1897.

G. M. Dawson's Papers.

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Behring Sea Sealing Regulations.

1897.

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BEHRING SEA.

CONFIDENTIAL.

[May 7.]

SECTION 1.

No. 1.

The Marquess of Salisbury to Sir J. Pauncefote.

(No. 74.)

Sir, *Foreign Office, May* 7, 1897.

I HAVE had under consideration, in communication with Her Majesty's Secretary of State for the Colonies, Mr. Sherman's note of the 9th ultimo on the subject of the fur-seal fishery, of which a copy was inclosed in your Excellency's despatch No. 98 of the 13th April.

Mr. Sherman urges that all killing of fur-seals should be suspended for the present, and that a joint Conference of the Powers concerned should meet at an early date to agree upon the measures necessary to preserve the seals from extermination, and to restore the herd to its normal conditions.

The same proposals were made in the note from the United States' Chargé d'Affaires of the 10th ultimo, a copy of which was transmitted to your Excellency in my despatch No. 71 of the 22nd April, with instructions as to the answer to be returned to the United States' Government on the subject.

Mr. Sherman, however, adduces certain statistics in support of the contention that the seals are threatened with early extermination, which make it necessary for Her Majesty's Government to deal with his despatch in a separate communication.

With regard to Mr. Sherman's complaint that the United States' Government had not been furnished with a copy of Professor Thompson's Report of his investigations last year, I have to state that Her Majesty's Government regret the delay that has occurred in the matter. It has been caused partly by Mr. Thompson's professional duties, and also by the necessity of his waiting for certain notes and information with which he had asked Mr. Macoun, the Agent of the Dominion Government, to furnish him. The Report is, however, now in the hands of the United States' Government.

Mr. Sherman proceeds to state that in the absence of Professor Thompson's Report the President has been forced to reach his conclusions as regards the condition of the seal fishery by a careful study of Dr. Jordan's Report, and other ascertained facts and statistics. It is to be regretted that Mr. Sherman has not referred to the passages in Dr. Jordan's Report on which the conclusions of the President have been arrived at. So far as Her Majesty's Government can judge in the absence of such indications, the President's conclusions would appear to be based only on general assertions and deductions in that Report.

Mr. Sherman states that Dr. Jordan's Report shows conclusively that there has been a distinct and steady decrease both in the total number of breeding seals, and in the number of harems of breeding cows in the season of 1896 as compared with that of 1895, and that it further conclusively appears from the Report that this diminution has been caused by pelagic sealing.

Dr. Jordan, however, states on p. 21 as follows: "In 1895 Mr. Murray made a careful count of the number of harems of the two islands, finding 5,000 in all. At the same period in 1896 he found that the number of harems was reduced to 4,853, a loss of $3\frac{1}{5}$ per cent., the number of bulls without harems having increased 7 per cent."

On p. 16 Dr. Jordan himself gives the number of harems in 1896 as 5,009, a small increase on Mr. Murray's count of 5,000 in 1895, instead of a decrease of less than 3 per cent. (not $3\frac{1}{5}$ per cent. as calculated by Dr. Jordan). Similarly, as regards the number of breeding cows, Dr. Jordan's count, as recorded on p. 16, gives 81,793 for 1896, while the figures for 1895, as given by himself on p. 20, were only 70,423. The state of the rookeries in 1895, as compared with 1896, is fully dealt with by Professor Thompson, and is referred to in my despatch No. 71 of the 22nd ultimo, and it is therefore unnecessary to discuss the matter at length. That Report also deals, so far as the information at present available is concerned, with the question of the mortality of pups owing to the killing of their mothers at sea, and the general conclusions at which he arrived, as set forth on p. 25 of his Report, show that the number 14,473, at which Mr. Sherman places the deaths from this cause, must be subject to very large deductions.

It may be the case, as stated, that it was as easy in 1880 to procure 100,000 skins on land of the same quality as those taken during the season of 1896, as it was to obtain the catch of last year, viz., 30,000, but it must not be forgotten that in 1890 not even 30,000 skins could be obtained. The question of the comparative ease or difficulty with which a stated catch was obtained in two years so far apart as 1880 and 1896 would, even if the same individuals were employed on each occasion, be an uncertain foundation on which to base any estimate of the comparative numbers of the herd; but Her Majesty's Government have never denied that the herd has diminished largely since 1880, though they maintain that any share pelagic sealing may have had in bringing about that decrease is insignificant compared with that of other causes which appear to be overlooked in the United States.

If, as alleged, the number of breeding females in 1880 was four times as many as in 1896, or 600,000 in the former year, and 150,000 in the latter, while in 1890 there were 280,000, the figures completely negative the conclusion that the pelagic sealing has been the cause of the decline, for in the eleven years, 1880 to 1890, while the herd was reduced, according to Dr. Jordan's estimate, by 320,000 breeding females, only 246,902 seals were killed at sea, while in the period 1891 to the end of the spring season of 1896 the pelagic catch reached a total of 269,388, and during this period the decrease in the number of breeding cows was only 130,000.

A herd of 600,000 breeding cows should mean, according to Dr. Jordan's estimate, an annual addition of 100,000 breeding cows to the rookeries, yet in the eleven years, 1880 to 1890, while the pelagic catch only averaged some 22,000 a-year, there was not only no addition to the rookeries, but an average annual decrease of some 30,000. If this enormous loss was entirely due to pelagic sealing, as Dr. Jordan maintains, it would have doubled when pelagic sealing doubled, and the herd ought to have ceased to exist some years ago. Yet during the years which followed, with a herd supposed to range from 280,000 to 150,000, and with an annual addition of cows to the rookeries which should, if Dr. Jordan is correct, have been from 48,000 to 25,000, the pelagic catch has averaged about 50,000 a-year, yet the loss to the rookeries has been only some 25,000.

These statistics of Dr. Jordan's, as set forth in his Report, prove clearly that the loss to the herd in the period during which pelagic sealing has been a large factor in the influences affecting it, has been insignificant compared with the destruction which went on prior to 1890 on the islands, and that the effect on the herd of that mode of sealing is much less serious than that of killing on land restricted to males only.

The frequent recurrence, moreover, of seasons characterized like that of last year by weather duriug which sealing operations at sea are interrupted affords a natural protection to the herd from exhaustion by pelagic sealing. The difference between the spring catch on the north-west coast in 1895 and 1896 furnishes an excellent illustration, fifty-two vessels in the former year securing only 8,383 skins, while forty-one vessels in 1896 secured 11,786 skins. The falling-off in the Behring Sea catch last season, which Mr. Sherman cites as due to the reduction of the herd, was, according to the information in the hands of Her Majesty's Government, fully explained by the interruptions due to bad weather; and as the great fall in the price of skins has led to a smaller number of vessels fitting out for the fishery this year, their contention that there is no immediate danger to the herd, so far at any rate as pelagic sealing is concerned, appears to be fully justified. But if the proceedings which led to the wholesale reduction of the seals between 1880 and 1890 are resumed, and all the best young male life is destroyed, there can be no question that the herd will at an early date cease to be of commercial importance.

In Mr. Sherman's note the killing of 30,000 males last year is justified on the ground that "it was plain upon scientific investigation that the dangerous mortality among female seals brought about by pelagic sealing had left the number of bulls greatly in excess of the due proportion between the sexes," and that "to properly care for the herd it became necessary to remove as far as possible this menacing excess of male life upon the islands."

If there was snch a "menacing" excess of bulls, it is unfortunate that instead of attempting to reduce the excess, the killing was confined to males who would not become "bulls" able to take a place on the rookeries for another three years, during which period, so far as the killing of 1896 is concerned, the alleged excess of bulls on the rookeries will continue.

Mr. Sherman, in the conversation reported in your Excellency's despatch No. 96 of the 9th April, pointed out that Great Britain was quite as much interested as the United States in the recuperation of the fur-sealing species.

As a matter of fact, the interest of this country has now for some years exceeded that of the United States, and should the herd be destroyed a large amount of British capital will be lost, and a large number of British subjects thrown out of employment. They have, therefore, reason to be more anxious for the establishment of proper Regulations than the United States, but the examination of the Reports of last year's investigations, while it has shown that there is no indisputable evidence that the herd has quite recently been decreasing, and that there is no ground, therefore, for immediate alarm, has also shown that all previous statements as to the numbers of the herd have been conjectural, and that there is consequently no means available for testing the efficiency of the existing Regulations, or for showing the direction which any amendment of them should take.

To enable a thoroughly satisfactory revision to be made accurate statistics should be available, extending over a sufficient period to eliminate accidental circumstances affecting the herd during the greater part of its life, which is spent where observation is impossible.

Until such information is available it would, in the opinion of Her Majesty's Government, be premature to enter upon the proposed conference to discuss measures based on conjectures admitted to be of doubtful value, and the interests of this country in the question are too serious to warrant Her Majesty's Government in imperilling them by the adoption of any hasty decision.

Your Excellency will read this despatch to Mr. Sherman, and leave a copy of it with him should he desire it.

I am, &c.
(Signed) SALISBURY.

No. 2.

Foreign Office to Colonial Office.

Sir, *Foreign Office, May 7, 1897.*

WITH reference to your letter of the 25th February, I am directed by the Marquess of Salisbury to transmit to you a copy of a despatch from Her Majesty's Ambassador at Washington* forwarding the reply of the United States' Government to the proposal that in future the prosecution of British sealing-vessels seized by American officers for violation of the Behring Sea Award Act should be conducted in the name of the Crown by Counsel employed by the United States' Government, and that the United States should further agree to satisfy the judgment of the Court if the seizure should be held to be wrongful.

The United States' Government decline to enter into such an arrangement on the ground that they are fully satisfied with the privilege accorded to them of appointing Counsel to watch the progress of the trials, and that they have never desired to become a party to the proceedings.

In my letter of the 10th February it was stated that should it be found impossible to obtain the consent of the United States' Government to such an arrangement, the plan suggested by Admiral Palliser in his Report of the 26th November last seemed to be worthy of consideration, viz., that a joint investigation should be held locally by British and American naval officers in cases where officers of either nation considered the evidence to be *primâ facie* insufficient to justify them in taking over a vessel and sending her for trial. The vessel, however, to be sent for trial in case of disagreement.

I am now to inquire whether Mr. Secretary Chamberlain would concur in the submission of the Admiral's suggestion to the United States' Government.

I am, &c.
(Signed) F. H. VILLIERS.

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* Sir J. Pauncefote, No. 109, April 20, 1897.

Number paragraphs for reference.

1. Canada was not satisfied with Sealing Regulations of Arbitration Tribunal, which while admitting rights, very seriously curtailed freedom of sealing & did not limit possibility of killing on islands.

2 Canada, nevertheless has not objected, & has endeavored in all respects to conform to regulations of award.

3 Practically no instances of wilful violation of regulations, & no object in keeping a large & expensive patrol in Bering Sea. Two or three revenue cutters would fulfil requirements.

4 The U.S. dissatisfied even with award, although Phelps & others originally expressed entire satisfaction. Pressing for revision before time stipulated by Tribunal, on ground that

4 Seals keeping on determination.

5 Conditions now differ from those before arbitration. U.S. then could not admit rights which they contested & therefore objected to allowing

there are undoubted rights on the islands to be ~~dealt~~ considered or pooled. Rights have determined, there can be no objection to Company, (if necessary, in a Compensatory sense) ~~compromising~~ what is involved on both sides.

6 Difficulty, however, arises in respect to facts of the Case, British Evidence being to the effect that seal life is ~~seriously endangered~~ endangered by killing the annual regulations remain at present ~~in force~~ adopted. the term suggested by Tribunal for their revision, next year.

7 ~~It~~ British evidence, however, admits a general decrease which is concurred in by U.S. Difference only as to its amount & Causes, but even taking U.S. figures, we have supplied serious consequences next season. (Decreases between last seven seasons.)

8 Thus, in Sufficient Knowledge of all the facts of Seal life, there ~~could~~ might be a Valid reason for suggesting an immediate change in regulations, but the observations of at least one more season will be required to obtain this Knowledge, as it now seems,

~~U.S. Contention her~~

9 Danger is all theirs in consequence of the self-regulative character of sealing at sea, ~~in consequence~~ because of which the sealing fleet has increased. This results perhaps partly from fewer seals but certainly from lower prices, skins & higher wages of sealers.

10 U.S. Contention has been, chiefly, that Pelagic sealing destructive because Coast Catch includes many female seals, B.S. Catch many nursing & pregnant females, hence pups die on islands.

~~History~~ ~~in~~ ~~Season~~ ~~of~~ ~~of that~~

11 Since 1891 it has become known that very many pups die each year before pelagic sealing in B.S., under the regulations, could have had any effect thereon. This admitted by U.S. attributed to various causes unknown. On St Paul in 1896 10,022 dead bodies ~~were~~ found, over 1,000 on St. George, whole number dead during season about 23,000. U.S. assumed that effect of Pelagic sealing might be ~~detected~~ admitted, all would be due to this.

Discovery of 1897 of Lucinaria as
Cause of death almost exclusively, before in season
~~[illegible]~~ Pelagic sealing — Number comparable Could have effect
with 1896 — Throws doubt over Gilbert
the whole subject.

12 There is no reason to believe that deaths
from this cause ceased when season of Pelagic sealing
~~began~~ opened in B.S. & it continued at Equal rate,
very small number left to be accounted
for by possible starvation. Mortality may from parasite
have increased on St. Paul, Island
in fact Very probably
~~The~~ mortality

13. There was in 1896 ~~not~~ too
noticeably increase in the mortality

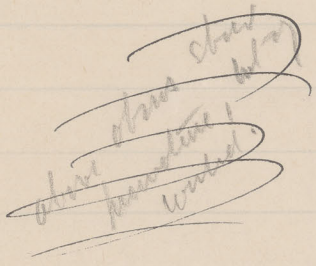
13 In 1896 there ~~40,000~~ 11,000 females
in milk, this undoubtedly ~~left~~ would
have left the islands before Pelagic
Sealing effects began. — ~~Probably~~ 20,000
during season. This seems fully to
account for the number of females in
milk taken beyond the 60 m. zone
in that year. (Total number of seals taken in
B.S. of all sexes was —)

(on Lucinaria)

14 Observations so far as known to us,
ceased before Aug. 15, 1897. If
Gyadly parasite after that date, it
practically means that one branch
of the U.S. evidence re Pelagic sealing

12. that relating to B.S., fails.

15 Attention is particularly directed to the
because a recent discovery, wholly unforeseen,
of fact seems the most important
enquiry to be made, & recommendations for its
solution continues uncertainties during
all of next season at least, before its
effect on any new regulations can be properly
allowed for.
If doubts & hopes as Islands (as seem as in certain cases)
Lucinaria, statement in B.S. Commissioners
report re regulations, fully borne out.
Seeding in B.S., outside zone, relatively
harmless. Coast Catch unobjectionable
in proportion & number taken. (Reps & P.-V.)



The above observations show that a
reconsideration of regulations of a satisfactory
kind, is at least premature. That imperatively
called for by the facts, in the interests of seal
life, & of undertaken, liable to dislocate
& injuriously affect existing industries
without any certain compensatory benefit.

If, however, the U.S. are so strongly of the
opinion that seal life is seriously menaced
by continuance of regulations of Tribunal for a
year or more, pending further enquiry as to facts,

that they are willing materially to curtail their right of killing on the islands in correspondence with changes in regulations of Pelagic sealing of a character suffered to be beneficial in the light of information now in hand, the nature of such changes may be indicated.

(It may here be remarked that the U.S. have never considered the interests of their own citizens engaged in Pelagic sealing, but at the same time have never attempted to apply to them regulations of the kind which they strongly advocate as absolutely essential.)

Guided by the indications above given, it might be proposed to do away altogether with the Early sealing season of "Coast Catch" which continues under Existing regulations to May 1st, (this being the time when many gravid females are killed), & to increase the length of the later sealing season.

This can be done only by adding to the open season some days previous to August 1st, the later season when it begins according to present regulations. This open season being naturally terminated by bad weather in September.

There can be no doubt that such change would favourably effect the Conditions of seal life, while it would practically obviate the unfortunate destruction of pregnant females allowed under the Award.

An examination of the available statistics shows that an addition of days previous to August 1st, would apparently effect this improvement in conditions equitably, in so far as the average Pelagic catch is concerned, taking the years

— — —

Such change would, however, undoubtedly put Pelagic Sealers to some disadvantage by introducing new conditions the bearing of which cannot fully be foreseen, & its probably beneficial effect on seal life might be absolutely nullified by the Conduct of the Lessees on the breeding islands. It is therefore essential that the U.S. should, on their part & as a preliminary, state what restrictions as to number killed under authority of the Treasury Department there, they propose to offer. If it should be insisted that their right on the islands should be unaffected & that restrictions should be imposed only on rights on the high seas, no equitable agreement can be come to.

Draft of my
Suggestions for
Argument - prepared
for Hon. Wm Dorsey
Nov. 97. previous
to his Mission to
Washington, with
Malcom Rose.

SUGGESTED LINE OF ARGUMENT BEHRING SEA CONFERENCE.

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1. Canada was not satisfied with sealing regulations of Paris Tribunal which while admitting rights, very seriously curtailed freedom of sealing and did not limit possibility of killing on Islands, although the Tribunal in Declaration No. I suggested that they (the regulations) should be supplemented by other regulations applicable within the limits of the sovereignty of each of the two Powers interested and to be settled by their common agreement.

2. Canada, nevertheless has not objected to the regulations laid down and has endeavoured in all respects to conform to them.

3. Practically no instances of wilful violation of regulations, and no object in keeping a large and expensive patrol in Behring Sea. Two.or three revenue cutters would fill requirements.

4. The United States dissatisfied now with Award, although Phelps and others originally expressed entire satisfaction. Pressing for revision before time

time stipulated by Tribunal, on ground that seals verging on extermination.

5. Conditions now differ from those before arbitration. United States then could not admit rights which they contested and therefore objected to allowing their own undoubted rights on the Islands to be considered or pooled. Rights now determined, there can be no objection to comparing, if necessary, in a compensatory sense what is of value on both sides.

6. Difficulty, however, arises in respect to facts of the case. British evidence being to the effect that seal life is not endangered by letting the present regulations run on at least to the term suggested by Tribunal for their revision next year.

7. British evidence, however, admits a general decrease which is concurred in by United States. Difference only as to its amount and causes but even taking United States figures, no reason to apprehend serious consequences ~~far~~ next season . (Decrease has moreover not been continuous.)

8. Thus if sufficient knowledge of all the facts

of

of seal life, there might be a valid reason for suggesting an immediate change of regulations, but the observations of at least one more season will be required to obtain this knowledge, as it now seems.

9. Danger is all the less in consequence of the self-regulative character of sealing at sea, because of which the sealing fleet has decreased. This results perhaps partly from fewer seals but certainly from lower prices of skins and higher wages of sealers.

10. United States' contention has been chiefly that pelagic sealing is destructive because Coast Catch includes many gravid females, Behring Sea Catch many nursing and also pregnant females, leaving pups to die on Islands.

11. Since 1891 it has been known that very many pups die each year before pelagic sealing in Behring Sea (under the restrictions in force in each year), could have had any effect on them. This admitted by United States. Attributed to various causes unknown. On St. Paul in 1896 over 10,000 dead pups found before this date; over 1,000 on St. George. Whole number dead during season about 23,000.

23,000. United States assumed that after date at which effect of pelagic sealing might be admitted, all mortality due to this. Discovery of 1897 re Uncinaria as cause of death almost exclusively in season before pelagic sealing could have effect, throws entirely new light on the whole subject.

12. There is no reason to believe that deaths from this cause ceased when season of pelagic sealing opened in Behring Sea. If it continued at equal rate, very small number left to be accounted for by possible starvation. Mortality from parasites may in fact very probably have increased later in the season.

13. In 1896 over 11,000 females in milk, thus undoubtedly bereaved of young, would have left the Islands before effects of pelagic sealing began -- possibly 20,000 during season. This seems fully to account for the number of females in milk taken beyond the sixty-mile zone in that year. Total number of seals taken in that year in Behring Sea of both sexes was less than 20,000.

14. Observations on Uncinaria so far as known to us ceased before August 15th, 1897. If deaths from this cause equally prevalent after that date, it means

means essentially that one branch of the United States' contention re pelagic sealing, i.e. that relating to Behring Sea, the starvation of pups due to sealing in that sea, fails. The sixty-mile zone of the Tribunal would remain a practically effective protective limit.

15. Attention is particularly directed to this cause of loss, because a recent discovery, wholly unforeseen. At present it seems the most important enquiry to be followed up and absolutely necessitates for its solution continuous observation during all of next season at least, before its effect on any new regulations can be properly allowed for. If deaths of pups chiefly (or even as is certain, largely) due to Uncinaria, statement in Behring Sea Commissioners' Report re regulations fully borne out. Sealing in Behring Sea, outside zone, relatively harmless. Coast Catch most injurious in proportion to number taken. (British Commissioners' Report, para. 128).

16. The above observations show that a reconsideration of regulations of a satisfactory kind, is at least premature. Not imperatively called for, in the interests of seal life, by the facts and if undertaken now is liable to dislocate and

injuriously

injuriously affect existing industries without any certain compensatory benefit of like value.

17. If, however, United States are so strongly of the opinion that seal life is seriously menaced by continuance of regulations of Tribunal for a year or more, pending further enquiry as to facts, that they are willing materially to curtail their right of killing on the Islands in correspondence with changes in regulations of pelagic sealing of a character supposed to be beneficial in the light of information now in hand, the nature of such changes may be discussed.

(It may here be remarked that the United States have never considered the interests of their own citizens engaged in pelagic sealing, but at the same time have never attempted to apply to their nationals regulations of the kind which they have for many years strongly advocated as absolutely essential.)

18. With regard to proposed changes in regulations and guided by the indications above given, it might be suggested to do away altogether with the early sealing season or Coast Catch which continues under existing regulations to May 1st, (this being the time when many gravid females are killed),

and

and to increase the length of the later sealing season.

19. This can be done only by adding to the open season some days previous to August 1st when the later or Behring Sea season begins according to present regulations; for this second open season is naturally terminated by bad weather in September

20. There can be no doubt that such change would favourably affect the conditions of seal life in an important degree, inasmuch as it would practically obviate the unfortunate destruction of gravid females allowed under the Award.

21. An examination of the available statistics shows that an addition of at least twenty-one days previous to August 1st. would be required to effect this improvement in conditions equitably, in so far as the average pelagic catch.is concerned. That is to say it would be possible, so far as available evidence goes, to take the same total number of seals at sea at less cost to seal life as a whole.

(During the so-called height of the season -- July 10th to July 20th there is a greater number of breeding females on the Islands than at any other time.)

22.

22. Such change would, however, undoubtedly put pelagic sealers to some disadvantage, (at least temporarily) by introducing new conditions, the whole bearing of which cannot fully be foreseen and its probable beneficial effect on seal life might be absolutely nullified by the conduct of the lessees on the breeding islands. It is therefore an essential prerequisite that the United States should, on their part, state what restrictions as to number killed under authority of Treasury Department there, they propose to offer. If it should be insisted that their rights on the Islands must remain unaffected and that restrictions should be imposed only on rights on the high seas it is obvious that no equitable agreement can be come to.

Behring Sea Argument

Discussed with
Sir L. Davies. Nov. 3.
1897

GEOLOGICAL SURVEY OF CANADA,
George M. Dawson, C.M.G., LL.D., F.R.S.,
DEPUTY HEAD AND DIRECTOR,
MUSEUM AND OFFICES, SUSSEX STREET, OTTAWA.

St. Paul Island 1897
June 14th.

Dear Dr. Dawson

After a very pleasant trip we from San Francisco the "Del Norte" reached St. George Island June 7th. We remained there five days giving me ample opportunity to visit all the rookeries. About the same number of bulls as were there last year had already arrived. There were but two cows on the whole island and I have seen only two here so that I am here in ample time to note anything of interest that happens on the rookeries while the formation of harems is going on. On St. George Island I made a very large collection of lichens, also I have found here in other years and several additions to my list I do not know when I shall have an opportunity of writing again but will have letters ready whenever a ship comes in

Yours truly
Dall

Malcom.
June 14. 97

Notes on Professor Jordan's Preliminary Report.

Whatever value this Report may have as a contribution to natural history its value as an aid to the consideration of the question of regulating the fishery is largely discounted by the obvious and irrational bias of its author against pelagic sealing.

The estimates attempted of the total number of seals are admitted to be worthless, and it is difficult to see why they have been made except for the purpose of prejudice. They have not even the merit of consistency. On page 17 we are informed "the number of three year olds is probably a little more than one third of the pups born three years ago, and a little lower on the same page the estimated total of three year olds at one time or another on the Islands in 1896 is given as thirty to forty thousand. If this estimate is correct then the number of pups in 1893 was at most 120,000 or 23,000 less than the number born on the Islands this year.

Moreover page 21 at least 32,000 three year old males were killed this year, as many probably being turned away, and all the hauling grounds are never driven in one year, yet the maximum estimate of 20,000 three year old males is two thousand less than the number actually killed.

The elaborate attempt on pages 17 and 18 to make out that pelagic sealing is the sole cause for the decline of the herd and that "there has never been a

time

time since 1870 at least when the cessation of land killing could have been helpful to the herd on the Pribiloff's" is astounding at this time of day.

Taking the figures of the pelagic catch from the Report of the United States Secretary to the Treasury for 1896 the total pelagic catch for the four years to the end of 1891 had been 156,429, for the four years ended 1895, the pelagic catch has been 195,583, and yet we are told that "there is evidence that the modus vivendi of 1892-3, by which Behring Sea was closed to the sealing fleet, has produced for 1895 and 1896 a slight check of the diminution. As regards the effect on the herd, if every mother killed at sea means a dead pup on the Islands, there can be no difference in point of distructiveness between the North Pacific catch and the Behring Sea catch. Yet though the pelagic catch since 1892 has been farm in excess of that for the four previous years and has been taken from a smaller herd, we are informed that the rate of decline has been partially arrested.

To any one less prejudiced the conclusion is irresistible that the comparative arrest of the decline is due to the diminished slaughter of males on the Islands beginning with 1890. The killable seals spared in that year became fit for service on the rookeries in 1893, and since that date the equilibrium has been preserved by the annual slaughter of as many females as males up to the present year when more males than females have been killed.

Professor Jordan is hard put to it in his

effort

effort to make out a decrease in the number of females on the rookeries in 1896 as compared with 1895. The count of females at the height of the season in 1895 was 70,423 and in 1896 at the height of the season it was 81,793, adding to each of these 75 per cent for cows absent at sea, we get the number of breeding seals in 1895 to be only 123,241 as compared with 143,071 in 1896.

The so-called evidence of Townsend's crosses (page 21) would be more conclusive of a decrease if it were established that the seals were as dense on the rookery in one year as another and that there was no lateral spreading out in one year as compared with the other. In the absence of such information it is worthless.

Mr Murrays count of the harems making 5,000 in 1895 and only 4853 in 1896 is a poor foundation to build an argument for a decreasepn, as on page 16 the number of harems in 1896 is given as 5009 or 9 more than Mr Murray's count of 1895. The insinuation in the same paragraph that the harems were individually less is equally unsupported.

The section of the Report (page 21) headed "Elements of change in the herd" is a notable example of how to prove a thing by statistics especially when your figures are mainly guess work. In the first place it is admitted that 22,000 three year old males were killed, and it says some 2,000 or 3,000 more of these are left, while nearly as many more were killed in 1895 as "long 2 year olds". This involves the assumption that <u>all</u> the three year olds were included

in

in the drives, but as in the case of breeding cows it was found that even at the height of the season three sevenths were absent at sea, it is not unreasonable to suppose that something like the same proportion of three year old bachelors are constantly at sea, and except by continuous redriving throughout the season it would be impossible to kill so large a proportion as 22000 out of 24,000. There was no need for such a redriving in 1896 to obtain the 30,000 killed, and the probability is that the number of three year olds was nearer forty than twenty thousand as put in the table on page 17, and the number of female three year olds the same.

If the gains to the herd are underestimated the losses are not. The females killed at sea are placed at 31,000 for the Behring Sea season of 1895 and the spring season of 1896 - a sufficient allowance out of a total catch at sea of 58,000 . Then there is an item of 5,000 shot at sea and lost, based on the assumption that for every eight seals caught in the North Pacific in the Spring five are killed and not recovered. Such an assumption is so obviously indefensible that Dr Jordan himself, tries to disarm criticism by saying that the elements of his table this one and the "natural loss at sea" especially - are so uncertain as to leave the calculation "almost valueless". I should say worse than valueless, totally misleading.

There are, however, some reliable figures to the significance of which I would call attention. The number of bulls active and reserve - that is males

of

of 6 years old and upwards was 8,000 in 1896. Now according to Professor Jordan page(22) the breeding cows in 1890 were 280,000, and I have no doubt he would allow that 290,000 would be a reasonable estimate for 1889, and 300,000 for 1888. The number of male pups born in these three years would therefore have been:-

1888	150,000
1889	145,000
1890	140,000
	435,000

Of the pups born in 1888 12,000 were killed as three year olds in 1891, of the pups of 1889, 7,500 in 1892 and of the pups of 1890, 7,500 in 1893, or a total of 27,000. The total pelagic catch of the four years 91,2,3,4 was 198,860, and as Dr Jordan says not more than 3/10ths of that is of males. The total number of males killed at sea would have been 59,658, say 60,000. I have allowed all the males of four years catch, so as to be perfectly safe.

Of the 435,000 males born in the three years in question therefore 27,000 were killed on the Islands and 60,000 at sea, leaving 348,000 to be accounted for. If we assume that 500[+] of the 8,000 bulls now in the Islands are over nine years of age, it follows that of 348,000 born in 1888-90 and not killed by man only 7,500 are now alive (i.e.) one out of 46.5. In other words the number of males born who survive to become breeders is one in 46.5 while according to Dr Jordan (page 17) the number of females who reappear

the

[+]If we are to believe with Dr Jordan (page 36) that "Doubtless ten years is a low estimate of the period of service of a bull", the number of bulls over nine years would be very much larger, and we should be entitled to claim to deduct

deduct 1,500 which would reduce the survivors of 1888-90 to 6,500 or one in 53.5.

the third year with pups "is probably a little more than 1/3rd of the pups born three years ago", and of those who reappear the second year to be impregnated for the first time at least one half (page 17) Every year therefore in a natural state of things would add 1 male out of 46.5 of those born to the breeding bulls and one in 2 of those born to the breeding cows, so that even supposing the average bull lives four years longer than the average cow, natural conditions would give only one bull to 23 cows, and the annual surplus of males which Dr Jordan advocates should be taken disappears.

If the statement on p.28 that "on the Pribilof Is. the number of fur seals (cows), exclusive of the young of the year (pups), is about double the number of males (bulls, half-bulls and bachelors)" is correct, and Dr Jordan's estimate of the proportion of females in the pelagic catch is also accurate, then as in the years 1890-5, more females than males have been killed by man, it follows that the natural mortality of males must be enormously greater than that of females.

