen black near tip; tarsus and feet uniform pale; claws darker.

The species has a range in eastern Asia including Japan, Korea, Northern China, and eastern Siberia.

Fringilla montifringilla Linnaeus. BRAMBLING.

A male brambling, the first known to have been taken in North America, was captured in the watch house at Northeast Point, St. Paul Island, on October 25, 1914. It is now in the collection of the

U. S. National Museum and has been recorded by G. Dallas Hanna, who preserved the specimen (1916, p. 400).

The brambling has a very extensive range in northern Eurasia, breeding regularly east to Kamchatka and wintering mainly in southern Asia.

Food.—The stomach of the bird collected contained bits of seeds of bunchberry (*Cornus suecica*), 90 per cent; and fragments of bugs (Hemiptera) and flies (Diptera), 10 per cent.

Pinicola leucura kamtschathensis Dybowski. KAMCHATKAN PINE GROSBEEK.

A fine adult male specimen of the Kamchatkan pine grosbeak, taken on the tundra on St. George Island in October, 1915, and preserved by A. H. Proctor, has been recorded by J. H. Riley (1917, p. 210). It forms the first record for the Pribilofs and for North America. It was sent to the U. S. National Museum, where it is now catalogued as No. 253121 of the bird collection. As indicated by its name, it is the breeding form of Kamchatka.

Loxia leucoptera leucoptera Gmelin. WHITE-WINGED CROSSBILL.

A female white-winged crossbill was taken by G. Dallas Hanna near Halfway Point, St. Paul Island, August 9, 1920, and has been recorded by Mailliard and Hanna (1921, p. 93). When shot the bird was apparently feeding on the unripe seeds of wild parsnip. It is now in the collection of the California Academy of Sciences.

Food.—The stomach of this bird was entirely filled with remains of blowflies (*Calliphora vomitoria*). This is a remarkable meal for a crossbill and no doubt reflects the predominance of blowflies among food items available to the bird at the time.

Leucosticte griseonucha (Brandt). ALEUTIAN ROSY FINCH.

The beautiful Aleutian rosy finch is a rather common breeder on the Pribilofs, nesting on the three larger islands, St. George, St. Paul, and Otter, and remaining in small numbers throughout the winter. It is the most familiar species on the islands, especially on St. George, where it is most common. It was first added to the Pribilof fauna by Dall, who took specimens on St. George in 1868 (Dall and Bannister, 1869, p. 282).

Although a few may be present in winter the bulk of the summer residents arrive in early spring. Hahn recorded them as numerous on St. Paul April 4, 1911, when they were heard singing for the first time, and as evidently pairing on April 5. Hanna, making observations on St. George in 1914, noted the birds as very common, singing and apparently mating, on March 28 and April 8, and estimated the number seen on the latter date as 500. On April 22 he considered them much more abundant than in winter, and on May 6 estimated a total of 2,000 birds seen.

On St. Paul, where the bird is less abundant, Hanna's notes for the spring of 1915 follow: March 31, 30 seen, first heard singing; April 6, 30 seen, singing general; April 18, 60 seen, paired; April 24, about 300 seen.

A nest and a set of 5 eggs were taken by Lutz on Otter Island, June 16, 1884 (1889, p. 31). Several sets of fresh eggs were collected by Hanna on St. George, June 15, 1914; on June 16 a set of 6 about one-half incubated was found. A female bird taken July 15, 1914, was nearly ready to lay what was presumably her second set of eggs. The previous year, also on St. George, Hanna saw one young bird not able to fly on September 15, and a brood just flying on September 18. H. P. Adams took eggs on St. George on June 4, 1916.

During the summer of 1914 the writer found the bird common on St. Paul Island. On June 22 a nearly completed nest was found on a narrow shelf beneath an arched rock about 15 feet from the ground. On July 4 this nest contained its complement of 5 eggs. Another nest found the same day in a small cavity on the face of a cliff contained 5 eggs which were obviously on the point of hatching. The first young out of the nest were seen on July 2. The bird continued to be abundant up to the time of my departure the last of August. The nests are quite bulky and are built of grasses and the dry stalks of various herbaceous plants, with a lining of fine grass and feathers. Hanna found a nest on St. George in 1914 which had a lining of reindeer hair. The eggs, usually 5 or 6, are white with a faint gloss.

Hahn, on St. Paul, noted the birds as common during September, October, and November, 1910; December 3, 20 seen; December 8, a flock; December 16, numerous; December 21, a few; January 2, 1911, 2 seen; February 1, 1; February 2, 1; February 27, 3; March 2, 30 or 40.

Hanna, making observations on St. George in 1913, saw upwards of 1,000 at Garden Cove, on September 28; many were seen at various times during the fall and winter. In 1914, on St. Paul, he observed approximately the following numbers: September 14, 16, 20, and October 12, about 150 birds each day; October 17, 20; October 25, 150; November 27, 200; December 4, 200. 1915, January 10, 25; February 18, 50; March 5, 30.

Ten male specimens collected and measured in the flesh by M. C. Marsh on St. Paul in the fall and winter of 1911-12, ranged in length from $7\frac{5}{16}$ inches to $8\frac{3}{8}$, and in extent of wing from $12\frac{1}{2}$ inches to $14\frac{1}{8}$. A male bird taken by Hanna on St. George, December 19, 1913, is recorded as having eyes, brown; feet, black; and bill, yellow, black at tip.

In the winter of 1916-17, owing to an unusual visitation of gyrfalcons, the rosy finches living on the Pribilofs were nearly all destroyed.

During a trip made around St. George in May, 1917, Hanna saw not over 4 pairs. Since that time, however, probably through migration, the birds have nearly or quite reached their former numbers.

Food.—William Palmer says of the Aleutian rosy finch on the Pribilofs (1899, p. 426) :

I have picked from the mouth of a freshly killed bird the most minute insects, and have watched them feeding on the drying carcass of a seal hanging outside of the house of an Aleut, and they do not scorn the possibilities afforded by the decaying seal carcasses on the killing ground.

The birds visited the latter situations, no doubt, for the insects attracted there, not with any intent of eating flesh or offal. Indeed, they take a surprisingly low proportion of animal food, if we may rely on the results from the collection of 22 stomachs examined for the present report.

The food in these stomachs was found to be vegetable, 75.5 per cent; and animal, 24.5 per cent. The plant diet was chiefly seeds, but in a few cases bits of leaves and fruiting capsules were eaten. Seeds of crowberry (*Empetrum nigrum*) were found more frequently than any other (i. e., in 6 gizzards) and from 20 to 40 seeds were present in certain of these stomachs. The largest numbers of seeds eaten by any of these rosy finches were 250 and 450, in two instances, of those of brook saxifrage (*Chryso-splenium beringianum*). In one case also 160 seeds of sea parsley (*Ligusticum scoticum*) were contained in a single stomach. Other seeds eaten included those of grass, rush (*Juncus* sp.), sedge (*Carex* sp.), chickweed (*Alsine borealis*), buttercup (*Ranunculus* sp.), water chickweed (*Montia fontana*), cinquefoil (*Potentilla* sp.), and bluebell (*Campanula* sp.).

Of the animal food, approximately 21 per cent of a total of 24.5 per cent consisted of two-winged flies, 2 per cent of beetles, and 1 per cent of springtails. The flies consumed were chiefly crane flies (Tipulidae), and the beetles included ground beetles (*Pterostichus* sp. and others), leaf beetles (*Chrysomela subsulcata*), beach beetles (*Aegialites californicus*), and weevils. Caterpillars occurred in 2 stomachs and springtails (Aptera: Collembola) in 1. The latter insects were identified as *Isotoma violacea* var. *mucronata*, and the record is the first of the occurrence of this species on American territory.

Mr. Hahn noted the rosy finch feeding on seeds of poochka, or wild parsnip (*Coelopleurum gmelini*), and of rye grass, and Mr. Hanna observed that in winter they appeared to feed almost exclusively on the seeds of poochka.

Acanthis hornemannii exilipes (COUES). HOARY REDPOLL.

G. Dallas Hanna has added the hoary redpoll to the Pribilof list by recording a female specimen taken at the village, St. Paul Island,

April 21, 1915 (1916, p. 401). Later notes taken on St. Paul by the same observer include the following: April 20, 1915, 1 seen; August 22, 6 seen in company with a small flock of *A. linaria*.

Food.—The single stomach of this bird available for examination (St. Paul, April 20, 1915) contained seeds of a plant of the pink family (*Lychnis apetala*), of a chickweed (*Alsine* sp.), of a grass, and of an unidentified kind.

Acanthis linaria linaria (Linnaeus). REDPOLL.

The common redpoll was added to the Pribilof fauna by H. W. Elliott, who took specimens on St. Paul, June 21, 1872. These he preserved in alcohol, but they were in some way lost (1881, p. 136); he had previously mentioned (1874, unpagged, and 1875, p. 172) having seen a small flock of redpolls on St. Paul in late October, 1872. No others appear to have been seen until 1910, when Hahn, on St. Paul, observed redpolls, probably of this species, as follows: October 5, about 50 seen; October 19, about 15; October 20, 3 at Northeast Point. No specimens were taken on these occasions. In 1913, Hanna, collecting on St. George, observed 5 birds on September 7, and collected 3. On October 18, 9 others, 1 of which was taken, were seen. These specimens are in the collection of the Biological Survey. On St. Paul, in 1914, Hanna observed the species as follows: September 14, 2; October 14, 1; October 25, 3; 1915: February 18, 1; April 18, 1; August 22, 8 seen and 1 collected at Northeast Point. The bird is thus, in all probability, a more or less regular migrant.

Food.—G. D. Hanna reports a small flock observed feeding on wild parsnip on St. George Island, September 7, 1913. This plant is *Coelopleurum gmelini*.

Spinus pinus pinus (Wilson). PINE SISKIN.

The pine siskin was added to the list of Pribilof visitors by G. Dallas Hanna, who recorded the capture (1919a, p. 177, and 1920a, p. 254). He comments (l. c., p. 254) as follows:

A male pine siskin was secured from a flock of 12 found among the Northeast Point sand dunes, St. Paul Island, on September 24, 1917. The birds seemed to be perfectly satisfied to feed on the seeds of the few ground plants which grow there.

This specimen was deposited in the bird collection of the U. S. National Museum, and catalogued as No. 255168.

Plectrophenax nivalis nivalis (Linnaeus). SNOW BUNTING.

A male specimen of typical *nivalis* taken by M. C. Marsh on St. Paul Island, March 31, 1912, was recorded by Evermann (1913, p. 18), being thus added to the Pribilof list. A snowflake taken on

St. George Island, October 3, 1899, by Wilfred H. Osgood also proves to be of the mainland race. It is now No. 165738 of the U. S. National Museum, Biological Survey collection.

Plectrophenax nivalis townsendi Ridgway. PRIBILOF SNOW BUNTING.

Plectrophenax nivalis townsendi Ridgway, Manual North Amer. Birds, p. 403, 1887 (type from Otter Island).

The breeding snow bunting was first definitely recorded from the Pribilofs by Dall (in Dall and Bannister, 1869, p. 283), under the name *Plectrophanes nivalis*; it is altogether probable, however, that Veniaminof in 1840 (Translation by Elliott, 1874, unpagged, and 1875, p. 242) referred to the present species under the name "snowfinch." The Pribilof bird was described as a race of the circumpolar species by Ridgway from a series of specimens which included No. 106695 (U. S. Nat. Mus., Otter Island, June 8, 1885, C. H. Townsend), indicated as the type specimen. It is a year-long resident of the islands.

The species nests on St. George, St. Paul, and Otter Islands. Palmer (1899, p. 425) has described the nest and eggs. He took sets on June 4 and 24, 1890; these eggs and a set taken on Otter Island, June 15, 1884 (Lutz, 1889, p. 31), furnish the only definite nesting dates available.