See p. 35

35

One important fact the enquiry of this year has added to our knowledge of the question is that the two year old virgin cows - come on the rookeries after the breeding season is practically over and are impregnated mainly by the "Reserve Bulls", the old cows having left. If there were no "Reserve Bulls" these would have to wait till the return of the old bulls in the middle of September provided they were then in "heat" or be served by immature bulls. The danger to the herd therefore from over-killing of males is no less real than that from the over-killing of females, though it takes longer to shew itself on the rookeries. If the rookeries are now, as alleged overstocked with bulls, it is due to the fact that since 1891, (inclusive) probably more females than males have been killed by man.

We come now to the all important question of "starved" pups, where the desire of Dr Jordan to

make

make out a case against pelagic sealing rather than to consider the facts in an impartial manner, is painfully obvious.

On Page 29 Dr Jordan says "The number of pups (16,019) known to have starved to death on the Pribiloff Islands through the death of the mothers is about 55 % of the number of skins (29,398) recorded as brought to ports by vessels engaged in pelagic sealing in Behring Sea".

Assuming that 16,019 represents accurately+ the total number of pups which died on the rookeries subsequent to the first count of dead pups which could not have been the victims of pelagic sealing it must be seen how far the statement that this mortality is entirely due to pelagic sealing is justified by the facts set forth by Dr Jordan.

+The figures are are partly estimated and the estimate is not by any means above criticism.

On page 49 he gives a list of the results of autopsies of 103 pup seals made between August 5 and August 14th - that is before deaths could have been due to pelagic sealing.

Of these only 42 died from trampling, while 24 died from starvation, 14 from drowning, and 16 from accident or natural causes, while 7 are put down as both starved and trampled. About 60% therefore died from natural causes or starvation before pelagic sealing began, yet we are assured that after pelagic sealing began all the causes of mortality up to that date ceased . The starvation previous to pelagic sealing is put down to the pup wandering away and getting lost, and one would have thought that as after the middle of August when the harems begin to break

break up, and the pups wander further and further afield, this cause would operate even more largely after August 15 than before, and that a largely increased mortality from this cause would be found. This is not a mere surmise - fortunately Dr Jordan himself furnishes us with conclusive evidence, that it is a fact.

In his account of his visit to Medni (Copper Island) (pages 53-4) he says "In the first little pod of 20 pups, 6 are evidently starving; 8 recently starved dead ones lie there, and there are four dead ones of older date, but also emaciated" That is to say 18 pups dead from starvation or starving to 14 healthy. He goes on "Zapadne Rookery seems not much larger than little Polavnia, of St.Paul on the rookery ground are 11 fresh starved pups, besides 14 which seem, some of them at least, to have been starved, but which are now largely decomposed. + + + + A pod of 46 pups on shore is examined as a whole they seem much less active than Pribiloff pups, smaller sleepier, and more stupid. Seventeen of the number are evidently starving. Some look plump, but it is probable that nearly all of these land pups are really starving; the large and well fed ones have taken to the water. Other pods show similar characteristics. In a group of some 200 about 80 are evidently starving. This is not a count but a rough guess. The percentage in general holds for all groups examined.

If this means anything it means that 80 out of 200 or 40% of the pups on Medne Island were starving or starved. All this appalling mortality Dr Jordan puts down to pelagic sealing, but unfortunately

unfortunately for him the table he gives on pages 63-4. shows that the total pelagic catch in the neighbourhood of the Commander Islands was 1,028, and we are informed (paragraph 27 Report of Commander of the "Swift") that "all the sealing was being carried out near the mainland about 90 miles from Behring Island". It was therefore impossible for any but an insignificant fraction of this mortality on Copper Island, to be caused by pelagic sealing. A perusal even of the Daily Record of Life on the Rookery Chapter XIX pages 54-61, might have moderated Dr Jordan's anathemas. P.60 "A wet cow is seen to recognize a pup which looks as if he were half starved" + + + "a little grey pup, very thin and with a starved look wakes up from under the big rock on the south side of the slide. + + + The cow recognizes him and &c.". + + + "He looks just like many of the pups we have been pronouncing doomed".
Page 61 "The little half starved gray pup noticed trying to find his mother yesterday is nursing today &c."

All this taken with the observations of Dr Jordan at Medni Island shews that a pup may appear to be starving simply because its mother has prolonged her absence too much, and that a large proportion actually die from that cause or from wandering away and being unable to find his way back to the place on the rookery where his mother is likely to find him.

Further of the seventeen autopsies made between August 15 and September 8 one death was due to inflammation

inflammation of the bowels and one to trampling, which so far as it is possible to argue from so very small a number of cases, proves that the natural causes other than starvation causing death before August 15 also cause death after that date.

The 16,019 includes 1527 pups "starving" and as the extracts quoted from the "Daily Record of Life on the Rookery" shew, it is rather dangerous to assume that a pup shewing signs of starvation has lost its mother - except temporarily and the 1527 is liable to a large deduction on this account.

Twenty per cent is also added to the dead actually found for those which disappeared between the two counts. This is an extreme allowance, and Dr Jordan might have made that a little clearer than he does on page 51.

In regard to the mortality on St.George Island it is only an estimate and a grossly extravagant one. The August count shewed that the mortality on St.George up to that date was only 3.6 per cent as compared with 8.4% on St.Paul, yet Dr Jordan calmly assumes that the rate of mortality after the middle of August was the same on St.George as on St.Paul though the number of dead pups found had only increased from 736 to 897, and though he himself says (page 53) that the rookeries on St.George possibly suffered less from pelagic sealing. In fact Dr Jordan manipulates by this averaging process 161 dead pups into 2240. The fact that only 19 "starving" pups were seen on St.George as compared with 1527 on

St.Paul

St.Paul though if the same proportion obtained on both Islands there should have been 250 "starving" on St.George shews how little attention Dr Jordan has paid to actual facts in his zeal for making out a case against pelagic sealing.

If we make proper allowance for error in the 20% added on St.Paul and the process of multiplication practised on the St.George figures, the 16,019 will reduce to something nearer 14,000.

It has also to be borne in mind in considering Dr Jordan's statement that the whole of this mortality is due to pelagic sealing, that it involves not only the denial of other admittedly serious causes of mortality, but also the assumption that the pup is totally dependent on its mother for subsistence until they both leave the Islands in November (page 50).

This assumption has as little foundation as the others which embellish the Report. Pups are born on the Islands from the 10th of June (page 10) to September (Page 24) that is over a period of three months. The bulk are born before July 1 and if the pup born in September or even August is fit to be weaned in the beginning of November surely those born in June, must have been practically independent of their mothers for two months earlier.

The fact that the stomachs of pups were mostly found empty proves nothing. The same condition practically was found in all other seals bachelors and females killed on the Islands. On page 31 Dr Jordan states that "the fur seals remain

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in the water until the food in their stomachs is digested", and that (page 10) as early as 26th August the pups begin to swim long distances from the rookery. Perhaps if one of these pups a long distance from the rookery had been killed or even watched, we should have been in a better position to judge whether pups take other food than mother's milk, at present at any rate, there is nothing to prove that in the case of the fur seal, there is not, as in the case of every other young animal, a transition period more or less prolonged during which it is gradually accustomed to its future food while still partially supplied by its mother and that if deprived entirely of its mother's support during that period it must necessarily die.

The account given on page 48 of the wanton starving of a pup in order that the starvation process might be watched, shews how much reality there is in all the outcry about "humanity" in connection with this question. The branding on an extensive scale too, is of a piece with the starvation experiment.

(Intd) J.A. 1.2.97.

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CONFIDENTIAL.

[March 4.]

SECTION 1.

No. 1.

Professor D'Arcy Thompson to the Marquess of Salisbury.—(*Received March* 4.)

My Lord, *March* 4, 1897.

AFTER visiting, according to your Lordship's instructions, the Pribyloff and Commander Islands for the purpose of investigating the condition of the seal rookeries thereon, I have the honour to submit the following Report:—

2. The main object of my mission was the collection of information and statistics with regard to the working and effectiveness of the Regulations for the fur-seal fishery prescribed by the Award of the Paris Arbitration Tribunal.

3. It was particularly enjoined on me to investigate the breeding rookeries with a view to ascertaining the extent and causes of the alleged mortality of unweaned pups.

4. I was further instructed to inspect and estimate the number of seals resorting to the islands, and in particular to the Pribyloff Islands, and to compare the phenomena that I witnessed with the information and statistics supplied for the season of 1895 by the American Agents. (54th Congress, 1st Session, Sen. Doc. 137, Part I, pp. 372, 373.)

5. Lastly, I was directed to call upon the authorities in Washington and Ottawa, and to obtain there, and collect also from persons connected with the sealing industry in Victoria, information bearing on the business of my mission.

6. Mr. G. E. H. Barrett-Hamilton was associated with me and placed under my orders, with instructions to proceed, in the first instance, to Robben Island and the Commander Islands, and to investigate those localities in particular. Mr. James Macoun was associated with me as an Agent of the Dominion Government, and Mr. A. Halkett was directed at the same time by the same Government to proceed to Behring Sea on board a sealing-schooner, and to watch during the summer the methods and results of the pelagic industry.

7. I left England on the 23rd May, and arrived in Washington on the morning of the 30th May. His Excellency Sir Julian Pauncefote presented me to Mr. Olney and to Mr. C. S. Hamlin, Assistant Secretary to the United States' Treasury. With the latter gentleman, who had himself visited the seal islands in the summer of 1894, I had the benefit of much conversation, together with the advantage of introductions to the whole body of naturalists resident in Washington who had given thought to the matter, or participated in the research. Among those who did most to entertain and enlighten me were Mr. J. Browne Goode, of the Smithsonian Institute, the news of whose untimely and lamentable decease was to reach me ere my return; Commander J. J. Brice, of the Fisheries Department; Mr. Ridgway, Assistant in the same Department; Dr. L. Stejneger, Mr. F. True, and Mr. F. A. Lucas, of the National Museum, who had all been, or were about to be, employed in this particular inquiry.

8. On the night of the 3rd June, I left Washington for Ottawa, in company with Mr. J. Macoun, who had met me in New York. From Ottawa I journeyed to Quebec, at the request of his Excellency the Governor-General, in order to confer with his Excellency regarding the object of my mission. Returning to Ottawa on the 9th June, I discussed the whole question at length with Dr. G. M. Dawson, who was kind enough to draw up a collection of notes and suggestions for my information and guidance. In company with Messrs. Macoun and Halkett, I left Ottawa on the 10th June, and arrived in Victoria, British Columbia, on the 15th June.

9. In Victoria I associated and conversed with a number of the captains of sealing-schooners, who were then engaged in fitting out their vessels for the summer's cruise, and especially with Captain Sieward, of the "Dora Sieward," who had offered the hospitality of his ship to Mr. A. Halkett for the summer. I became acquainted also with several gentlemen connected with the industry, and particularly with Mr. Joseph Boscowitz, a leading trader, with large interests in the sealing business.

Admiral Stephenson, who was at that time leaving the station, and Admiral H. St. John Palliser, who was then assuming the command, received me with much kindness, and undertook to meet my requirements for conveyance in or from Behring Sea on board Her Majesty's ships.

I had previously received information that the United States' Government had extended to me an invitation to proceed to Behring Sea on board the United States' ship "Albatross," and I now learned that an American Commission had been appointed on the 18th June (since my departure from Washington) for an identical investigation. This Commission was headed by Dr. David Starr Jordan, President of the Leland Stanford University. Mr. Joseph Murray, of Fort Collins, Colorada, formerly United States' Treasury Agent at St. Paul Island, was selected as Assistant Commissioner, and the following gentlemen from the United States' National Museum and the United States' Fish Commission were detailed as associates: Lieutenant Commander Jefferson F. Moser, commanding the United States' Fish Commission steamer "Albatross;" Dr. Leonard Stejneger, Curator of Reptiles, United States' National Museum; Mr. Frederic A. Lucas, Curator of Comparative Anatomy, United States' National Museum; and Mr. Charles H. Townsend, Naturalist of the "Albatross."

Mr. G. A. Clark acted as Secretary to the Commission, and took a very important part in its subsequent investigations.

10. On the 19th June I departed from Victoria for Seattle, in the State of Washington, to join the "Albatross." On the 24th June I set sail from Seattle for Unalaska on board that vessel, in company with the American Commissioners and Mr. Macoun, Mr. Barrett-Hamilton being then on his way from San Francisco to Japan, *en route* for the Kurile Islands and the Sea of Ochotsk.

11. On the 3rd July we reached Unalaska, and disembarked on the 8th July on the Island of St. George. We were here received with great kindness by Mr. James Judge, Resident Agent of the United States' Treasury, and by Dr. L. A. Noyes and Captain Daniel Webster, of the North American Commercial Company.

12. On the 12th July we left the Island of St. George, and arrived on the same day at that of St. Paul, where we were received by Mr. J. B. Crowley, Resident Agent of the United States' Treasury, by Mr. J. B. Stanley Brown, Agent of the North American Commercial Company, and by Dr. O. H. Voss and Mr. J. C. Redpath, officials of the Company. Quarters were provided for us in the Company's house, a small laboratory and a photographic room were presently fitted up for our use in an empty hut, and then and thereafter, during the whole of our stay, we experienced the greatest kindness and attention from the above-named gentlemen and from the people of the island.

13. On the 15th August Her Majesty's ships "Satellite" and "Icarus" arrived off the island. On the following morning I embarked for the Commander Islands on board the "Satellite," accompanied by Dr. Jordan, to whom Commander Allen had offered the hospitality of the ship.

14. On the 22nd July we arrived at Behring Island, where we were received by Mr. Emil Kluge, agent for the Russian Fur Company.

We learned that the Governor of the islands, Colonel Grebnitzki and Mr. Barrett-Hamilton were both on Copper Island, and we accordingly set sail thither on the 24th July. On the intervening day it was impracticable to visit the rookeries, 12 miles distant from our anchorage at Nikolski, and our intention to return thither had to be afterwards abandoned.

15. On the 25th July, in the early morning, we anchored off the village of Preobrajenski, in Copper Island, where I immediately landed and paid my respects to the Governor. We then, accompanied by Mr. Barrett-Hamilton, sailed to the neighbouring village of Glinka, from which place we crossed the island, and, under the guidance of Major Waxmuth, Governor of Copper Island, spent a day in surveying seven out of the twelve portions that constitute the great rookery which takes its name from the village. Our journey going and coming followed two of the three chief drive-routes of the seals.

16. The conditions of weather and the difficulties of anchorage and of landing rendering it inadvisable to delay, and the other Commander Island rookeries having been sufficiently surveyed by Mr. Barrett-Hamilton, we departed the same night on our return voyage to the Pribyloffs by way of Unalaska, from which place Her Majesty's ship "Pheasant," Commander F. A. Garforth, conveyed us to the islands.

17. We regained the Island of St. Paul on the 1st September. On the 8th September, in company with Dr. Jordan and Mr. Lucas, of the American Commission, I left St. Paul on board the United States' revenue-cutter "Rush," Captain W. H. Roberts, reached Sitka on the 22nd September, and arrived in Victoria on the 30th September. Messrs. Barrett-Hamilton and Macoun and Mr. Clark and Colonel Murray, of the American

Commission, remained behind upon the islands, in order to resume and repeat during the first days of October the investigation and count of the dead pups.

18. I spent some days in Victoria, during which time Mr. A. R. Milne, C.M.G., Collector of Customs, furnished me with much information, and made me acquainted with several gentlemen versed or interested in the seal question, besides those whom I had met formerly.

19. Leaving Victoria on the 10th October, I travelled, in accordance with my instructions, to Ottawa, for the purpose of conferring with Dr. G. M. Dawson, and also, in the absence of the Minister of Marine and Fisheries, with Mr. Gourdeau, the Deputy Minister, and with Professor Prince, Commissioner of Fisheries. I had also here an opportunity of discussing the circumstances of the case with Sir C. Hibbert Tupper, who was about to proceed to Victoria as counsel for the Canadian sealers in the cases awaiting arbitration.

20. On the 20th October I left Ottawa, and arrived in London on the 31st October.

21. It is my duty to inform your Lordship that I and my colleagues received at every stage of our journey and in every portion of our work such kindness and hospitality as call for the warmest expression of our thanks. In our association with the officials of the United States' Government, with the captains and officers of the United States' ship "Albatross," with the captains and officers of the United States' revenue-cutters cruising in Behring Sea, in the conduct of the Company's officials resident on the islands, and in a very high degree in the attitude of the American Commission, we recognised continual anxiety for our comfort, and thoughtful provision for the accomplishment of our business.

It deserves to be particularly recorded that on the islands we enjoyed, together with the American Commissioners, opportunities and privileges that had never before been accorded to any investigators, whether American or British; that the utmost liberty of action within the bounds of reason was permitted us; that, in short, we were left free to see all that was to be seen, and to do whatsoever commended itself to our inclinations or judgment.

22. Lastly, it behoves me to acknowledge that in the investigations presently to be described my own part was that of one among many, and that the chief burden lay with Dr. Jordan and his Commission. On those great and scattered rookeries a man working singly can do little, where a company working in collusion can do much. Accordingly it was my business to co-operate continually with the Americans, to see what they saw, and to participate in what they did; and, as an eye-witness of all that they witnessed, I desire to place my testimony on record that the general success of our expedition, the new knowledge as to matters of fact that we obtained, and in particular the censuses that we for the first time attempted and achieved, were one and all the direct result of Dr. Jordan's counsel and leadership.

It is my purpose to deal in this Report with the general case under the following sub divisions:—

1. The present condition of the seal rookeries on the Pribyloff Islands.
2. The extent and causes of the mortality of pups.
3. The driving and killing of seals on the islands and other matters of local management.
4. Statistics of the industry.

St. George Island.

The Aspect and Condition of the Rookeries.

North Rookery.

This rookery occupies a stretch of rough shore, strewn with great blocks of basalt, for the space of about 1,000–1,100 yards west of the village, on the north shore of the island.

Behind the more or less narrow beach rise low cliffs, broken here and there by gullies giving easy access to the gently sloping plateau above, the main resort of the young seals and bachelors. Such a configuration of low beach and higher background conveniently approached is characteristic of the majority of the rookeries on both islands. In this case a deep gully at the east (cf. photograph No. 95) and another about 300 yards beyond the west end of the breeding rookery form the main ascents to the hauling-grounds. The westernmost gully of the actual rookery (photograph No. 94) was, we were told, an important ascent to the hauling-grounds ten or fifteen years ago.

The harems occupy the beach in a line at first sight continuous, but interrupted by five short breaks amounting in the aggregate to a space of about 150 yards. In the two westernmost patches of the rookery the harems run back from the beach up two convenient gullies to a distance in the westernmost case of about 50 yards from the shore in the early part of the season.

On our first visit (the 8th July) we attempted to compare the aspect of the rookery with the outlines marked by Mr. Townsend, on the 18th July, 1895, upon Mr. Stanley Brown's map of the rookery (cf. Sen. Doc. 137, Part II, Chart I).

Mr. Townsend pointed out to us that the extremities of the re-entrant avenues in the western gullies were now apparently slightly curtailed, that a small break existed, not marked in his map, in the first or eastern patch, and that the middle patches were thinned off at their ends. But it seemed to me that in at least one part (of the westernmost patch but one) the space occupied was broader than the map displayed; and bearing in mind, firstly, that the original survey was a rough one (as Captain Moser and his officers proved by a partial resurvey this year), and, secondly, that the plotting of the occupied areas by a bird's-eye inspection was rougher still, and, thirdly, that our visit was ten days earlier in date than that of Mr. Townsend the year before, and fell by so much the more short of the period of maximum expansion of the rookery, it seemed clear to me that at least no such curtailment of the rookery's extent had taken place within a year as could be certainly discerned by the eye or demonstrated on the chart.

(The "spreading" of the rookery as the season advances may be shown by a comparison of Mr. Macoun's photographs Nos. 2, 4, taken the 10th July, 1896, with mine No. 93 taken from the same station on the 30th July.)

On the hauling-ground above the eastern end of the rookery (still on the occasion of our first visit) we saw a body of about 200 bachelors, mostly young or old, those of intermediate "killable" size being very few. A "drive" had taken place two days previously (the 6th July) from this rookery and the neighbouring one of Staraye Atil, at which 700 were killed. The circumstance that another drive on the 13th July from the same two rookeries yielded 487 skins, and a final one, on the 24th July, 308, illustrates the fact that the bachelors, at least, are never all at once upon the rookery, but keep coming and going between land and sea, so that any one apparent clearance is never a complete one.

We counted a large number of harems with a view to ascertaining the average number of cows. I, for instance, counted 34 harems west of the middle point of the rookery, and obtained the following numbers:—43, 14, 15, 16, 67, 15, 8, 1, 2, 3, 1, 4, 50, 4, 1, 26, 10, 3, 10, 1, 4, 16, 5, 7, 49, 19, 5, 1, 132, 31, total 563, giving an average of about 16·6.

The large harem numbering 132 cows was by far the largest that we met with during the summer. It was situated on the smooth flat rock above the last gully but one to the west, its position being near the left of my photographs Nos. 90 and 91. The bull was very large and active, going round and round his cows. In his immediate neighbourhood were eight other well-grown bulls, one with fourteen cows, two with one each, the rest with none.

On my subsequent visit on the 30th July this large harem we found to be broken

up and apparently divided between six or seven bulls. Within a short distance of it were nineteen harems and six well-grown bulls still "idle."

We have here illustrated several elementary facts of seal economy; for instance, that there is no moderation in the bull's desires, but that he gets to himself as many cows as he possibly can; that the harems are as diverse in number as the bulls are unequal in strength and ferocity; that the harems, once formed, are not immutable, but may in the ceaseless combat be broken up and redistributed; and that many bulls, apparently in full strength and vigour, may for months together fail to establish a harem at all.

Other partial counts of the rookery (still on our first visit) gave us, for instance, 684 cows to 35 bulls (average 19·5), 510 to 30 (average 17), 874 to 54 (average 16·2), on the whole an average of 17·4, and this was very approximately the average that similar counts elsewhere afterwards led us to.

On the 30th July Colonel Murray, together with Mr. Lucas and me, counted the harems then existing on North Rookery, and found 225, with about 100 idle bulls. Colonel Murray's statistics for the previous year give 100 harems and 50 idle bulls. (Sen. Doc. 137 1, p. 373.)

Staraye Atil.

The rookery of Staraye Atil occupies, like several others (*e.g.*, at Zapadnie and East Rookeries on St. George Island), the place where a comparatively level shore merges into a line of cliffs. The bevelled end of the higher ground in such cases furnishes a gradual slope upon which the body of seals extends to a considerable elevation. At Staraye Atil a high green hill-side slopes in semi-circular form to a shingly tract facing northward. In a hollow between is a small lake, the resting-place of innumerable kittiwakes. Beyond the western point of the bay the coast bends at a sharp angle south-westward, and changes to a line of cliffs, precipitous, inaccessible, and unapproachable. The sharp ascending summit-line of the beginning of the cliffs forms the boundary of the hollow. The main rookery faces north-west, occupying the border of the slope towards the edge of the precipice, to about half-way up. On the front of the green hill-side, two thick patches of wild celery (*angelica*) form a conspicuous land-mark, and around these and below them is visible the outline of the old hauling-ground, less distinct than in the photographs of 1892. On the 30th July a considerable body of bachelors was seen high on the hill above the main rookery, while other bachelors and idle bulls congregated in small numbers on the beach.

A comparison between Mr. Townsend's photograph No. 38 (18th July, 1895) and mine No. 1 (7th July, 1896) or No. 89 (30th July) shows clearly enough that no conspicuous change had taken place in the rookery within a twelvemonth, while a comparison of the last two, taken at an interval of three weeks, shows that in the course of the season the rookery had spread somewhat further up the hill and somewhat further from the edge of the cliff.

In this rookery Colonel Murray counted, in my presence and Mr. Lucas's, on the 30th July, seventy-five harems and seventy-five idle bulls. His statistics for 1895 give sixty harems and forty idle bulls.

Zapadnie (St. George).

This rookery occupies the southern half of a wide bay on the south-west side of the island. To the southward, as at Staraye Atil, beyond the point which terminates the bay, a line of high cliffs succeeds to a level stretch of shore. The rookery consists of two elongated patches on the beach and a third larger patch which partly lies below and partly ascends the sloping edge of the rising ground where the beach merges into the cliffs. The main hauling-ground for the bachelors lies between the two latter portions, and above and behind the last.

We first visited this rookery on the 9th and 11th July.

The first or northernmost patch upon the beach then contained thirty-two harems, the nine largest counting from ten to thirty-three cows, the rest varying from one upwards, giving (at this date) the low average of 9·2 cows to each. Twenty-four large idle bulls were counted in the immediate neighbourhood. The great number of idle bulls in all parts was a conspicuous feature of this rookery.

The middle patch of the same rookery is somewhat larger.

Both of these patches appeared to be somewhat narrower than Mr. Townsend had represented them in his chart of 1895, but the first patch seemed to me somewhat more

elongated along the shore in a northerly direction. At this date the region close to the water was in both photographs almost unoccupied, and in neither case did the harems rise up above the sloping tract to the level of the higher ground. They had to some extent spread out backwards by the time of our second visit on the 1st August.

The south end of the rookery is of greater extent and much more populous. It commences where the level ground meets the cliffs. The harems ascend the slope, on which a broad shelf or "bench" gives a convenient habitation for many, and a small number of harems run along the beach for a short distance below the first stretch of ascending cliffs. Reference both to the map and the photographs tends to show that this rookery has diminished in recent years. We must make some allowance for the fact that our first photographs of this year were taken (11th July) before the spreading of the rookery had begun, and that my second series were made (1st August) when many cows had begun to go to sea; but, nevertheless, it is evident that Mr. Townsend's photographs Nos. 39 and 40 (18th July, 1895) depict a larger body of seals, both on the slope of the hill and in the distant patches of the rookery, than do my corresponding ones, No. 13 (11th July) and No. 98 (1st August). Mr. Macoun's photograph No. 50 of the 29th July, 1892, shows also a decidedly larger mass of seals on the slope of the hill than do Mr. Townsend's pictures of 1895.

This reduction of numbers on Zapadnie is, I think, unmistakable, and it deserves to be pointed out that there seemed to be no particular circumstances attending our inspection of this rookery, no special facilities for our close examination of it, such as might account for a decrease being here more easily demonstrated than on other rookeries where we failed to observe it.

On the other hand, while the photographs undoubtedly give indications of a diminution, its extent must not be exaggerated. On comparing my photographs above quoted of the 11th July and 1st August, we see that on the slope of the hill there were far fewer seals present at the latter than at the former date, while a very large number are congregated below the cliff. In this latter situation there appeared to me to be at least 1,000 pups. The day was exceptionally bright and warm, and I think the rookery was in part deserted. Moreover, Colonel Murray's actual count gives us for 1896 182 harems and 100 idle bulls, against 110 and 50 respectively for 1895. For this reason I can lay little stress on the apparent indications of decrease since last year, although I think that in the longer interval since the taking of Mr. Macoun's photograph of the 29th July, 1892, the diminution in this particular locality is distinct and considerable.

East Rookery.

East Rookery lies along a convex shore near the extreme end of the north side of the island. In the eastern portion of the rookery, as at Zapadnie and Staraye Atil, the low-lying shore merges into a line of cliffs, and the harems are in part scattered upon the connecting slope and in part distributed further eastward beneath the cliffs. The open part of the tract, on which are four or five patches of seals, is divided by a small point and terminated by another. A little lake intervenes between the first point and the sloping hill. On the rough face of the latter, as at Staraye Atil, is the main body of seals, thinly scattered and not nearly covering the whole face of the hill. On this portion and on the beach below are about sixty bulls with harems. On the more inland portion of the slope and around and behind the little lake, are congregated the bachelors. On the shore in front of the lake, and again between the two western points, are colonies of sea-lions, the first including about 150 individuals, the others much smaller. Still further to the westward is yet another point occupied by sea-lions; and between this and the former one, well up beyond the beach, are bands of bachelors.

On the beach between the lake and the first point were about twenty harems, between the two points thirty-three, and below the cliffs to the eastward of where our joint count began Mr. Lucas counted nineteen.

Little East Rookery.

This little rookery occupies a rough stretch of very rocky shore, about 400 to 500 yards west of East Rookery. We found it to contain forty bulls with harems.

In the case of the small rookery of Little East, the photographs give an adequate picture of the breeding herd. I think that a comparison of Mr. Townsend's photograph No. 39 (18th July, 1895) with mine No. 2 (9th July, 1896) or No. 84 (29th July, 1896) shows very clearly that the rookery was at least as well filled last year as the year before.

Taking East and Little East together, Colonel Murray counted (1st August, 1896) 179 harems and 55 idle bulls, that is to say, about as many harems as at Zapadnie and but half as many idle bulls. His figures for last year give 105 harems (East 80, Little East 25) and 60 idle bulls (East 40, Little East 20).

(I may here venture to say in parenthesis that, while Colonel Murray's enumeration always seemed to me most careful, I was on the occasion of this visit particularly impressed by his punctilious accuracy. While in every case his count nearly tallied with my own, yet in every section of the rookery his figures exceeded mine by a unit or two, showing that he had every here and there detected a harem which had escaped my eye.)

In the following table of statistics from St. George Island, I have set side by side the results of this year with those of last. For this year we have the count of harems (and idle bulls) made by Colonel Murray in company with Mr. Lucas and myself. The number of cows is estimated, first, on the basis of 17·3 cows to the average visible harems; secondly, plus the addition of 75 per cent. deduced from our count of pups on Ketavie, and elsewhere, which count showed to that extent a larger number of pups than of cows present at any one time (*vide infra*, pp. 9, 10). For 1895 we have, firstly, Colonel Murray's similar count of bulls and of harems, which he then made out to be over 43 per cent. less numerous than last year; the cows he estimated at 40 to a harem, as against our extreme corrected estimate of 30·2 ($17{\cdot}3 \times \frac{75}{100}$), nevertheless producing a total, 35 per cent. below that accepted for this year by the American Commissioners and by ourselves. Lastly, we have for 1895 the rough estimate based on average of Messrs. True and Townsend, who place the number of cows at over 55 per cent. less than the number admitted to exist this year; and the fact that, according to these gentlemen, the number of bulls was comparatively high (only 16 per cent. below our own), is not of equal importance, for their estimate was based primarily on the cows, and the bulls were not counted at all.

STATISTICS for St. George Island, 1895–96.

Rookery.	1895.					1896.			
	Colonel Murray.			Messrs. True and Townsend.		Colonel Murray.		Dr. Jordan.	
	Harems.	Idle Bulls.	Cows at 40.	Harems.	Cows.	Harems.	Idle Bulls.	Cows at 17·3.	Cows + 75 per cent.
North	100	40	4,000	175	2,800	225	100	3,891	6,809
Staraye Atil ..	60	50	2,400	87	1,398	75	75	1,297	2,269
Zapadnie	110	50	4,400	174	2,786	182	100	3,148	5,508
East	80	40	3,200	92	1,476	135	55	2,335	4,086
Little East ..	25	20	1,000	33	527	44		761	1,381
Totals ..	375	200	13,000	560	8,987	661	335	11,432	20,003

I do not in this case, nor in other similar cases in the sequel, quote my friends, Messrs. True and Townsend, with the least intention of imputing inaccuracy to their observations. On the contrary, I shall take pains to show in another place that we have ample indications of the care and accuracy with which their estimate was made, according to their opportunities and the knowledge current in their time. It is Dr. Jordan's own discovery of the fact that no enumeration of cows, even at the "height of the season," comes within 75 per cent. of the actual number appertaining to the rookery, that has thrown a new light upon the question and shown us that such numerical estimates as those of Messrs. True and Townsend were utterly misleading, in spite of all their care and truth and accuracy.

I do not claim the right to draw from these discrepant figures any positive evidence of an actual increase of the herd on St. George's Island between the seasons of 1895 and 1896, or at least any accurate measure of such an apparent increase. But, on the other hand, it is abundantly clear that we have no evidence at all to show a decrease during that period, and further that the state of the herd upon the island is at least very much better than it was believed to be on the authority of the American Agents of 1895.

St. Paul Island.

Ketavie.

The rookery of Ketavie lies on the eastern side, near the south end of St. Paul Island, on the opposite side to, but within a short walk of, the village. It runs along the shore for nearly a mile of coast-line, beginning some 300 yards from Ketavie Point, along the northern shore of a crescent-shaped bay, and then extends from Ketavie Point due north to another point forming an artificial boundary between it and Lukannon. The first portion south of the point occupies a steep beach, shingly and rocky. The northern portion consists of straight stretches interrupted by small coves or bays, of which the last one is next to Lukannon, and forms a natural amphitheatre. Close to the water's edge the shore consists of an entablature of columnar basalt, above which a shelving slope, gravelly and stony, leads with or without bolder interruptions to the level ground above. The chief hauling-ground lies near the south end of the rookery, and is approached from seaward in the neighbourhood of Ketavie Point. The rookery affords peculiar facilities for close inspection, and the counts made upon it are of particular importance.

We visited Ketavie for the first time on the 13th July. In the little amphitheatre-shaped bay already mentioned I then counted 500 cows, and Dr. Stejneger, counting independently, made out 501. Taking the bay and a little tract adjoining, I counted thirty-five harems with from 1 cow to 80 (the next largest being 75, and the next 53), and with a total number of 781, giving the large average to each of 22·1. There were rather more than twenty idle bulls within this area.

On the next portion, which consists of a broken terrace of columnar basalt, with a narrow sandy acclivity behind, I found the first twenty-five harems to include 395 cows (1 to 56), giving an average of 15·2. The further counts made on this occasion need not be recapitulated. They were not complete, and only give an idea of the average size of the harems.

My photograph of the middle portion of Ketavie, looking towards Ketavie Point (No. 16, 13th July, 1896), coincides in position with that of Mr. Macoun (No. 16, 25th July, 1892) and that of Mr. Townsend (No. 14, 20th July, 1895). I cannot detect any appreciable difference in the number of seals represented in the three.

The small bay already twice alluded to is beautifully depicted in Mr. Townsend's photograph No. 13 (20th July, 1895), and is also very clearly portrayed in my No. 15 (13th July, 1896). It seems to me that there are actually considerably more seals figured in the latter picture. However, I do not wish to press this point too much, for it may be that at the later date a larger number of cows were feeding at sea. But, on the other hand, Mr. Townsend's photograph does not show any great preponderance of pups, and at the date when it was taken the older females have not, as a matter of fact, betaken themselves in large proportion to the water. My companion picture (No. 116), taken on the 8th August, 1896, shows, however, that by that time a partial exodus has taken place, and the spot is black with a crowd consisting almost wholly of pups grouped around the bulls. Moreover, the photograph at this last date shows the rookery dispersed much higher up the ascent, the earlier photographs—mine and Mr. Townsend's—alike showing the rookery in its earlier, more restricted condition.

Whether or not there be any reasonable grounds for suspecting an increase, I am perfectly certain in my own mind that there is no evidence at all of recent diminution in this rookery.

On the same date (13th July) of our first visit Colonel Murray counted 190 harems and 100 idle bulls (according to the list communicated to me by him on the 7th September). At the average rate adopted by us of 17·3 cows to a harem at this period, that number would give 3,217 cows. The figures adopted by Dr. Jordan (Preliminary Report, p. 16) show 182 harems, and (at the same average) 3,152 cows, an unimportant difference. In 1895 Colonel Murray set the total at 200 harems and 50 idle bulls.

It was in this rookery, after noticing the apparently disproportionate number of pups, that Dr. Jordan initiated the crucial experiment of counting the latter. The count of living pups on Ketavie was performed on the 15th August, and showed the surprising number of 6,049. This figure represents an increase of 91 per cent. over what we had at first believed to exist on the basis of Dr. Jordan's entire estimate, or of 88 per cent. on the basis of Colonel Murray's.

Note.—Dr. Jordan's figures for the other rookeries are calculated by adding 75 per cent. to those furnished by the count of harems in the earlier part of the season after

allowing, as was then done, 17·3 cows to a harem. The strict count made upon Ketavie would, as is above shown, permit the addition of 90 per cent. rather than 75 per cent., and, indeed, Dr. Jordan himself speaks (Preliminary Report, p. 20) of the number of pups on any rookery being nearly double the greatest number of cows counted upon it at any one time. The lower figure is adopted on the ground of a lower result obtained on Lagoon Rookery and the Reef of Zapadnie.

We may now sum up the statements made for this year and last as to the number of female seals on Ketavie.

Mr. True (Sen. Doc. 137, Part II, p. 101, 1896) gives as the result of an actual count made between the 8th and 10th July, 1895, a total number of 2,640.

In the same year Colonel Murray estimated the number at 8,000, using the very high average of forty cows to a harem. Had he set the average at thirty, a number that would now seem to be a more reasonable one, his result would have tallied almost exactly with the 6,049 that were this year demonstrated by actual count of the pups; and if we add to Mr. True's actual count of 2,640 the increase of 91 per cent. to which the count of the pups now entitles us, we reach the figures of 5,042 for 1895, a number which may or not, as we please, be employed to indicate a positive increase since that time.

It is noteworthy that this rookery of Ketavie seemed to the gentlemen who inspected it five or six years ago to present particularly serious indications of loss and diminution.

In his Report for 1893 (Sen. Doc. 137, Part II, p. 6, 1896) Mr. Townsend says: "Ketavie, now the thinnest rookery on the islands, shows a perceptible decrease since 1892. This decrease is perceptible in some, if not all, of the photographs of the rookery." And, again, in the following year, Mr. Townsend says (*ibid.*, p. 12): "This small and gradually diminishing rookery, I believe, shows a shrinkage since last season, but not a very marked one." It may be remarked that in this last Report this was the only instance on St. Paul Island in which Mr. Townsend chronicled a shrinkage since the previous year.

Lukannon.

Lukannon Rookery is in reality, as has been stated already, continuous with Ketavie. It runs from the end of the latter rookery along half-a-mile or so of rocky shore, till the rocks end in the sandy beach that stretches all the way to Half-way Point and Polavina Rookery. The hauling-ground is at the northern end, near the sandy beach. This long sandy beach later on in the season, in late August and September, is thickly dotted with bulls from the adjacent rookeries, as are the sands of Middle Hill and English Bay on the other side of the island. The hauling-ground of Lukannon is said to be remarkable for the large proportion of young males that its drives furnish, and is spoken of on the islands as "the nursery" in consequence.

The photographs (Macoun's No. 64, 6th August, 1892, Townsend's No. 11, 20th July, 1895, and mine No. 22, 13th July, No. 23, 15th July, and No. 119, 8th August, 1896) are on different scales and for the most part from different points of view, and hence do not give us very much information as to the relative states of the rookery; but, so far as they can be compared, my No. 119, when regarded together with those of the earlier years, shows no perceptible decrease.

It struck me on our first visit (13th July) that idle bulls were very numerous here at that time, and that the harems were, on the average, of large size. At a convenient point in the middle of the rookery I found the adjacent harems, 11 in number, to contain respectively 42, 4, 25, 17, 60, 47, 6, 7, 19, 43, 22 cows, a total of 302 and an average of 27·5.

The count accepted by Dr. Jordan gives 147 harems for the rookery, or 2,543 cows, at the usual average of 17·3, and 4,450 breeding cows, allowing for an increase of 75 per cent. on that number. Colonel Murray gave me for the same rookery his count made on the 13th July, which places the bulls and harems at 205, with idle bulls at 125. For 1895 Colonel Murray placed the numbers at 300 harems and 200 idle bulls, but it must be remembered that for that year Colonel Murray's statistics were in round numbers and professedly less accurate than for 1896. Messrs. True and Townsend for 1895 only admitted 2,672 cows for Lukannon Rookery.

Lagoon.

This little rookery occupies a shingly spit which stretches across from Tolstoi Hill nearly to the harbour, and separates the bay on which the harbour is situated from a

broad, shallow, muddy lagoon. In stormy weather the waves break right across the spit on which the seals lie. No seals are driven from this small rookery.

Op. cit, p. 100. On this rookery Messrs. True and Townsend made a careful census on the 10th July, 1895, "passing in front of the rookery in a boat, using a low-power field-glass. The harems were separated here by considerable intervals, and as the whole rookery was in plain view, there was no obstacle to counting." The numbers thus obtained were 82 harems and 1,264 cows. Colonel Murray's figures are in this instance discrepant, as he states the number at only 50 harems, with no idle bulls.

I fancy that in this particular case Messrs. True and Townsend's census was the more accurate of the two, and that Colonel Murray's was probably based on a more distant view.

In 1896 Dr. Jordan, accompanied by Mr. Clark and Mr. Macoun, walked over the rookery, making a close count of bulls, cows, and pups. They found 120 harems, 1,474 cows, and 2,484 pups. These figures give the low average of 12·3 cows *visible* in a harem, and of 20·7 (an increase of 69·3 per cent.) as the actual size of the average harem estimated by pups. Mr. Murray's estimate of the number of harems in 1896 is very similar to Dr. Jordan's, viz., 115, with 40 idle bulls. The general results therefore are an increase of cows in sight over those witnessed by Messrs. True and Townsend in the previous year, and a confirmation by the count of pups of the inadequacy of any single inspection of the cows to give a full account of the number appertaining to the rookery. The less percentage of pups to cows in sight than in the count made on Ketavie is a justification for abating (to 75 per cent.) the addition (91 per cent. on Ketavie) requiring to be made to the average counts of cows.

Tolstoi.

This rookery occupies the rocky portion to the east and south of a great bay (English Bay) in the middle of the southern coast of the island. The bay is for the most part sandy, and where its shore becomes rocky again to the westward we have the rookeries of Greater and Lesser Zapadnie.

At Tolstoi, to the southern end of the rookery, the seals occupy a rocky beach under high cliffs or steep slopes (photograph 75), difficult of inspection until as the season advances it becomes possible to penetrate into it. At the other end of the rookery, towards the sands of English Bay, the rocks lie further back from the shore (photograph Nos. 40, 74, &c.), and the seals are freely visible from the sands to the westward and from various stations on the hill above. Between the rocks and the sea are sandy stretches, to be afterwards referred to in my account of the dead pups. The chief hauling-ground is above this latter portion of the rookery and on the more or less stony slope above the adjacent portion of English Bay. Other tracts (photograph No. 39) in the middle of the bay (Middle Hill) serve as hauling-grounds for this rookery and Zapadnie.

My first photograph of Tolstoi was taken on the 25th July.

While in the more rocky parts of the rookery to the southward the seals lie scattered in a manner similar to those on the other rookeries already described, at the other extremity they lie in a dense mass (photograph No. 40), extending for some distance up the hill at the extreme end of the rookery, but leaving almost vacant the smooth, sandy interspace already alluded to. This rookery showed very markedly the change in outline and in extent of ground covered by the seals at a later period in the season. By the time our second series of views were taken (7th August, photograph No. 109), the sandy interspace was largely occupied by seals, and harems were dotted among the stones almost to the very top of the hill; still later they reached the rock at the very top.

Mr. Townsend's views of this rookery are particularly fine and on a larger scale than ours. His photograph No. 25 (24th July, 1895) would appear at first sight to show a much larger number of seals than ours; but it is taken at short range and from a very advantageous locality. When we take it in connection with its companion picture No. 26 and then compare the result with that of this year, the apparent difference tends in great part to disappear.

Messrs. True and Townsend give us no complete and specific estimate of the number of seals in this rookery for 1895; but Colonel Murray places the number of harems in that year at 400, and of idle bulls at 250. In 1896 (16th July) he estimated the harems at 325, and the idle bulls at 220; but Dr. Jordan and his party found somewhat later 389 harems on the main or northern part of the rookery and 168 more under the cliffs. On the latter portion of the rookery the cows were counted and found to number 1,498, an average of 13·87 to a harem; and the live pups were afterwards counted to the number

of 2,664, giving an increase of 77·8 per cent. over the original count of cows, or an average of 24·6 to the counted harems. The partial count of the rookery for 1895 given by Mr. Townsend (*op. cit.*, p. 35), "from the point to the end of the Grass Bluff," appears to correspond with the one above alluded to as "under the cliffs." For this area Mr. Townsend gives 113 harems and 1,539 cows, an average of 13·6 to a harem. These numbers are approximately identical with those of Dr. Jordan for 1896.

While we have thus no evidence to show a decrease of the rookery during the period 1895–96, yet it must in this case be admitted that a change is perceptible since the earlier photographs were taken in 1891–92. The great mass of seals, mostly bachelors, shown in Dr. Dawson's photograph No. 35 (19th August, 1891), was far beyond anything we saw on the spot this year, and the rookery is, I think, undoubtedly more populous as represented in Mr. Macoun's photographs Nos. 70 and 71 (8th August, 1892) and Nos. 91 and 92 (21st August, 1892). The case as regards the bachelors diminishes in importance, if its importance does not altogether vanish, when we remember the small number killed upon the island during 1890, 1891, and 1892, as compared with the number slain before and during our inspection of 1896; and as regards the breeding areas, inspection of the photographs above quoted suggests that the areas occupied have shifted since that time. The pictures seem to me to indicate that while the seals extended considerably beyond, they were less numerous immediately within, what is the present margin of the rookery. Mr. Townsend himself alludes to such a change and the possible reasons for it (*op. cit.*) when he says that "allowance should be made for a change in the shape of the bay itself, 100 feet or more of sand being filled in the bight at the left end of the rookery." But, making the best of the evidence in hand, I am quite prepared to believe that Tolstoi Rookery is towards its northern extremity considerably poorer than it was five years ago.

Zapadnie (St. Paul).

This large rookery known also as Upper or Greater Zapadnie, fringes the rocky western extremity of English Bay. The ground is low and irregular, consisting of patches of rock, tracts of broken stones, and intervening spaces of sand. The seals occupy the shore for a space of from 1,500 yards to a mile, and run backwards, following more or less closely the contour of the ground, in long re-entrant lines or avenues. Three of these re-entrant lines, near the east end of the rookery, are conspicuous in photographs taken from the direction of the adjacent rookery of Little Zapadnie, to the east. The rookery terminates to the westward in a line of cliffs. The whole area covered by seals is very large.

The great extent and irregular distribution of the rookery render a bird's-eye inspection or the comparison of photographs of little value. So far, as far as the photographs go, my photograph No. 33 (15th July, 1896) compares favourably with Mr. Townsend's No. 10 (20th July, 1895). The only picture showing evidence of a once greater abundance is Mr. Macoun's No. 41A, 1892, which covers the eastern portion of those just alluded to; but when we reinspect the more recent pictures, we see that, though the precise spot is bare, the adjacent ground immediately to the west is thickly populated, and the evidence of the little area by itself bears no conclusion.

Little Zapadnie occupies the stony front of a knoll about 500 yards long, separated from Greater Zapadnie by a small sandy bay (South-west Bay), into which runs a streamlet from a lake. Patches of snow above the bay and rookery remain throughout the summer, and form a conspicuous landmark. The rookery is compact in form and pretty thickly populated.

From the knoll of Lower Zapadnie a stony beach extends eastward for about 1,000 yards to the sands of English Bay, and along this beach are scattered eight or nine patches of seals, which were spoken of collectively last year as the "Reef of Zapadnie." These patches are approximately identical with Mr. Townsend's chart of them for 1895; even a very tiny patch immediately to the east of Lower Zapadnie being still occupied, though only by a single bull and cow. (It probably contained no more than a single harem the previous year.)

For 1895 Colonel Murray estimated the whole area of Zapadnie (including Lower Zapadnie and the "Reef") to contain 500 harems, with 400 idle bulls. In 1896 (16th July) he placed the number at 577 and 421 respectively, assigning 477 harems and 310 idle bulls to Greater Zapadnie.

The enumeration made under Dr. Jordan produced a result very considerably in excess of this, viz., 583 harems for Greater and 210 for Lesser Zapadnie and 176 more for the Reef, a total of 969 in all. The cows were counted on Lesser Zapadnie

and the Reef to the number of 2,400 and 2,256 respectively, and the pups on the Reef to the number of 3,862, showing on the latter breeding-ground 71 per cent. beyond the visible number of cows.

Polavina.

This rookery, with its neighbour or outlier, Little Polavina, lies half-way along the eastern coast of the island, at the far end of the long sandy shore that stretches northwards from Lukannon. In the centre of the rookery a long, low spit projects into the sea, to the south of which are other low-lying, half-submerged reefs. Opposite to these a rocky terrace fringes the shore, and above it lies a broad, bare plateau, on which the seals congregate. At the south end of the rookery the terrace is broken, and the ascent is gradual from the beach. Beyond this point the beach is narrower, and its cliffs higher (though not so high as to prevent frequent possibilities of ascent or descent), and in these cliffs are found several deep recesses in the columnar basalt (photograph No. 55), each occupied by its group of harems, while other harems are scattered sparsely below the cliffs. The flat, bare plateau extends the greater part of the way to Little Polavina, a distance of more than a mile, and about mid-way between the two rookeries a convenient gully furnishes an ascent to it for the bachelors. The chief hauling-grounds are therefore to the south of Polavina, where the sands end and the rocks begin, half-way between the two rookeries, and again around the rookery of Little Polavina. Little Polavina itself (photographs Nos, 56, 57) is a small rookery surrounding the base of a small jutting point. The seals lie for the most part on stony level ground, facing a low hillock above the sea.

Of the rookery of Polavina we have two very excellent photographs antecedent in date to our visit, viz., Mr. Macoun's, panorama, 60, 61 (6th August, 1892), and Mr. Townsend's No. 9 (26th July, 1895). In Mr. Macoun's pictures taken later in the season, the seals spread further back than in Mr. Townsend's, and the aspect of the picture is affected by the different state of the tide, which in Mr. Macoun's nearly submerges the reefs; but, nevertheless, comparison of the two is plain and simple, and I am quite unable to see any sign of diminution in the later view. Indeed, it seems to me that the later picture shows actually more seals than the earlier.

The evidence in regard to Polavina is very conflicting, and the condition of the rookery deserves particular attention in the future. It seemed to me, and it seems on reinspection of my photographs Nos. 52, 53 (23rd July, 1896), and Mr. Macoun's No. 17 (15th July) and Nos. 69, 71 (28th July), that the rookery is less than the earlier photographs show it to have been, but I saw nothing on the spot, and I can see nothing in the photographic evidence to warrant Mr. Townsend's strong assertion (*op. cit.* p. 31), that, comparing 1895 with 1894, the "main rookery, situated on a comparatively level tract, *is shrunken perhaps* 50 *per cent. in dimensions.*"

North-east Point.

The great rookery of North-east Point is by far the largest on the islands. It is grouped around the sides of a peninsula commanded by Hutchinson's Hill, an eminence about 80 feet high. This hill lies towards the western side of the middle of the peninsula, and on the shore below it and up the slope extends the most densely populated portion of the rookery. The rookery begins on the west side of the narrow isthmus of the peninsula on a rocky beach, and extends with a few slight interruptions to the extremity of North-east Point, a distance of about 2,500 to 3,000 yards. About the middle of its length, where it skirts the hill, the ground is more sandy, and the space occupied by the seals is much broader than elsewhere. The chief hauling-grounds on the west side are just to the northward and southward of the hill. On the east side the breeding-grounds are much less extensive. On this side, nearly opposite to Hutchinson's Hill, is a rocky cape about 250 yards long, known as Sea-Lion Point. On its northern and southern shores (photographs Nos. 42, 43) are small patches of harems; south of it, on the beach, is a more considerable one (photograph No. 44). A large rookery (photograph No. 41, Macoun's photograph No. 96) lies about 300 to 400 yards north of it, and a long narrow strip fringes the greater part of the shore between this last and North-east Point. The rookeries on the two sides of the peninsula are now distinguished by Dr. Jordan under the separate names of Vostochni for the larger western portion and Morjovi for the smaller part or parts on the east. The latter name is given in allusion to the once innumerable walruses that have left their whitened bones in witness of a slaughter more ruthless than

any that the seals have here ever been subjected to. When the store house on the isthmus was built, it is said to have had its sandy foundations paved with thousands of tuskless skulls. Colonies of sea-lions still exist on Sea-Lion Point, on a smaller point midway between that and North-east Point, between the two patches of seal rookery, and again at one or two small points on the western side near the far end of the peninsula. The chief hauling-grounds of seals on the eastern side lie just beyond Sea-Lion Point (photograph No. 41) and around the rookery beyond. Many seals also haul out close to North-east Point itself. From this great rookery the seals are not driven all at once, but usually from the west and east sides on consecutive days.

As regards the eastern portion of the rookery, our photographs give good pictures of the large mass midway between Sea Lion Point and the far end. This is shown in Mr. Townsend's photograph No. 7 (24th July, 1895), in Mr. Macoun's Nos. 1 and 2 (22nd July), and No. 59 (5th August, 1892), and No. 18 (16th July, 1896), and less well in mine No. 41 (15th July, 1896). There is no difference whatsoever between the pictures of this portion of the rookery taken in 1895 and 1896. (The little patch marked beyond the great one on Mr. Townsend's chart of 1895, was still distinctly recognisable, though not shown in the photographs.)

In Mr. Macoun's photographs of 1892, the bachelor seals were very much more numerous. This fact, like the similar phenomenon already noticed at Tolstoi, may be simply due to the small number killed at that time, but, to judge by the photograph, I fancy the rookery itself was then somewhat larger.

On the western side of the rookery, looking from the top of Hutchinson's Hill, we have an enormous number of seals in direct view. With the older photographs in hand, it appeared to me at my first visit (16th July) impossible to doubt that a diminution of seals had taken place here since 1891–92, and wider intervals separated the seals from the hill, and, especially towards the south, the extent of this part of the rookery seemed curtailed. The broad stretch of sand here was almost bare where in the 1892 photographs it was thickly bestrewn. This impression still remains with me, but I am bound to say that it was weakened, and my estimate of its extent diminished by my subsequent visits. The extent to which the "spreading" of the herd alters the appearance of this rookery as the summer advances is enormous. It was with complete astonishment that on the 9th August we found the breeding seals extending up to the topmost rocks on the western side of the hill, and surrounding the photographic station from which we had three weeks before viewed them at a distance. The effect is shown in Mr. Macoun's photographs of the 10th August. The early photograph on which my first impression of decrease has been based was that taken by Mr. Macoun on the 20th August, 1892, a still later day allowing for still greater possibilities of extension. Between our photographs of 1896 and Mr. Townsend's No. 6 (24th July, 1895) I can detect no perceptible difference.

The counts of this rookery are not very satisfactory. For 1895 Colonel Murray estimated the harems (in round numbers) at 1,725; in 1896 (18th July) he found 1,595. The census by Dr. Jordan's party fell considerably below Colonel Murray's figures, giving only 975 harems for the western and 293 for the eastern side, a total of 1,268 for the whole rookery. I cannot help thinking some qualification or supplement is required to this estimate. It may be that the harems were all on the average large, or it may be that the influx of younger cows added largely in the later part of the season to these numbers. For the numbers are certainly surprising; inasmuch as they would make the rookery out to be only two and a-half times as large as Tolstoi and less than one-third larger than the whole of Zapadnie, or, in other words, one-sixth smaller than the united rookeries at the two ends of English Bay; and it is certain that the apparent size of North-east Point Rookery is greater than this, and that the yield of its killing-grounds is beyond the proportion of such an estimate.

Reef Rookery.

This rookery encircles the southern peninsula of the island, as that of North-east Point surrounds the northern. The western side of the rookery is known as Garbotch.

The small bay to the south-west of the village has in its middle part a stretch of some 250 yards of sandy beach, sloping upwards to some sandy dunes, known as Zoltoi Sands. Behind the dunes the ground continues to rise till it forms, on the eastern side of the isthmus, a precipitous cliff, beneath which lie many bachelors and half-bulls.

On the west side, facing the south half of the sands, is a stony ascent, on which and on the stones below the holloschikkie repose (photograph No. 49).

Beyond the sands the shore of the bay consists of a rough narrow beach, at first with low, rough grassy cliffs above, further on with a high bank of broken stones, and at the

south extremity of the bay a long, high, bare, cindery acclivity, which rises towards the "parade ground" or plateau.

All along the bay from Zeltoi Sands westwards are first scattered harems under the cliff, then more numerous harems on the broad beach below the stony ground, and lastly, on the lower portion of the great slope, a more numerous colony, running up here and there in long lines to nearly half the height of the hill.

Beyond Garbotch, near, but to the west of the extreme point of the peninsula, is a rocky beach with an ascending slope, commanded from above by a parapet of rocks. This spot is known as the "Slide," and Dr. Jordan has accepted for it the Aleut name of Ardiguen (photograph No. 62; Macoun's photograph No. 26, 25th July, 1892). This spot was kept under close personal observation by Dr. Jordan, whose account of its daily economy will be found on pp. 54–61 of his preliminary Report.

The east side of the peninsula constitutes Reef Rookery in the stricter sense. It consists of a broad rocky beach, on which a nearly continuous band of harems runs from the point to the isthmus. Towards the middle of the rookery are two shallow land-locked pools of foul water, through which the bachelor seals flounder, or pass between them to and from the extensive hauling-ground behind this portion of the rookery. The east portion of the rookery does not extend so far to the north as the west, stopping short at the isthmus, the eastern side of which is high and precipitous. Near the north end of the isthmus on the east, opposite Zoltoi Sands, and behind the dunes, is a small bay in which the bachelors haul out, and from the cliffs above which a close view of them may be enjoyed unobserved (photograph No. 50).

The greater part of the peninsula proper is occupied by a smooth plateau, sloping gently to the east (photograph No. 71), known as the parade ground. It is now for the most part grassy, except near the western edge, where the seals ascend the slope of Garbotch to it in small numbers. Two main and three smaller "pinnacles" rise above the parade ground, and command the best views of the Eastern Rookery. Near the southern end of the isthmus the ground is very rough and stony; near the southern end, by the dunes, it consists of loose-blown sand, a short stretch of which is by far the most arduous part of the journey to the seals driven to the village.

Between the dunes and the parade ground, on the route of the drives, is an old killing-ground, whose use is not recollected. On this ground seals of all sizes appear to have been slaughtered.

The smooth slope of Garbotch is the part of the rookery where we might expect the photographic evidence to be clearest, and where we might hope to see most easily changes in the superficial extent of the herd. As a matter of fact, however, it is in just such a place that the seasonal changes in area are so clearly perceptible and so striking that they hopelessly confuse one's estimate of the changes that may have taken place from year to year.

In Mr. Macoun's photograph No. 30 (20th July) and in my No. 60 and 61 (24th July), the seals only fringe the lower portion of the slope, except at the far end, where a wedge-shaped mass runs up to about the middle. The appearance is practically identical with that shown in Mr. Townsend's photograph No. 17 (20th July, 1895). But the older photographs, such as Mr. Macoun's No. 74 (15th August, 1892), show the seals spreading over the face of the slope and reaching its summit at both ends. Coming back to the photographs of this year, we see the seals spreading far up the hill in Mr. Macoun's photograph No. 65 (5th August) and reaching the top of it and invading the parade ground in Nos. 105, 106 (31st August). It is here, in my opinion, certainly true, as has been already said in so many other cases, that the photographs of 1895 show absolutely no superiority in numbers over 1896, but that already quoted of 1892 does appear to show somewhat more than those of the present year.

For the whole of Reef Rookery Colonel Murray estimated the number of harems at 1,000 for 1895 and 900 for 1896; Dr. Jordan in the latter year placed the number at 831. On Ardiguen "or the Slide" Dr. Jordan counted 27 bulls, 550 cows (an average 20·4), and 652 pups (an average of 23 to a harem).

Besides the figures quoted and compared in the preceding account, we possess yet another estimate of the breeding seals for 1895, that of Judge Crowley, Resident Agent of the United States' Treasury on the islands. Mr. Crowley says in his Report (Sen. Doc. 137, Part I, p. 35, 1896) "The breeding herd has been reduced to such proportions that they can now be counted with comparative accuracy. I made the count as follows:—

"St. Paul Island. Breeding cows, 78,696; bulls, 4,372.

"St. George Island. Breeding cows, 21,240; bulls, 1,180."

It is obvious here that the number of cows is estimated by applying to the number of bulls an average of eighteen cows to each harem. One-half of these statistics are as remarkable for their agreement with Colonel Murray's for 1895 and ours for 1896 as the other half are for their complete discrepancy.

The number of bulls assigned to St. Paul Island (viz., 4,372) is very near that of Colonel Murray for 1895 (viz., 4,625) and about identical with Dr. Jordan's for 1896 (viz., 4,348).

But Judge Crowley's enumeration for St. George is three times larger as regards the bulls than that of Colonel Murray for the same year 1895, and twice as big as Colonel Murray's for 1896. The result, on the other hand, of Judge Crowley's low estimate of eighteen cows to a harem is to bring out a number of cows for St. George approximately equal to this year's, but to give to St. Paul for 1895 only three-fifths of what we now believe to exist there.

Before passing from the later to the earlier numerical estimates, I would draw attention to a passage on pp. 20, 21, of Dr. Jordan's preliminary Report. Dr. Jordan says:—

"Accepting the figures of last year, 70,423 cows on the rookeries would mean an aggregate of 123,240 breeding cows. To this number must be added 25,000 to 40,000 virgin 2-year-olds and as many yearlings to form an estimate of the actual number of cows for 1895. That the figures given by us for 1896 are slightly higher than those for 1895 does not mean an increase in numbers since 1895, but simply an increase in the data on which an estimate may be made. Messrs. True and Townsend, for example, count 2,640 cows on Kitovi Rookery. This count is the most important element in their estimate by acreage. In this estimate, Kitovi is given credit for $3\frac{3}{4}$ per cent. of the total number of seals (70,423). This figure cannot be far from the truth. But the fact that, in 1896, in spite of some shrinkage, Kitovi shows 6,049 pups, demonstrates that the figures based on counts made at the height of the season are far from complete: 6,049 is $3\frac{3}{4}$ per cent. of 161,060."

Now, passing over the apparent fact that the phrase "in spite of some shrinkage" savours of a begging of the question, the one thing that this paragraph appears to me to prove is the surprising accuracy of Messrs. True and Townsend's estimate of $3\frac{3}{4}$ per cent. as the proportionate value of Ketavie to the total seal population of the islands. For if we take our own count for 1896 of 3,152 cows visible on Ketavie at the height of the season and multiply it first in the proportion of $3\frac{3}{4}$ per cent., as Messrs. True and Townsend did, to find the total seal population of the islands, and then add 75 per cent. to the result, as Dr. Jordan has shown it is necessary to do, we get the result of 147,090 for the breeding cows in the rookeries for 1896, a surprisingly close approximate to the 143,071 that we actually found. In short, so far as it goes, the whole count is decidedly opposed to any signs of either local or general decrease, and would strongly tempt us to accept Messrs. True and Townsend's estimate (as corrected by Dr. Jordan) of 123,240 breeding-cows for the two islands in 1895 as not far from correct.