During the breeding season, the snow buntings keep rather closely to the more elevated parts of the islands and are seldom seen about the village or the beaches. Hahn noted the bird on St. Paul as follows: Numerous during fall of 1910; occasional in December; not found in village during mild weather; numerous in village December 21 and 27; also observed there on January 2, 4, 23, and 28, 1911; February 4 to 10, appear in the village daily; first heard singing March 18, singing full song March 31. By April 16 the birds had lost the buffy tinge and were pure black and white.

Hanna, making observations on St. George in 1913, noted the species frequently during the autumn and winter, stating that the birds left the higher parts of the island about the end of September. They were singing and mating on May 6, 1914. H. P. Adams noted the species on St. George, January 13, 1917.

On St. Paul in the autumn of 1914 Hanna noted the bird as follows: October 4, common in village; October 17, 2; October 25, 200; November 27, 20; December 13, 50. 1915: January 10, 50; February 18, 50; March 20, 10; April 6, 4 (singing); April 18, 30; April 24, 30; May 6, 4.

My own experience with the species is limited, being confined to the observation and collection of a few specimens on both St. Paul and St. George in 1914, when the birds, sometimes accompanied by their young, were found to be fairly common on their breeding grounds.

There are numerous specimens in the collection of the Biological Survey and the U. S. National Museum. Specimens from St. Paul measured in the flesh by Hahn and Marsh varied as follows: Length, 7 to 7 $\frac{3}{4}$ inches; extent, 12 $\frac{1}{4}$ to 13 $\frac{3}{4}$.

Food.—The stomachs of Pribilof snow buntings collected by William Palmer have been reexamined, but the writer is unable to reconcile great discrepancies between the findings of Dr. Judd and those of the present investigation. He contents himself, therefore, with a simple statement as to what was identified in the stomachs available, a total of 21, including two for which percentages were not estimated and which, therefore, are not included in the calculations of food proportions. The articles of food composing more than 1 per cent of the total contents of the 19 well-filled stomachs were: Vegetable matter, chiefly seeds, 50.5 per cent; two-winged flies (Diptera), 32.52 per cent; beetles, 5.3 per cent, and caterpillars and moths, 1.5 per cent. The seeds eaten included those of sedge (*Carex* sp.), rush (*Juncus* sp.), water chickweed (*Montia fontana*), buttercup (*Ranunculus* sp.), cinquefoil (*Potentilla* sp.), crowberry (*Empetrum nigrum*), and lousewort (*Pedicularis* sp.). From 47 to 81 seeds of the latter were found in the stomachs of the four birds eating them.

The Diptera eaten by the snowflakes were largely crane flies (Tipulidae), but dung flies (Scatophagidae) were eaten as well as larvae of a snipe fly (*Spania edeta*). Among the beetles, the leaf beetle (*Chrysomela subsulcata*) was identified more frequently (in 5 stomachs) than any other species, among which were ground beetles (*Amara* sp. and *Pterostichus* sp.), rove beetles (*Tachinus* sp.), and beach beetles (*Aegialites californicus*). Hymenoptera (*Amblyteles* sp. and a sawfly) were found in two stomachs, and a spider in one.

Plectrophenax hyperboreus (Ridgway). MCKAY SNOW BUNTING.

G. Dallas Hanna has added the McKay snow bunting to the Pribilof list (1919a, p. 176), and later commented as follows (1920a, p. 254):

Since this species is known to wander from its only breeding place, St. Matthew Island group, to the mainland of Alaska, it has been expected and searched for on the Pribilofs for several years. But it was not definitely known to come until March 30, 1918, when a male in full winter plumage was secured on St. Paul Island. It and a female, which escaped, were found on the top of Rush Hill, the highest point of the island.

This specimen is now catalogued as No. 255167 of the collection of the U. S. National Museum.

Food.—The stomach of the specimen above mentioned contained the following food: Remains of more than 160 seeds, apparently of a sandwort (*Arenaria* sp.), 57 per cent; 14 or more rove beetles (Staphylinidae), 8 per cent; 1 larva of a leaf beetle (*Chrysomela*

subsulcata), 4 per cent; 3 sawfly cocoons, 15 per cent; 1 moth cocoon, 15 per cent; 4 fly pupae, and 1 adult long-footed fly (*Hydrophorus innotatus*), 1 per cent.

Calca rius lapponicus alascensis Ridgway. ALASKA LONGSPUR.

Calca rius lapponicus alascensis Ridgway, *The Auk*, vol. 15, p. 320, Oct. 1898 (type from St. Paul Island).

The longspur, one of the few small land birds breeding on the Pribilofs, is an abundant summer resident. It is in some respects the most pleasing of the bird population, owing to its habit of delivering its beautiful song on the wing, while it slowly flutters earthward. It usually arrives in early May, and departs by the end of October. It was first recorded by Elliott (1874, unpagcd, and 1875, p. 178).

Hahn noted the bird as common and singing on St. Paul, May 13, 1911, and as singing on the wing on May 29. Hanna observed it on St. Paul in 1915 as follows: May 6, 6 seen; May 9, 15; May 16, 40; May 28, abundant. On St. George, in 1917, he notes that the birds arrived in a body, already paired, on May 8.

It nests in late June and July, and fresh eggs may be found even as late as early August. Elliott took fresh eggs on St. George on July 7 [1873] (1874, unpagcd, and 1875, p. 178). Palmer, in 1890, found nests on St. Paul as follows: June 20, 5 eggs; June 21, 5 eggs; June 21, 3 eggs, 2 young; July 2, 6 young, well feathered; July 5, 5 young just from the nest. Prentiss, in 1895, found the species nesting as follows: St. Paul, July 1, 5 young partly fledged; July 2, 6 eggs, well incubated; July 3, 6 eggs, fresh; July 6, 3 eggs, fresh; St. George, July 21, 3 eggs, fresh; July 22, 1 young, very small (1902, p. 102). The nest is usually placed on a sloping place, sometimes in the shelter of a tuft of grass or a tall plant.

During my own visit to the Pribilofs in 1914 I found the bird rather common and quite generally distributed on St. Paul, St. George, and Otter Islands, throughout my stay from June 21 to the end of August. A nest containing 4 fresh eggs was found on St. George on August 4, at which time the birds were still giving their pleasant aerial song. During the same autumn, after my departure, G. Dallas Hanna observed large numbers of the birds during September. On October 4 he saw 10, and on October 12 noted that all had departed. In the autumn of 1913, on St. George, Hanna had observed the bird last on September 28, when he saw about 20. On St. George, in 1916, he noted that it was still abundant on October 26.

Hahn in 1910 saw the species frequently during September on St. Paul Island, and during early October noted it as follows: October 3, 10; October 4, 5, and 6, about 50 each day; October 8, less common; October 10, observed; October 11 (the last observation recorded) 10.

Specimens taken on St. Paul by Hahn and Marsh in 1910 and 1912 measured in the flesh as follows: Length, $5\frac{5}{16}$ to $6\frac{5}{8}$ inches; extent, $9\frac{1}{2}$ to $11\frac{1}{8}$.

Food.—The collection of stomachs of Alaska longspurs from the Pribilof Islands consists of the six collected by Palmer and examined by Judd, which are said (1899, p. 423) to have contained only insect cuticle and grinding material; and 18 others, of which one contained food so finely ground that percentages for its constituents could not be estimated. The principal items of diet of the remaining 17 were: Seeds of various plants, 26.5 per cent; two-winged flies, 38.3 per cent; beetles, 15.8 per cent; caterpillars and moths, 10 per cent; bugs, 6 per cent; spiders, 1.4 per cent; and parasitic wasps, 1.2 per cent.

The seeds eaten by these longspurs were from a variety of plants, of which sedge (*Carex* sp.), cinquefoil (*Potentilla* sp.), and violet (*Viola langsdorfi*) were most frequently taken. Others identified were grass, water chickweed (*Montia fontana*), poppy (*Papaver macounii*), brook saxifrage (*Chrysosplenium beringianum*), crowberry (*Empetrum nigrum*), and gentian (*Gentiana* sp.).

Flies contributing to the diet of the Alaska longspur were chiefly crane flies (*Tipula* sp.), but blowflies (*Cynomyia hirta* and *Calliphora vomitoria*), dung flies (*Scatophaga crinita*), and kelp flies (*Fucellia* sp.) also were consumed. The beetles were about evenly divided between ground beetles (Carabidae), weevils (*Lophalophus inquinatus*), and leaf beetles (*Chrysomela subsulcata*). None of the moths and caterpillars eaten were more closely identified, but among the Hymenoptera, small parasitic wasps were named as follows: *Amblyteles*, *Campoplex* (?), and *Tryphon* (?); and among the spiders, the single species *Tegenaria derhami*.

Passerculus sandwichensis sandwichensis Gmelin. ALEUTIAN SAVANNAH SPARROW.

Palmer added the Savannah sparrow to the Pribilof list on the basis of one seen June 3, 1890, near Lukanin Beach, St. Paul Island (1899, p. 422).

Since it seems more likely that Savannah sparrows occurring on the Pribilofs should be referable to the race breeding in that region, I include under this heading those seen by Hanna on St. George Island, August 18, 1913, when he noted 10 individuals. He mentions, also, without giving details (1920a, p. 249), having collected a specimen on St. Paul Island, probably referring to a specimen, now No. 255169, female, of the collection of the U. S. National Museum, taken by him on St. Paul, September 24, 1917.

Passerculus sandwichensis alaudinus Bonaparte. WESTERN SAVANNAH SPARROW.

A female specimen of the western Savannah sparrow taken on St. George Island, September 1, 1913, by G. Dallas Hanna has been identified as this form and has been formally recorded by the collector (1916, p. 402). It was the only one seen at the time.

Zonotrichia gambeli Nuttall. GAMBEL SPARROW.

Evermann (1913, p. 18) recorded a male Gambel sparrow taken by M. C. Marsh on St. Paul Island, May 24, 1912, the only record for the Pribilofs. It measured: Length, 7 inches; extent, $9\frac{1}{8}$.

Junco hyemalis hyemalis (Linnaeus). SLATE-COLORED JUNCO.

On the same day that he added the pine siskin to the Pribilof list, G. Dallas Hanna took specimens of the slate-colored junco, before unknown on the group. He has recorded the occurrence (1919a, p. 177) and later (1920a, p. 254) published particulars, as follows:

The female juncos were secured from a flock of 6 at Northeast Point, St. Paul Island, on September 24, 1917. They were feeding about the buildings there, apparently as contented as if they were in the midst of civilization.

These skins are now in the collection of the U. S. National Museum, being catalogued as Nos. 255170 and 255171.

Melospiza melodia sanaka McGregor. ALEUTIAN SONG SPARROW.

Among the numerous species which have been added to the Pribilof Island bird list by G. Dallas Hanna is the Aleutian song sparrow. He has recorded its occurrence as follows (1916, p. 401):

Two specimens were collected on St. George Island, a male, October 28, 1913, at the village; and a female, December 21, 1913, at Garden Cove. Both birds were feeding on the beaches.

Passerella iliaca sinuosa Grinnell. VALDEZ FOX SPARROW.

This race of fox sparrow was added to the Pribilof list by Evermann, under the name *P. i. insularis*, on the basis of a male specimen collected on St. Paul Island, near the village, September 7, 1910, by W. L. Hahn. It measured in the flesh: Length, $7\frac{3}{8}$ inches; extent, $10\frac{3}{8}$. Dr. H. C. Oberholser, from a recent critical comparison of this specimen, identifies it as *P. i. sinuosa*.

Hahn's notes regarding this and other individuals observed follow:

September 7, 1910, 1 shot among the rocks near Gorbach Rookery. High northeasterly winds had prevailed for several days. October 4, 1 seen near where the first was killed. Another seen among the rocks back of Reef Rookery later the same afternoon. October 15, 1 seen among the rocks at Kaminista.

Passerella iliaca unalaschensis (Gmelin). SHUMAGIN FOX SPARROW.

This race, the Shumagin fox sparrow, was added to the Pribilof list by G. Dallas Hanna, who thus records the specimen (1920b, p. 173): "On May 20, 1919, a female fox sparrow was found at Northeast Point, St. Paul Island, feeding among the piles of drift wood. Mr. Mailliard is responsible for the identification." This specimen is deposited in the collection of the California Academy of Sciences.