Earlier Numerical Estimates.

When it is so manifestly impossible to reconcile the statements made or to realize the conditions that obtained so lately as 1895, it is natural that earlier statements should lead us into still greater uncertainties and difficulties. By far the most important of such early estimates is that of Mr. H. W. Elliott in 1872–74, an estimate repeated by him in 1890. (*Cf.* Report on the Pribyloff Islands by H. W. Elliott, Paris edition, 1893, p. 9, *et seq.*, and "Monograph of the Seal Islands," Census edition, 1881, p. 48, *et seq.*) The essence of Mr. Elliott's computation lies in his belief that the number of seals is in direct ratio to the superficial extent of the rookery. His statement is exceedingly precise, and may be here quoted (Report, pp. 15 and 16):—

"At the close of my investigation, during the first season of my labour on the grounds in 1873, the fact became evident that the breeding seals obeyed implicitly an imperative and instinctive natural law of distribution, a law recognized by each and every seal upon the rookeries, prompted by a fine consciousness of necessity to its own well-being. The breeding-grounds occupied by them were, therefore, invariably covered by the seals in exact ratio, greater or less as the area upon which they rested was larger or smaller. They always covered the ground evenly, never crowding in at one place here to scatter out there. The seals lie just as thickly together where the rookery is boundless in its eligible area to their rear and unoccupied by them as they do in the little strips which are abruptly cut off and narrowed by rocky walls behind. For instance, on a rod

of ground, under the face of bluffs which hemmed it in to the land from the sea, there are just as many seals, no more and no less, as will be found on any other rod of rookery-ground throughout the whole list, great and small, always exactly so many seals, under any and all circumstances, to a given area of breeding-ground. There are just as many cows, bulls, and pups on a square rod at Nah Speel, near the village, where in 1874, all told, there were only 7,000 or 8,000, as there are on any square rod at North-east Point, where 1,000,000 of them congregate."

"This fact being determined, it is evident that, just in proportion as the breeding-grounds of the fur-seal on these islands expand or contract in area from their present dimensions, the seal will increase or diminish in number.

" The discovery, at the close of the season 1872, of this law of distribution, gave me at once the clue I was searching for in order to take steps by which I could arrive at a sound conclusion as to the entire number of seal herding on the island."

After further discussing the case he says (on p. 18), " Taking all these points into consideration, as they are features of fact, I quite safely calculate upon an average of 2 square feet to every animal, big or little, on the breeding-grounds, as the initial point upon which to base and intelligent computation of the entire number of seals before us." It is on this estimate that Mr. Elliott bases his computation of 3,030,000 seals of all ages on the breeding-grounds for the Island of St. Paul in 1872–74, and 160,670 for that of St. George.

I believe, after careful perusal of Mr. Elliott's work, that he maintains precisely the same position as to the number of seals on the ground in 1890. He states indeed that the bulls were fewer and wider apart, but also that the harems were immensely larger; and though I do not quite understand the process of survey by which in the latter year he arrived at an estimate of the "average depth" of the rookery, yet, having done so, he certainly calculates its population at the same ratio of one seal to 2 square feet.

Now it is perfectly certain that no rookery last year, nor in the preceding year, presented to any observer so great a density. Where the dead bodies were lying almost as close as they could lie on the killing-ground at Polavina, they occupied an average space of $13\frac{1}{2}$ square feet to each body (*cf.* Jordan, Preliminary Report, p. 20), and on Ardiguen Dr. Jordan measured the space occupied by a single harem of thirty-three cows, and found, within the limits of a single harem, a space of 8 square feet for each seal (*loc. cit.*) Not one of our observations and not one of our photographs shows on the more rocky rookeries a density (taking the harems collectively) near so great as this. The conformation of the ground and the interspersal of the boulders must at all times, as it does now, have prevented anything approaching to so uniformily compact a distribution of the seals. But it is not necessary to do more than cite the opinion of the American Commission of 1896 as expressed by Dr. Jordan, who in arguing concerning Messrs. True and Townsend's estimate of 23 square feet to each seal on the most crowded rookeries (Report 1895), and considering it excessive, says (p. 20), " Where seals are massed on rookeries, the space occupied by each seal is more nearly 12 than 23 square feet," and further that the 46 square feet which Messrs. True and Townsend's estimate for the more rocky and less densely populated localities is, as a matter of fact, doubtless too low. "We cannot believe," Dr. Jordan also says (p. 19), " that even in the most favourable times the fur-seals were evenly crowded over the rookeries, and it is evident that as they grow fewer this arrangement tends to become more sparse, especially on rocky slopes and boulder-strewn beaches."

I need not follow out in detail the deduction that such newer estimates involve in the numbers put forward by Mr. Elliott, but I may say that, taking Mr. Elliott's calculation of 3,190,000 breeding seals on the rookeries of both islands in 1872–74, deducting from that number the 90,000 bulls (Report, p. 90), and dividing the balance by 6 (to give instead of 2 feet for a seal the 12 feet that Dr. Jordan admits for each cow on the most crowded portion of Tolstoi, Preliminary Report, p. 18), we get the reduced number of 516,000, which is only about three and a half times as great as that which we know to exist now.

The calculation is of no great importance, and in making it we admit far too much, in particular that every part of every rookery was then as densely filled as is the most crowded spot to-day. But however much these figures may be twisted and the case reargued, it is perfectly clear that Mr. Elliott's gigantic computation can never again be upheld as a reasonable statement of the numbers that once existed on the islands, or with which the present numbers ought to be compared.

But if we refuse to admit Mr. Elliott's estimate of the seals, let us try to accept his measurement of areas. His surveys, he tells us (Report on the Pribyloff Islands in 1890, Paris edition, 1893, p. 19), were made with all scientific precautions in 1872–74 by measured

baseline and azimuth compass, in 1890 with a fine prismatic compass, and in 1874 with the help of a trained topographer, Lieutenant Maynard. "There is no more difficulty," he says (p. 17), "in surveying these seal margins during this week or ten days (10–20) in July than there is in drawing sights along and around the curbs of a stone fence surrounding a field." He tells us that in 1890 there were 9,000, and in 1872 37,000 seals on Lagoon Rookery; and as he estimates this number on his usual computation of 2 square feet for each, it follows that he is ascribing to that rookery an area of 18,000 and 74,000 square feet respectively in the said years. Yet Messrs. True and Townsend give the occupied area on Lagoon Rookery in 1895 as 82,241 square feet, 4½ times what Mr. Elliott asserted five years before.

For Lukannon and Ketavie he gives the measurement in 1890 as 145,050 and 56,000 respectively, a total of 201,050; it was 226,303 square feet by Messrs. True and Townsend's measurements five years later.

For Tolstoi he gives 124,800 square feet in 1890; Messrs. True and Townsend give 240,800 in 1895. For the entire island of St. Paul he gives 1,757,164 square feet in 1890; Messrs. True and Townsend give 2,202,557 in 1895.

The discrepancies on St. George are equally surprising. We may express them best in a tabular form :—

Rookery.	Area in Square Feet.		
	Elliott, 1872–74.	Elliott, 1890.	Messrs. True and Townsend, 1895.
Zapadnie	36,000	24,000	128,171
Staraya Atil	60,840	32,000	64,329
North	152,500	77,046	128,868
Little East	25,500	9,600	24,254
East	50,500	18,200	67,884
Totals..	325,340	160,846	413,506

Leaving aside for the moment the statements whose extravagance, I believe, we have adequately demonstrated, we may fall back on the plain and simple way of estimating the actual yield of the rookeries and the decrease of their productiveness; that is to say, we may set the 30,000 skins taken this year against the 100,000 that were got with neither less nor more difficulty (*Cf.*, Jordan, Preliminary Report, p. 22) in the plenitude of the supply. We should then have to admit that the herd was now something less than one-third of what it was twenty years ago. Even in this admission we admit too much, for, apart from other corrections that might be suggested, we should surely add for the purpose of such a comparison to the 30,000 taken on the islands the number of males taken in the sea, but this, for lack of better knowledge of the proportion of each sex and age in the pelagic catch, we cannot do. But if we fall back on Dr. Jordan, we find him placing (*loc. cit.*) the number of breeding females in 1880 at, "at least," four times as many as in 1893. It is not worth arguing whether we should say three times rather than four, for either number is vastly different from those which we have been of late accustomed to hear maintained and reiterated.

In the preceding account I have not attempted to prove that there has been *no* decrease, general or local, in recent years, but I have sought to show how inadequate and conflicting is the evidence at hand to prove such a decrease. The matter with which we are immediately concerned, and as to which we have most evidence at hand, is the relative state of the rookeries in 1895 and 1896. Had the decrease in the rookeries been as great and evident as it was reported to be up to 1895, the next twelve months should surely have shown signs still more unequivocal of continued impoverishment of the impoverished stock. The photographs show us time after time, with very few exceptions, an identical record. The harems on St. George were counted in both years by the same gentlemen, and all the rookeries but one show a large increase in the latter year. In the only instance on St. Paul Island where the cows were actually counted in both years, viz., on the Lagoon, they were one-sixth more numerous when counted in 1896; and

when the pups were counted on the same place they were twice as numerous as the cows were supposed to be in 1895. Though Colonel Murray's count of harems for St. Paul in 1895 was approximate only, and expressed in round numbers of hundreds and fifties, it only exceeded by $\frac{1}{16}$th (4625 to 4348) that of Dr. Jordan in 1896; in three instances, Lagoon, Tolstoi, and Zapadnie, it fell far below it.

I do not analyse these statistics further; they furnish clear and instructive lessons to those whose business it may hereafter be to unravel them further.

The following is a tabular recapitulation of the figures quoted in the preceding pages:—

Summary of Statistics for St. Paul and St. George Islands, 1895-1896.

	1895.							1896.						
	True and Townsend.	Colonel Murray.				Judge Crowley.		Murray.			Jordan.			
	Cows.	Harems.	Idle Bulls.	Cows at 40 per Harem..	Cows reduced to 30 per Harem.	Bulls.	Cows.	Harems.	Idle.	Cows at 30 per Harem.	Harems.	Cows counted or estimated at 17·5.	Pups counted.	Cows at 75 per cent. extra.
St. Paul Island.														
Ketavie	2,640	200	50	8,000	5,000			190	100	5,700	182	3,152	6,049	..
Lukannon	2,672	300	200	12,000	9,000			205	125	6,150	147	2,543	..	4,450
Lagoon	1,264	50	..	2,000	1,500			115	40	3,450	120	1,474	2,484	..
Tolstoi (main)		400	250	16,000	12,000			325	220	9,750	389	6,729	..	11,775
,, (cliffs)											108	1,498	2,664	..
Zapadnie		600	400	24,000	18,000			577	421	17,310	583	10,085	..	17,648
Little Zapadnie											210	2,400	..	4,200
Zapadnie (reef)											176	2,256	3,862	..
Gorbatch		1,000	500	40,000	30,000			900	411	27,000	302	5,224	..	9,142
Ardiguen	54,860										27	550	652	..
Reef											504	8,719	..	15,258
Sea-Lion Rock		..	..	..	..			..	..	..	63	1,090	..	1,907
Polavina (main)		350	200	14,000	11,500			285	254	8,550	138	2,387	..	4,177
,, (cliffs)											86	1,268	..	2,496
Little Polavina											45	779	..	1,363
North-east Point (east)		1,725	1,000	69,000	51,750			1,595	1,095	47,850	975	15,879	..	27,148
,, ,, (west)											293	4,328	..	7,773
Total for St. Paul ..	61,436	4,625	2,600	185,000	138,750	4,372	78,696	4,192	2,666	125,760	4,348	70,361	..	..
St. George Island.														
North	2,800	100	50	4,000	3,000			225	100	6,750	225	3,891	..	6,809
Little East	527	25	20	1,000	750			179	55	5,370	44	761	..	..
East	1,476	80	40	3,200	2,400						135	2,335	..	4,086
Zapadnie	2,786	110	50	4,400	3,300			182	100	5,460	182	3,148	..	5,509
Staraya Atil	1,398	60	40	2,400	1,800			75	75	2,250	75	1,297	..	2,269
Total for St. George ..	8,987	375	200	15,000	11,250	1,180	21,240	661	330	19,830	661	11,432		
Grand total ..	70,423	5,000	2,800	200,000	150,000			4,853	2,996	145,590	5,009	81,793		

Lastly, let me take Mr. Elliot's categorical statements regarding the condition of the rookeries in 1890 (*Cf. cit.*, p. 91).

1. There is but one breeding bull now upon the rookery-ground where there were fifteen in 1872; and the bulls of to-day are nearly all old, and many positively impotent.

2. This decrease of virile male life on the breeding-grounds causes the normal ratio of fifteen or twenty female to a male, as in 1872–74, to reach the unnatural ratio of fifty to even 100 females to an old and enfeebled male.

3. There is no appreciable number of young males left alive to-day on these "hauling" or non-breeding grounds to take their place on the breeding-grounds, which are old enough for that purpose, or will be old enough, if not disturbed by man, even if left alone for the next five years.

Not one of these statements (I am not discussing the first clause) is true to-day. The bulls show no signs of senility or impotence; they are not "inert and somnolent," as Mr. Elliot said two pages before. But they are in the highest degree active, vigorous, and bellicose. Every rookery is surrounded by "idle" bulls, most of them to all appearance as robust and virile and full-grown as their more fortunate brethren; and from every drive are turned away a large proportion of younger ones to take their places in time.

There is no "unnatural ratio" of fifty to 100 females to "an old and enfeebled male." The harems show an average of about seventeen females to a male, and though we may have to add to these some 75 per cent. more (a circumstance of which Elliot knew nothing) to allow for the greater number appertaining to the rookery than are ever visible at once, yet, if we add at the same time the number of bulls at first idle on the rookery, we shall get a ratio between cows and bulls that compares favourably with Mr. Elliot's description of the most prosperous period in the history of the herd.

Mortality of Pups.

In this important matter the labours of the past season have added very materially to our knowledge.

On the 1st August, the date of the opening of Behring Sea to pelagic sealing, a plump healthy pup was captured and placed in a box in the open air, in order to ascertain the period of death by starvation. The experiment was a necessarily cruel one, and was performed with great reluctance, but the importance of the inquiry was held to justify it. When captured, the pup weighed 12 lb; it died on the 15th August, its weight being then reduced to 9 lb.

From the very beginning of our inspection we saw daily, as we watched from the verge of the rookeries, a dead pup here and there, and now and then one was drawn out by the aid of a long pole and submitted to dissection. By the 1st August, dead pups were conspicuous wherever we went.

Until near the end of the first week in August it was impossible to enter the rookeries, and no more systematic investigation could be made. On the 5th August a regular progress was made through the rookeries, and the dead pups were systematically counted under Dr. Jordan's leadership. The count was completed for St. Paul Island on the 12th August, and on the 16th and 17th August, a similar count was made on the Island of St. George by Mr. Lucas, Mr. Macoun, and Colonel Murray. The following are the resulting numbers of dead pups for each rookery on the two islands:—

St. Paul—		
Ketavie	100	
Lagoon	78	
Lukannon	205	
Tolstoi	1,895	
Zapadnie	3,095	
Little Zapadnie	134	
Zapadnie reef	712	
Gorbatch	712	
Ardiguen	2	
Reef	950	
Sea-Lion Rock	50	
Polavina	635	
Little Polavina	47	
Vostochni (North-east Point, west)	1,808	
Morjovi (North-east Point, east)	485	
Total		10,309

St. George—			
North	259		
Little East	31		
East	112		
Zapadnie	199		
Staraya Atil	135		
		736	
Grand total			11,045

This very large aggregate is admitted to consist entirely of pups for whose death pelagic sealing is not to blame. On St. Paul they were all counted before, and on St. George within two days of the death of the pup alluded to, whose enforced period of starvation commenced with the opening of the pelagic fishery.

The existence of a large mortality of pups from natural causes has been the subject of much conflict of opinion. Elliot (*Op. Cit.*, p. 68) estimates the mortality in infancy, or up to the age of five or six months, as trifling, "say 1 per cent., while on and about the islands of their birth, surrounding which, and upon which they have no enemies whatever to speak of."

Mr. Townsend, in 1895 (*Op. Cit.*, p. 37), could find no dead pups until after the 1st September; from that time on, the death of the young was continuous, and for 1894 (*Op. Cit.*, p. 15) Mr. Townsend makes the same statement in almost identical words.

Mr. True, in 1895 (*ibid.*, pp. 99, 100), saw a number of dead pups during his sojourn, but did not think that the total would exceed 150 for all the St. Paul rookeries. He counted twenty-three dead pups on the 2nd August on Ketavie, and at the north end of Tolstoi he observed, on the 15th August, seventy in one small area, and about twenty-five more a little further south. "The area referred to" [in the neighbourhood of which, about the same day of the month, we found 1,895] "was occupied earlier in the season by a great mass of seals, and I regard the number of dead pups found here as representing the ordinary mortality of the young."

Judge Crowley (Sen. Doc. 137, Part I, p. 16) speaks of the first dead pup of the season appearing on the rookery breeding-grounds "in the latter part of August 1894."

Colonel Murray, in his Report for 1894 as Special Agent of the United States' Treasury, says (*ibid.*, p. 55) as follows:—

"Another very important feature observed in our inspection of the rookeries in 1894 was the absence of dead pups in the early part of August, for up to our leaving on the 8th I had not seen a dead pup on the island, and the agent in charge, who was on St. Paul Island from June to the latter part of August, and who kept a close watch for dead pups, tells me now that it was not till about the 20th August there was a dead pup to be seen, but from that date to the close of the season, according to official communications received from the islands, the carcasses of dead pups, starved and emaciated, increased with appalling rapidity until 12,000 were encountered by the assistant agents."

But it is not necessary to multiply such instances or quotations. It is plain that recent American observers have almost wholly overlooked the early mortality of pups from natural causes, and have attributed the whole mortality of the season to pelagic sealing.

On the other hand, precisely the same phenomen that we witnessed was described in detail by the British Commissioners (Report, p. 61) from their observations in 1891, and again with still greater precision by Mr. Macoun (Supplementary Report, p. 195) from his observations in 1892.

The Commissioners, "when visiting Tolstoi Rookery on the 29th July, observed, and called attention to several hundred dead pups, which lay scattered about in a limited area, on a smooth slope near the northern or inland end of the rookery-ground, and at some little distance from the shore." No dead pups caught their eye on St. George Island, and comparatively few on North-east Point, but at Polavina they found several hundred on the 4th August, and on the 19th August at Tolstoi, many more than had been there before. In short, broadly speaking, they saw what we have seen; they found the mortality slight where we found it slight, and great where we found it great.

Mr. Macoun, in 1892, investigated the matter with great care. On the 22nd July he counted, close around his camera at Polavina, 143 dead pups. On the 14th August he found about 4,000 at Tolstoi "on the same ground on which those seen last year (1891) were lying, but scattered over a larger area, and in much greater numbers." On North-east Point, on the 20th August, he saw, with a glass, at least 500 in the view from Hutchinson's Hill. All this took place in a year when no pelagic sealing was permitted in Behring Sea.

It is clear that by our work of last summer the statements of the British Commissioners, and of Mr. Macoun, are amply corroborated.

Causes of Death.

While this first count on St. Paul Island proceeded, about 150 bodies of pups were dissected. The dissection was in the greater number of cases performed conjointly by Mr. Lucas and myself. The examination was a somewhat cursory one; the bodies were rapidly opened on some convenient stone on the rookery ground, and the appearances noted on the spot. Neither Mr. Lucas nor I are pathologists, and the symptoms noted are simply those that would present themselves at once to any anatomist's eye. So far as they go, however, they are not without interest.

In the first place a very considerable number of pups died during this early period of starvation. Dr. Jordan (Preliminary Report, p. 47) attributes to this cause the death of only "perhaps of 200 in all," or less than 2 per cent. of the whole. This is, I think, the only point of any consequence where I find myself at variance with Dr. Jordan on a matter of actual fact and observation.

I take the following five consecutive cases from my notes of dissections made at North-east Point on the 10th August. The pups were not selected by me, but such as seemed fresh enough for dissection were laid aside by Dr. Jordan and Mr. Clark as they passed over the rookery making their count, and I dissected them there and then :—

40. Female pup, thin, no subcutaneous fat. Stomach empty; rectum full of very black sticky matter; lungs and viscera apparently normal.

41. Male pup, large, very thin. Muscles pale in colour; lungs deeply congested; stomach and small intestines empty, the latter stained with much bile; rectum contained black slimy matter.

42. Male pup, thin; stomach empty; lungs normal; rectum contains small quantity of black slimy matter.

43. Female pup, very thin; lungs deeply congested; stomach empty.

44. Male pup, very thin; lungs deeply congested; stomach and rectum empty; intestines suffused with bile.

In every one of these cases it seems to me safe to say that the pup was starved. In the case of the pup starved for experiment, and dissected by Dr. Voss on the 15th August, the record of autopsy was as follows :—

"Lungs small, flaccid, deeply congested; comparatively little blood in heart, and no clot; liver small, thin, and very dark; gall bladder full; much dark bile secretion in intestines; kidneys small and dark; both branches of uterus congested."

The accumulation of tarry matter in the intestines, black with bile products, or perhaps with the pigments of extravasated blood, was found by us to be a constant accompaniment of starvation, and though our general knowledge of the symptoms of death by actual starvation is scanty, yet we are not without evidence of a similar phenomenon in the human subject (*cf.*, Taylor's "Medical Jurisprudence," edition 3, vol. ii, p. 138). Suffusions of bile and a distended gall-bladder are still more familiar concomitants of death by starvation. I have preserved notes of eighty-one autopsies of pups, made mostly by Mr. Lucas and myself, some by myself alone, others by Dr. Jordan and Dr. Voss; and of these eighty-one, nineteen are described as "emaciated and very thin," and six more as "thin." Nine showed the slimy or tarry black or greenish matter in the rectum, besides others which showed more or less conspicuous suffusions of bile.

In some of these cases injuries had been received from the immediate effects of which the pup died; but in all, if starvation did not actually take place, it had at least been imminent.

In my opinion, difficult as it may be to account for the fact, the deaths attributable to starvation, or that occur after a stage of emaciation has been reached, are, even in the early season, before pelagic sealing can have produced its effect, very much nearer to 12 or 20 per cent. than to the 2 per cent. below which Dr. Jordan estimates them.

Whatever may be the proportion of deaths from starvation in this early part of the season, the bulk of the pups have undoubtedly met their death by accidental injuries, by being smothered in the sand, injured by bulls, and sometimes by drowning in the surf. We could detect no sign whatever of any disease of an epidemic kind.

The following are the percentages of dead pups to the whole number born on the various rookeries as shown in the August count :—

	Per cent.
Ardiguen..	0·3
Ketavie	1·8
Sea-Lion Rock	2·5
Zapadnie (reef)	2·7
Lagoon	3·1
Zapadnie (Little)	3·2
Polavina (Little)	3·4
Lukannon..	4·6
Reef	6·2
North-east Point (east)	6·2
„ „ (west)	6·6
Gorbatch	7·7
Polavina	9·5
Tolstoi	13·1
Zapadnie	16·9

The great differences here tabulated go hand in hand in a way that is clear on the whole, if not not traceable in every single instance, with broad differences in the nature of the ground. The rocky rookeries show the least mortality; the stony beaches come next in order; the large rookeries of the Reef and North-east Point stand midway; Polavina, with its flat, level expanse, stands higher, and Tolstoi and Zapadnie owe their pre-eminence to sandy interspaces among the rocks, so fatal to the pups that we came to speak of them as "death-traps." The project of removing these last sources of danger by filling up the sandy hollows with rocks and stones has been put forward by the American Commissioners. The scheme is a big one, and I am for myself inclined to think that the labour involved would be very great indeed, and beyond the power of the islanders to accomplish.

After the middle of August my journey to the Commander Islands and other matters occupied my time, and I made no more autopsies. Accordingly, I cannot speak from personal observation of the cause of death indicated by the bodies of the dead pups later in the season.

The Mortality subsequent to August 15.

The second count of the dead pups was postponed until the end of September, in order that the pelagic fishery might produce its full effect. This count was made for St. Paul Island by Messrs. Macoun and Clark, with the assistance of Judge Crowley, Colonel Murray, and Mr. Barrett Hamilton, between the 28th September and the 1st October.

The count on St. George Island was made on the 6th October by Mr. Barrett Hamilton and Mr. James Judge on East and Little East Rookeries, and by Mr. Macoun and Mr. Clark on Zapadnie, Staraya Atil, and North Rookeries.

The following is the complete result of the October count, the number found in August being deducted from those found in October, to give the number that had died in the interval, and an addition of 20 per cent. being made in the case of St. Paul Island to fully cover the possible loss by putrefaction and other causes between August and the 1st October: the addition is a liberal one:—

Pup Statistics.—Summary.

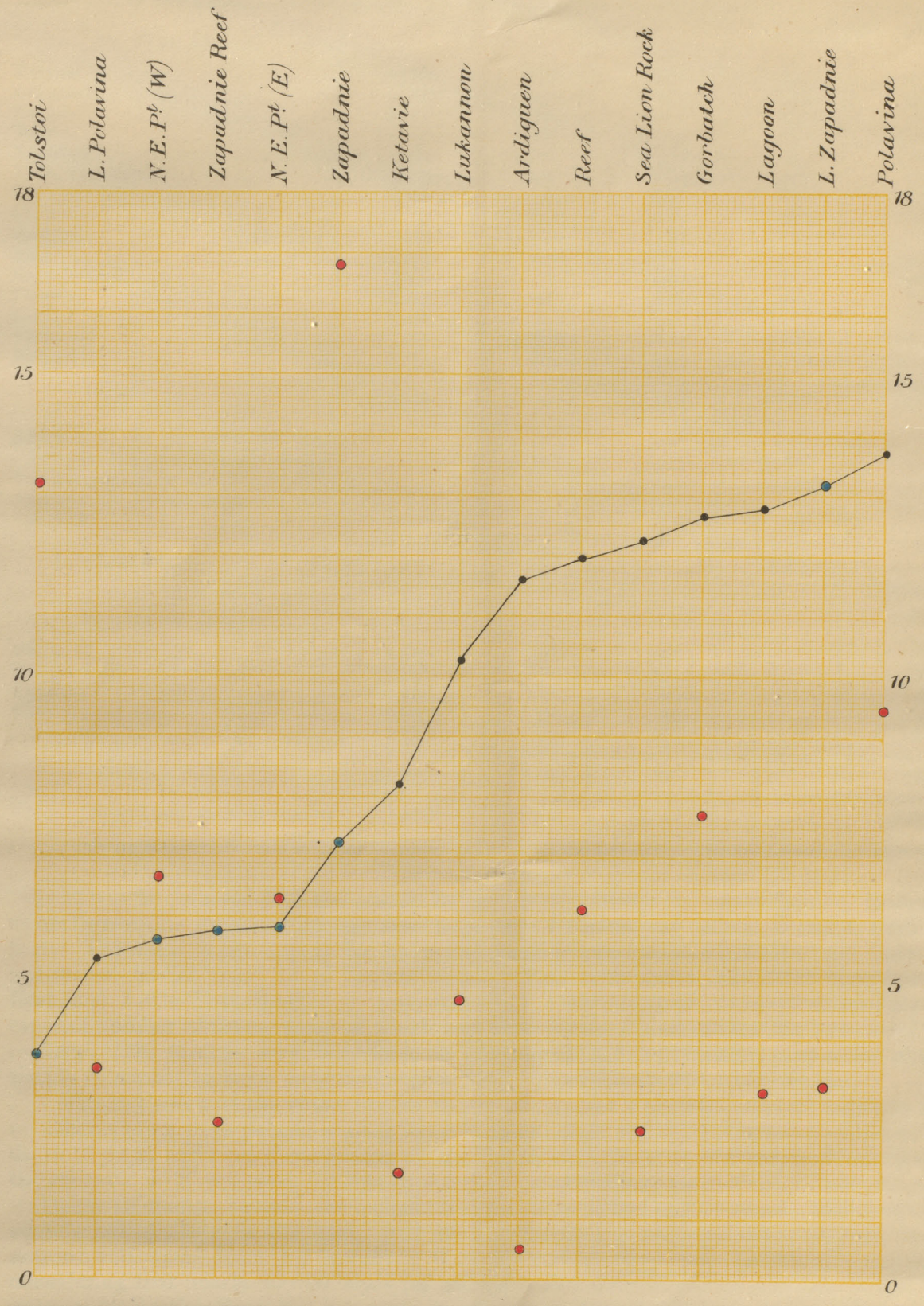
Rookery.	Total Born.	Dead.		Died since August Count.	Starving.
		August.	October.		
St. Paul Island.					
Ketavie	6,049	109	609	500	42
Lukannon	4,450	205	579	374	27
Lagoon	2,484	78	316	238	51
Tolstoi	14,439	1,895	2,449	554	191
Zapadnie	17,648	3,095	4,395	1,300	154
Little Zapadnie	4,200	134	693	559	64
Zapadnie Reef	3,862	104	327	223	18
Gorbatch	9,142	712	1,878	1,166	126
Ardiguen	652	2	78	76	8
Reef	15,258	950	2,786	1,836	300
Sivutch Rock	1,907	50	284	234	31
Polavina	6,673	635	1,555	920	55
Little Polavina	1,363	47	119	72	22
Vostochni	27,148	1,808	3,313	1,525	329
Morjovi	7,773	485	950	445	109
Total	123,048	10,309	20,331	10,022	1,527
Addition of 20 per cent. for loss between August and October counts	..	..	..	2,061	..
Starving pups to be added as starved.	..	..	..	1,527	..
Addition for bodies taken for dissection	..	..	..	150	..
Total starved	..	..	..	13,760	..
St. George Island.					
North	6,809	259	145	..	7
Staraya Artil	2,269	135	194	..	3
Zapadnie	5,509	199	527	..	4
East	4,086	112	15	..	4
Little East	1,350	31	16	..	1
Total	20,023	736	897	..	19
Grand total for both islands.	143,071	11,045	21,228	..	1,546

It will be observed that the result for St. George Island is unsatisfactory, inasmuch as on three of its rookeries far less dead pups were found on the second occasion than the first. The blue foxes appear to have devoured the carcasses wholesale, and only two untouched bodies were found on the island. This destruction was most complete on East and Little East Rookeries, and just there I had noticed in the end of July the especial number of foxes, some of which had their earths almost within the bounds of the rookery. St. George may, therefore, be left out of the calculation, unless we choose simply to ascribe to it an estimated mortality in proportion to that of St. Paul.