Family HIRUNDINIDAE.

Petrochelidon lunifrons lunifrons (Say). CLIFF SWALLOW.

The cliff swallow was added to the list of Pribilof birds by G. Dallas Hanna, who thus records the specimen taken (1919a, p. 177, and 1920a, p. 254): "A cliff swallow was shot and skinned on St. Paul Island about June 10, 1918, by a native from whom the specimen was secured. This makes the second species of swallow to be collected on the island." (l. c., p. 254.) The specimen is now No. 255172 of the bird collection of the U. S. National Museum.

Hirundo rustica erythrogastra Boddaert. BARN SWALLOW.

The barn swallow was given a place in the Pribilof list by Palmer on the basis of a bird observed by him near the village of St. George, May 28, 1890. The same bird remained about the village for nearly two weeks. Another was seen near Black Bluffs, St. Paul Island, June 4, of the same year. The species has not been since observed.

Iridoprocne bicolor (Vieillot). TREE SWALLOW.

A male specimen taken by John Hanson, a native, at Northeast Point, St. Paul Island, May 25, 1922, and recorded by Mailliard (1923, p. 31), adds this species to the Pribilof list. The specimen is deposited in the California Academy of Sciences.

Tachycineta thalassina lepida Mearns. VIOLET-GREEN SWALLOW.

On August 22, 1914, while G. Dallas Hanna and myself were traversing St. Paul Island toward Zapadni Rookery, we saw three swallows flying about the cliffs near the head of the lagoon, and Mr. Hanna secured two of them. They were at once identified as this species, thus first detected on the Pribilofs. Mr. Hanna has since (1916, p. 401) recorded the occurrence. He also observed a single bird about some high bluffs on St. Paul, June 22, 1919.

Food.—The two stomachs of violet-green swallows available taken on St. Paul, August 22, 1914, were examined by the late Prof. F. E. L. Beal, who recorded that they were filled with finely ground Diptera.

Family COMPSOTHYLPIDAE.

Wilsonia pusilla pileolata Pallas. PILEOLATED WARBLER.

Two mummified specimens of the pileolated warbler, a male and a female, preserved by A. G. Whitney on St. Paul Island, August 25, 1913, are the first known from the Pribilofs. These specimens, as well as an individual observed on St. George Island, August 20, 1913, by G. Dallas Hanna, were recorded by Hanna (1916, p. 402).

Family MOTACILLIDAE.

Anthus spinoletta rubescens (Tunstall). PIPIT.

The pipit seems to have been first recorded from the Pribilofs by Nelson (1887, p. 208), who states that the species was taken on St.

George Island on August 15. He evidently refers to a specimen taken by W. H. Dall on St. George, August 15, 1868. This was recorded by Palmer (1899, p. 421) as being then in the collection of the U. S. National Museum, and formed the sole basis for the inclusion of the bird in his list.

In the course of Mr. Hanna's work on the Pribilofs he has found this bird to be a rather regular migrant in fall, and has taken it once in spring.

In the fall of 1913, on St. George Island, Hanna observed about 20 pipits on September 1, taking 2 specimens, and saw 10 on September 4. In 1914, on St. Paul, he noted the birds as follows: August 31, 2 seen, 1 collected; September 20, 1 taken; October 12, 1. The specimens taken by him are in the collection of the Biological Survey.

The only spring record is of a specimen taken by Hanna on St. Paul May 25, 1919, and recorded by him.

Food.—This species is reported by Hanna to feed during its stay on the islands in fall migration almost exclusively on maggots on the killing fields. However, the contents of two stomachs, collected August 31, 1914, and September 20, 1916, contained no trace of such maggots. The food in these gizzards consisted of 10 per cent vegetable matter (seeds of a violet, *Viola langsdorfi*) and 90 per cent animal matter. The components of the animal food were beetles (ground beetles, *Pterostichus* sp.; and weevils *Lophalophus inquinatus*), 37 per cent; caterpillars, 33.5 per cent; plant bugs (*Irbisia sericans*), 8 per cent; spiders, 7.5 per cent; flies, 2.5 per cent; and Hymenoptera, 1.5 per cent.

Anthus spinoletta japonicus (Temminck and Schlegel). JAPANESE PIPIT.

G. Dallas Hanna collected a Japanese pipit on St. Paul Island on August 29, 1916, thereby adding the species to the list of Pribilof visitors. The specimen, which is now No. 255173 of the bird collection of the U. S. National Museum, was recorded by him (1919a, p. 177, and 1920a, p. 251).

Family TROGLODYTIDAE.

Nannus troglodytes alascensis (Baird). ALASKA WREN.

Troglodytes alascensis Baird, Trans. Chicago Acad. Sci., vol. 1, 315, 1869 (type from St. George Island).

This interesting resident wren, the "Limmershin" (i. e., chew of tobacco) of the natives, was first recorded from the group by W. H. Dall (in Dall and Bannister, 1869, p. 280) and was formally characterized as a new species by Baird in a later article (1869, p. 315) of the same volume. The basis of these accounts, and the type specimen, was a bird taken by Dall on St. George Island on August 17, 1868.

The species is a year-long resident and varies greatly in abundance in different years, becoming scarce because of especially severe winters or an unusual visitation of predatory birds, but soon recovering its numbers evidently owing entirely to its rapid rate of increase. Thus Elliott (1875, p. 173) found it rather rare on St. George in 1873, but quite numerous in 1874. Palmer observed a few on St. George in 1890, and secured specimens. Hanna took a series of specimens on St. George in the autumn of 1913 and the following winter, and his notes show that the birds were common, since on one occasion, near Garden Cove on September 28, he estimated that he saw 200 individuals. I saw many and took a few on St. George in mid-July and early August, 1914.

Up to 1914 no naturalist had ever seen one of the birds on any island of the group excepting St. George, and the natives declared that it was absent elsewhere. It was, therefore, a great surprise when Mr. Hanna, on October 29, 1914, took 2 specimens along the shore between East Landing and Reef Rockery, St. Paul Island. On May 16, 1915, Hanna collected another specimen near Lukanin Rookery, and the natives reported seeing 2 near Rock Point. During the same summer, according to notes kindly furnished me by Mr. Hanna, Mr. George Haley saw 11 individuals on Otter Island, this being the first record for that place. The birds since seem to have become well established there, as Hanna (1920b, p. 175) states that it bred there in 1916, 1917, and 1918. He states also (1920a, p. 250) that a wren, probably from Otter Island, was seen on St. Paul in the summer of 1918. It seems likely, therefore, unless the species meets with a reverse on Otter Island from some cause, that it will in time become regularly established as a breeder on St. Paul, and that, therefore, the likelihood of the species surviving will be strengthened.

During the winter of 1916-17 St. George was visited by an unusual number of gyrfalcons, which preyed on the wrens and rosy finches to such an extent that they were almost extirpated. G. Dallas Hanna states that in May, 1917, he found not over six pairs of wrens during a trip made entirely around the island. Since then, however, as elsewhere detailed, the species has become at least fairly common again and has even spread to the other main islands, previously unoccupied. For many years after the discovery of this species its nest and breeding habits were almost unknown. A nest and incomplete set of eggs taken by a native in June, 1876, were forwarded with other specimens to the Museum of Comparative Zoology and were described by Dr. J. A. Allen (1877, p. 82). The attempts of various naturalists, who visited the islands subsequently, to find the nest of this abundant but elusive species failed entirely until 1918, when Dr. Harold Heath, in May and June, by studying the habits of the birds was able to discover upward of 16 nests. The number of eggs was generally 7, and

this seemed to be the maximum number. In the case of a nest found by Mr. C. E. Crompton on St. George later the same summer, a second set of eggs was deposited within a week after the first brood of young left the nest. The habit of raising two broods is almost unique among the birds of this far northern station.

The nests found by Heath were all situated in the faces of cliffs at elevations ranging from 8 to 100 feet. They usually occupied a crevice between shattered rocks, or blowholes in the lava, or cavities beneath mossy banks. In several cases the sites had been occupied in previous years. The nests were usually globular with the entrance at the side and were composed of a meshwork of grass and roots, often roofed with moss. The lining was usually composed of fine rootlets and lichen, mixed with feathers and fox hair, and in some cases reindeer hair. A very full and extremely interesting account of the nesting habits and homes of this species, from which the above notes are gleaned, was published by Doctor Heath (1920, p. 49-55).

Food.—Of the 11 stomachs of Alaska wrens available 9 were examined some time ago by less discriminating methods than those at present in use, and it is only possible, therefore, to indicate the nature of the food in very general terms. The sustenance was entirely animal and included the following groups: Amphipods, 24.1 per cent; two-winged flies (partly Borboridae), 24.1 per cent; beetles (including ground and rove beetles), 14.3 per cent; bugs (Hemiptera), 13.2 per cent; caterpillars, 12.9 per cent; and Hymenoptera, 11.4 per cent.

A recently examined stomach contained the following items: Six beetles of the sexton-beetle family (*Lyrosoma opaca*), 12 per cent; rove beetles (*Olophrum fuscum* and 2 *Liparocephalus brevipennis*), 3 per cent; 3 small parasitic wasps (including *Phygadeuon* sp. and *Plesignathus* sp.), 1 per cent; remains of dung flies (*Scatophaga* sp.) and perhaps other flies, 74 per cent; one mite of an undescribed genus of the family Gamasidae, trace; and amphipod remains, 10 per cent.

Another stomach, lately examined, taken October 29, 1914, contained remains of 24 or more rove beetles (Staphylinidae), 70 per cent; 4 beach beetles (*Aegialites debilis*), 19 per cent; 1 other beetle, 1 per cent; and a few flies, 10 per cent.

Family TURDIDAE.

Hylocichla minima aliciae (Baird). GRAY-CHEEKED THRUSH.

A chance specimen of the gray-cheeked thrush has been taken by G. Dallas Hanna, who recorded the incident as follows (1920a, p. 254): "A female gray-cheeked thrush was collected on St. Paul

Island September 9, 1917. It was found feeding on spaded-up ground about the Naval Radio Station." The specimen is deposited in the collection of the U. S. National Museum and is catalogued as No. 255175.

Food.—The contents of the stomach of this bird were 3 blowflies (*Calliphora vomitoria*) and 2 dung flies (Scatophagidae), 60 per cent; 4 ground beetles (*Pterostichus* sp.), 1 rove beetle (Staphylinidae), and 1 weevil (*Lophalophus inquinatus*), 40 per cent.

Planesticus migratorius propinquus Ridgway. WESTERN ROBIN.

Elliott observed a robin on the hill back of the village of St. Paul on October 15, 1872. The same bird was seen for several days, but the statement is made that he did not shoot the bird (1874, unpagged, and 1875, pp. 170, 172). In his later account of the occurrence Elliott states (perhaps through an error) that a specimen was secured in October, 1872. The bird seen by Elliott remained the only record until 1910, when Hahn recorded 1 found at the watch house at Northeast Point on October 19. The bird had been shot by a native two weeks previously. Among the specimens which had accumulated at St. Paul Island and which were brought in to Washington in 1914 were the head and feet of a robin, unlabeled, but probably the remains of this individual.

The above notes referring to birds not identified subspecifically are placed under the present heading, since a specimen taken by G. Dallas Hanna on St. Paul Island September 15, 1919, and recorded by him (1920b, p. 175) proves to belong to this race. This specimen was deposited in the collection of the California Academy of Sciences.

Oenanthe oenanthe oenanthe (Linnaeus).¹⁵ WHEATEAR.

A specimen of the wheatear, taken by R. E. Snodgrass and A. W. Greely on St. Paul Island, August 29, 1897, was first recorded by Seale (1898, p. 139), and thus added to the list of Pribilof birds. Grinnell, reporting on the collection of which this specimen formed a part, comments on this bird as follows (1901, p. 20):

An immature bird (No. 3486, Coll. L. S. Jr. U.), taken on St. Paul Island August 29, forms the first record for the Pribilofs and fills in another gap in the known range of this remarkably widespread species.

A second specimen was taken by G. Dallas Hanna on St. Paul Island, September 1, 1917, and has been recorded by Mailliard and Hanna (1921, p. 94). This is now No. 255174, male, of the collection of the U. S. National Museum.

¹⁵ *Saxicola oenanthe oenanthe* of the A. O. U. Check list, 1910.

MAMMALS OF THE PRIBILOF ISLANDS.

By EDWARD A. PREBLE.

While the birds of the Pribilofs are of great popular interest, the mammals, though fewer in number of species, are of even greater importance. The herd of fur seals is one of the most interesting and valuable aggregations of mammals in the world, and their presence is, of course, responsible for the settlement of the islands and the consequent comparatively intensive study of its fauna and flora. The foxes afford one of the best examples known of the selective breeding of a wild animal carried on under practically natural conditions. In the present treatment the accounts of these species are by no means commensurate in volume with their importance. Since, however, they have been the subject of many special reports, it has seemed unnecessary to treat them more than briefly here.

For convenience in citing references, the titles referring to mammals are given together with those relating to birds in the Bibliography (pp. 121-128).

Family SORICIDAE.

Sorex pribilofensis Merriam. PRIBILOF SHREW.

The Pribilof shrew, which is confined to St. Paul Island, was first discovered by William Palmer, in 1890, and a series of 16 specimens was collected. Other specimens were taken by Dr. C. Hart Merriam in the summer of 1891. The species was not named, however, until Doctor Merriam wrote his Synopsis of American Shrews in 1895, when he formally characterized it (1895b, p. 87). A. G. Whitney collected one in full winter pelage, and a small series in the summer of 1914. The writer also took a few in the summer of 1914, and during the next year or two G. Dallas Hanna collected a large series. Altogether, about 135 specimens have been collected, nearly all of which are in the U. S. National Museum. Most of these specimens were taken in a partially marshy tract, grown up to rank grasses, bordering a shallow pond between the village and East Landing. A few have been collected at Northeast Point.

Ten specimens, measured in the flesh by the writer, average in measurements: Total length, 103.1 mm.; tail vertebrae, 35.8; hind foot, 13.2. This series showed remarkable uniformity in size, the total length ranging only from 100 to 106 mm., and the tail vertebrae only from 34 to 37.

Family URSIDAE.

Thalarctos maritimus (Phipps). POLAR BEAR.

Polar bears have been transported to the Pribilofs on drift ice and have landed on a number of occasions. True (1899, p. 354) merely mentions the fact but gives no details.

W. L. Hahn found in the St. Paul Island log, under date of September 20, 1874, an entry stating that a party visited the cave on Bogoslof and brought back a bear skull known to have been there since the time of the first occupation of the island. Other notes from the same source record a white bear seen at Halfway Point March 28 and 30, 1880, and at Northeast Point, March 13, 1884. Frederic A. Lucas (1898, p. 718) has recorded the skull of a polar bear from the Pribilofs, but whether this is the Bogoslof specimen above noted is not known. I have been unable to find any Pribilof specimen in the U. S. National Museum collection.

The following account of a bear observed on St. George Island, by G. Dallas Hanna (1914, p. 218) summarizes the evidence relating to that place:

On February 14, 1914, a polar bear was seen and shot at by an Aleut at Zapadni Rookery, St. George Island. The tracks were seen on shore in the snow by the writer and others. This animal was formerly an abundant inhabitant of the northern part of Bering Sea, but rarely came south of St. Matthew Island. If native reports are to be believed, it has been seen on St. Paul Island on at least three different occasions, but this was many years ago. From the same source of information comes the only previous record of the animal on St. George. This was about 1820, when a bear came ashore from the ice pack at the village and went westward to a small pond where it spent some time on the ice. Thereafter this has been known as Bear Lake. The numerous tracks along the beach in the snow show that the bear seen at Zapadni had been ashore also. During the winter no drift ice had been sighted from the island. But this could not have been seen unless it had come within 10 miles.

Family CANIDAE.

Alopex pribilofensis (Merriam). PRIBILOF ARCTIC FOX; BLUE FOX.

Pl. VII, fig. 3.

The foxes of the Pribilof Islands have been described as a separate race, the long period of isolation evidently having resulted in their differentiation from the mainland stock. On the Pribilofs the blue phase of coloration, which is really an abnormal type and which occurs more or less rarely throughout the range of the Arctic foxes, at least in America, has become predominant. The white fox is merely the winter condition of the normal animal, which in summer has tawny sides and brown back and shoulders. The so-called blue fox is brownish or sooty in its summer coat and lighter in winter.

The animals usually mate in March or early April, and new-born young have been found from May 17 to June 6. Among 22 litters

examined, the smallest contained 5 and the largest 11 pups. A newly born pup weighed $2\frac{1}{4}$ ounces. The adults vary greatly in weight, according to sex and condition. Males taken in midwinter may range from $5\frac{1}{2}$ to $17\frac{1}{2}$ pounds, and have reached as high as $20\frac{1}{4}$ pounds. Females are recorded weighing from 4 to 15 pounds, and in one case $21\frac{3}{4}$ pounds. (Chichester, 1908, p. 51.)

Foxes have been found on both St. Paul and St. George Islands ever since they were first discovered, and it seems that the blue phase of coloration has always been predominant there. Indeed, the early accounts of the islands aver that at the time of their discovery only the blue foxes were found, but that white ones came (presumably on the ice) a few years later. But since white foxes are still known to come from time to time in the same way, it is likely that some of this color were always found there. From the first efforts have been made to keep down the number of the less valuable white foxes. On St. Paul, where only steel traps are used, these efforts have been only partially successful, and, judging from the catches of the past few years, about 17 per cent of the foxes there are white. On St. George, however, where food is much less abundant, the foxes can be attracted to certain places and then taken in large cage traps. By this means, a good proportion of all the foxes of the island being annually handled, no white ones are allowed to live, and a supply of the best blue ones are annually liberated as breeders. The natural result of this selective method has been to improve the blue ones and to restrict the normal phase to a minimum. Thus the catch of white foxes on St. George, in spite of the fact that all white ones taken are killed, has averaged during the past few years considerably less than 1 per cent of the total.

We know little about the numbers of foxes found on the islands in earliest times. During the period from 1842 to 1860, inclusive, the Russian-American Co. made on the Pribilofs an average annual catch of 1,829 foxes, more than two-thirds of which came from St. George. Figures from 1861 to 1870 are not available. Between 1871 and 1890, 24,792 skins were taken; 20,412 came from St. George. From 1890, the foxes diminished rapidly, owing, no doubt, to the lessened number of seals killed, the bodies of which had formed their chief food. Special feeding was then resorted to, but in spite of this, and of some close seasons, only 11,250 were taken from the seasons 1890-91, to 1913-14, inclusive, a yearly average of only 469. During recent years the numbers taken are again increasing as shown by the table given below.

Most of the improvements in methods of dealing with the foxes on the Pribilofs are the results of the painstaking work of James Judge, who studied the problem carefully on St. George for many years and published two papers on the subject. (See Bibliography.) From

these papers and from his manuscript notes are taken much of the data on which the present account, as well as the one referred to later, are based.

The history of the fox industry on the Pribilofs was discussed in a fairly comprehensive manner by the writer (in Osgood et al., 1915, pp. 105-116). In a table there given the numbers taken between 1890 and 1914 are set forth in detail. In order to bring the subject up to date the following table, compiled from figures published by the Bureau of Fisheries, and so arranged as to be readily comparable with the table referred to, has been prepared.

Number of foxes taken on Pribilof Islands, 1914-1921.

Year.	St. Paul.			St. George.			Total, Pribilof Islands.		
	Blue.	White.	Total.	Blue.	White.	Total.	Blue.	White.	Total.
1914-15.....	173	39	212	63	1	64	236	40	276
1915-16.....	211	18	229	209	2	211	420	20	440
1916-17.....	150	37	187	417	2	419	567	39	606
1917-18.....	90	14	104	602	5	607	692	19	711
1918-19.....	119	25	144	548	5	553	667	30	697
1919-20.....	156	32	188	746	4	750	902	36	938
1920-21.....	123	13	136	1,062	1	1,063	1,125	14	1,139
1921-22.....	138	21	159	574	574	712	21	733

Formerly even the best fox skins from the Pribilofs were worth only a few dollars, but during the period of inflated prices following the World War, due partly to the growing scarcity of furs, large sums have been realized. Thus 665 blue foxes sold at St. Louis September 10, 1919, brought an average price of \$195.90. On February 21, 1921, 901 blue foxes brought an average of \$88.12, and 37 white foxes brought \$35 per skin. On September 28, 1921, 1,125 blue foxes were sold at an average price of \$96.83.

Vulpes alascensis Merriam. ALASKA RED FOX.

Red foxes are said to be sometimes brought to the Pribilofs on the pack ice, but I have no definite data. True (1899, p. 354) states that Mr. Palmer reported in 1890 that not more than six or seven had been taken in twenty years.

Family MUSTELIDAE.

Lutra lutris Linnaeus. SEA OTTER.

At the time of the discovery of the Pribilof Islands sea otters were found in great numbers, but the cupidity of the Russian fur hunters soon caused their extirpation. According to Elliott (1874, unpagged, and 1875, p. 54) as many as 5,000 were killed on St. Paul Island during the first year of its occupation (1787); after this the decline was rapid. Veniaminof, quoted by Elliott (l. c., p. 242),

states that the animals became scarce there in 1811, and extinct within the next 30 years. Elliott himself, in 1872 and 1873, seems not to have observed any, nor to have added anything to the history of the species on the islands.

W. L. Hahn found in the St. Paul Island log entries to the following effect: A sea otter was seen by fishermen September 23, 1889, the first for several years. On June 1, 1896, one which had been crushed by the ice was found at Rocky Point. On December 1 (apparently of the same year) one was reported close inshore at Southwest Bay. True (1899, p. 353) mentions a skull found on St. Paul by C. H. Townsend in 1892, and the Rocky Point find, above noted. There are two skulls in the collection of the U. S. National Museum, received years ago from the Bureau of Fisheries, which may be these specimens. The Biological Survey collection contains two large skulls collected by A. G. Whitney on St. Paul Island, a very much weathered one picked up on lagoon beach on October 9, 1913, soon after a violent storm, and one which seems much more recent found at Rocky Point on June 21, 1914.

Hanna notes that the St. George Island log for July 24, 1892, records the finding of a dead sea otter by a native at Zapadni Rookery. The skin of this animal was sold for about \$100.

Family ODOBENIDAE.

Odobenus divergens (Illiger). PACIFIC WALRUS.

The walrus formerly resorted to the two main islands of the Pribilofs in some numbers judging from the reports of early historians and by the remains which are still found there. There is no indication, however, that the animal ever bred in the vicinity, and most of the visitors apparently were males. They must have occurred most commonly in the vicinity of Cross Hill, near Northeast Point, at that somewhat remote time when the encroaching sand was closing up the passage between the main island and that portion, topped by Hutchinson Hill, which now constitutes Northeast Point, and concerning which both tradition and topographic features indicate former separation. Considerable quantities of bones and teeth have been dug out of the sand dunes there, and remains are still sometimes found. The last stand as a regular hauling place, however, was Walrus Island, where upwards of 150 individuals were observed by Elliott in 1872. These were all males, but he was afterwards informed that on one occasion a single female was seen there. The animals continued to resort there as late as 1890, when, according to True (1899, p. 354), William Palmer observed 8, "but killed none, and they were reported all killed the following season."

The following notes, taken from the St. Paul Island log by W. L. Hahn, afford some indication of the number killed, and the diminishing frequency of their appearance in recent years:

Walrus Island: June 10, 1872, many seen; June 29, 1873, a few; August 21, 1873, 3 killed; May 22, 1874, very few; May 23, 1877, 1 taken; June 2, 1876, 3 shot; February 26, 1881, 1 seen; May 21, 1881, 60 seen near the island; June 8, 1881, 1 killed; June 14, 1881, 3 seen; June 22, 1890, 3 killed; August 24, 1890, 1 shot; June 10, 1893, 1 seen. St. Paul Island: February 26, 1875, 3 found dead at Northeast Point; May 26, 1875, 1 found dead at Gorbach Rookery; December 25, 1877, 1 killed on Reef Rookery; March 23, 1899, 1 found dead near Rocky Point; April 22, 1899, 1 found dead at Northeast Point; March 17, 1900, 1 found dead at Northeast Point; August 4, 1904, 2 found dead at Rocky Point; November 4, 1904, 1 seen in water near East Landing; June 23, 1907, 1 found dead at Northeast Point.