The net result of the count for St. Paul is that, even were we prepared to admit that no other causes save pelagic sealing were at work after the 15th August to lead to the death of pups, and even if we reckon all the "starving" pups as starved, and add besides the estimate of 20 per cent. for loss or defects of observation, we then should have a total mortality to charge against the pelagic sealer a little more than equal to that which has already taken place in the early part of the season from causes acknowledged to be natural and apart from his agency. We may wonder that this mortality is not more, considering that nearly 30,000 seals (of all ages and both sexes) were taken during the summer in Behring Sea; but it is clear we cannot prove more nor any longer allege more. And such mortality is a very different matter from what has of late years been asserted to take place.

Dr. Jordan appears to charge in his preliminary Report the whole of this autumnal mortality, the whole loss of pups after the August count, to starvation, resulting from the operations of the pelagic sealers. I have no wish to dispute, nor have I any inclination to

PERCENTAGE OF DEAD PUPS, AUGUST TO OCTOBER ON THE SEVERAL ROOKERIES OF St PAUL ISLAND.



REFERENCES.

The rookeries to North and West are represented by Blue dots.

" " " South and East " " " Black dots.

The red dots indicate the earlier mortality ending with the beginning of August.

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doubt, that to the death of the mother at sea a large part of this mortality is due, but that this is the entire and sole cause is surely impossible to maintain after our experience of the earlier mortality, which showed no signs of having ceased at the time we estimated it.

Let us make, for comparison with the similar table previously given (p. 23), a table of the later mortality on the various rookeries expressed in percentage proportion of the dead pups to the whole number born.

PERCENTAGE Proportion of Pups found Dead in the September–October Count (after deduction of the whole number already counted in August) to the whole number born on the several Rookeries.

	Per cent.
Tolstoi	3·8
Little Polavina	5·3
North-east Point (west)	5·6
Zapadnie Reef	5·7
North-east Point (east)	5·9
Zapadnie	7·3
Ketavie	8·2
Lukannon	10·3
Ardiguen	11·6
Reef	12·0
Sea-Lion Rock	12·3
Gorbatch	12·7
Lagoon	12·8
Little Zapadnie	13·3
Polavina	13·8

The contrast or comparison of these two tables is exceedingly interesting to me. We still have a wide discrepancy between the percentages on the different rookeries where we should certainly be inclined to look for much closer agreement were a general and distant cause (such as the catch at sea) the only factor in operation. But the order of percentage is totally different from the preceding one. Differences in the nature of the ground have now little effect or none at all. Zapadnie and Zapadnie Reef come near together, as do Ketavie and Lukannon; Ardiguen, Reef, Sea-Lion Rock, and Gorbatch are nearly identical one with another; Tolstoi, which stood all but at the head, now stands at the bottom. It is curious to note that, with the exception of Little Polavina, all the rookeries at the bottom of the list are on the north and west of the island, and, with the exception of Little Zapadnie, all those at the top of the list are rookeries on the south and east.

I do not propose to explain all the points that an examination of the statistics suggests. But while I believe that there are sufficient discrepancies to indicate the presence of other factors in the case, yet it would, in my opinion, be useless to deny that the figures tend to corroborate the presumption that pelagic sealing is responsible for a large part of this autumnal mortality.

The general result of our investigation accordingly is that pelagic sealing, instead of being the one and only cause of the whole mortality of pups upon the islands, is in fact responsible for an unknown but considerable fraction of a fraction which is somewhat over one-half of the whole.

If, moreover, we require further warning not to ascribe too large a coefficient to the influence of pelagic sealing on the aggregate mortality, we may find it in a comparison of the statistics for 1895 and 1896. We have every reason to believe that the count was made, for the Island of St. Paul at least, as conscientiously in the one year as in the other; the numbers are congruent for the rookeries severally as well as collectively. Yet we have evidence of only some 1,600 more dead pups in the former than in the latter year, against a pelagic catch in Behring Sea greater (*cf.*, United States' Treasury Doc., No. 1932, p. 37, 1897) by nearly 15,000.

In 1895 the count of dead pups on the islands was made, once for all, in the days immediately preceding the 10th October. The enumeration on St. Paul Island was evidently systematic and careful, and its results tally very closely with those of 1896.

On St. George Island the count is said to have been made by Mr. Ziebach, the agent in charge. Mr. Ziebach reports the finding of 6,012 dead pups (where, in 1896, only 897 were obtained), a figure that would indicate a mortality of about one-third of all the pups born on the island. I can offer no explanation of this stupendous discrepancy.

The following Table sums up the total mortality of pups reported from the two islands for 1895 and 1896.

Comparative Statement of the Total Mortality of Pups in 1895 and 1896.

St. Paul Island.

Rookery.	1895.	1896.	Remarks.
Ketavie	857	609	The figures for 1895 are from Sen. Doc. 137, Part II, pp. 36 and 37, 54th Cong., 1st Sess.
Lukannon	1,347	579	
Lagoon	300	316	
Polavina	1,970	1,674	
Gorbatch	1,514	1,956	
Zapadnie	5,231	5,415	
Little Zapadnie	381	..	
Tolstoi	2,582	2,449	
Reef	3,376	2,786	
Sea-Lion Rock	361	284	
North-east Point	4,017	4,263	
Total	21,936	20,331	

St. George Island.

Rookery.	1895.	1896.	Remarks.
Zapadnie	2,083	527	
North	1,559	145	
Staraya Atil	1,131	194	
East	986	15	
Little East	253	16	
Total	6,012	897	

Summary of Statistics for 1896.

Date of Counting Cows.	Rookery.	Harems.*	Cows.	Counted or Estimated.†	Pups Alive, August.	Pups Dead, August.	Total of Pups Born.‡	Cows Dead.	Bulls Dead.	Pups Dead (October).§	Pups apparently Starving (October).
	St. Paul Island.										
July 13	Ketavie	182	3,152	C. + E.	5,940	109	6,049	..	..	609	42
,, 20	Lukannon	147	2,543	E.	4,245	205	4,450	2	..	579	27
,, 13	Lagoon	120	1,474	C. + E.	2,406	78	2,484	4	2	316	51
,, 14	Tolstoi (main)	389	6,729	E.	9,996	1,779	11,775	9	2	2,449	191
,, 14	,, (cliffs)	108	1,498	C. + E.	2,548	116	2,664	7	1		
,, 14	Zapadnie	583	10,085	E.	14,553	3,095	17,648	16	6	4,395	154
,, 14	Little Zapadnie..	210	2,400	C. + E.	4,066	134	4,200	6	..	693	64
,, 14	Zapadnie (reef)..	176	2,256	C. + E.	3,758	104	3,862	5	1	327	18
,, 16	Gorbatch	302	5,224	E.	8,430	712	9,142	5	1	1,878	126
,, 13	Ardiguen	27	550	C. + E.	650	2	652	..	..	78	8
,, 16	Reef	504	8,719	E.	14,308	950	15,258	24	2	2,786	300
,, 15	Sea-Lion Rock	62	1,000	E.	1,857	50	1,907	..	..	284	31
,, 23	Polavina (main)	138	2,387	E.	3,593	584	4,177	4	2	1,555	55
,, 15	,, (cliffs)	86	1,268	C. + E.	2,445	51	2,496	..	..		
,, 23	,, (Little)	45	779	E.	1,316	47	1,363	..	..	119	22
,, 16	North-east Point (west ct.)	224	2,887	C. + E.	4,117	295	4,412			3,313	329
,, 16	,, ,, (west est.)	751	12,992‖	E.	21,223	1,513	22,736	30	11		
,, 16	,, ,, (east ct.)	112	1,194	C. + E.	2,173	116	2,281			950	109
,, 16	,, ,, (east est.)	181	3,134	E.	5,115	369	5,484				
	Total for St. Paul	4,348	70,361	..	112,739	10,309	123,040	112	28	20,331	1,527
	St. George Island.										
,, 10	North	225	3,891	C. + E.	6,550	259	6,809	7	..	145	7
,, 11	Little East	44	761	C. + E.	1,319	31	1,350	1	..	16	1
,, 11	East	135	2,335	C. + E.	3,974	112	4,086	2	..	15	4
,, 12	Zapadnie	182	3,148	C. + E.	5,310	199	5,509	2	..	527	4
,, 10	Staraya Atil	75	1,297	..	2,134	135	2,269	6	..	194	3
	Total for St. George	661	11,432	..	19,287	736	20,023	18	..	897	19
	Grand total	5,009	81,793	..	132,026	11,045	143,063	130	28	21,228	1,546

Otter Island had one harem, containing five pups.

* The count of harems here given for the Island of St. Paul was made during the general count by the Commissioners and Agents on the dates specified. Another count made by Colonel Murray, somewhat different to the above, is recorded on p. . For St. George Island, Colonel Murray's count is here made use of.

† The estimate of cows, where counting was impossible, is based on an average of 17·3 to a harem, that being the number given by the count of Ketavie Rookery.

‡ The total number of pups born is based on an actual count in the cases of Ketavie, Lagoon, Tolstoi Cliffs, and Zapadnie Reef. Elsewhere it is arrived at by adding 75 per cent. to the number of cows as observed or estimated in the foregoing columns.

§ The latter count of dead pups for St. George Island is very inadequate, the bodies having been destroyed or removed by foxes in great number.

‖ The estimate for the more crowded parts of the North-east Point is based on less perfect data than the rest, an accurate account even of harems being here impossible. Colonel Murray's count, above alluded to, is largely in excess of that here adopted for this rookery.

The Drives.

On the morning of the 15th July, in company with Dr. Jordan, Judge Crowley Captain Moser and Lieutenant Garrett of the "Albatross," Dr. Stejneger, Mr. Lucas, and Mr. Clark, I witnessed the entire conduct of a drive from Reef Rookery. This drive is minutely and accurately described by Dr. Jordan in his preliminary Report (pp. 38–40). The points which I especially noted at the time, and which may be here recapitulated in brief, were the silence, orderliness, and absence of haste with which the whole proceedings were conducted; the care taken in sorting out, as the drive progressed, the largest of the half-bulls included in it; the much greater ease with which the younger seals travelled over the ground than their older and heavier brethren; and, lastly, the ease with which the herd travelled over the harder and rougher portions of the ground, compared with the labour involved in crossing a short stretch of sand at Zoltoi. Before traversing the latter, arduous, though apparently unimportant, part of the journey, the herd was allowed to rest and cool for 10 minutes. The difference was quite enough to show that distance in itself is (within reasonable limits) an unimportant cause of fatigue and hardship compared with the character of the ground traversed, and, furthermore, that the ground which seemed to the novice the most arduous was far from being so, for the seals clambered actively and with ease over great boulders and high angular masses of broken rock, while they panted with fatigue over a level stretch of sand.

I could see absolutely nothing to find fault with in the drive. The route is the most fatiguing now made use of on the islands, but I could discover no great hardship, and certainly no cruelty, involved. The seals certainly puffed and blew, and sweated and steamed; they stopped every now and then to rest, and panted, as Dr. Jordan says, "like dogs," but a moment after they went on again briskly. The signs of distress were less painful than I have often witnessed in a flock of sheep on a hot and dusty road, and I have seen drovers show less regard for the comfort of their sheep. No seal died or was injured by the way; they came to the end of their journey all in good condition, and when the killing was over, those that were permitted to escape betook themselves straight and quickly to the sea.

We left the village at 2 A.M., and the drive commenced immediately thereafter at Zoltoi Sands. The seals driven from there and from the bay opposite were guided by three men straight to the village killing-ground, where they waited till the drive was over, about 5 o'clock. It was 3 o'clock when we reached the end of the reef, and the seals there were gathered together and started on their way by half-past. About 1,500 seals were included in the drive and driven in two batches, one of which reached the killing-ground about 5 o'clock, the other about a quarter to 6. On reaching the killing-ground they were first turned into the shallow lake by its side and afterwards rounded up on the grass; 1,919 seals in all were driven up to the killing-ground; of these, 849 were killed, and 1,070 rejected, 522 as too small, and 548 as too large (according to my figures), besides the small number of still larger ones that were turned away in the course of the drive. The percentage killed on the ground was, therefore, only 44·3 of those driven up. The killing was concluded by about 10 o'clock, an interval for breakfast intervening.

A week before, on the 9th July, I had attended, not a whole drive, but the last portion of one and the subsequent killing, at Zapadnie, St. George, and I append my notes made on the spot.

Leaving the village at 5 A.M., in company with Mr. J. Judge and Colonel Murray, we arrived on the ground shortly before 7 A.M. We found the pack of bachelor seals that had been driven on the previous evening from the hauling-grounds gathered together on rising ground near the watchman's hut. We walked down the hill to another hut, used by the Company's officers, at a distance of about half-a-mile, or rather more, and were there met by the Company's agent, Captain Daniel Webster. We had scarcely arrived there when the seals, driven by a couple of boys, arrived too, having covered the distance with no sign of exertion in less time than ourselves.

The killing-gang consisted of nineteen men and lads, three of whom carried wooden clubs 5 feet long. The seals were kept back a couple of hundred yards from the shore, and allowed to come forward in batches or packs to the killing-ground between the main batch and the sea. Captain Webster, club in hand, pointed out to the men what seals in each pack were to be slaughtered.

I counted in each batch the seals killed, and those rejected as too young or too old, as follows:—

Rejected as too Young.	Rejected as too Old.	Killed.	Total.
25	..	28	53
18	4	20	42
13	7	20	40
30	3	22	55
12	14	10	36
21	10	17	48
28	1	13	42
7	4	12	23
16	8	11	35
15	6	21	42
30	1	13	44
17	6	20	43
33	..	14	47
265	64	221	550

Percentage killed, 40·2.

The work of killing was completed at 8·20 A.M.

The men employed were clean, skilful, and vigorous. A single blow, or two at most, dispatched each seal, and I saw no failure of aim, even in the confused mass of seals tumbled pell-mell over one another. Though two killings (of 578 and 333 respectively) had already taken place from this rookery this season, I saw no seal bearing marks of previous injury. They showed no signs of terror; the survivors of each batch made quickly for the water, and were already swimming homeward as the next batch were being slain. Of the nineteen men, two drove down the batches of seals and two did the work of killing; two younger lads went round plunging a knife into the heart of any seal that still breathed, five (rippers) proceeded to slit the skins down the belly and around the neck and paws, after which the rest flayed the carcases. The work of skinning nearly kept pace with that of killing.

I could not detect in the whole process either intentional or accidental cruelty.

After a short rest, we saw the skins placed in the salt-house, the tally taking place under the eye of the Company's Agent and the Treasury Agent; 213 skins were tallied, my former count having been only approximate in the hurry of the killing operations.

Eight skins were produced in addition, as those of seals killed in the preceding days by the watchmen for food.

When I watched the killing, after the drive already described from the Reef, it seemed to me that if there was any difference at all between the operations on the two islands, the men of St. George were perhaps the more skilful of the two. I noted that it seemed to me that on St. Paul the animals were hit more on the nose and less on the back of the head, and that a second or a third blow was more often necessary. But though there may have been a man here and there less skilful than another, the operation on the whole was performed with very remarkable good order, dexterity, and speed; and, both in respect to the driving and killing on the two islands, I at least have no recommendations to suggest for their improvement.

I afterwards attended a killing at Polavina, on the 23rd July. The gang here consisted of twenty-six men (five with clubs to kill) and four boys; 585 seals were killed, and 344 released as young, and 313 as old. Two young seals were here accidentally injured; of these one was killed a few minutes afterwards, and the other was found dead in the afternoon. Work was over by 8·45 A.M. The drive here is a rather long one, the killing-ground being fully a mile from the extreme part of the rookery, but the ground is level and easy; the drive is lengthened in order to bring the killing-ground near to a small lake, where the seals are cooled off.

I afterwards witnessed the last killings of the season, save for a small number killed later for food, on the 25th and 27th July. The proceedings call for no further remark or description.

The drive on the 25th July was a large and comprehensive one, seals being brought from Lukannon, Ketavie, Zoltoi Sands, and the Reef; on the 27th July the chief drive was from Tolstoi and Middle Hill, afterwards from Lukannon. Although Lukannon had been driven so recently, there were said to be a remarkable number of good first-class skins in this final drive from that rookery.

This drive completed the season's catch of 23,842 for St. Paul Island. About sixty

killable seals were turned away, and a drive from Zapadnie that it had been intended to make was not required. Up to the previous week 5,858 skins had been taken on St. George Island, when Mr. Crowley arranged that other 300 should be taken, that being, in Captain Webster's opinion, the utmost that could be done.

I append a Table showing the proportion of seals killed and released on the various rookeries from the date of our arrival.

PERCENTAGE of Seals Killed and Released at the several Drives.

Zapadnie, St. George Island, July 9 (D.W.T.)—		
Rejected as too young	265	
Rejected as too old	64	
Killed	221	
Percentage	..	41·8
Reef, July 14 (D.W.T.)—		
Rejected as too young	522	
Rejected as too old	548	
Killed	849	
Percentage	..	44·3
North-east Point, July 13, 14 (Mr. Adam)—		
Rejected young only	1,159	
Killed	2,214	
Tolstoi, July 16 (Mr. Adam)—		
Rejected as too young	1,038	
Rejected as too old	279	
Killed	1,138	
Percentage	..	47·2
North-east Point, west side, July 21 (Mr. Adam)—		
Rejected as too young	637	
Rejected as too old	811	
Killed	808	
Percentage	..	35·8
Polavina, July 23 (D.W.T.)—		
Rejected as too young	344	
Rejected as too old	313	
Killed	585	
Percentage	..	47·1
Lukannon, Ketavie, and Reef, July 25 (D.W.T.)—		
Rejected as too young	1,177	
Rejected as too old	1,008	
Killed	1,630	
Percentage	..	42·7
Tolstoi and Middle Hill, July 27—		
Rejected as too young	137	
Rejected as too old	457	
Killed	450	
Percentage	..	43·1
North and Staraya Atil, July 13 (Mr. J. Judge)—		
Killed	487	
Percentage	..	46·0
East, July 21 (Mr. Judge)—		
Killed	221	
Percentage	..	27·0
North and Staraya Atil, July 24 (Mr. Judge)—		
Killed	308	
Percentage	..	17·0

Mr. Judge further supplied me with the following statistics of the percentage killed at the earlier drives on St. George Island. In these cases the percentage given is not the result of a close count, but is merely an approximation.

Date.	Rookery.	Killed.	Percentage killed.
June 19	East	576	32
„ 24	Zapadnie	568	76
„ 26	North and Staraya Atil	999	72
„ 29	East	804	62
July 2	Zapadnie	333	68
„ 6	North and Staraya Atil	700	56
„ 7	East	614	57

These figures, though not nearly so complete as we might wish them to be, are nevertheless exceedingly instructive, and illustrate a large number of useful truths.

In the first place they show that a very considerable proportion of males are rejected at every drive as too old for killing, and that to this extent the system is not a ruthless one, but leaves a liberal supply for breeding purposes. In some cases the animal taken is so little less than its neighbour which is left that the amateur can scarcely detect the difference, so inconspicuous is the incipient "wig" or growth of coarse hair over the withers which determines the rejection.

In the second place, the falling percentages are a rough measure of the extent to which the successive drives exhaust, or fall short of exhausting, the available stock.

In this instance the conclusion is inevitable that the drain upon the Island of St. George was this year much more severe than that upon the Island of St. Paul.

Note.—It is unfortunate that no more exact statistics are available as to the proportion of bachelor seals killed to those released. A careful count of the numbers released was not made until we arrived upon the islands, and the rough estimates furnished us for some of the earlier drives are useless as a basis for calculation.

It is clear that, if we may assume that the time intervening between two successive drives is sufficient to allow of a thorough redistribution of the bachelor herd, and if the case be not rendered much more complex by a great diversity in habits, or in the date of arrival of the bachelors of different ages, then we ought to possess in the falling percentage of "killable" bachelors in the successive drives a means of estimating approximately the total number of the bachelor herd for each rookery.

My colleague, Dr. John McCowan, has furnished me with the following solution of this problem:—

Let m be the ratio of killed to spared in the second drive, and n the like ratio for the first.

Let r be the reciprocal of $1 - \frac{m}{n}$.

Then the total original number of seals = r times the number contained in the first drive.

For example, taking the killings from North Rookery and Staraya Atil on July 6 and 13, as being perhaps the best (or the least faulty) instance at hand, we have—

$$\text{July } 6 \quad n = \frac{56}{44}$$

$$\text{„ } 13 \quad m = \frac{46}{54}$$

$$\therefore r = \frac{1}{1 - \frac{\frac{46}{54}}{\frac{56}{44}}} = \frac{1}{1 - \frac{253}{378}} = \frac{1}{\frac{125}{378}}$$

$$= \text{(nearly) } 3$$

Now, on the 6th July were killed 700, being 56 per cent. of the drive.

The drive on the 6th July, therefore, contained 1,250 seals.

The whole herd on the 6th July, therefore, contained $1{,}250 \times 3 = 3{,}750$ seals.

And 3,750 + 999 (killed on 26th June) = 4,750, is thus given us as an approximate number of bachelors for the hauling-grounds of these two rookeries at the beginning of the season.

Estimating either by the count of cows or by the yield on the killing-grounds, these two rookeries are equivalent to about one-fifteenth of the two islands; and we, therefore, arrive at a total of somewhat over 70,000 as the number of bachelors (of two years old and upwards) frequenting the islands at the beginning of last season.

The subsequent drive on the 24th July from the same rookeries, at which only 17 per cent. are said to have been killed, is unfortunately not available as a check on the

above calculation. It was the last drive of the season, and was only made to furnish the balance of the quota.

The estimate is here given merely as an illustration of a method, which, with better data to work upon, might prove valuable. The percentage given for the 6th July is not to be relied on. Nevertheless, the result arrived at is probably not a very long way from the truth.

Statistics of Seals Killed on the Pribyloff Islands in the Season 1895–96.

St. Paul Island.

Season.	Date.	Rookery.		Seals killed.
1895	Autumn ..	Food-skins		929
1896	May 13 ..	„ Sea-Lion Rock ..	121	
	„ 22 ..	„ North-east Point ..	3	
	„ 26 ..	„ Tolstoi	102	
	June 4 ..	„ North-east Point ..	3	
	„ 8 ..	„ Reef	149	
	„ 13 ..	„ Watchmen to date ..	6	
				384
	„ 19 ..	Zoltoi		283
	„ 20 ..	Watchmen		2
	„ 23 ..	North-east Point..		1,414
	„ 24 ..	„ „		1,408
	„ 27 ..	Reef		2,076
	„ 29 ..	English Bay, Middle Hill, Tolstoi		1,398
	July 2 ..	North-east Point..		1,396
	„ 3 ..	„ „		1,109
	„ 6 ..	Zoltoi, Lukannon		1,535
	„ 7 ..	Zapadnie		784
	„ 8 ..	Polavina		961
	„ 10 ..	Reef, Zoltoi		1,271
	„ 13 ..	North-east Point..		1,045
	„ 14 ..	„ „		1,169
	„ 15 ..	Reef, Zoltoi		849
	„ 16 ..	Tolstoi, Middle Hill, English Bay		1,138
	„ 21 ..	North-east Point..		808
	„ 22 ..	„ „		1,047
	„ 23 ..	Polavina		585
	„ 25 ..	Lukannon, Ketavie, Zoltoi, Reef		1,630
	„ 27 ..	Middle Hill, Tolstoi, Lukannon		621
		Total		23,842

St. George Island.

Season.	Date.	Rookery.		Seals killed.
1895	Autumn ..	Food-skins		166
1896	May 18 ..	„ North Rookery ..	15	
	„ 31 ..	„ „ „ ..	46	
	June 11 ..	„ „ „ ..	100	
				161
	„ 19 ..	East Rookery		576
	„ 24 ..	Zapadnie		568
	„ 26 ..	North and Staraya Atil		999
	„ 29 ..	East		804
	July 2 ..	Zapadnie		333
	„ 6 ..	North and Staraya Atil		700
	„ 7 ..	East and Little East		614
	„ 9 ..	Zapadnie		221
	„ 13 ..	North and Staraya Atil		487
	„ 21 ..	East		221
	„ 24 ..	North and Staraya Atil		308
		Total		6,163

TOTAL.

	1895–96.	1896 to August.
St. Paul Island	23,842	22,913
St. George Island	6,163	5,997
Total	30,005	28,910

NOTE.—All skins of seals killed on the islands in 1896 were accepted by the agents of the North American Commercial Company. Seven skins taken for food in the previous autumn (15th October) on North Rookery, St. George Island, were rejected, one as being under-sized, the rest as stagey.

The above figures were furnished me for St. Paul Island by Judge Crowley, United States' Treasury Agent in charge of the Pribyloff Islands, and for St. George Island by Mr. James Judge, United States' Treasury Agent.

COMPARATIVE Frequency of Drives in past Years on the Pribyloff Islands.
Cf. Sen. Doc. 137, Pt. I, pp. 302–319.)

ST. PAUL ISLAND.

Rookery.	1878.	1888.	1889.	1896.
North-east Point	4	33	33	4
Reef, including Zoltoi	18	17	18	6
Tolstoi and Middle Hill	9	13	13	3
Lukannon and Ketavie	9	6	12	3
Zapadnie	4	8	8	1
Polavina	3	8	7	2

ST. GEORGE ISLAND.

Rookery.	1878.	1888.	1889.	1896.
North	7	16	13	5
East	7	14	15	4
Zapadnie	7	10	12	3
Staraya Atil	5	15	13	4

NOTE.—In the above Table all the "food-drives" and all the drives in autumn subsequent to the "stagey" season are omitted.

The figures given for the years 1888–89 are not in all cases, at least not in the case of the larger rookeries, strictly comparable with those for this year, since they record as separate drives drives that obviously covered only a portion of the rookery; the figures for North-East Point in those years should, at any rate, be divided by two. Nevertheless, the comparison is of some value, and may be checked by an inspection of the full statistics from which the above epitome is drawn.

It is manifest from the above statistics that the rookeries, especially those on St. Paul Island, were last year subjected to vastly less severe handling than in days gone by, especially in the latter years of the Alaska Company's tenure.

There was no "raking and scraping" required to furnish the quota of 30,000 skins that was last year permitted and obtained. It is equally clear that the 30,000 might have been considerably exceeded, though it is not safe to make assumptions regarding the measure of such possible excess. But we may at least take note that the killing came to a satisfactory end last year without the need for even a second drive at Zapadnie, from which

no seals were taken after the single drive on the 7th July, at which 784 skins were taken; while in 1895 Zapadnie furnished—

	Skins.
July 2	861
„ 19	834
Total	1,695

And in 1894—

	Skins.
June 23	846
July 17	933
Total	1,779

Statistics of Killing on North-east Point.

Captain David Webster had the kindness to communicate to me (5th August, 1896) his private memoranda of the killing on North-east Point that he had himself superintended. Captain Webster has had more experience than any man alive of seals, their quest and their slaughter. His experiences are in part recorded in the Report of the British Commission of 1891, and the Commission then bore testimony, which it would be superfluous for me to repeat, as to his extreme regard for accuracy of statement.

Year.		Date.	Killed.
1868	Finished killing (for want of salt) September 15, after killing 26,000. Then twice as many more were killed on the same rookery by other hands. In regard to the great and unrestricted slaughter of this year, it has been alleged that the slaughter was indiscriminate, and regardless of sex or age. Captain Webster is positive in asserting that bachelor males only were killed; that these were so abundant that it was unnecessary to disturb the more difficultly driven breeding-grounds for the bulls and females; and that the natives would have refused even then to kill after being all their lives accustomed to protect them.		
1869	None killed.		
1870	Captain Webster absent on Robben Reef.		
1871	Killing completed	October 28 ..	18,000
1872	„ „	July 19 ..	23,444
1873	„ „	„ 23 ..	26,369
1874	„ „	„ 17 ..	35,775
1875	„ „	„ 17 ..	35,118
1876	(Absent on Commander Islands.)		
1877	Killing completed	„ 9 ..	25,264
1878	„ „	„ 10 ..	22,839
1879	„ „	„ 10 ..	29,245
1880	„ „	„ 9 ..	25,799
1881	„ „	„ 8 ..	18,077
1882	„ „	„ 17 ..	23,211
1883	„ „	„ 9 ..	13,361
1884	„ „	„ 18 ..	23,099
1885	„ „	„ 23 ..	19,818
1886	„ „	„ 24 ..	26,924
1887	„ „	„ 22 ..	28,565
1888	„ „	„ 26 ..	32,863
1889	„ „	„ 31 ..	28,805

From these statistics two deductions may be fairly drawn.

Firstly that the diversities of dates by which the work was completed and the varying numbers obtained indicate a variation in the numbers of the stock from year to year even in very early periods. This fact Captain Webster himself pointed out, and bore witness from his recollection to its truth. He was positive that even in those early days the seals were more abundant one year than another, and that the yield was gathered in with varying

degrees of labour and in varying plenty; but he professed himself unable to explain this fact. Secondly, we may see from the continual lengthening out of the season something of the increasing difficulty experienced in the last years in obtaining the total; and the large numbers secured to the end (that of 1888 exceeding that of any year since 1875) may perhaps be interpreted as showing how this great harvest-ground was drawn upon to the utmost in the struggle to achieve the whole quota of 100,000 for the islands during the last years of the Alaska Company's tenure.

Conclusion

Besides the facts or statements that I have dealt with in the preceding pages, there are still many other points, to which my attention was directed, concerning which I beg leave in the meanwhile to prætermit my report. Such matters as these are the dates of arrival and departure of the various classes of seals, their manner of feeding and periods of abstinence from food, their distribution at sea and the duration of their stay ashore, the diet of the pups at weaning, the measure of virility of the bulls, and the phenomena of pregnancy in the females.

Certain of these matters are discussed in the Reports of my colleagues; certain of them are matters in regard to which the poverty of our knowledge invites suspension of judgment and fresh search for evidence.

In the foregoing account I have merely set forth my observations of the herd and its past history in so far as both together show that the alarming statements to which utterance has been given in recent years, the accounts of the herd's immense decrease and the prophecies of its approaching extinction, are overdrawn and untenable. But it is my duty to state to your Lordship that there is still abundant need for care and for prudent measures of conservation in the interests of all. A birth-rate which we estimate at 143,000 per annum is not great in comparison with the drain upon the stock. From one cause or another, a loss of over 20,000 is experienced among the pups ere they emigrate to sea; and though the dangers they there encounter are unknown to us, we may take it for certain that the risks they run are great and the loss they endure considerable. When to the measured loss in infancy and to the unmeasured loss in youth and age we add the toll taken on the islands and the toll taken in the sea, it is not difficult to believe that the margin of safety is a narrow one, if it be not already in some measure over-stepped. We may hope for a perpetuation of the present numbers; we cannot count upon an increase. And it is my earnest hope that a recognition of mutual interests and a regard for the common advantage may suggest measures of prudence which shall keep the pursuit and slaughter of the animal within due and definite bounds.

I am, &c.

(Signed) D'ARCY W. THOMPSON.

British Columbia Sealing Catch, 1896.