During my visit to the Pribilofs, in 1914, I saw a few skulls near Northeast Point, one on Otter Island, and a number among the rocks on Walrus Island. Later in the same year Hanna (1914, p. 218) published the following note:

During the month of March, 1914, walrus were sighted three different times swimming along just offshore. They were at no very remote time abundant on St. George, as the skulls may yet be seen about the beaches. Five dead ones floated in at Garden Cove about 1907.

In July, 1918, Hanna observed a young male walrus asleep on a surf-washed rock at North Rookery, St. George. The animal was not at all wary, and Hanna was able to photograph it at a distance of a few feet, and to retire without disturbing it.

Family OTARIIDAE.

Eumetopias jubata (Schreber). STELLER SEA LION.

Only a few hundred sea lions, found in two small breeding colonies, are all that now remain of the many thousands which until comparatively recent years inhabited the islands. Elliott (1875, p. 153) estimated that in 1872 there were from 20,000 to 25,000 about St. Paul Island, and 7,000 or 8,000 on St. George. They then occupied a considerable area at Northeast Point, St. Paul, and several locations on St. George.

Elliott (l. c., p. 71) states that a few formerly bred on Walrus Island, but apparently this colony no longer exists, although a few of the animals sometimes haul out on rocks there, as well as at many points on all the islands. According to True (1899, p. 351) at least one harem persisted on Walrus Island as late as 1890. He states that on St. George the principal stations were near Tolstoi Point and East Rookery. Sea lions are believed to breed still at these places, and also at Garden Cove.

Their breeding habits are similar, in general, to those of the fur seal. The harems are smaller, usually numbering only 10 or 12 cows

to a bull. The young are born about the middle of June. The animals are much more timid than the seals, and therefore their intimate habits are more difficult of observation. The bulls fight among themselves with great ferocity. With the exception of a few old bulls all the sea lions are said to leave the islands in winter. They return in March, April, and May, the old bulls first.

Like the fur seal, the difference in size of the male and female sea lion is very great. The breeding males have been estimated to weigh from 1,500 to 2,000 pounds, while a cow may weigh up to 500 or 600. I have no data on the weight of the new-born young. Young approximately 3 weeks old, observed by the writer at the breeding rookery at Northeast Point, on June 27, 1914, were estimated to weigh about 35 pounds.

The animals were formerly of great economic importance to the natives, being used as food, clothing, and in the construction of their skin boats. They were formerly killed in large numbers, not only for use on the Pribilofs but for exportation to Unalaska, Kodiak, and other points. Between 1870 and 1890 from 30 to 500 were killed annually. The animals were formerly gathered in small herds, called pods, by a party of natives stealing at night between a sleeping herd and the water, and by suddenly rising with a clamor of shouting and firing of pistols, getting as many as possible of the startled animals to start inland instead of toward the water. When once headed away from the sea they were easy of control, and when, by a number of such sorties, a sufficient number had been collected, they were started to the village. This was to save the labor of transporting the skins and meat by teams. The journey of 11 or 12 miles took from 5 days to 3 weeks according to the weather, for the huge beasts could travel but slowly, and could not be forced in warm weather without great mortality. On arrival at the village the entire herd were killed with guns and lances. Since about 1882 the lessened number of the animals has made driving impracticable, and the killing has been done at Northeast Point. The topographic conditions on St. George are such that driving has never been practicable there.

During recent years they are seldom killed except for their skins, which are still used to cover the framework of the large bidarras, used principally to land the cargoes from the supply steamers, which must anchor some distance from the wharves. For this purpose the young bulls only are killed, as the hides of the old bulls are unsuitable. The skins of 12 animals are needed for covering one boat and this cover lasts four or five years.

Callorhinus alascanus Jordan and Clark. PRIBILOF FUR SEAL.

The fur seal, which seems to have been directly responsible for the discovery of the Pribilof Islands, and which has been the dominant

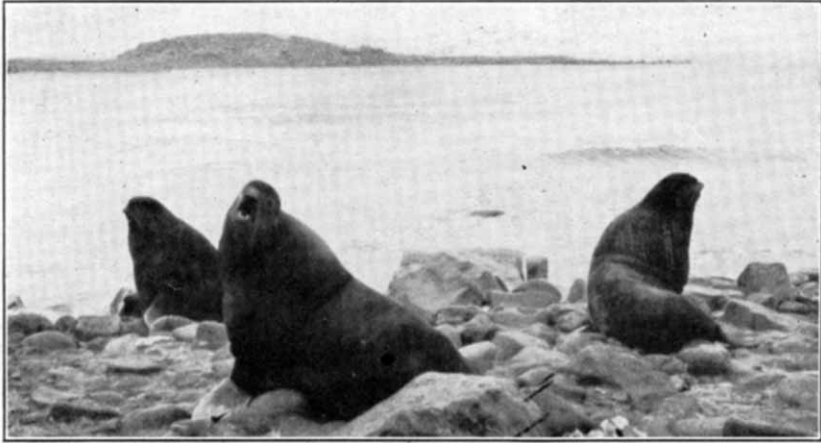


FIG. 1.—BULL SEALS IN SPRING, ON THEIR ROOKERY STATIONS.

The males arrive early in spring and select a home site, where they are joined later by the females. Photograph by A. Christoffersen, on Reef Rookery, St. Paul Island.



FIG. 2.—BULL SEALS IN AUGUST, ON THE GRASSY LEVELS.

The old males, which arrive in spring fat and full of energy, are much reduced in flesh and spirits after three months of fasting. Photograph by G. Dallas Hanna, St. Paul Island.



FIG. 3.—BLUE FOX (*ALOPEX PRIBILOFENSIS*).

The blue phase of coloration practically attains perfection as regards quality of fur and freedom from inferior strains on St. George Island. Photograph by G. Dallas Hanna, November, 1916.

factor in its subsequent history, is one of the most interesting animals known. It resorts to these islands only during the breeding season, and spends the remainder of the year at sea, not being known to land at any other place. Its migration carries it as far south as the latitude of southern California, the females going farthest and the old bulls wintering mainly south of the Aleutians or in the Gulf of Alaska.

On the approach of the breeding season the old bulls return to the islands, the earliest arriving about the first of May, and each one takes a position on the rookery ground, often in the spot occupied the previous year. (Pl. VII, fig. 1.) From the time he lands until the end of the breeding season, late in July or early in August, the bull never leaves his station and consequently takes no food. Shortly after the first of June the females begin to arrive, each one impelled by her pregnant condition to seek a place to bring forth her pup. On arrival the females land and join some male which is gathering a harem. (See frontispiece.) Before many days, sometimes almost at once, the female is delivered of her pup, and within a few days is again impregnated. She is then allowed to depart in her quest for food, which she must have in abundance in order to nourish her pup. She feeds at sea, going from 50 to 100 miles, and after gorging on fish remains in the water until digestion has taken place. She then returns to the land, picks out her own pup from among the thousands that swarm over the rookeries, and nurses it until she is impelled to repeat her trip for food.

The harems, comprising from a few to as many as 100 cows and each attended by a single bull, are crowded together until practically all the rookery ground is occupied. As the young grow larger they wander farther afield during the absence of their mothers, but the female always finds her own pup, and will nurse no other.

By early August practically all the cows have given birth, and the old bulls, exhausted by their long fast and their protracted harem service, after a few days' rest, go to sea to feed and recuperate (Pl. VII, Fig. 2). The females, however, continue to nurse their young, which learn to swim during the late summer, until November, when they, too, leave the islands.

The sexes differ greatly in size, the breeding bulls weighing from 400 to 500 pounds, while the breeding cows vary from 50 to 60 to about 100 pounds, according to age and condition. The pups when born weigh from 10 to 12 pounds. Just before leaving the islands in November the pups have been found to weigh from about 25 to 50 pounds; when they return, in the following August, or when a little over a year old, they weigh from 33 to 40 pounds, having become

longer but much less fat since being weaned and living the life of the adults.

During the early years of the occupancy of the group, the slaughter of the animals for their valuable skins was pursued in a very wasteful manner, both males and females being killed in such numbers as to exceed the hunters' resources for the proper preservation of the catch, and to glut the market. The imperfect records of these early days indicate that more than 1,800,000 seals were killed between 1786 and 1834, and the herd was seriously depleted. From 1835 to 1867 the females were spared, and the killing was otherwise restricted so that the herd gradually increased. At the time of the purchase of Alaska by the United States in 1867 various estimates placed the number of fur seals between 2,000,000 and 5,000,000 animals.

In 1870 the privilege of sealing on the islands was leased to the Alaska Commercial Co. for a term of 20 years. During this period 1,977,377 skins were taken on the islands. At the expiration of this lease the North American Commercial Co. was awarded the sealing privilege for a further period of 20 years, and 342,651 skins were taken.

About 1890 the effect of killing seals at sea, a large percentage being females, the death of which caused the loss of unborn or young pups, began to be recognized as an intolerable waste of valuable life. As a result, by agreement between the countries interested, pelagic sealing was curtailed, and finally, in 1911, by a treaty between the United States, Great Britain, Russia, and Japan, it was abolished for a period of 15 years. Under its provisions the United States and Russia, as guardians of the seal herds, agreed to pay Great Britain and Japan a percentage of the value of the seals taken on land.

In 1912, owing to the fear that the seal herd had become depleted to the danger point, all killing was forbidden by law for a period of five years, excepting such numbers as were needed by the natives for food purposes. At this time, more intensive studies of the herd were inaugurated, and as a result it became possible to estimate the numbers of the animals with more accuracy than had before been possible. One of the important features was the counting each year of the newly born pups, which afforded an index to the increase of the herd. This, and related matters, was rather fully discussed by Osgood, Parker, and Preble (1915, pp. 39, 44, etc.), the data being brought up to 1914.

Since 1914 a summer survey of the breeding herd has been made annually. The following table, giving the number of pups born since 1912, and the estimated size of the entire herd, will serve to

show the steady increase in numbers. The figures have been taken from publications issued by the Bureau of Fisheries. Those for the pups up to 1916, inclusive, are actual counts; while from 1917 on they are based on counts for some of the rookeries, the others being estimated by counting the harems and applying the figures representing the average harem.

Count of seal pups, and estimated numbers of entire herd.

Year.	Pups.	Seals of all ages.	Year.	Pups.	Seals of all ages.
1912.....	81,984	215,738	1917.....	128,024	468,692
1913.....	92,265	268,305	1918.....	143,005	496,600
1914.....	93,250	294,687	1919.....	157,572	524,235
1915.....	103,527	363,872	1920.....	167,527	552,718
1916.....	116,977	417,281	1921.....	176,655	581,457

Family PHOCIDAE.

Phoca richardii pribilofensis Allen. PRIBILOF HARBOR SEAL.

The hair seal of the Pribilofs, which has been separated as a race of *Phoca richardii*, the harbor seal of the northwest coast, is found in comparatively small numbers mainly on the larger islands. The animals have their young on the bare sea-washed rocks, breeding on St. Paul mainly or entirely on the unfrequented north shore, though they frequently haul out on the rocks at various other places. I have no definite data on the breeding of the species about St. George, but the animal is frequently seen there, and probably breeds about the less accessible parts of the shore. The young, which are said by Elliott (1884, p. 28) to weigh from 3 to 7 pounds when born, are white in color, but change in a few months to the color of the old ones, which is usually steel gray, blotched and mottled with dark brown.

Hahn collected notes from the St. Paul Island log, showing that hair seals were taken nearly every year by the natives. Under date of May 30, 1910, about 50 are stated to have been seen on Otter Island. On the only occasion when we visited that place in 1914, on June 27, we saw about a dozen at the edge of the surf near the landing place.