Vessel.	Tons.	Maste .	Crews.		Boats.		Particulars of Catch.								Total.	Number of Special Sealing Licence.
							British Columbia Coast.		Japan Coast.		Vicinity of Copper Islands.		Behring Sea.			
			White.	Indians.	Boats.	Canoes.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.		
Ada	91	G. R. Ferey	6	20	1	10	..	..	..	..	..	..	204	519	723	67
Agnes MacDonald ..	107	M. F. Cutler	25	..	10	..	..	..	235	310	..	..	147	135	827	26
Ainoko	75	G. Heater	6	12	2	6	198	230	..	..	..	..	6	133	567	49
Allie J. Alger	75	C. E. Locke	23	..	9	..	..	..	397	262	16	32	123	288	1,118	12
Amateur	18	C. Jipson	..	16	..	8	22	87	..	..	..	..	..	..	109	57
Annie C. Moore	113	C. Hackett	8	34	2	16	271	160	..	..	..	..	583	505	1,519	51
Annie E. Paint	82	A. Bissett	26	..	12	..	..	..	419	396	..	..	81	144	1,040	24
Arietis	86	P. Martin	25	..	9	..	..	..	715	319	..	..	108	330	1,472	20
Aurora	41	T. H. Brown	20	..	6	..	..	..	44	281	16	19	8	69	437	14
Beatrice (Shanghae) ..	66	Wm. Heater	6	26	2	13	239	142	..	..	..	..	179	353	913	38
Beatrice	49	A. H. Jones	6	11	2	6	272	91	..	..	..	..	45	47	455	44
Borealis	37	A. Wasberg	23	..	7	..	..	..	82	245	..	..	70	235	632	3
Carlotto G. Cox	76	W. D. Byers	25	..	9	..	..	..	552	670	..	..	74	160	1,456	27
Carrie C. W.	92	J. A. Gould	9	31	2	16	112	57	..	..	..	..	273	630	1,072	42
Casco	63	C. Le Blanc	22	..	7	..	..	..	186	622	63	139	..	..	1,010	15
C. D. Rand	51	J. O. Townsend	6	27	2	13	..	..	..	..	..	..	214	355	569	64
City of San Diego	46	W. McDougall	6	22	1	11	149	64	..	..	..	..	93	307	613	29
Diana	50	A. Nelson	18	..	6	..	..	..	475	522	19	76	..	..	1,092	7
Director	87	F. W. Gilbert	23	..	7	..	..	..	460	433	85	98	..	..	1,076	21
Dolphin	72	John Daley	8	26	3	13	454	48	..	..	..	..	333	274	1,109	54
Dora Siewerd	93	H. F. Siewerd	10	32	2	16	174	203	..	..	..	..	336	490	1,203	45
Doris	60	Fred Griffiths	6	25	1	12	..	..	..	..	..	..	129	533	662	65
E. B. Marvin	96	C. J. Harris	23	..	11	..	..	..	397	439	..	..	109	142	1,087	9
Favourite	80	L. McLean	6	23	2	16	514	310	..	..	..	..	454	595	1,873	48
Fawn	59	M. Foley	9	26	2	13	286	143	..	..	..	..	371	243	1,043	40
Fisher Maid	21	C. Chipps	..	9	..	4	8	55	..	..	..	..	..	..	63	56
Florence M. Smith ..	99	L. McGrath	27	..	11	..	..	..	396	206	..	..	137	134	873	36
Fortuna	97	Thos. O'Leary	24	..	7	..	..	..	162	372	44	130	..	..	708	10
Geneva	92	W. O.Leary	26	..	8	..	..	..	190	309	162	289	..	..	950	8
Ida Etta	69	W. O. Hughes	22	..	9	..	..	..	195	455	3	10	65	305	1,033	39

Kate	58	C. Stromgren	7	25	2	12	82	122	..	..	..	..	87	231	522	22
Katharine	81	J. E. Fulton	20	..	6	..	..	..	99	116	..	..	..	..	215	2
Kilmeny	18	W. Holgarn	4	12	1	6	63	37	..	..	..	..	..	..	100	18
Labrador	25	John Haan	7	10	2	5	48	43	..	..	..	..	163	145	399	13
Libbie	92	F. Hackett	8	28	2	14	358	144	..	..	..	..	312	281	1,095	50
Mary Ellen	63	D. McPhee	6	24	3	11	..	..	..	..	..	..	274	262	536	63
Mary Taylor	43	R. O. Lavender ..	19	..	6	..	..	..	174	209	..	..	35	102	520	30
Mascot	40	E. Lorenz	6	16	2	7	..	..	99	93	..	..	191	226	609	5
Maud S.	97	R. E. McKeil	10	20	3	11	..	..	..	..	..	..	244	358	602	68
Mermaid	73	W. H. Whitley ..	25	..	8	..	..	..	438	502	..	..	141	204	1,285	23
Minnie	46	V. Jackobsen	6	20	2	10	327	159	..	..	..	..	193	291	970	25
Ocean Belle	83	A. B. Whidden ..	18	13	3	10	..	..	154	430	..	..	97	219	900	4
Ocean Rover	55	O. Buckhaltz	7	18	2	9	..	..	..	..	..	..	180	422	602	65
Oscar and Hattie	82	T. Magnesen	9	28	3	14	197	156	..	..	..	..	331	258	942	41
Osprey	40	G. N. Fulton	8	10	3	5	..	..	..	..	..	..	68	132	200	61
Otto	86	J. McLeod	9	25	2	12	..	..	534	185	..	..	121	380	1,220	17
Pachwellis	20	J. Nyetam	..	20	..	10	49	103	..	..	..	..	..	..	152	58
Penelope	70	D. G. Macaulay ..	6	25	2	12	332	126	..	..	..	..	324	570	1,352	37
Pioneer	66	W. E. Baker	24	..	7	..	..	..	439	410	30	14	154	221	1,268	32
Sadie Turpel	56	A. S. Crane	9	20	4	8	..	..	288	294	..	..	118	163	863	6
San José	31	Fred Cole	7	18	2	10	49	181	..	..	..	..	162	443	835	53
Sapphire	109	Wm. Cox	9	40	3	18	217	201	..	..	..	..	528	474	1,420	43
Saucy Lass	38	Daniel Martin	6	22	1	11	301	170	..	..	..	..	337	218	1,026	33
Selma	21	J. Mohrhouse	3	10	1	5	..	..	..	..	..	..	66	119	185	60
South Bend	21	C. F. Dillon	4	10	1	5	17	53	..	..	..	..	59	300	429	55
Teresa	63	G. Meyer	10	15	2	9	..	..	130	101	..	..	206	273	714	1
Triumph	98	C. N. Cox	14	23	5	12	..	..	348	258	7	13	304	446	1,376	16
Umbrina	99	C. Campbell	25	..	10	..	..	..	265	477	34	7	103	195	1,081	11
Venture	48	A. Mathieson	6	16	2	8	118	151	..	..	..	..	207	235	711	35
Vera	60	Wm. Shields	22	..	7	..	..	..	317	225	..	..	63	201	836	28
Victoria	63	R. Balcam	8	22	2	11	78	86	..	..	..	..	460	441	1,065	46
Viva	92	M. Pike	26	..	7	..	..	..	280	327	..	..	34	36	677	19
Walter L. Rich	76	E. F. Robbins	8	27	2	13	80	13	..	.	..	..	44	355	492	52
Zillah May	66	S. Balcam	9	22	3	11	..	..	..	..	..	..	437	384	821	69
Totals	4,222	.. .. ..	809	889	263	442	5,015	3,335	8,470	9,498	479	827	10,185	15,515	53,324	

Total catch of sealing fleet for 1896 53,324
„ „ Indian canoes on British Columbia Coast 2,353
55,677

Port of Victoria, British Columbia, November 1896.

(Signed) A. R. MILNE, *Collector of Customs.*

Appendix.

Communication from Messrs. C. M. Lampson as to the market prices of salted fur-seal skins, 1886–96.

64, *Queen Street, E.C., London, January* 30, 1897.

Dear Sir,

We are in receipt of your favour of yesterday's date, and in reply beg now to inclose statement showing the yearly catches of the different kinds of fur-seals sold by public auction in London since 1886.

You will notice that prices advanced very greatly in 1890, when the take of the Alaskas was suddenly reduced to about one-fifth of the usual quantity. Prices generally kept at a high figure during the years 1891–92, and they showed a decline as soon as the largely increased quantity of the north west coast catch began to tell. Since then there has been an almost uninterrupted decline in the leading sorts until the present time.

In explaining our classification, we beg to state again that—

Alaskas comprise the male seals taken by the North American Commercial Company on the Pribyloff Islands;

Coppers, the males taken by the Russian Seal-skin Company on the Siberian Islands;

North-west Coast, those taken by the pelagic sealers off the west coast of North America from San Francisco to the Aleutian Islands, along the coast of Japan, in the neighbourhood of the Siberian Islands and in the Behring Sea;

Lobos, the skins taken by a Uruguayan Company on the Lobos Islands, off Monte Video;

South Sea, skins taken in the Antarctic Ocean.

Besides the seals enumerated above, about 3,000 skins per annum are taken off Cape Horn, about 1,000 skins per annum in Australasian waters, and about 2,000 skins per annum off the Cape of Good Hope, all these being of comparatively little value.

We shall at all times be happy to furnish you with any information that is in our power to give.

Yours truly,
(Signed) C. M. LAMPSON AND Co.

Professor D'Arcy W. Thompson,
University College, Dundee.

STATEMENT of Gross Average Prices obtained for Salted Fur-seal Skins.

Year.	Alaska.		Copper Island.		North-west Coast, &c.		Lobos.		South Sea.	
	Number of Skins.	Price of Skin.	Number of Skins.	Price of Skin.	Number of Skins.	Price of Skin.	Number of Skins.	Price of Skin.	Number of Skins.	Price of Skin.
		s. *d.*		*s.* *d.*		*s.* *d.*		*s.* *d.*		*s.* *d.*
1886	99,947	69 3	41,750	40 0	49,079	29 5	15,049	18 1	..	..
1887	99,949	56 0	54,584	40 0	39,419	26 0	14,831	16 4	..	..
1888	100,037	77 11	46,296	38 4	30,285	34 8	17,774	20 6	..	..
1889	100,031	66 11	47,411	50 6	39,884	42 0	13,205	27 8	..	..
1890	20,994	146 6	52,765	58 2	47,467	64 4	14,241	35 0	..	..
1891	13,494	125 4	53,946 5,800 30,681	84 9 58 10 68 6	63,733	54 9	13,634	33 6	..	..
1892	7,554	125 4	31,380	81 1	72,973	68 7	12,202	26 6	..	..
1893	7,500	108 6	32,832	71 10	106,368	51 3	13,624	30 4	45	77 4
1894	15,888	86 0	27,298	57 0	135,686	35 7	12,145	21 1	..	..
1895	15,002	81 9	17,721	54 0	102,460	43 10	12,017	20 0	..	..
1896 ..	7,500 22,500 still unsold	68 1	14,415	45 2	63,696 6,900 still unsold	32 2	14,019 5,153 still unsold	22 6	584	51 8

A table showing, from the above figures, the actual value of the pelagic catch in recent years, makes it evident that the fall in price has been a more serious matter than the diminution in the catch.

TOTAL Value of the North-west Coast (Pelagic) Catch.

Year.								Value.
					s.	*d.*	£	£
1891	63,733	skins at	..	..	54	9		174,469
1892	72,973	,,	..	..	68	7		250,236
1893	106,368	,,	..	..	51	3		276,568
1894	135,686	,,	..	..	35	7		241,408
1895	102,460	,,	..	..	43	10		224,558
1896	63,696	,,	..	..	32	2 =	102,444	113,541
	6,900	unsold at	..	..	32	2 =	11,097	

A table showing, from the above figures, the actual value of the pelagic catch in recent years, makes it evident that the fall in price has been a more serious matter than the diminution in the catch.

TOTAL Value of the North-west Coast (Pelagic) Catch.

Years.			Value.
	£	s. d.	£
1881	68,783	1 0	174,439
1882	72,974	1 0	220,320
1883	108,858	1 0	276,108
1884	156,080	1 0	441,408
1885	102,400	1 0	259,648
1886	63,686	1 0 = 102,644	118,541
	6,900	1 0 = 13,897	

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Printed for the use of the Foreign Office. *May* 1897.

CONFIDENTIAL.

Read 24.97 Wa

No. 1.

Mr. G. E. H. Barrett-Hamilton to the Marquess of Salisbury.

My Lord, *March* 4, 1897.

AFTER visiting, according to your Lordship's instructions, the seal islands in Behring Sea and the Sea of Okhotsk, I have the honour to submit the following Report:—

2. I was instructed to assist and co-operate with Professor D'Arcy Thompson in examining the methods at present employed for killing seals on land and sea, and to inspect in particular the seal islands appertaining to the Russian dominions, viz., the Commander Islands and Robben Reef, in order to obtain information and statistics with regard to the working of the Sealing Agreement with Russia of 1893.

3. Leaving England on the 23rd May, I proceeded direct to San Francisco, and arrived there on the 4th June.

4. On arrival at San Francisco I found that the steam-ship "Peru," in which I was to have sailed on the 6th, had been delayed, and had not yet arrived at San Francisco. She did not start until the 10th June, so that I was delayed six days in San Francisco.

5. While at San Francisco I had interviews with people interested in the sealing business, and I had also the advantage of consulting Mr. Warburton, Her Britannic Majesty's Consul-General, who, with Mr. Moore, the Sub-Consul, rendered me every assistance in their power in the pursuance of my inquiries.

6. The "Peru" sailed from San Francisco on the 10th June, and arrived at Yokohama on the 29th.

7. On the 30th June I had the honour of an interview with Sir Ernest Satow, Her Britannic Majesty's Minister at Tôkiô, and also with Mr. Hall, Her Britannic Majesty's Acting Consul. Sir Ernest Satow informed me that Her Majesty's ship "Edgar" would sail on the following morning for Hakodate, and that Captain Henderson would give me a passage.

8. The "Edgar" sailed at 9 A.M., on the 1st July, for Hakodate, and arrived there on the 3rd.

9. At Hakodate I found Her Majesty's ship "Spartan" awaiting my arrival. Captain Winsloe at once came on board the "Edgar," and informed me that he was ready to take me on to the Commander Islands. There being, however, some discrepancies between my orders and those which he had received, it was decided to wait for the arrival of the Admiral before sailing.

10. The Admiral arrived on the 6th July, and, after seeing him, I arranged to sail on the following day. We were, however, delayed by bad weather until the 8th, on which day we sailed for Robben Island.

11. While at Hakodate I had interviews with several persons interestel in sealing, including Mr. Cox, of Victoria, British Columbia, and also was able to consult Mr. Bonner, Her Britannic Majesty's Consul. The sealing fleet had just left the harbour to begin the second part of their season's work when I arrived, so that I was unable to interview any of the captains of the vessels. Mr. Cox was himself about to leave Hakodate for Victoria on the very day on which I saw him, so that I was unable to obtain any detailed statement from him.

12. The "Spartan" arrived at Robben Island on the 11th July, and we were fortunate enough to find there Her Majesty's ship "Pigmy," the vessel detailed for patrolling the island. Lieutenant Bellairs, in command of the "Pigmy," gave me much valuable information, and, the weather being favourable, we were able to land twice on the island, to inspect the seals, and to photograph them.

13. The "Spartan" sailed from Robben Island on the same day on her way to the Commander Islands.

14. I arrived at Nikolski, the chief village of Behring Island, on the 19th July, where we found Her Majesty's ship "Swift," and I had a conversation with Commander Macalpine.

15. I landed at Nikolski on the same day, and the "Spartan" and "Swift" left the harbour on the following day.

16. I remained on Behring Island until the 10th August, when, through the courtesy of the captain of the Russian cruiser "Yakut" I was able to cross in that vessel to Copper Island, where I arrived on the 11th.

17. On Copper Island I remained until the 25th August, on which day Her Majesty's ship "Satellite" arrived at Preobrajenski.

18. The "Satellite" had on board Professor D'Arcy Thompson and Dr. D. S. Jordan, and together we sailed for Unalaska on the 25th August.

19. We arrived at Unalaska on the 29th August, and on the 31st August sailed in Her Majesty's ship "Pheasant" for St. Paul Island, and arrived there on the 1st September.

20. I remained at St. Paul Island until the 10th October, on which day I crossed over to St. George Island, on the United States' revenue-cutter "Bear." On these islands I was engaged, together with M. J. Macoun and Colonel Murray, and Mr. Clark, of the American Commission, in enumerating the dead pups on the various rookeries.

21. I remained on St. George Island until the 22nd October, on which day I sailed in the "Bear" for Port Townsend, touching on the way at St. Paul Island and at Unalaska.

22. From Port Townsend I proceeded by the Canadian-Pacific Railway to Ottawa, and thence to New York and Washington.

23. Finally, I sailed from New York on the 21st November, and arrived in London on the 30th of that month.

24. I beg leave to record, with very grateful feelings, the hospitality that I received from all whom my journey brought me in contact with. Rear-Admiral Buller at Hakodate, and the Commander of Her Majesty's ship by which I travelled, were at very great pains to facilitate my movements. Colonel Grebnitsky, Governor of the Commander Islands, received me with peculiar courtesy; and to him, to Major Waxthum, Governor of Copper Island, to Messrs. Cantor, Lukeem, Klugé, and other officials on the islands, I am indebted for innumerable kindnesses. I afterwards received the same kindness and hospitality from the American officials on the Pribiloff Islands, and from Captain Tuttle and the officers of the United States' revenue-cutter "Bear," which conveyed me from Behring Sea to Port Townsend.

Robben Reef.

Present State of the Rookery.

In former days it is said that the seals at Robben Island occupied the whole of the beach right round the central rock, but the total capacity of the whole island under such conditions would not, I think, exceed 30,000 animals.

This year the rookery is reduced to a small patch of seals which lie on the sandy beach and also on a reef which is partly covered by the sea to a depth of from about 6 inches to 1 or 2 feet, on the north-eastern side of the island, at about the middle of the beach. Our anchorage was at the other side of the island, and neither there nor at any other time or place as we came up to the island did we see any seals, and Lieutenant Bellairs says that on only one occasion had a seal been seen to come round to the opposite side to that on which the rookery is situated.

This is the only rookery on which the breeding seals lie on sand, except at Tolstoi, on St. Paul Island, and on small parts of larger rookeries on that island as at Zapadnie. Here, on Robben Island, however, the seals have no choice of their ground, as the reef on which they lie becomes covered with sand as it meets the beach.

This is an excellent rookery for observation, as the seals can be approached from the top of the island, whence a very close view of them can be obtained. When

we looked at them from the top of the rock they made no attempt to go into the water and showed no signs of fear at our presence, but on being approached along the beach they began to move into the water when we came within about 150 yards of them. From the little I saw of the bulls here, I do not think that any of them would face a man.

I thought that it would be a very liberal estimate that would put the number of breeding females on shore at 450, with about 30 bulls, but it was impossible to count the number of seals which were sitting in the water on the outlying reef, or resting idly in the sea further out—all, however, were pretty close to the rookery. The number of breeding seals on the rookery altogether, including absentees, can hardly, I think, amount to 1,000. Lieutenant de Horsey gives the total number as some 1,800, "the greater proportion being females and their pups, as well as a few old males, there being, however, only twenty-eight of the latter," which agrees pretty well with my own estimate, as mine does not include pups. Adding 256 seals killed on the island this season, the whole rookery, breeders, and non-breeders combined, cannot amount to more than about 2,000 seals; yet the lessees expected to kill about that number.

The proportion of bulls, as given above, would be about one to thirty females, and this agrees very closely with the average number of females in the harems on the Pribiloff Islands.

I do not think, however, that a proportion of one to thirty gives a very good estimate of the true state of things on Robben Island as I saw it, as several of the bulls were lying away by themselves, apart from the rookery, apparently in great indifference to the presence of the females, so that the bulls which were in among the harems must have had a good many more than thirty females each to manage.

Some of these bulls were, no doubt, what are called on Pribiloff Islands "idle bulls," *i.e.*, bulls which have been unable to secure any females for themselves; but I could not help thinking that several of them were old played-out animals, as they were lazily sleeping outside the rookery, apparently not taking enough interest in the females even to quarrel about them, and when disturbed showing no signs of fight; they were extremely ragged and old looking. In this I am corroborated by Lieutenant Bellairs, who, in his Report to the Commander-in-chief of the China Station, states that "the number of old male seals is largely out of proportion to the number of females, and several are lying at some distance from the rookery, utterly impotent." Besides these bulls, there were two or three young bulls, shown on the right of my photograph No. 19. I think then, that, from whatever cause it may be due, the harems in this rookery averaged over thirty cows to each bull, but I put forward the above remarks with all diffidence, as it is impossible for a person who is suddenly introduced to an animal with the complicated social habits of the fur-seal to form a final and trustworthy opinion about them until after some study.

The females at Robben Island were huddled together very thickly, as is shown in my photographs, not in one broad belt or mass, but in several small masses or groups on the sand.

All or most of them seemed to have already pupped, and many were escaping from the bulls and going into the water.

In two instances we saw copulation going on, and the breeding season was evidently at its height; in one instance the copulation was taking place in the shallow water on the reef.

The little black pups seemed to be getting very hard treatment from their elders on the rookery,* and one of the first things that I was told by Lieutenant Bellairs when he came on board the "Spartan" was that the bulls were trampling upon and killing a good many pups, and I noticed on the rookery quite a large proportion of dead ones lying in among the others, all flattened on the sand, this small rookery being one in which one could easily observe these dead bodies, although it is not easy to count them all.

When a bull charges down upon them, both pups and females get out of his way as much as they can, but they cannot always do so successfully, and this kind of blind charging is going on all day and, for all I know, all night as well for some weeks on end, so that, where pups are thickly crowded together, as is their wont, in pods, only a few can possibly escape the approach of the lumbering brutes. It is no wonder, then, that soon after their birth the little pups begin to gather together apart and just outside the rookery in flocks and companies where they can enjoy themselves untroubled by the clumsy charges of the bulls and the snappy crossness of their

* Compare also "Report of Officer commanding Patrol Vessel in 1895," pp. 5 and 6.

mothers. Thus, at Robben Island (photograph No. 19) many pups were already lying apart on the sand asleep just outside the harems, and others were already playing or washing in the sea. Here my notes disagree with those of Elliott, for these were pups who could not possibly have been older than 26 days, since the first females arrived on the island between the 14th and the 22nd June, and in fact on the 15th of that month only one female had arrived.

Most of the pups seemed to have been not long born, and there was a good deal of a blood-red coloured stuff among the seals, which appeared to be afterbirth, although I did not see it closely. There were a good many large black-backed gulls among the seals which were pulling the stuff about with their beaks, and evidently eating it.

The only bachelors to be seen on the rookery were the small group of about half-a-dozen, which are shown on the right of Plate 19. These, I was told, would shortly be killed; they were larger than the females.

According to Lieutenants Bellairs and De Horsey, 256 seals were killed this year, of which only 114 were obtained up to the 4th August.

I was informed that the seals here are very hard to drive, and certainly it would have been very hard to have cut off the few bachelors which I saw on the island, as there is no cover under which a man can conceal himself while approaching them, and the beach is so narrow that they can very easily get back into the sea. It is probably owing to this circumstance that the number of bulls here is as great as it is, those which were on the rookery having probably owed their life to having escaped from their persecutors, and not to any forethought on the part of the latter.

The killing-ground is at the southern end of the island, where the beach is a little higher than at its sides. The drive must be a very easy one for the seals.

I was informed by Mr. Klugé that the seals at Robben Island are very irregular in their movements, and that many seals are caught there on their way south from other islands and seas. This was to account for the fact that I saw so few bachelors on the island. I merely quote it as the opinion of Mr. Klugé, who spent many seasons on Robben Island.

Mortality of Pups.

The mortality of pups here seems to be large in proportion to the size of the rookery, and, as I have already stated, the condition of the ground agrees with that on the rookeries in the Pribiloffs, where the mortality is known to be highest. It would be extremely interesting to have information or statistics regarding the mortality at different periods during the season, especially as the case here is very little complicated, or not complicated at all, by the collateral influence of pelagic sealing.

Feeding-grounds.

Very little is known as to where the seals of Robben Island feed while at the island, or as to where they pass the winter, but it is known that they leave the island late in the autumn. The furriers state that the skins may be distinguished from those of the Commander Islands' seals, and that the former are the better of the two. I do not wish to indorse this opinion, but I think it is highly probable that the seals which resort to this island do not mix with those of the Commander Islands. If it be true, as stated by Dr. Stejneger (p. 53), on the authority of Captain D. Groenberg, "that sealers who are said to have followed up the migrating herd assert that these seals come up the Gulf of Tartary and pass through La Perouse Straits into the Sea of Okhotsk," and, on the authority of Mr. C. L. Townsend, that the schooner "Penelope" caught seals in the Sea of Japan and in La Perouse Straits on a voyage round the Island of Yezo in 1895 (p. 62) then it may be possible that this little herd never goes out into the Pacific, but keeps entirely in the waters of the seas west of the Kuril Islands and the islands of the Japanese Archipelago.

Past History of the Island.

The history of the island has been given at some length by Dr. Stejneger at pp. 54 to 58 of his Report, and I have no doubt that what he has said will be found to be very accurate, although some information which Captain Daniel Webster, now representing the North American Commercial Company on St. George's Island, was

good enough to give me differs in some minor details from the account given by Dr. Stejneger of the transactions with which Captain Webster's name is connected.

Briefly summarized, the history of the island is that of one long series of raids and of constant destruction of the seals ever since about the year 1852.

According to Captain G. Niebaum (Fur-seal Arbitration III, p. 203), 50,000 or 60,000 skins were taken by whalers on the island in two seasons, about 1852 and 1853. The island was depopulated, abandoned, and all but forgotten. By 1869, however, the recuperated herd again covered the reef, and in 1870 some 20,000 skins were taken (cf. Report British Commission, p. 89), a proceeding that again for a time exhausted the stock. We are told that Captain G. Niebaum, representing the Russian American Company, landed on the island in August 1871, and reported that "there were not over 2,000 seals to be found on the entire island," a state of matters, that is to say, comparable to what is at present to be observed, but probably even less serious than the present depleted condition. Captain Niebaum immediately prohibited further molestation of the seals "until such time as it should seem prudent to resume." Two years afterwards the herd had so far recovered, that 2,700 skins were taken by the lessees in 1873.

From that time onward the history of the island is a chronicle of bold and piratical raiding under various flags. Particulars of these raids will be found in Dr. Stejneger's Report, and in the Reports of the British Commissioners and Agents. Lastly, it is now an open secret that within very recent years the guard appointed to protect the island betrayed their trust, and participated in the unlicensed slaughter.

The Influence of Pelagic Sealing.

The long and authentic history of plunder on shore is amply sufficient to account for the present depopulation of the rookery, as in past times it is known to have produced a similar temporary result again and again. It is almost needless therefore to look for, and it is also impossible to discover, any clear evidence of direct influence of legitimate pelagic sealing.

The rookery, while large enough to furnish rich plunder to a landing party, was probably never, at the best of times, large enough to disseminate over the surrounding sea a body of seals so numerous as to repay the pelagic fisher; and it may be taken for certain that it has never done so within the past decade. We do not know for a fact of any pelagic sealers plying their trade in the neighbourhood of this remote island; and if the views above quoted be correct regarding the migration route of this particular herd, it follows that even on its travels the herd has suffered very little indeed at the hands of the pelagic sealer. We may justly, I think, hold it as doubtful whether pelagic sealing, properly so-called, has ever affected the herd at all, or we may take it as quite certain that the utmost extent of its influence has been trivial compared with the operations of plunderers, alien and native.

It cannot, in my opinion, be doubted that a period of complete rest for the rookery is as essential now as when it was imposed in 1871 by Captain Niebaum, and that the resultant benefit would now, as then, be certain and rapid.

The following notes have been taken from the reports of the officers in command of the patrol vessels for the various years to the Commander-in-chief on the China station.*

1893. "I saw probably 1,500 to 2,000 seals, chiefly calves; this year 1,500 were killed." Lieutenant and Commander J. F. W. Ingram, Her Majesty's ship "Peacock," in Report of the 16th August, 1893.

1894. On the 27th May, 1894, the seals had not arrived, but were expected (letter of the 11th June, 1894). They were stated to have decreased: 1,540 were killed in 1893, and 290 up to the 26th July, 1894. The Officer Commanding Her Majesty's ship "Redpole" (Letter dated the 1st August, 1894.)

"Robben Island was not visited by any Russian man-of-war during the whole time I was employed on the service, and the garrison would have been in some straits had I not conveyed 3 tons of coal for them from Korsakovsk, to be used for cooking, distilling, and warming purposes." Lieutenant the Honourable F. C. B. Addington, Her Majesty's ship "Plover," in Report of the 8th December, 1894.

1895.—Two sail only seen, "one a Russian schooner belonging to the Sealing Company, the other a Japanese fish-carrying schooner, and I heard from the officer in charge of the island that they had only sighted one sail besides the former."

* Bellairs' Notes by officers in future years.

No Russian man-of-war visited the place except the "Yakut," which brought the garrison, consisting of the officer and fifteen seamen on the 11th June, and then left for Petropaulovsky. Three visits were made by the English patrol vessel, viz., on the 11th June, 1895, when very few seals seen, nearly all old males; 1st July, 1895, when the numbers were greatly increased; and the 23rd July, 1895, when they were still more so, the beach being crowded; many young were crushed by the males. (Extract from report of patrol vessel in 1895.)

1896.—"Pigmy" arrived 14th June, 1896; ten large bulls seen; 15th June, 1896, "Yakut" arrived, bringing garrison of one officer and fifteen men—one female; 22nd June, 1896, seventy-six females; 26th June, 1896, Aleuts arrived in steamer from San Francisco, viâ Commander Islands; no other ships seen except two Japanese schooners and one schooner from Vladivostock. Information supplied by Lieutenant Bellairs in temporary command of Her Majesty's ship "Pigmy" on patrol duty off Robben Island.*

Further Note in regard to Robben Island.

The foot-note to p. 53 of Dr. Stejneger's Report is important, for it is there stated that "in 1891, at the end of the period of birth, there were on the 3rd July 5,000 females and 4,000 pups, showing one-fifth of the females to be virgin. Lieutenant Brumer notes the following special circumstance:—In July and the beginning of August there were about 15,000 to 17,000 seals, but in September the inhabitants of the rookery had increased considerably."†

If these figures are to be trusted there are several points well worthy of notice in connection with them. Thus, with regard to the 5,000 females and only 4,000 pups, if the observations made on the Pribiloff Islands this year apply, as it is probable they do, to Robben Island also, then no virgin females would have at that time (about the height of the season) as yet arrived on the rookery, and the 1,000 surplus of females does not represent virgin females, but females which for some reason or other had not pupped, *i.e.*, females which had either not been impregnated in the previous year or were barren. That there is in normal conditions any appreciable quantity of barren females has been shown to be very doubtful by observation on the Pribiloff Islands, so that one can only conclude that if the figures as given above are correct, the 1,000 surplus of females represents a number of females which had not been impregnated in the previous year.

If that were true in 1891, as the rate of killing since that date, except in the following year, when no seals were killed,‡ has been pretty high, reaching 1,500, 1,000 and 1,300 in 1893, 1894, and 1895 respectively, it would well account for the present small size of the herd, and it is evident that another period of total cessation of killing on the island is badly needed.

That there were non-bearing females on Robben Island is rendered more probable by the statement of Captain D. Groenberg, of the Russian Fur Seal Company's steamer "Bobrik," that in 1895 the weight of the skins taken was good, and yearlings were scarce," a statement which, if it is reliable, and unless there had been any unusual mortality of pups at sea, probably means that few pups were born in the previous year ("Stejneger," p. 58).

The Commander Islands.

Behring Island.

"Behring Island, the north-western island of the Commander group, is situated approximately between 55° 22′ and 54° 42′ north latitude and 165° 40′ and 166° 41′ east longitude. Its greatest length from north-west to south-east is a little less than 50 miles, the average width being about 10 miles." (Dr. Stejneger's Report, p. 36.)

* *Vide* Diary, July 11, 1896.

† Quoted from Dr. Slunin.

‡ Stejneger, p. 58.

The southern two-thirds of the island are extremely mountainous, with peaks rising to a height of about 2,200 feet. The northern third does not rise higher than about 600 feet.

The rookeries are two in number, viz., North Rookery, which is situated at Cape Yushin at the northern extremity of the island, and South Rookery, on the west coast of the island, half-way between North-west Cape and Cape Manati, the southern extremity of the island. Its distance in a direct line from Nikolski village is 16 miles, and it can only be visited by open boat when the weather is fine enough to permit a landing to be made, or by a two days' walk over the hills and mountains, and with only such baggage as the natives can carry.

The North Rookery.

I arrived at North Rookery on the 21st July, and was met and welcomed by M. Selivanoff, the Cossack officer in charge, and by M. Puffski, who represents the Russian Company. On the following day I paid my first visit to the rookery, under the guidance of M. Selivanoff.

The rookery consists of two sections, one of which, called "Na Reefoo," is quite close to the village, and occupies a reef which here runs out into the sea; the other section, which is called "Kishotchnaya," is farther away to the west, and is also on rocky ground. Between the two sections is a rocky beach, much of which is exposed at low tide. There were no breeding seals elsewhere this year.

Owing to their situation, the two sections of the rookeries are exceedingly hard to examine thoroughly without driving the seals off the ground.

As at Robben Island, bachelors were chiefly conspicuous by their absence; in fact, there was no regular hauling-ground occupied by them, but for the most part they haul up among the breeding seals, which makes it difficult to recognize them, except those which are very close, and any one who has seen the mistakes which even the natives sometimes make in a drive in the identification of young males and young females will understand how hard it is for an almost complete stranger to seals, as I was at that time, to distinguish them. I had to spend a considerable time in learning the differences between the bachelors and the females.

The pups seemed to be of about the same size as those which I had seen at Robben Island, but some of them, at any rate, were larger.

Bulls did not strike me as being numerous, but in this rookery it is very hard to count or see them all, as it is not possible to see the whole rookery at one time. Even with permission to go in among the seals, the numbers of bulls could not be well estimated, as the seals would be stampeded before they could be properly seen.

It was obvious that the bachelors must be killed, if at all, as they arrived, and whenever a sufficient number were on shore to make a drive worth the trouble. Where the bachelors are as scarce as they are here, any regular system of driving would be impossible.

There was very little to guide me as to the former extent of this part of the rookery, and I doubt if the breeding seals ever extended over much more ground than they do at present. The seals lay in two distinct belts, and there was room for many more on the reef without their spreading off it or inland.

After looking at the reef we went on to the other section of the rookery, which is called Kishotchnaya, and which lies at a distance of about five-eighths of a mile from the base of the reef (photograph No. 39).

The North Rookery, with its two sections, forms the largest rookery on the Commander Islands, and, practically the whole Behring Island catch of late years has come from it, except the few hundred skins taken on the small South Rookery.

There had been a drive of the whole rookery, on the 20th, so that the actual disposition of the seals as seen on the 23rd could not be very much relied upon.

The drive-ways of the North Rookery are described by Dr. Stejneger (p. 41). That which leads from the reef is only 600 feet in length from the base of the reef to the killing-ground; it leads for the most part over grass and up hill, the only difficult part of it being the climb up the short though steep escarpment which rises at the base of the reef. Seals, however, which are driven from the farther portions of the rookery and from Sea Lion Rock have to come a longer distance, the rock being at a distance of about half-a-mile from the base of the reef.

From the other section of the rookery the drive-way is nearly three-fourths of a

mile in length, and is all over grass. It at first leads along level ground and over the grass, which grows luxuriantly at the foot of the tundra and between the tundra and the beach, and it then ascends by a gradual ascent of several hundred yards before it reaches the killing-ground.

There were no seals far away from the rookeries or much out at sea, as far as I could see, except a few coming in from the east. I did not observe the scattering of the seals which Mr. Venning mentions in his Report (p. 10), but he visited the rookery later in the season than I did (on the 21st August), when the conditions of things were probably different, as well as in a year when there are said to have been many more seals than there are now.

On the 23rd July I spent some time close to the seals on the western portion of the rookery (Kishotchnaya). The harems seem to be much scattered, though the bulls are still jealous, but, as I have stated above, it is impossible to say much about these points when a rookery has been so recently driven.

I noted some bulls lying asleep just outside the harems. These bulls seemed to be large and fully adult, yet they were very apathetic and appeared to spend their whole time in sleep, and to be paying no attention whatever to the females in their neighbourhood. I saw one large bull going right down to the sea. The regular arrangement of the rookeries, if there ever was any, seems to be already breaking up.

A Drive at North Rookery.

On the 25th the wind blew from the south-east strongly, so no fires were allowed in the village, in order that the seals might not be frightened off into the water. This is a most uncomfortable regulation, especially when the weather is cold, and a fire is needed for warmth and cooking. But with seals so scarce the Russians cannot be blamed for taking every precaution to keep them on shore. I could have got permission to have my fire kept in, but did not like to be different from the natives, especially as I was able to get hot water from the Company's representative, who had a stove.

We were to have commenced to drive the seals at 5 A.M., but the tide was still high on the rookery, so we did not start until about 7 A.M. by my watch. By that time we had together a party of forty-six men, all armed with long sticks (not clubs); I saw them in many cases pick the sticks up from the ground as they came through the village. They use any long and heavy stick, and there is no special make of club as on the Pribiloff Islands.

One lot of men went to the smaller western section of the rookery, and another to the "Reef," and with the latter went M. Selivanoff, and I kept with him. After a brief consultation, when we got fairly close to the rookery, a rush was made to get between the seals and the sea on the south-west side (leeward) of the Reef, and in a few minutes each part of the big "Reef" section was easily surrounded, the low state of the water enabling the men to go between the seals and the sea without wetting themselves. Then the men began to drive the breeding seals. At first I thought this was only in order to make way for the bachelors, who otherwise could not well be driven to the killing-ground through the thick masses of breeding seals. But this was not the case, as they proceeded to drive all the seals right up to the killing-ground. Here were pups, breeding females, and bulls, all driven together and in a state of the utmost confusion. The bulls and pups were mostly left behind at once, and I saw masses of the latter huddled together in heaps with sometimes a cow below them in the middle of the heap. A good many bulls and pups were, however, included in the drives, as the figures I give below (p. 11) will show. Every available seal was pressed into the drive, and once two men were sent to cut off four or five bachelors who were resting on an outlying rock—so precious is each seal-skin! Last year's patrol vessels' report had prepared me for a scarcity of seals, but I never expected anything like this, and had not properly realized the meaning of Captain Pelly's words.

As the seals began to move off in the direction of the killing-ground they were easily separated into smaller droves, each in charge of two or three men, and these proceeded one after the other towards the base of the reef.

I myself did not go with these first droves, but followed M. Selivanoff to the extreme end of the reef on to the rock called Sivutchi Kamen, where our business was to cut off the seals which lay there. This was done without any difficulty, as the

stupid animals had paid no attention whatever to the confusion in the other parts of the rookery.

It is half a-mile's walk to Sivutchi Kamen, and on the way there I had opportunities of observing several points in connection with the seals, and also took some photographs. Of these (Nos. 42 and 43) show the seals being driven over the rocks, with (in No. 42) a native standing in the background, between the seals and the sea, to keep the drove in the right direction. This photograph shows plainly the different kinds of seals driven—females, pups, and bulls; some of the latter are facing the drivers and roaring. The last seal in the drove is about to give in, and is already dragging its hind-flippers helplessly behind it in the manner so graphically described by Mr. Elliott. On the left are two or three pups.

There was a strong and unpleasant smell on the rookeries, and I saw a good deal of yellow excrement, which had been very much trampled on by the seals. On the killing-ground many of the bachelors voided some of this. In some of this excrement I noticed ascarid worms.

I had no opportunity of counting the dead pups, but there were a number of flattened pup carcasses on the ground we passed over. Whether these met their death by being trampled on or not I cannot say, but it struck me that the number was quite small in proportion to the total number of pups on the reef. The pups seem to be able to stand a great deal of trampling and ill-treatment.

M. Selivanoff and I found one mass of twenty or thirty pups all huddled together on and about a rock on which was a pool of water. After some difficulty we succeeded in making these move off, as we were afraid that some of them would be smothered. One of the lower ones actually was drowned, and I kept this one as a specimen.

One pup which I noticed had the umbilical cord still quite fresh.

In one instance I noticed a female courting a bull, and these two paid no attention to us, except that the bull roared at us occasionally.

At Sivutchi Kamen I found a scene of indescribable confusion, as the men cut off the seals from the water, and all sizes and sexes were jumbled up together, the bulls fighting each other and trampling on the pups. In the hollows and crevices of the rock seals got jammed in, and the Aleuts gave them no peace, poking them with their long sticks, and forcing even the old bulls to move on, so that it was not many minutes before all sexes and sizes were being rapidly driven shorewards, the pace weeding out most of the pups at once, but many keeping on with the older seals.

Photograph No. 45 shows (as far as the mist would allow it) the dense mass of seals collected in the background by the drivers, whence a narrow stream is moving towards the foreground of the picture and forming a drove.

At first we drove the seals over the rookery towards the base of the reef, and although this is all ground on which the seals are constantly lying or travelling when left to themselves, still it is very rough, and there are many rocks and large boulders in the way. Over these the seals would climb (quite unnecessarily) in their terror, and would jump down on the other side without a thought as to where they were going. Others would fall, and soon I noticed that some of the cows had their flippers cut and bleeding.

When a seal could absolutely go no more, it would be left behind; but otherwise it was almost impossible to cut off a pup, much less an older seal, from the drove. Rather than be left behind the pups would plunge into the mass of advancing seals, apparently caring nothing how much they were trampled on. On our way we were constantly picking up fresh lots of pups which had been left behind from a previous drove, and these took the places of those we ourselves left behind, so that we eventually drove quite a number of them to the killing-ground.

I noticed that one or two bulls which got out of the drive or escaped went at once into the sea, and did not attempt to stand their ground.

After crossing the rocky rookery ground we passed over the sandy beach at the base of the reef, and crossed the creek at the foot of the steep escarpment. It struck me that the sandy portion of the drive was almost worse on the seals than the rocks, as the particles got into their fur, and, besides, the going is heavier than it is over the rocks.

In the creek one bachelor refused to go any further, and, in almost less time than it takes to write this, was knocked on the head and skinned.

Behind us we left a strange sight. On the rookery there remained many old bulls deprived of their harems and surrounded only by pups. Yet they fought, scolded,

whistled, and chuckled to the pups just as if these were females, and did not seem to care much how or to whom their admonitions were directed, as long as they had their say. The rookery as we left it is shown in photograph No. 44, where the few cows left behind show up light-coloured among the bulls and black pups. The scarcity of bulls will also be noticed.

As we went up the steep escarpment, on the bare roadway made by previous drives, we made frequent halts to allow the seals to rest and take breath. Many of them at this point refused to be driven, and some dropped exhausted. The Aleuts were very skilful in dealing with recalcitrant seals, and the end of one of their long killing poles thrust roughly into a seal's mouth generally brought it to its senses. Many of the cows were, however, very determined, and made their escape.

On the steep hillside we met squads of pups returning to the rookery, only to be caught up again in the drive and sent up once more.

Above the escarpment the ground slopes gradually up to the killing-ground through the thick grass, and it was not long before we brought our drove to the place where were those previously driven up. Here all were allowed to rest in one big bunch, with a few men around them to keep them together.

In this last part of the drive there was but little sound of seal voices, all the breath the animals had left being required for locomotion.

We had started our drive at 7·40 A.M., and got in at 8·50 A.M.; but some of the droves from the more distant western section of the rookery did not get in until 9·10 or later. The seals from the other (Kishotchnaya) section were "cooled off" at a different part of the killing-ground, 100 yards or so from where we left ours.

From 9·30 A.M. to 10·30 A.M. we had an hour for breakfast, leaving the seals to cool—a very necessary precaution if one might judge of their heat from the amount of hot steam and breath which arose into the misty air from those which had arrived on the killing-ground more recently. When I left the old bulls were, as far as I could see, quite happy in the midst of the females, and were busily engaged in chuckling and whistling to them as if they were on the rookery itself.

After breakfast the killing began and was carried on in two places at once, near each of the large groups of seals. A few seals, fifteen or twenty at a time, were separated from the rest, and then several men stood round them discussing their sex. The seals would in abject terror crowd one on top of each other in a state of absolute confusion, especially when a bull or large bachelor was in the squad. The bachelors would then be distinguished by the men as they struggled with the other seals, and would be deftly tapped on the nose with the end of a long pole. Then, when all which were of a suitable size had thus been hit and stunned, the remainder of the squad would be allowed to go, and the stunned bachelors would be finished off by blows on the head. In this work the Aleuts were wonderfully smart, seldom missing their aim, even when only the tip of a nose showed itself out of the seething mass of bodies, and when a number of other heads were close around the one aimed at, so that a miss would mean a female stunned. A very small blow on the nose seemed to completely stun the seal, which literally curled up at once, writhing very often right out of the squad.

I could not myself distinguish between cows and bachelors, and the Aleuts themselves had often a great difficulty in doing so. In a couple of cases seals, which were only stunned experimentally with a view to ascertain their sex, proved to be females and were allowed to recover. This I do not approve of, and I think a seal that is hit should never be spared; the killing of one or two females in such drives seems to be almost inevitable, and is, I think, far preferable to allowing the same animals to go away in a maimed and injured condition. The strict Russian Regulation against killing females I think defeats itself, for the females are now allowed to go away injured, probably in some cases to die later elsewhere, or not to recover for some time, owing to the men being afraid to enter them in the list as killed. Only five females were killed, but of these, two were seals which had been stunned and were then allowed to go away. One of these was in such a miserable condition that I requested that it might be killed, otherwise it would have been left where it was and the number of cows killed would have been entered in the reports as only four.

As the bachelors were thus separated from the females and killed they were at once skinned by the same men who had killed them. At skinning a seal the Aleuts are exceedingly skilful. A knife is driven into the (often still beating) heart and the skin very rapidly removed, so that in many cases I saw the flesh still quivering and the heart still beating after the body had been skinned. When a few skins were ready they were checked, weighed, and sent to the salt-house. A list of weights and

other details was carefully kept by M. Selivanoff and the Chief of the natives, and the number of skins was then checked by the Company's agent. The weights varied from 7 lbs. to 20 lbs., but the average would probably be about 10 lbs. I saw one skin only weighing 20 lbs. The whole business of driving and killing was superintended by M. Selivanoff.

The details as to number of seals killed, number of seals driven and weights of skins are afterwards entered on a printed form.

The rejected seals seemed to be quite bewildered, and often, if one was allowed to escape alone, it insisted on returning to those still awaiting their turn for death or freedom, so strong is the herding instinct in these animals. Many seals, especially pups, fell into the holes, at that time full of stinking water and mud, which surround the killing-ground, and in which meat is stored up for the use of the sledge dogs in winter. Here I found several and rescued them, for the young pups could certainly not have escaped themselves from some of the deeper holes. I noticed, however, that they could swim and dive excellently.

At 1 P.M. we knocked off for an hour or so for dinner. Fires were now allowed, as the wind was veering to east and north-east. Then we went at it again, until 8·40 P.M., when we killed the last seal.

Nearly all the stomachs of the seals killed were empty, but one contained a little fish and fish bones, and another some yellow matter.

M. Selivanoff's figures for the day's drive give the number of seals driven as—

Yearlings	59
Pups	281
Cows (deduct five cows killed)	2,083
Bulls	25
	2,448
Add to this the bachelors killed	710
Total number of seals driven	3,158

Before I received these figures I had myself estimated the number of seals which escaped as (very roughly) being about in the proportion of ten to one of those killed, which would give us—

$710 \times 10 = 7{,}100$ as the number of seals driven from the rookery. If then we left as many seals behind on the rookery and in the sea as those which we drove (it should be remembered that we drove all the seals we found on shore as far as possible, except bulls and pups) that would give the whole number of seals on the rookery as 14,200, so that only by a very liberal estimate can there be 20,000 seals on the whole north rookery.

I do not wish to put my figures in front of M. Selivanoff's; only if we take M. Selivanoff's figures as correct, it would make the total number of seals on the rookery very small. I give these figures chiefly with the object of showing how different may be the estimates of the number of the same body of seals made by two different people on the same occasion.

After the drive four pieces of buck-shot were given to me. They had been found in some of the seals by the natives who skinned them.

On the 26th July I went over the killing-ground and the drive-ways of the previous day. The Aleuts were busily engaged in cutting up the bodies. On the track of the seals driven from the smaller rookery I found two carcasses, evidently those of seals which had succumbed in the drive, and had been killed and skinned where they lay. I found also one dead cow and three live ones, the latter together (one with a terrible-looking wounded red eye), and these I drove into the sea.

There were, I fancied, fewer seals to-day on the Kishotchnaya, and they were quieter and for the most part asleep. A constant procession of seals was coming in from the sea.

The larger section was noisy, and the distant parts looked very much as usual. The patch nearest to which one gets when looking at the rookery was quite changed, and presented quite a new appearance. There was not a single bull there, and only a few females and pups.

Between the two sections I saw two more females on the beach. These I also drove into the sea, when they appeared to go to the reef.

The whole system of driving, as above described, is in strong contrast with that pursued, according to the accounts of Professor D'Arcy Thompson and others, on the Pribiloff Islands, and seems open to very grave objections.

1. It cannot but be injurious to completely overturn and break up a whole rookery, not once, but many times in a single season.

2. It cannot but be injurious to drive up the whole body of females, most of which are suckling, some have only recently given birth, and some doubtless are late in pregnancy.

3. The strict rule against killing females is powerless to prevent the unintentional injury of many, and leads only to unnecessary suffering in the release of those severely though accidentally injured.

4. The pups, many of them extremely young, are subjected to many risks of loss and injury.

5. The bachelors, instead of being culled, as on the Pribiloffs, to furnish skins of medium weight, a process resulting in the release of a considerable portion to perpetuate the stock, are killed off to the last one.

The whole system is an index of the impoverishment (from whatever cause it may arise) that the rookery has undergone, an efficient preventive to its recovery, and a clear warning that a period has been reached when a temporary cessation of all operations is urgently required.

The Past History of North Rookery.

Dr. Stejneger has given a very minute description of the North Rookery at pp. 40 to 42 of his Report, and I have not, therefore, thought it necessary to repeat in detail what he has said, and have only given a description of the North Rookery sufficient to enable one who may read this Report to understand what is said about the seals.

Steller's account of the rookeries.

It is interesting to note, however, that Dr. Stejneger thinks (p. 39) that the seals which Steller found on Behring Island in 1741 were all hauled up at the South Rookery, and "that vast numbers of bachelors hauled up in Lissonkovaya Bay, where there are none now, nor have there been any apparently within the memory of the natives residing on the island." He thinks (pp. 38 and 39) that in Steller's time either there were no seals at the North Rookery, or that, if there were, Steller never visited that part of the island.

Comparison of the past and present conditions of the rookery.

On pp. 106 to 111 Dr. Stejneger has compared the condition of the North Rookery as he saw it in 1882–83 with that of the same rookery in 1895.

Stejneger's account of the rookery in 1882–83,

In the former years Dr. Stejneger (pp. 106 and 107, and Map VII) says that "the North Rookery consisted of three distinct breeding areas, viz., the reef (including Sea-Lion Rock), Kishotchnaya, and a smaller patch between that and the reef. The bachelors occupied many positions, both on the outlying rocks around the breeding seals, and also in the rear of them. Between the creek and Kishotchnaya there were three patches of bachelors, so that the whole distance from Sea-Lion Rock to Blizhni Mys, the first cape south-west of Kishotchnaya, was practically one continuous seal-ground. The breeding-grounds at Kishotchnaya were surrounded by a heavy fringe of bachelors, who also sported in great numbers on the smooth, gravelly space in the rear of the rookery. South of Kishotchnaya, between the latter and Maroshnik, were again two separate patches of bachelors. In 1883 for the first time bachelors were known to haul out regularly throughout the season on the beach called Kisikof, beyond Maroshnik. The permanent settling on the beach in question was then regarded as an indisputable proof that the rookeries were increasing."

"The rookeries were in excellent condition, both as to quantity and quality. All classes of seals were well represented, and only skins of standard size were taken. This was particularly the case in 1883, when the Company's representative had very strict orders not to accept a single skin under 8 pounds. During that year 50 per cent. more skins could easily have been taken, but for business reasons the Company wished to reduce the catch as much as possible, and it was only after some strong pressure was brought upon Captain Sandman by M. Grebnitski that he agreed to take as many skins as he did."

And in 1895.

When Dr. Stejneger again visited the rookery in 1895 he states (pp. 107 to 111, and Map VIII) that "the entire beach between Babin—a detached rock which marks the western base of the reef—and Kishotchnaya was depleted of seals—not a single breeding seal between Babin and the creek, nor a bachelor—all the way to Kishotchnaya . . . the hauling-grounds south of the latter place were also deserted. Instead of the imposing series of breeding and hauling-grounds from Sivutchi Kamen to Kisikof I found only two patches of breeding-grounds, now forming almost two distinct rookeries, the reef and Kishotchnaya."

Dr. Stejneger states that he was prepared for a diminution in the seals, and it caused him no surprise. On the other hand, he "was considerably surprised at finding (8th to 10th July and 15th to 20th July) the breeding-grounds of the reef outlined very much" as he had seen them in 1883. He adds that "while thus the distribution on the whole was the same as formerly, there was a perceptible shrinkage in the width of the areas covered by the seals, and it seems to me also in the density of the seals," though of this he could not be so sure. Decrease of seals.

At Kishotchnaya he found (p. 108) the same state of affairs as on the reef, "only that the patch had shrunk still more, and the seals apparently covered the ground less densely than on the reef. This last observation, however, is not to be relied upon, as the breeding-ground can be looked down upon from a much greater elevation (70 feet), though at a greater distance. Bachelor seals in small numbers hauled out on the outer rocks and in among the females in the rear of the rookery, but the centre of the parade-ground was deserted all summer, and never a seal entered the posterior third of the latter, now covered with a scanty growth of tufted grass."

"It was at once apparent that there was a low percentage of bulls on both rookeries, though at the reef the formation of the ground made it utterly impossible to make a reliable estimate of the average number of females to each bull by counting a sufficient number of harems." At Kishotchnaya, however, on the 16th July, Dr. Stejneger (pp. 108 and 109) was able to average "at the south end of that rookery about fifty females to a bull, while at the northern end the harems appeared smaller, most of those counted containing fifteen to twenty-five females. A great many females were in the water that day, however, so in all probability the whole rookery averaged no less than forty females to the bull. This proportion did not seem to have caused any lack of vigour in the males, for there were quite a number of large half-bulls skirting the rookery or hauled out on the outlying rocks, looking longingly towards the breeding-grounds." Scarcity of bulls,

"The greater falling-off in this rookery was due to the decrease in the number of bachelors, especially the younger ones. But instead of affecting all classes, this diminution was chiefly confined to the younger ones." Dr. Stejneger has printed in his Report, at p. 109, a Table showing the weights of the skins taken in thirteen drives between the 14th July and 13th September, 1895. From this it appears that no single skin of under 7 pounds weight was taken, and of this weight only 235 skins; in four drives not a skin under 8 lbs. was taken, and in none of the drives was the average weight less than 9·7 pounds; of 6,725 skins, 5,558 weighed 9 pounds and over; while the average weight of these 6,725 skins was 10·3 pounds. "This Table," says Dr. Stejneger, "is also very interesting, showing how uniform was the size of the animals driven during the period of two months. Its true significance, however, can only be appreciated when it is remembered that the rookeries were scraped absolutely clean, and that not a seal was allowed to escape that would have yielded an acceptable skin. It can be stated with absolute certainty that there was not a bachelor seal on North Rookery, Behring Island, of the class yielding 6-pound skins." Of bachelors,

"Though not literally absent, the yearlings were practically so," and Dr. Stejneger gives on p. 110 a Table which shows the numbers and the sex and ages of the seals driven to the killing-grounds in thirteen drives, whence "it will be seen that out of 29,112 seals driven to the killing-grounds only 540 were yearlings, or 1·86 per cent. It was a constant source of wonder on Behring Island in 1895 what had become of the yearlings. From time to time it was confidently predicted that they would turn up 'later,' but they did not come at all. There was a slight proportionate increase after the middle of August, but too trifling to amount to anything. And again I must emphasize the fact that the rookery was scraped clean in search of seals" (p. 109). And of yearlings.

It should also be noted that in the case of the North Rookery of Behring Island the same yearlings were probably repeatedly driven in the seventeen drives of 1896, so that if that fact were also taken into consideration, the proportion of yearlings to seals driven would probably have been even lower.

On p. 111 Dr. Stejneger gives the figures for the seals killed in each drive of the season, from which it appears that this rookery was driven seventeen times, from the 13th June to the 13th September inclusive, and that in all 8,341 skins were thus obtained.

Dr. Stejneger has obtained what he considers accurate figures for the percentages of each class of seals contained in each of the above drives, with the exception of four, and for these he has calculated the numbers from those given for the remaining

thirteen. He notes "that it was necessary to drive off over 29,000 seals in order to obtain 6,725 skins, and that of these 29,000 no less than 20,568 were females. As already stated, there is no reason to suppose that the percentage of females differed materially in the other four drives, except one (that of the 13th June, the first drive of the season, in which he was informed that there were no pups or females). If, therefore, we calculate the corresponding figures for a total of 8,231 (8,341—110) skins, we find that in order to obtain 8,341 skins, the total catch for the season, it was necessary to drive off to the killing-grounds 35,741 seals, of all ages, of which *the astounding number of* 25,174 *were females.* In this count are not included such females as were allowed to escape along the road of the drive, although the number of females thus culled was comparatively few, as the men were afraid of letting a single killable bachelor escape." The number of males of all ages driven was, therefore, 10,567, of which 8,341 were killed and 2,226 rejected, or about 25 per cent., a figure which, however, becomes very much lower when it is remembered that many of the rejected males must have been driven repeatedly to the killing-ground.

Effect of driving.

"Nothing," says Dr. Stejneger, "could better illustrate the straits to which the rookery has come. On the other hand, nothing could better demonstrate how little the driving disturbs the seals. Here is a rookery where the females have been driven probably as long as seals have been taken, though not in the same proportion as now. Yet the females return to be driven over and over again, and the breeding-ground is the part of the rookery least affected in the general decrease."

Here Dr. Stejneger seems to exaggerate the facts of the case, for it was only in 1895 that the *whole* rookery was first driven, and his statement that "the females," implying all the females, have been driven is misleading, only *some* females having thus been driven. In proof of which the Report of Captain F. R. Pelly, of Her Majesty's ship "Porpoise," on patrol duty at the Commander Islands in 1895, may be cited (see below, p. 53), as well as Dr. Stejneger's own statement, on p. 67 of his Report, "that the great rookery on Behring Island was never before raked and scraped for the last bachelor seal as it was during the past season," *i.e.*, in 1895, and that (p. 107) although even before that year females and pups got unavoidably mixed up in the drives, the percentage was not very great.

Importance of Stejneger's remarks and conclusions.

I have quoted Dr. Stejneger at considerable length, because I think his remarks are as important as any which have ever been written on the seal question. Before considering them in detail, however, I must draw attention to the fact that the same writer has on p. 135 of the same Report recorded his conviction in the following words: "*I have been unable to resist the force of the logic which places the blame for the decrease of the Commander Islands' seals upon pelagic sealing, and upon pelagic sealing alone.*"

Scarcity of yearlings not attributable to pelagic sealing.

It is difficult to understand how pelagic sealing is to be made accountable for the fact that of 29,112 seals driven to the killing-ground, only 540 were yearlings. It is obvious that any scarcity of yearlings in 1895 must have been due to an unusually small birth-rate in 1894, or an unusually large death-rate among the 1894 pups, and whatever the cause of this may have been, pelagic sealing at any rate could have had nothing to do with it on the North Rookery, for we have Dr. Stejneger's own statement* that the feeding-grounds of this rookery had not been seriously tapped by pelagic sealing up to 1895, and I have shown (pp. 38–42) that the great mortality of pups which he discovered on this rookery was not at all unusual. It is also to be noted that if yearlings were scarce, bachelors of a slightly older age were scarcer still, for "it can be stated with almost absolute certainty that there was not a bachelor seal on North Rookery, Behring Island, of the class yielding 6-lb. skins." (Stejneger, p. 109.) In fact it appears to me that in laying stress on the scarcity of yearlings on this rookery Dr. Stejneger has somewhat missed the point. It would have, I think, been more correct to say that *all* males were scarce, but especially the younger males.

It is my opinion that Dr. Stejneger's description of the North Rookery for 1895 is about the most powerful indictment of overkilling on land and its evil results that has ever been put on paper.

Summary of Stejneger's remarks.

Here are briefly the points which Dr. Stejneger has noted with regard to the state of the rookery:—

1. The breeding-grounds retain their 1883 outline, but there was a certain decrease in the thickness of the seals.

2. There was a low percentage of bulls, especially on Kishotchnaya.

* Pp. 87 and 128.

3. The greater falling-off in this rookery was due to the decrease in the number of bachelors.

4. "It can be stated with absolute certainty that there was not a bachelor seal on North Rookery, Behring Island, of the class yielding 6-lb. skins."

5. Though not literally absent, the yearlings were practically so.

6. The rookery was scraped clean in search of seals. Not a seal was allowed to escape that would have yielded an acceptable skin.

7. In order to obtain 8,341 skins the whole rookery was driven no less than seventeen times.

All of these headings may be briefly summarized by stating the whole rookery had decreased, but that the decrease manifested itself chiefly in the males, and especially in the younger males.

There was the same low percentage of bulls in 1896 as in 1895, although I cannot give exact figures for the number of females to each harem. Spare or reserve bulls were practically, if not entirely, absent, the only bulls seen outside the harems being apparently old, if not impotent.

Yearlings were also scarce, and there was a great scarcity of bachelors, and the same "scraping" of the rookery to obtain the few there were, the whole body of seals on the rookery, including females and as many bulls and pups as were gathered up in the drive, being driven up to the killing-ground at each drive and there sorted to obtain the skins of the few bachelors among them.

We may then, I think, regard the condition of the rookery in 1896 as being very similar to what it was in 1895, but probably worse.

Now to lay the blame for the above peculiar condition of the rookery to the doors of pelagic sealing alone is illogical.