The flesh of this seal is very much relished by the natives, and the few that are taken are shot mainly for this reason.

True (1899, p. 351) noted a few solitary examples at various points about St. Paul in 1895 and states that three young ones were brought to the village.

Phoca fasciata Zimmermann. RIBBON SEAL.

This species was recorded by True (1899, p. 351) as follows:

A young female of this species was taken by one of the sealers 84 miles west of St. Paul in August, 1896, so that it may be regarded as a probable occasional visitant to the Pribilofs.

Erignathus barbatus nauticus (Pallas). PACIFIC BEARDED SEAL.

The bearded seal has only recently been added to the list of Pribilof mammals. G. Dallas Hanna (1921b, p. 126) records a specimen taken at St. George Island in the winter of 1917-18 by C. E. Crompton.

In a recent note Hanna gives more data regarding this species. The specimen referred to was shot at East Rookery by a native, on January 29, 1918. The animal was in advanced age, judging by the fact that it had lost all its teeth; it was fat, however, indicating that it had been able to capture sufficient food. Its sex was not recorded. Among the detailed measurements made from the fresh specimen the following may be noted: Total length (nose to tip of tail), 93 inches; tail, 7 inches; hind foot, $17\frac{1}{2}$; girth behind fore flippers, 60.

The seals referred to by a reliable St. George native, who reported to Hanna that several very large hair seals, 8 to 10 feet long, were found on the beaches in 1900, a record year for pack ice, were most probably of this species.

Family MURIDAE.

Lemmus nigripes True. PRIBILOF LEMMING.

The Pribilof lemming, which is found only on St. George Island, was first reported by Elliott (1874, unpagged; 1875, p. 72), under the name *Myodes obensis*, but Merriam in 1891 seems to have been the first naturalist to collect specimens. In 1892 or 1893 two specimens were taken by C. H. Townsend. One of these, No. 59152, U. S. National Museum, male, was made the type of the species, which was formally characterized by Frederick W. True (1894, p. 2).

In recent years Hanna has taken a series, and in the summer of 1914 the writer collected a few. Two adult males then taken measured, respectively: Total length, 152 mm.; tail vertebrae, 21; hind foot, 20; and 154, 19, 23. Two adult, though not fully grown, females measured 140, 18, 21, and 136, 18, 21. A female measuring 128, 17, 21, collected on July 23, contained three small embryos.

As in other regions, the lemmings of St. George suffer considerable fluctuations in numbers. Elliott reported them very abundant in 1873; Palmer in 1890, and True in 1895, 1896, and 1897, reported them scarce. They were rather common in 1913 and 1914. Their periodical scarcity has been attributed to the foxes, but G. Dallas Hanna states that he has found no evidence that these animals prey on the lemmings. It would be very remarkable, however, if a fox did not occasionally snap up such a tender morsel.

True (1899, p. 346), on information furnished by Palmer, stated that a few had been introduced on St. Paul from St. George, and in 1911 Hahn was assured by a native chief that this had taken place on two occasions, the last time about 15 years before, but that he did not know of any having been seen afterwards.

Fiber zibethicus zalophus Hollister. ALASKA PENINSULA MUSKRAT.

The introduction of muskrats on the Pribilofs was advocated some years ago, and has once been attempted, but was not successful. Seven individuals were captured near Nushagak in the summer of 1913 by G. Dallas Hanna for planting on St. George Island. During transit to the islands the animals preyed on each other until only the strongest was left. This was liberated in a pond near the village, but is not known to have survived the winter.

With a view to introducing these animals most of the ponds on St. Paul Island were surveyed by W. L. Hahn, but were found to be too shallow. Among the ponds not critically examined, one in particular, Antone Lake, seems to the writer to be suitable, at least as far as its physical characteristics are concerned. The introduction of the animals, however, is not advocated by the writer, since it is not believed that they would be of any importance as food for the foxes, and it is unlikely that the comparatively small number that could live in the one or two ponds of possible suitability would prove economically profitable.

Mus musculus Linnaeus. HOUSE MOUSE.

Elliott, from observations made in 1872-73, says that mice had been brought to the islands in ships' cargoes long before and were a great pest (1875, p. 73). True, from observations made in 1895, states that the animal was extremely abundant about the village of St. Paul, and had been noted by various observers on St. George (1899, p. 348). G. Dallas Hanna thinks that there are now none on St. George, but there seems to be no good reason for this condition, unless the pests are kept from increasing there by the greater number of foxes. On St. Paul, however, they were abundant in 1914, not only about the village, but were taken in my traps set for shrews at some distance from the buildings, and were found even about the salt house at Northeast Point.

Rattus norvegicus (Erxleben). NORWAY RAT.

Elliott (1875, p. 73) states that at the time of his observations the islands were free from rats. True (1899, p. 348) reports as follows:

I saw nothing of rats while on the islands in 1895, but observe that Mr. Palmer has noted [1890] that they arrive occasionally in ships, but do not breed.

While on the islands in 1914 I saw no evidence of rats.

Family SCIURIDAE.

Citellus plesius ablusus Osgood. NUSHAGAK GROUND SQUIRREL.

Ground squirrels have been liberated on the Pribilofs with a view to furnishing an additional source of food for the foxes. Preble (in Osgood et al., 1915, p. 129) has summarized the matter as follows:

The introduction of ground squirrels has been attempted on two occasions, but neither has proven a success. In 1899 some were brought from Unalaska

and liberated on St. Paul, near the village. Their disappearance has been attributed to cats, but whether they were eaten by cats or foxes is immaterial.

In the summer of 1913 the assignment of G. Dallas Hanna for work on St. George Island afforded an opportunity to make another attempt, and 22 ground squirrels, including both sexes and different ages, were captured at Nushagak. Of these, four died from natural causes before their journey was begun. Various circumstances made it impracticable to provide small cages for the animals, and they were shipped in a single large crate. Although plentifully supplied with green food, they preyed on each other, and while this tendency was overcome to some extent by supplying them with meat, the stock of 18 had been reduced to 5 before they reached their destination. These 5, an adult female and 4 young, including both sexes, were liberated near the village on St. George Island in August. At least two survived the winter, and were seen on several occasions in early May, 1914. They were not known to have been observed later; during our visit in early August none were seen, and a careful search disclosed no positive evidence of their presence. It is doubtful if any survived the summer, and in view of the fact that numbers of foxes continually ranged in the vicinity of the spot where they had been observed, the destruction of the squirrels would seem to be inevitable.

Family CERVIDAE.

Rangifer tarandus (Linnaeus). REINDEER.

Reindeer were introduced on the Pribilofs in the summer of 1911, when a herd of 40 animals was brought from Unalakleet. Twenty-one cows and four bulls were landed on St. Paul; one of the bulls was injured in landing, and died soon after. Of the 15 landed on St. George, 3 were males, 1 adult and 2 yearlings; the adult bull met with some accident a few days later and disappeared. During the following summer 18 fawns were born on St. Paul, and 11 on St. George. The herds have since continued to increase, and now number over 400 animals. Annually since 1917 a number of the surplus bulls have been killed for food, and have furnished a welcome and substantial addition to the tables of officials and natives.

Upon their introduction, the animals sought out the least frequented and most favorable parts of the islands, over which they roam at will. The lichens on which they mainly subsist in winter grow over considerable tracts, and a recent survey of the situation shows that large areas still remain practically untouched, so that even considering the comparatively slow growth of these plants, no apprehension need be felt at present that the herd is becoming too large for its natural food supply.

On each island a corral has been built into which the respective herds have been driven from time to time for examination. As the herds have increased and the commercial taking of seal skins has been resumed, less attention could be devoted to the reindeer, because of the increased demand on the time of the able-bodied natives, and in consequence the animals have become somewhat wild and unmanageable. Since, however, they are steadily increasing, cost

nothing for maintenance, and are more and more valuable as a source of food, the experiment may be considered highly successful.

The rate of growth of the two herds since their introduction, under practically natural conditions and without special care, is of interest.

Growth of reindeer herd on Pribilof Islands.

Year.	St. Paul.	St. George.	Total.
1911.....	25	15	40
1912.....	40	25	65
1913.....	155	40	95
1914.....	75	58	133
1915.....	92	62	154
1916.....	111	85	196
1917.....	144	93	237
1918.....	158	114	272
1919.....	164	123	287
1920.....	192	125	317
1921.....	250	160	410

¹ Approximate.

² Excluding 3 killed.

³ Excluding 2 killed.

⁴ Excluding 18 killed.

⁵ Excluding 14 killed.

⁶ Excluding 22 killed.

⁷ Excluding 31 killed.

⁸ Excluding 32 killed.

⁹ Excluding 19 killed.

Family BALAENIDAE.

Balaena mysticetus Linnaeus. BOWHEAD WHALE.

In a number of instances whales have drifted ashore on the Pribilofs, and in some cases they have been identified. St. Paul has apparently received the larger share, a natural result of its longer and more easily observed coast line. Hahn collected notes from the St. Paul Island log detailing some of these occurrences. On January 1, 1890, a large right whale was discovered at East Landing, St. Paul. The head was gone; the body was more than 60 feet long. Another carcass came ashore at Zoltoi, near the village, on August 31 of the same year. From the same source Hahn learned that other whales (species not stated) were stranded as follows: October 18, 1886, a whale 56 feet long, bearing a harpoon, drifted into English Bay. Others were recorded as coming ashore on September 13, 1892; March 27, 1903; and August 9, 1906.

Dr. Frederick W. True, himself a student of this group, examined the bones of a number of individuals of this species, and made measurements of the right mandible of one found on the beach north of Lukanin (1899, p. 352). He mentions also a bowhead whale which came ashore on St. George in 1889, from which the natives secured about 1,500 pounds of whalebone. The remains of others found by True near East Landing and at Zoltoi were probably those of individuals above mentioned, records of which were found by Hahn.

Scammon says (1874, p. 68): "The last seen of them in high latitudes, by whalers, is on their return from the Arctic Ocean, when they are found in the vicinity of St. Paul's Island, Behring Sea, in the month of October, and these are usually very large."

Family BALAENOPTERIDAE.

Balaenoptera velifera (Cope). LARGE FINBACK WHALE.

True summarized the result of his observations on the large finback whale as follows (1899, p. 352):

The hind part of a skull of a large finback, which may be this species, was found by Mr. Prentiss and myself on the shore of the lagoon in 1895. The greatest breadth across the temporals was 6.35 feet. The height of the occipital from the upper margin of the foramen magnum to the nasals was 3.15 feet.

I saw nothing of these whales about the Pribilof Islands in the summer of 1895, but when returning homeward observed them in large numbers on September 3 along the south coast of Kadiak. Mr. Palmer remarked in 1890: "Not common about the islands in summer, but a number were seen after leaving St. George for the south on August 11. A dead one was stripped of its 'bone' on St. Paul last winter."

Hahn found in the St. Paul Island log a record of a large finback which drifted ashore at the north end of St. Paul Island on February 13, 1884.

Balaenoptera davidsoni Scammon. DAVIDSON LESSER RORQUAL.

True (1899, p. 352) gives the following brief account of the rorqual, which comprises all the data available:

The bones of a small finback, belonging without doubt to the species, were found at Rocky Point, St. Paul. There were 27 in all—the seventh cervical, 11 dorsals, and 15 lumbar and caudals.

Megaptera versabilis Cope. PACIFIC HUMPBACKED WHALE.

According to a note taken by Hahn from the St. Paul Island log, a female humpback, about two-thirds grown, came ashore at Zoltoi beach on September 27, 1876.

Family PHYSETERIDAE.

Physeter macrocephalus Linnaeus. SPERM WHALE.

The only record of the sperm whale on the Pribilofs seems to be that of G. Dallas Hanna (1914, p. 218), who thus details the occurrence:

A sperm whale or cachelot came ashore at Zapadni Rookery April 14, 1914. It was a male 47 feet long and had probably been dead a week. About 5 tons of blubber were saved for fox food when the head and carcass floated away. Although other species of whales are abundant about the island, the cachelot had never been seen before by any of the Aleuts.

In a recent note Hanna mentions a female sperm whale which came ashore in an advanced stage of decomposition near Kitovi Rookery, St. Paul Island, in the summer of 1919.

Family ZIPHIIDAE.

Berardius bairdii Stejneger. PACIFIC BEAKED WHALE.

The first notice of the occurrence of this species is apparently that of True, who recorded it as follows:

Two large beaked whales were found on the coast of St. George Island, Pribilof Group, Alaska, in June, 1903, by Mr. James Judge, the resident treasury agent. One of these, a female, was reported by Mr. Judge as being 40 feet 2 inches long. * * * The other specimen, a male, was 25 feet 5 inches long.

These were skeletonized and sent to the U. S. National Museum, and were later exhaustively discussed and figured by True, together with a third individual reported by Ezra W. Clark as occurring at the same place on August 21, 1909, but which, apparently, was not preserved (1910, pp. 2, 60 et. seq.).

Family DELPHINIDAE.

Orcinus rectipinna Cope. KILLER WHALE.

Killer whales are often seen about the Pribilofs and are known to prey on seals and sea lions, both young and adults. True (1899, p. 353) reported as follows:

The skull of a killer was brought from St. Paul Island in 1895 by Mr. Charles H. Townsend, obtained from a specimen which came ashore to the south of Hutchinsons Hill. Many nominal species of killers have been established, but it has not yet been demonstrated whether there are really several or only one.

I saw two killers on one occasion quite close inshore at St. Paul in 1895. In 1890 Mr. Palmer wrote: "A few seen about the islands in May and early in summer. They return in August. We saw quite a number on August 12 between St. George and Unalaska."

Most of the natives have seen killers chasing sea lions, and have seen both sea lions and killers strand on the rocky shore. The majority of the killers seen had a large whitish blotch on each side of the back, immediately behind the dorsal. In no case was this blotch pure white, though the center and upper part of it was always lighter than the sides. The tip of the dorsal in no case turned over.

Preble (in Osgood, et al., 1915, p. 72) has summarized the relations of this species to the fur seal, as follows:

While the young pups are still about the islands in autumn many are destroyed by killer whales (*Orcus gladiator*), which are frequently observed singly or in small schools cruising about in front of the rookeries and are known to prey especially on the pups. The following actual records of killer whales observed about St. Paul Island in autumn, selected from a large number of observations taken from the island log by the late Doctor Hahn, indicate to some degree the part played by them in the destruction of young seals. A large school of killers was seen near East Landing on October 21, 1875, and 5 near the same place on September 21, 1891; 1 seen off Reef Rookery on December 2, 1902, was playing havoc with a band of seals; fragments of both

cows and pups, the work of killer whales, were found strewn along the beach at Northeast Point on November 6, 1904. In the autumn of 1907 killers were reported on numerous occasions, and native watchmen at Northeast Point and Polovina reported considerable destruction. A killer 24 feet long was stranded at Northeast Point on December 16, 1908. On November 1, 1913, G. Dallas Hanna observed three killers close to the reef near the village of St. George preying on the seal pups. Two of these came so close to the bluffs that he was able to hit them with a rifle and killed at least one.

These records indicate that killer whales are by no means uncommon about the Pribilofs. The stomachs of two killers examined by Captain Bryant contained, respectively, 18 and 24 seal pups [Rept. Fur-Seal Investigations, 1896-97, pt. 3, p. 93, 1899], and it is certain that the total number of young seals killed by them must be very great.

As possibly having some bearing on the seasonal movements of killer whales, the dates on which they have been noted in the St. Paul Island log, as extracted by Hahn, may be given: October 21, 1875; June 6, 1877; May 21, 1881; June 8, 1881 (Walrus Island); June, 1882; May 15, 1884; May 21, 1884; May 19, 1886; May 28, 1888; May 31, 1889; September 21, 1889; June 1, 1894; May 26, 1895; May 22, 23, 24, and 26, 1900; July 18, 1902 (school); December 2, 1902; May 5, 1903; November 8, 1904; October 12, November 16, 1907; December 16, 1908; December 6, 1909; June 6, 1910; June 21, 1910; May 31, 1911 (Hahn).

G. Dallas Hanna, in notes kindly forwarded recently, gives some data regarding the occurrence of killer whales about the islands within the past few years. A part of his account may be quoted:

In the fall schools of them cruise round and round the beaches in close formation and actually devour seals by the hundreds. The official journals which are kept on the islands contain many accounts by eyewitnesses of their depredations. I once saw two killers take three seals in five minutes.

The fall visit of the animals coincides with the period when the young seal pups are learning to swim, and it is upon them that the greatest damage is wrought. At times, however, they have been seen to capture older animals. In the spring of 1917 a school of them maintained a stand between St. Paul Island and Sealion Rock, and for more than a week succeeded in capturing or driving away practically every seal which approached the great breeding grounds in the vicinity.

Phocaena phocaena (Linnaeus). HARBOR PORPOISE.

True (1899, p. 353) sums up the evidence regarding the occurrence of this species in Bering Sea as follows:

A few bones of a small porpoise, apparently of this species, were picked up at St. Paul June 3, 1890, and two small schools were seen in the harbor at Unalaska May 20 and 21, the same year. A specimen of this species was obtained by Mr. Charles H. Townsend at Captains Harbor, Unalaska, August 17, 1895.

I find in the collection of the U. S. National Museum the skull and skeleton, No. 49428, taken by True and Prentiss at St. Paul, in the summer of 1895. Another skull and skeleton No. 217912, male, was taken at Northeast Point, St. Paul, by G. D. Hanna, on July 19, 1916.

On February 12, 1917, a school of porpoises was forced ashore by the heavy ice in the Village Cove at St. George Island. Thirteen were thus trapped, 12 of which were carefully measured and skeletonized. Eleven of these, 10 complete skeletons and 1 skull, are now in the collection of the U. S. National Museum.

Family ELEPHANTIDAE.

Elephas primigenius Blumenbach. MAMMOTH.

Remains of the mammoth have been found on several occasions. The earliest specimen seems to have been a tooth found on St. George in 1836. Dall (in Dall and Harris, 1892, p. 266) refers to this in part as follows: "[The discovery of] a mammoth tooth on the island of St. George of the Pribilof group, in 1836, vouched for by Veniaminoff (Unal., I, p. 106)." A native chief, Gromoff, informed Dr. W. L. Hahn that he had found two mammoth tusks on St. Paul, one on the north shore and the other at Northeast Point. The latter is probably the one referred to by Stanley-Brown (1892, p. 499), who says:

There are two fragments of paleontologic evidence connected with the islands which, as they have been used by writers, demand a cautionary word. The tusk of a mammoth was found in the sands of Northeast Point on St. Paul Island, and the tooth of one is reported as coming from the shores of St. George. As there is not a foot of earth on either island, save that which has resulted from the decomposition of the native rock and the decay of vegetation, the value of such testimony is questionable.

Whether Stanley-Brown doubts that the specimens were actually taken on the islands, or questions the deductions which had been drawn from their presence by previous writers on the geology of the North, is not clear.

George M. Dawson (1894, p. 4), in the course of a somewhat extended discussion of the subject of mammoth remains in northwestern America, refers to these finds and to Stanley-Brown's comment, and professes not to understand "the precise intention of the cautionary remark just quoted." His conclusion is that the presence of these remains on the Pribilofs indicates a former connection with the mainland.

Frederic A. Lucas (1898, p. 718) has put on record two teeth of the mammoth obtained by R. E. Snodgrass from the cave on Bogoslof Hill, St. Paul Island, in 1897. Lucas (l. c., p. 718) is also of the

opinion that the presence of the remains of the mammoth on the group argues for former land connection. Maddren (1905, p. 21), in discussing this and other finds, has described at some length the circumstances attending the collection of these teeth from the testimony of Bristow Adams, who was a member of the party which made the collection.

G. Dallas Hanna, in a recent paper on the geology of the Pribilofs (1919c, p. 222), makes the following statement:

It should be stated here that the reports of the finding of bones of fossil elephants on the Pribilof Islands are probably attributable to practical jokes which have been played on credulous naturalists in the past. No such bones have thus far been found that were not planted by man, according to reports of eyewitnesses to some of the pranks.

This statement can hardly be considered as applicable to the finding of the teeth and tusks above mentioned, since their authenticity seems to be as well established as is usual in such cases. It would seem to the writer, however, that these remains were most probably accidentally transported to the islands, most likely on floating ice, and that, therefore, their occurrence there has no special geological significance.

BIBLIOGRAPHY.

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The following list of titles relate mainly to the birds and mammals of the Pribilof Islands, and, while known to be incomplete, is believed to include all the more important works. It is designed mainly to furnish complete citations of works referred to in the preparation of the present lists of birds and mammals, and especially the articles drawn upon for information. Most of the voluminous literature relating to fur seals is listed in *Fur Seals and Other Life of the Pribilof Islands*, by Osgood, Preble, and Parker, published in 1915, and no attempt has been made to include such titles in the present list.

ALLEN, JOEL ASAPH.

1877. Nest and eggs of the Alaskan wren: *Bull. Nuttall Ornith. Club*, vol. 2, no. 3, p. 82, July.

Descriptions of first nest and eggs known, taken on St. George Island, in June, 1876.

1902. The hair seals (family Phocidae) of the North Pacific Ocean and Bering Sea: *Bull. Amer. Mus. Nat. Hist.*, vol. 16, art. 34, pp. 459-499, December 12.

Original description of *Phoca richardii pribilofensis* (p. 495). Mention of ribbon seal (*Histiophoca fasciata*) from vicinity of Pribilofs.

BAIRD, SPENCER FULLERTON.

1869. On additions to the bird-fauna of North America, made by the scientific corps of the Russo-American Telegraph Company: *Trans. Chicago Acad. Sci.*, vol. 1, pt. 2, art. 10, pp. 311-325.

Contains discussion of several species first noted from the islands by Dall and Bannister, including original description of *Troglodytes alascensis* from St. George Island.

BAIRD, S. F., T. M. BREWER, and ROBERT RIDGWAY.

1884. The water birds of North America, vol. 2.

Original description of *Rissa tridactyla pollicaris* (p. 202).

BEAN, TARLETON HOFFMAN.

1882. Notes on birds collected during the summer of 1880 in Alaska and Siberia: *Proc. U. S. Nat. Mus.*, vol. 5, pp. 144-173, July 8, 1882.

Notes on a few species from the Pribilofs or vicinity.

BENT, ARTHUR CLEVELAND.

1919. Life histories of North American diving birds, order Pygopodes: *Bull. 107, U. S. Nat. Mus.* 245 p.

Contains many references to habits of birds on the Pribilof Islands.

BENT, ARTHUR CLEVELAND—Continued.

1921. Life histories of North American gulls and terns, order Longipennes: Bull. 113, U. S. Nat. Mus. 345 p.

Contains many references to habits of birds on the Pribilof Islands.

1922. Life histories of North American petrels and pelicans and their allies: Bull. 121, U. S. Nat. Mus. 343 p.

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BISHOP, LOUIS BENNETT.

1900. Birds of the Yukon Region, with notes on other species: North Amer. Fauna No. 19, pp. 47-96.

Notes on a few species taken on St. George Island in October, 1899.

CHICHESTER, HARRY D.

1908. [Report on condition of affairs on St. George Island, August 14, 1905, to June 1, 1906]. In Reports Relating to Alaska Seal Fisheries, by W. I. Lembkey and others; Senate Doc. 376, 60th Cong., 1st sess., pp. 47-58.

Records, in discussion of food of foxes, the occurrence of vast numbers of "sea quail" (*Simorhynchus cristatellus*).

CLARK, AUSTIN HOBART.

1910. The birds collected and observed during the cruise of the United States Fisheries steamer *Albatross* in the North Pacific Ocean, and in the Bering, Okhotsk, Japan, and Eastern Seas from April to December, 1906: Proc. U. S. Nat. Mus., vol. 38, pp. 25-74, April 30.

Records specimen of *Colaptes auratus luteus* from St. George Island, the first record for the Pribilofs.

COINDE, J. P.

1860. Notice sur la faune ornithologique de l'île de Saint-Paul, suivie de l'énumération de quelques espèces d'insectes (Coléoptères) des Aléoutiennes et du Kamtschatka: Rev. et Mag. de Zool., vol. 12, 2^e sér., pp. 396-405.

Earliest account of a collection of birds from the Pribilofs, nine species taken by Doctor Warneck in 1842.

DALL, WILLIAM HEALEY.

1873. Notes on the avifauna of the Aleutian Islands from Unalaska eastward: Proc. Calif. Acad. Sci., vol. 5, 1873-74, pp. 25-35, February 8.

Includes notes on the occurrence of a few species on the Pribilofs.

1874. Notes on the avifauna of the Aleutian Islands, especially those west of Unalaska: Proc. Calif. Acad. Sci., vol. 5, 1873-74, pp. 270-281, Mar. 14.

Includes notes on the occurrence of a few species on the Pribilofs.

DALL, W. H., and H. M. BANNISTER.

1869. List of the birds of Alaska, with biographical notes: Trans. Chicago Acad. of Sci., vol. 1, pp. 267-360.

Contains first recorded instance of occurrence of several species on the Pribilofs.

DALL, W. H., and GILBERT D. HARRIS.

1892. Correlation papers: Neocene: Bull. 84, U. S. Geol. Surv. 349 p., 3 pls., 43 figs.

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DAWSON, GEORGE MERCER.

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Includes discussion of probable origin of mammoth remains found on the Pribilofs.

DWIGHT, JONATHAN, Jr.

1918. A new species of loon (*Gavia viridigularis*) from northeastern Siberia: The Auk, vol. 35, no. 2, pp. 196-199, April.

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ELLIOTT, HENRY WOOD, and ELLIOTT COUES.

1874. Report on the Pribilof Group or Seal Islands of Alaska, by Henry W. Elliott, assistant agent, Treasury Department. Pub. by Treas. Dept.; 129 p. (not numbered), 2 maps, 45 pls.; in appendix is an article entitled "Ornithology of the Pribilof Islands, by Dr. Elliott Coues, U. S. A. (based on Mr. H. W. Elliott's manuscripts and collections)."

Forty species are treated under specific headings and two or three others are referred to by Elliott in the introduction to the formal list. Original description of *Tringa ptilocnemis* given in a footnote. Bears date of 1873 on title page, and 1875 on cover, but was issued early in 1874.

1875. A report upon the condition of affairs in the Territory of Alaska, by Henry W. Elliott, special agent, Treasury Department. Pub. by Treas. Dept.; 277 p., many illus.; chap. IX, "Ornithology of the Pribilof Islands," by Dr. Elliott Coues, pp. 168-212.

A reprint, without the illustrations, of the report (unpaged) by the same authors published in 1874.

ELLIOTT, HENRY W.

1881. The seal-islands of Alaska; 176 p., with maps and text illus. Published (together with "The history and present condition of the fishery industries," by G. Brown Goode) as Bull. Tenth Census of United States, by Int. Dept.

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Contains lists of the mammals and birds of the group, pp. 124-136, in substance much like the lists in his earlier work, but rewritten, and entirely by Elliott.

EVERMANN, BARTON WARREN.

1913. Eighteen species of birds new to the Pribilof Islands, including four new to North America: The Auk, vol. 30, no. 1, pp. 15-18, January.

Based on collections made by W. L. Hahn and M. C. Marsh on St. Paul Island from 1910 to 1912.

GRINNELL, JOSEPH.

1901. Record of Alaskan birds: The Condor, vol. 3, pp. 19-23, January.
Briefly annotated list of 21 species in the collection of Leland Stanford University, taken by R. E. Snodgrass and A. W. Greeley on the Pribilofs in the summer of 1897. *Totanus melanoleucus* and *Saxicola oenanthe* added to the Pribilof list.

HANNA, G. DALLAS. (See also Mailliard and Hanna.)

1914. Interesting mammals on the Pribilof Islands: Proc. Biol. Soc., Washington, vol. 27, p. 218.
Notes occurrence of polar bear, walrus, and cachelot on St. George in 1914.
1916. Records of birds new to the Pribilof Islands, including two new to North America: The Auk, vol. 33, no. 4, pp. 400-403, October.
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- 1919a. Additions to the avifauna of the Pribilof Islands, Alaska, including species new to North America: Journ. Washington Acad. Sci., vol. 9, no. 6, pp. 176-177, March 19.
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- 1919b. Check list of birds of the Pribilof Islands, Alaska, with the names of persons first recording the species from the Islands: In Alaska Fisheries and Fur Industries in 1918, Bur. Fisheries, Doc. No. 872, by Ward T. Bower; App. VII, Rept. U. S. Comm. Fisheries for 1918, pp. 105-107.
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Twenty-one species added to the Pribilof list; four of these new to North America. (These were listed in Jour. Washington Acad. Sci., vol. 9, no. 6, pp. 176, 177, publ. March 19, 1919, in a brief report of the meeting of the Biological Society of Washington for January 25, when the discoveries were announced.) Notes on several other species.
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Account of the breeding distribution, nesting habits, and eggs of *Arquatella ptilinocnemis*.

HANNA, G. DALLAS—Continued.

- 1921b. Natural history records of Pribilof Islands: in Alaska Fisheries and Fur Industries in 1920, by Ward T. Bower: Bur. Fisheries, Doc. No. 909, App. VI, Rept. U. S. Comm. Fisheries for 1921, pp. 122-127.

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Description of *Tringa gracilis* (= *Arquatella ptilocnemis*) from St. Paul Island. In a postscript, the author admits that his supposed new species is identical with *T. ptilocnemis* described a few months earlier by Coues.

HEATH, HAROLD.

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JUDGE, JAMES.

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LUCAS, FREDERIC A.

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LUTZ, JOHN E.

1889. Report of Lieut. J. E. Lutz: Rept. of Cruise of revenue steamer *Corwin* in Arctic Ocean, 1884, pp. 28-35, 1889.

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MADDREN, ALFRED GEDDES.

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MAILLIARD, JOSEPH.

1923. The tree swallow added to the Pribilof list: The Condor, vol. 25, no. 1, p. 31, January.

Records a specimen of *Iridoprocne bicolor* taken on St. Paul Island.

MAILLIARD, JOSEPH, and G. DALLAS HANNA.

1921. New bird records for North America, with notes on the Pribilof Island list: *The Condor*, vol. 23, no. 3, pp. 93-95, May.

Adds two species, *Micropus pacificus* and *Loxia leucoptera*, to the Pribilof list.

MERRIAM, CLINTON HART.

1895a. Mammals of the Pribilof Islands: *Science*, N. S., vol. 1, no. 25, p. 698, June 21.

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1887. Report on natural history collections made in Alaska between the years 1877 and 1881: Arctic ser. publ. issued in connection with Signal Service, U. S. Army, no. 3; *Birds*, pp. 21-226.

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1922. Notes on North American birds, XI: *The Auk*, vol. 39, no. 1, pp. 72-78, January.

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1915. Fur seals and other life of the Pribilof Islands, Alaska, in 1914: Senate Doc. 980, 63d Cong., 3d Sess.; also Doc. 820, U. S. Bur. Fisheries, 172 p., 24 maps, June 19. (Document 820 also reprinted with addition of index, pp. I-V, 1916.)

Mainly on fur seals; brief treatment of other mammals and birds.

PALMER, WILLIAM.

1894a. Do wading birds swim? *The Nidiologist*, vol. 1, no. 12, p. 175.

Instance of swimming of Pribilof sandpiper; mention of other species.

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PALMER, WILLIAM—Continued.

1899. The avifauna of the Pribilof Islands: In the Fur Seals and Fur-Seal Islands of the North Pacific Ocean, pt. 3, pp. 355-431, with 4 pls.

History and detailed discussion of ornithological work on the islands, with comparative lists of species, discussion of distribution and migration, a bibliography, and an annotated list of 69 species.

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Notes on 25 species observed on St. George and St. Paul during the summer of 1895. Specimens of *Pagophila alba*, *Aegialitis semipalmata*, and *Oceanodroma furcata* recorded from the islands for the first time.

RIDGWAY, ROBERT.

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Records specimen taken by C. H. Townsend on Otter Island, June 8, 1885.

1887. A manual of North American birds; 631 p., 124 pls.

Original description of *Plectrophenax nivalis townsendi*, from Otter Island (p. 403).

1898. New species, etc., of American birds, II: The Auk, vol. 15, no. 4, pp. 319-324, October.

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RILEY, JOSEPH HARVEY.

1917. A bird new to the North American fauna: The Auk, vol. 34, no. 2, p. 210, April.

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SCAMMON, CHARLES MELVILLE, and W. H. DALL.

1874. The marine mammals of the northwestern coast of North America, described and illustrated: together with an account of the American whale-fishery. 4to., p. 319+V, San Francisco and New York.

An appendix, by W. H. Dall, pp. 281-319, comprises mainly a catalogue of the Cetacea of the North Pacific Ocean.

SEALE, ALVIN.

1898. Notes on Alaskan water birds: Proc. Acad. Nat. Sci. Philadelphia, 1898, pp. 126-140.

Includes brief annotations on eleven species taken on the Pribilofs by A. W. Greely and R. E. Snodgrass. *Totanus melanoleucus* and *Saricola oenanthe* added to the Pribilof list; *Tringa couesi*, also added, evidently based on misidentification; dates of specimens unreliable.

STANLEY-BROWN, JOSEPH.

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Reference made to discovery of remains of mammoth on the islands.

STEJNEGER, LEONHARD.

1889. Notes on the downy young of the parrot auk and of the crested auk: Rept. of Cruise of Revenue-Steamer *Corwin* in Arctic Ocean, 1884, pp. 125, 126.

Describes and figures the young of these species, not before known, from specimens taken on Otter Island by J. E. Lutz in 1884.

1885. Results of ornithological explorations in the Commander Islands and in Kamtschatka: Bull. 29, U. S. Nat. Mus., 382 p., 8 pls.

A few notes on Pribilof birds.

TOWNSEND, CHARLES HASKINS.

1887. Notes on the natural history and ethnology of northern Alaska: Rept. of Revenue Marine Steamer *Corwin* in Arctic Ocean in 1885.

Includes "Notes on Mammals, Birds, and Fishes obtained at various places between the Aleutian Islands and Kotzebue Sound" (pp. 96-102). A number of species recorded from the Pribilofs.

TRUE, FREDERICK WILLIAM.

1899. Mammals of the Pribilof Islands: In Fur Seals and Fur-Seal Islands of North Pacific Ocean, by David Starr Jordan and others; pt. 3, pp. 345-354.

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1904. Note on three very large beaked whales from the North Pacific: Science (N. S.), vol. 20, no. 521, pp. 888-889, December 23.

Records two large specimens, the skeletons of which were later received by the U. S. National Museum, found by James Judge, on the shore of St. George Island in June, 1903.

1910. An account of the beaked whales of the Family Ziphiidae in the collection of the United States National Museum, with remarks on some specimens in other American Museums: Bull. 73, U. S. Natl. Mus., 89 p., 42 pls.

Includes account of two skeletons of *Berardius bairdii* from St. George Island.

TURNER, LUCIEN M.

1886. Contributions to the natural history of Alaska, extending from May, 1874, to August, 1881: Arctic ser. publ., issued in connection with Signal Service, U. S. A.; no. 2, pt. 5; Birds, pp. 115-196.

A few species mentioned as found on the Pribilofs.

VENIAMINOF, BISHOP INNOCENT.

1840. [Extract from] *Zabieska ob Octrovah Oonahlalshkenskaho Otdayla*. St. Petersburg, 1840. Translation of "selections most pertinent to subject" (Pribilof Islands) published by Elliott in his report on the condition of affairs in the Territory of Alaska, 1875, pp. 241-244.

A paragraph mentioning somewhat over a dozen species of birds which visit the Pribilof Islands seems to be the earliest note on the ornithology of the group.