Pelagic sealing destroys at least as many females as males. American writers have at various times claimed that the number of females in every hundred seals killed at sea is from seventy to ninety, but the figure used on the Pribiloffs during the past season with regard to pelagic sealing was that of Mr. A. B. Alexander, who, in 1895, spent the season in the sealing-schooner "Dora Sieward" on behalf of the American Government, and found that the percentage of females to males in the whole of that vessel's catch for the season was 62 (to be exact 62·3) females to 38 males in every hundred. Dr. Stejneger too has himself stated (p. 129) that "one-half of the loss to the herd during the four years 1892 to 1895 was probably females."

If, then, a rookery has suffered from pelagic sealing, we ought to find a decrease which should show itself in the whole herd, and not in any special absence of males, or of yearlings and young bachelors. In fact, there ought to be too many old males on a rookery where the whole of the decrease is due to pelagic sealing and to pelagic sealing alone. Every female ought to be fertilized properly, and there ought to be a plentiful supply of yearlings in proportion to the size of the rookery, as there would appear to be this year on Copper Island, on which island the losses due to pelagic sealing must, if Dr. Stejneger's statements on pp. 87 and 128 already referred to are correct, have been much heavier than on Behring Island. The decrease of the rookery as a whole may be in part due to pelagic sealing, but I cannot believe that the scarcity of male life generally, which is acknowledged to exist on it and in the younger males especially, can be due to that cause.

In my opinion, and I have tried to show on p. 36 how this opinion is borne out by an inspection of the conditions prevalent on the other rookeries of the Commander Islands, the scarcity of males, and especially of young males, can hardly be accredited to any other cause than to over-killing on land.

I have shown elsewhere that there was an undoubted decrease in the Commander Islands killable seals, which means a decrease of the whole herd also, before the commencement of pelagic sealing, that in spite of this, the decreasing males were killed off at a rapidly increasing rate, until finally there were so few of them left that in 1895 it was found necessary to drive the whole rookery, in order to obtain the skins of the few remaining killables which now hauled up among the females. How that process was carried on in that year has been well described by Dr. Stejneger and quoted above. Even if we admit that the driving of a whole rookery seventeen times in the season does no harm, we cannot see any other termination to the course of over-killing which is now being carried on than a constantly increasing scarcity of male life, followed by a rapidly decreasing herd, the decrease taking place quite independently of pelagic sealing, as from year to year more and more females go away from the rookeries unfertilized, especially the late-arriving virgin females.

In conclusion I may note that what Dr. Stejneger says about the breeding-

grounds of the North Rookery as observed by him in 1883 retaining very much the same outline in 1895, and the fact that, although bulls are scarce on Behring Island, yet they are comparatively plentiful on Copper Island, is extremely interesting and tends to support the opinion that the bulls always haul up, if possible, on the same spot, and take up, if they can, the same position on the same rookery.

This is especially interesting, as going to show that the bulls do not even change their ground in cases like that of the little South Rookery of Behring Island, which, though very short of male life, is not recruited from the more plentiful males of Copper Island—not 50 miles away. Whence I infer that to spare one rookery in order that its surplus male life may overflow on to another can do no good whatever to any rookery other than the actual one spared.

The South Rookery.

On the 5th August, I left Nikolski at 8·20 A.M., by boat with a party of natives, and reached the South Rookery in the afternoon.

The landing is on rocks, and is quite unprotected in bad weather. Above the rocks is the beach, which consists of two belts (as at the rookery), the one sandy and the other clothed with luxuriant green vegetation. Above this rises the usual Behring Island escarpment. Our boat was hauled up on the sand, and we walked up the escarpment to a height of about fifty feet to the green tundra above it, where are two wooden huts, which we had already seen from the sea.

One of these is the salt-house, and in the other live two or three natives with a Headman, who constitute the rookery guard and who kill the seals. There is no Russian stationed permanently at this rookery.

I walked down to the rookery with the Headman of the natives. The way to the rookery leads by a little path and a pretty steep climb down the escarpment at the little cape which marks off on the north-west the little bay where we had beached the boat. Just north of this little cape, there is a beautiful waterfall, by which the water of a fair sized stream is sent down to the sea.

In the next bay are the seals, and we lay down in the thick grass behind them at a distance of only about twenty feet from the nearest of them.

The rookery is hardly deserving of the name now, whatever it may have been in times past. I found only a small patch of seals on the beach. Here lay possibly sixty-five seals; I counted sixty, but there may have been a few asleep among the rest, which I could not see. At least two or three that I saw were young non-breeding seals (? virgin females), which had hauled up among the breeding females. There were perhaps four or five times as many black pups as there were females, but it was impossible to make an accurate count of them. There was not a single bull, and no sign of any separate parade-ground for the bachelors. It being delightful weather, a good many seals were in the water, both inside and outside the protecting reef, but the whole number of seals in the rookery can hardly exceed 500.

I saw black pups suckling, and one pulling at a sleeping seal who could hardly have known whether the pup was hers or not. These black pups now play and leap in the water exactly like the older seals.

The drive-way here has a length of about 2,000 feet. It leads along the beach south-eastwards along the bay in which the seals lie, and then along the next small bay where is the waterfall, after which it ascends the escarpment close to the landing-place, at the part where I had already ascended it, and where, according to Dr. Stejneger (p. 43), it is "about 50 feet high," and steep. Once the seals have reached the top of the escarpment, the way to the killing-ground in the grassy valley above is short. Dr. Stejneger thinks that this drive-way, "although not long . . . . . is somewhat harder than on the North Rookery, as the seals have to be driven mostly over sand and loose stones."

In the afternoon I wandered over the killing-ground, and examined the bodies of some seals which had been killed on the previous day. I opened seven stomachs, one of which was empty, while the remainder were more or less full of a pink, soupy, and nauseous-smelling liquid, in which were many eyes and a few beaks of squid, also a few strips of white flesh—either fish or squid. In one stomach there was a piece of salmon, and, apparently, bits of sea-weed in others, but the stomachs were somewhat decomposed. This is interesting in view of the statement of Dr. Stejneger (p. 69), that he was informed "that once on the South Rookery a flock of bachelors was so full of octopods that they vomited up quantities of these mollusks while being

driven." Possibly a certain amount of this squid food is taken by the seals near the rookery, and I was informed that squid does occur close in shore at the islands.

On the 6th I visited the rookery again at about 7 A.M. This time I counted twenty-five sleeping females on shore. Most of the pups also were out on the reef or in the water. There could not have been more than thirty adult seals on shore, in fact they formed quite an insignificant "pod," and quite unworthy of the name of rookery.

I saw no dead pups at the South Rookery, but blue foxes were numerous round me, and were unheeded by the seals, so that it is not probable that, had there been any dead pups, they would have been left on the ground.

There was not a single bull on the rookery either on the 5th or 6th.

Any bachelors which may have been present, and there could not have been many in view of the recent drive, must have been in among the females, and so indistinguishable from them, or in the water.

All the females were quite dry, or nearly all of them.

A comparison of this rookery as seen on the 6th with the appearance it presented on the 5th, as regards the numbers of the seals is interesting, as it shows how a rookery may vary in appearance from day to day, or even from hour to hour, according to the weather or other conditions affecting the seals. The shape of the rookery on the 6th was quite different from what it was on the 5th. There was only one small "pod" of seals now, instead of, as before, two "pods," connected at the beach-line by a thin line composed of a few sleeping seals.

This is an excellent rookery for daily observation, and I wish I could have camped on the spot early in the season, as the seals are so few that one can count nearly all of them and keep them all under observation at once, whilst one can lie quite unperceived by the seals at a distance of about 20 feet from the rookery.

On the way back to Nikolski, on the same day (August 6th), we passed a party of killer-whales, with great triangular pointed dorsal fins, blunt heads, and white patch behind the eye. They were travelling in two lots, the individuals swimming side by side and quite close together.

Past History of the South Rookery.

The South Rookery of Behring Island (Poludionnoye Lezhbishtche) is, thinks Dr Stejneger, who has described its position at pp. 42 and 43 of his Report, "the only remnant of the countless multitudes of seals which Steller saw on this side of the island." He gives its latitude as 55° 57′, and its distance in a straight line from the village of Nikolski as 16 miles. It is situated on the west coast of the island, half-way from Cape Manati, the southern extremity of the island, and North-west Cape, at the other end of it. "It occupies a narrow, curved beach under the steep bluffs of the coast escarpment, which here rises perpendicularly from 60 to 100 feet high."

The seals lie on a narrow beach of pebbles and stones. Dr. Stejneger gives its width as "hardly 100 feet," and between it and the escarpment is another narrow belt, level and thickly clothed with strong sea grass and cow parsnips. The rookery is well protected by a reef, on which the seals can haul up, and inside the shelter of which the pups play and learn to swim.

The remainder of Dr. Stejneger's account of this rookery will be found on pp. 111 and 112 of his Report. He there states that "this rookery, has not been of much account of recent years. After the interregnum—1869–71—it was so insignificant that no regular catch seems to have been made until 1880, although occasionally, *i.e.* before and after the season closed on North Rookery, a few seals were killed at Poludionnoye in order to get fresh meat for the main village, Nikolski. Thus, in 1878 fifty were killed in June, and thirty on the 5th November. The result was that the rookery was gradually increasing. Finally, in 1880, it was deemed sufficiently large to station a small force of men, under M. Volokitin, at the place, and in that year 787 skins were taken. It seems, however, that the capacity of the rookery was under-estimated, and not enough salt was landed, so that no more could be taken care of. In 1881, in spite of the complaint that, although there are 'many sikatchi on both rookeries,' there are 'but few hollustiaki, mostly in the water,' the South Rookery yielded 1,150 skins. The following year (1882) the catch was 1,410."

When Dr. Stejneger visited this rookery on the 21st August, 1882, he "found the entire beach between the first and second cape west of the waterfall covered with

seals, the breeding seals occupying the portion nearest to the water, the bachelors' patches at both ends and in the rear up to the inner grass-covered belt."

Dr. Stejneger has not given us with his Report any photographs of the rookery in 1882, but those of Colonel Voloshinof, taken in 1885, and which form plate 31 of his Report, show that in that year the beach was still covered in much the same way as Dr. Stejneger describes it to have been in 1882.

On the 17th August, 1895, when Dr. Stejneger (p. 112) visited the South Rookery, he found that "only a handful of females were left at the extreme western end of the rookery."

In respect to the proportions of the various classes of seals, he "found the conditions to be similar to those on the North Rookery. It was reported in Nikolski that there had been only one bull on the rookery in 1895, but on inquiry at the rookery" he "was informed by Nikanor Grigorief, the native in charge, that the actual number of sikatchi had been five. This number may be considered exact, and the number of females to each bull was, therefore, probably nearly 100. There were plenty of pups when" Dr. Stejneger "visited the rookery, and no barrenness of the females was suggested."

"By dint of hard scraping, no less than 564 skins were secured in 1895, 159 of them, however, between the 17th August and the 9th September."

On p. 64 Dr. Stejneger estimates the "number of breeding females (for 1895) at about 600, possibly only 500, and remarks that it would be a "comparatively easy matter to observe this year (1896) whether the number of pups born be very markedly small in proportion to the number of females hauling out."

In 1896 I was lucky enough to obtain several good photographs at the South Rookery. Of these, plates 49 and 50 were taken on the 5th August, and show the rookery from the grassy belt just behind it at a distance of less than 20 yards, at a time when about sixty-five females were on shore. At that distance I could get the whole rookery into two plates, intended to be joined together to form a panoramic view. In this view the tide was fully in. On the morning of the 6th August I took the rookery as it then appeared, when there were only about thirty adult females on shore. The tide was then out, so that the photograph (No. 53), although taken from the same point as the others, shows the reef now left exposed by the sea. The sleeping seals are not very easy to see, owing to the bright light in which the picture was taken.

Plate 58 shows the salt-house on the left, the native wooden hut on the right, and my tent between the two. Behind are the mountains with the snow-patches on them. The killing-ground is quite near to the huts.

Comparing my photographs with those of Dr. Stejneger (plates 28, 29, and 30), I think that his show a few more seals on shore than do mine, but the immense variation shown in the numbers of seals on shore on the two different days on which I visited the rookery indicates that to estimate the numbers of seals on this small rookery purely by the number of seals seen on shore, especially in August, must be a very unreliable enumeration, and I imagine that the number of breeding females on the rookery in 1896 was not very much less than it was in 1895.

This rookery is the smallest and most nearly exterminated of any rookery on the islands, and differs from both the Copper Island and the North Rookeries, in that whereas on the North Rookery bulls are scarce, neither they nor females are nearly so scarce as here proportionately, the latter especially. On Copper Island, on the contrary, while bulls are comparatively plentiful, the most noteworthy decrease is in the female part of the rookeries.

The conditions of this rookery, more than those of any other, point to over-killing on land as being the chief cause of the decrease. I fancy that the over-killing at this rookery must have been even greater than at the North Rookery, and this may be due to the fact that here there is no Russian, but only a native in charge of the seals; probably also the bachelors are easily secured here. In support of my assumption that the over-killing on this rookery has probably been excessive, I may quote Dr. Stejneger, who says that (p. 112) "by dint of hard scraping, no less than 564 skins were secured in 1895." Without doing more than pointing out that the full meaning of the expression "hard scraping" should be considered, I should like it to be noted that the number of seals thus killed at this little rookery in 1895 equals, and perhaps exceeds, Dr. Stejneger's estimate for the whole number of breeding females in the rookery for the same year, viz., "about 600, possibly only 500" (p. 64). If the killing on the Pribiloffs during the season of 1896 had borne the same ratio to the number of breeding females as does the above to that of those on the South Rookery,

there would have been killed on the latter islands not 30,000, but at least the whole quota of 100,000 bachelors.

Perhaps pelagic sealing has also fallen heavily upon this little rookery, and, if it be true, as I have suggested (p. 48), that the females of the South Rookery feed in the same part of the ocean as those of the Copper Island Rookeries, then the over-killing on shore will account for the losses of male life and that on sea for the corresponding loss of females, and will explain the fact that on this little rookery both males and females are very few in number. The double influence of both the coast and the Copper catch would soon be felt on a small rookery like this one, and if the feeding-ground of the North Rookery has enabled it to escape the latter drain upon its resources, the difference should be plainly visible in the two rookeries. If over-killing on land has been going on on this rookery for any length of time, then it, too, must be held responsible for its share in the destruction of the female part of the herd, as well as of the male, but the only evidence I have on this point is that of Dr. Stejneger, who states, on p. 100, that the number of fur-seals killed on the South Rookery for the years 1891 to 1895, inclusive, was 648, 506, 349, 627,* and 564 respectively.

With regard to the number of pups seen on this rookery, I have already maintained that statements like Dr. Stejneger's that "there are plenty of pups," have been made without reference to the fact which has this year been proved, that nearly half the females belonging to a rookery are always absent at sea, nor should we be satisfied at finding pups plentiful, for a rookery must have, indeed, come to a low state when "the number of pups born is very markedly small in proportion to the number of females hauling out." Such a state of things I should never expect to find so long, at all events, as pelagic sealing, by reducing the number of females in a rookery is constantly bringing their number into a more natural proportion to that of the males left by those who kill the seals on shore. It is sufficient to prove that a rookery is in a bad state from over-killing on shore, if we find any appreciable proportion of the females without pups (as was probably the case at Robben Island in 1891, see p. 6); and it seems likely that this was also the case at the South Rookery in 1896. Unfortunately when a certain proportion of both females and pups are in the water, it would be impossible to tell if, say 50 or 100, females were without pups, and yet that would be a very large proportion for a small rookery like this one. On the whole, I should conclude from my estimates that nearly two-fifths of the females in the rookery were without pups, but it must be understood that my estimate of the numbers of seals on the South Rookery was at best a rough one, and I submit this conclusion rather with a view to suggest further investigation than as a final statement of opinion.

Copper Island.

This island is long and narrow and very mountainous, its length being about 30 miles, its average breadth only about 2 miles. It is distant about 29 miles from Behring Island, which, on clear days, can be plainly seen even from its southern end, and, like Behring Island, its general trend is north-west to south-east.

The island consists of a backbone of peaked mountains from 1,000 to 2,000 feet high, connected by ridges varying from 500 to 900 feet high, with only two breaks in continuity. The shores are mostly high and precipitous. "Narrow beaches, covered with large boulders of rocks fallen down from the cliffs behind, extend with many interruptions around the island, but the latter are so numerous as to make travelling along the beach for any distance impracticable. Cliffs and pinnacles, formed into most fantastic shapes by the action of the waves, rise out of the sea all around the island, sometimes singly, sometimes in clusters." (Stejneger.)

Narrow deep valleys cut into the sides of the island vertically to its axis, ending usually in a very abrupt and steep ridge whence another valley runs down to the opposite side of the island.

The entire western coast is very steep, with but few shallow indentations, and it is on this side that all the rookeries are situated. The three villages are on the opposite (eastern) coast, but there is no anchorage which can afford shelter to more than a small boat.

The main village is Preobrajensky (village of the Transfiguration), which is situated in the more northern portion of the island. Besides Preobrajensky there

* To the figure for 1894 must be added an unknown number for skins secured in the fall of the year.

are two smaller villages where the natives live in summer while the sealing season lasts, and which are opposite to the main groups of rookeries on the eastern side of the island. These are Karabelni, situated slightly more than half-way from the extreme northern end of the island, and Glinka—so-called from the yellow clay which occurs there—which is near the southern end of the island.

The only way to get to and from these villages is by boat, as, although the natives sometimes walk from one to the other over the mountains, it is not possible to take any baggage in that way.

There being no harbours, boats can only pass between the villages when the weather is calm enough to allow of a landing being made on the exposed beaches and on which—with the exception of that at Preobrajensky—a tremendous surf breaks in heavy weather. By keeping a boat at the eastern side of the island, it is, however, sometimes possible to go from Glinka to Karabelni on that side when there is too much surf on the eastern side to allow of a boat being launched, but there are many days when there is a heavy surf on both sides of the island.

At Copper Island the seals lie on the narrow beaches at the foot of the cliffs on the western side of the island. The rookeries are therefore very different in character from those of Behring Island, with which, indeed, they seem to have only one point of resemblance, namely, that on neither island do any seals haul up on the eastern coast, and Dr. Stejneger (p. 45) states that there are, to his knowledge, no records to show and no reason to believe that they ever did so.

The rookeries are usually stated to be two in number, but in reality consist of two groups, each of which includes many rookeries. The northernmost of these is called Karabelni, and the southernmost Glinka.

The rookeries being situated on the opposite side of the island from that on which are the villages, there has always been a difficulty in getting the seals over the island to the salt-houses, and it is not surprising that the natives have preferred to make the animals carry their own skins over the mountains rather than carry them themselves. The result was that in former days, when seals were more numerous than they are now, they were driven over the mountain passes by drive-ways, which are in some cases difficult climbing even for a man. In late years, however, the trouble of driving a few seals over the mountains would have been greater than that of carrying the skins over, and so the seals have been killed at the rookery side of the island, and their skins are then carried over by the natives. A full description of the drive-ways will be given below.

Glinka village is situated at the foot of a valley which runs across the island almost to its opposite side, and down which runs a small stream.

It is down this valley that the seals from several of the sections of the rookery used to be driven in former days, and I have called it "The Valley of the Drives." Just behind the village the ground rises suddenly about 100 feet, and at this point the valley is very steep, being bounded on either side by steep mountains.

From this second escarpment the valley rises more gradually, and runs across the island until it reaches very nearly to the cliffs of Zapadnie on the other side of the island. At the summit is a small rounded hill, and at this point the valley splits into two smaller passes, right and left, over which are driven the seals from Zapadnie and Sabatcha Dira, on the left, and from Pestshani hauling-grounds, on the right, to meet in the "Valley of the Drives," and to descend by it to the village below.

The highest part of the pass at the extremity of the valley is only 760 feet above the sea (Stejneger, p. 50), but on the south-east towers one of the tallest mountains on the island right above the rookery known as Sabatcha Dira (the Dog's Hole). Over this mountain the seals from Palata Rookery used to be driven by a pass which reaches a height of more than 1,200 feet (Stejneger, p. 50) to join their comrades lower down the valley than do the seals from the other rookeries.

The Pestshani drive-way (following it from the village) as soon as it has reached the pass on the north (right) at once descends into a valley up which the seals have to climb in their journey from that rookery to the salt-house at the village. The height of this pass is given by Dr. Stejneger as 780 feet (p. 51).

In order to see the various sections of the Glinka Rookeries I had to ascend the "Valley of the Drives" nearly every day while I was there. The rocky, muddy path is difficult walking, but the natives go up and down at a great pace. The track splits up into three as it ascends, and it is necessary to turn either to the left or to the right (*i.e.*, south or north) to the rookeries which lie south or north of Zapadnie, which itself lies almost directly opposite to the village.

The path is marked by the rotting carcasses of seals which have died while being

driven, and their bones in various stages of decay and bleaching are strewn about the ground. Among the carcasses are those of many bulls, but bulls are comparatively plentiful here, and some of them, I am told, are killed for their skins as well as for their flesh, as the sea-lions have now been almost exterminated.

Two of the photographs taken by Professor Thompson's and his photographer show the "Valley of the Drives." Both show the thick grass of the lower parts of the valley and the barer upper slopes of the mountains, whose summits in that marked (B) are covered with mist. In (B) the drive-way from Palata is shown on the left of the picture, while on the extreme right is the small rounded hill which I have mentioned above, and on its left the drive-way from Zapadnie. This hill is shown better in the photograph marked (D), where it is in the centre of the plate, and on either side of it are seen the passes over which the seals are driven from Zapadnie (on the left) and from Pestshani (on the right). Photographs (B) and (D).

On the 13th, in the afternoon, I went with Mr. Lukeem up the Valley of the Drives to look at the rookeries. Having ascended to the top of the pass leading to Zapadnie, we descended by a steep path which led us to the top of the cliffs on the western side of the island. Here we found our way to the top of the cape which rises above Zapadnie Rookery (I think about 600 feet above the sea), and which we reached after three-quarters of an hour's walk. This is the most central position from which to view the Glinka series of rookeries as a whole.

From the summit of this cape we looked down on the seals, which here lie on the boulder-strewn strip of beach at the foot of the cliffs. The rookery is divided into sections, each of which has its name, but which were formerly much more nearly continuous than they are at present. I took two photographs from the summit of the cape, one looking north-west (No. 67), and the other south-east (No. 68); these show almost the whole extent of the rookery coast at Glinka.

Immediately below us was the Rookery of Zapadnie, where the seals lay in three patches. Most of them were black pups, with a few females and bulls, but great numbers of the adult seals seemed to be in the water.

These rookeries cannot be seen well from above, and no hauling-grounds or parade-grounds of the bachelors were visible, except the large bare parade-ground at Palata.

Photograph No. 68 shows, in the immediate foreground, part of the summit of Zapadnie Cape, beneath which is the rookery of that name. On the beach, a little nearer the background of the picture, is shown the patch of seals which now forms the Sabatcha Dira Rookery ("the Dog's Hole"), and above this magnificent cliffs rise abruptly from the sea. The headland in the extreme background is that of Palata ("the Palace"), whence is named the once magnificent rookery which occupies the reef shown stretching out seawards from the head, and which also runs along the beach on the nearer side of the head, as is just indicated in the picture by the blackness on the beach where the seals lie in masses. On the near side of the head is the Palata parade-ground, an extensive square-shaped space, almost bare of grass, rising more gently from the sea than the cliffs on either side of it, and here in past times great numbers of seals, chiefly bachelors, hauled out. A few breeding seals still occupy positions in a little gully which runs up inland just on the nearer side of Palata Head, and are just visible, as shown by the extra darkness of the photograph, in the picture. These points are shown in more detail in the pictures which I took when I had an opportunity of examining these rookeries more closely.

South-east of Palata are three small bays, of which the first is the largest, and contains the Rookery of Zapalata ("behind Palata"); the other two smaller ones contain the Rookeries of Sikatchinskaya and Gavarushskaya ("Bulls' Bay" and "Kittiwake Bay"). Beyond these no breeding seals lie, but bachelors are said to have hauled up on the beaches there formerly when they were numerous, and old bulls late in the season.

Plate 67 was taken from almost the same position as plate 68, but looks in the opposite direction. It shows the remainder of the coast on which the seals of the Glinka Rookeries lie. The curved beach and shallow bay in the foreground is Pagani ("the Unclean"); here are no seals, but the natives keep a boat for use when the surf on the other side of the island prevents them from leaving Glinka village on that side. Beyond Pagani the first big cape is Pestshani Mys ("Sandy Cape"), and in the little bay just beyond that (Pestshanoye) is the Pestshani hauling-ground of bachelors, where I found a few bachelors later on in the season. After this bay, a rock may

just be seen lying close to the shore; this is Urili Kamen ("the Shags' Rock"), and here is situated the rookery of the same name, just visible in the photograph as a dark mark on the beach. A little beyond Urili Kamen are two capes, of which the nearer and smaller one is Peresheyek, ("the Isthmus") and on the near side of this is a small rookery of the same name. The bigger cape, easily recognisable by the two rocks which lie in the sea in front of it, is Lebiazhi Mys ("the Swan's Cape"), and in the bay between this and Peresheyek is a hauling-ground for male seals. A few also have been known to haul up in the bay just beyond Lebiazhi Mys, and this hauling-ground is known as Gorelaya.

This is the northern termination of the Glinka Rookeries, and between that and the Karabelni Rookery, which begins at the cape which is shown in the extreme background of the picture, is a piece of coast where no seals haul up.

This completes the list of Glinka Rookeries and hauling-grounds, of which the following is a concise list, taking them from south to north:—

1.	Babinskaya	Hauling-ground.
2.	Gavarushkaya ..	Rookery.
3.	Sikatchinskaya ..	„
4.	Zapalata	„
5.	Palata	„
6.	Sabatcha Dira ..	„
7.	Zapadnie	„
8.	Pagani Bay.. ..	„
9.	Pestshani	Hauling-ground.
10.	Urili Kamen ..	Rookery.
11.	Peresheyek	„
12.	Lebiazhi Cape ..	Hauling-ground.
13.	Gorelaya	„

The total length of beach occupied at intervals by these rookeries and seal-grounds is given by Dr. Stejneger (p. 48) as about 6 miles, and there is a gap of 4½ miles of coast between the Glinka and the Karabelni Rookeries.

These will be described in detail, as I had occasion to visit them. They are in many cases picturesquely situated, but from their inaccessibility, whole or partial, are not so easy to observe as those of Behring Island. On the 15th, as some natives were going by boat to Karabelni, I took the opportunity of going with them, in order to get a look at the various rookeries from the sea.

We started at about 8·30 A.M., and walked over the island by the Valley of the Drives. At the summit of the pass we turned to the right and north-west, and descended to the beach at Pagani Bay, where a stiff climb by a waterfall brought us to a place where two boats were beached.

The inaccessibility of the Copper Island coast is very great. Between Pestshanoye, the bay next to and north of Pagani, and the southern termination of the seal-grounds at Gavarushkaya, there are only four or five places where one can descend to the sea, viz., at Pagani, at Zapadnie, at Palata, and at Zapalata; all these descents are very steep, in fact, the way down to Zapalata seems to have been only recently discovered, as Dr. Stejneger says that the rookery is inaccessible (p. 114); the descent looks from the top to be a dangerous climb, and I did not go down by it, but I was told that some skins had been brought up by the natives that way. The natives seem, also, to have discovered a rough way down to Sikatchinskaya.

The sea was calm, and we had a pleasant journey up the coast to Karabelni.

We passed several of the detached sections of the great Glinka Rookery, and had a look at them from the distance; we saw a good many seals in the water, but there was a quite distinct region both on the sea and on shore, where we saw no seals at all.

There were some bulls scattered on the beach at Pestshanoye and elsewhere (when I saw them, I had not yet become acquainted with the various names of the different parts of the coast-line at Glinka); these, Dr. Mallinoffski characterized as "tired with the breeding exercise." I think that these are possibly "the lonesome, patiently waiting polusikatchi" of Dr. Stejneger (p. 115).

I could see no seals except the bulls mentioned above, in the neighbourhood of the "great Pestshani hauling-ground."

I have no note that I saw any seals on the beach north of Peresheyek, *i.e.*, between this and Lebiazhi Mys, and certainly there were none north of the latter cape.

We arrived at Karabelni Rookery at about 1 P.M., and landed in a little cove there, which is quite unsheltered from the surf, and can only be approached in calm weather. Here we beached the boat. Karabelni.

Karabelni Rookery is much more concentrated than Glinka, and we saw plenty of seals both on land and water.

From the rookery we walked to the village of Karabelni, at the other side of the island, going over the same ground as the seals do when driven from the rookery to the village.

Above the little cove where we landed, there is one of Dr. Stejneger's "kettle-shaped" valleys which terminates inland in a steep abrupt manner, but at the sea in an escarpment of about sixty feet high. To enable the seals to get up this, a flight of wooden steps has been made, as shown in Dr. Stejneger's plate 44*b*, and in my own photograph No. 71, though from a slightly different position. On ascending the steps, the drive-way, as at Zapadnie makes use of the bed of a stream, up which it ascends for some little distance, and then having got out of the steepest part of the immediate ascent from the sea, it follows the course of the stream alongside of it up the valley until it reaches the abrupt ascent at the inner end. Here it turns northwards and ascends the steep side of the valley, which, on this (northern) side, forms a partition between it and another similar valley which runs down to the village of Karabelni. I found this ascent very steep and difficult, although it is not very long. The height of the pass is said to be 643 feet.

From the top of the pass the second valley runs down for some distance to the village in a winding course. There is a stream at the bottom of it, and that is the only road for the seals. We made our way sometimes on the bed of the stream, but more often by means of a very narrow track worn by the feet of the natives on the steep side of the stream, and which was in places liable to slip away as one trod on it. Finally, the stream ends in a flat grassy space close to the sea, and on which is the village; here also is the killing-ground.

The road is marked as usual by the carcasses of the unfortunate seals who have failed to face it to the end.

It took me from 1 o'clock to 2·30 o'clock to walk this distance, which is said by Dr. Stejneger (p. 46) to be "fully 2½ miles long," and I found it a very trying walk.

I took two photographs of the "Valley of Death," one, No. 69, showing the ascent from the summit, and the other, No. 70, showing the descent, from a few yards below the summit, as, owing to the winding nature of the valley, it is possible to get more into the plate in that position than it is at the summit. The photographs, however, fail to give a good idea of the height of the drive. The "Valley of Death." Photographs Nos. 69 and 70.

I regret that I never had an opportunity of seeing the ascent from Vodopad, at Karabelni, which has been described by Dr. Stejneger (p. 47).

I think that a road could easily be made here from Karabelni village to the rookery. As it is, I fancy that Spanish donkeys or mules could almost do the journey with skins, and I expect that, with care in the winter, they could be kept in good condition, as there is plenty of grass for their food.

We started to return at 3 P.M. and found the top of the pass now enveloped in mist, through which we had to pass.

On our return to Karabelni, I saw several patches of seals on land, and there was a great play of seals in the surf outside the rookery.

We did not get back until after 8 P.M., having been away about twelve hours.

On the 16th a drive took place at Zapadnie at 3 o'clock A.M., at which 100 seals were killed. I was unfortunately not warned beforehand, and missed the drive. Drive at Glinka.

The carcasses had been left on the beach for the advancing tide to wash away, so there was no time to be lost if I was to see them at all.

Taking a native with me, I walked up the Valley of the Drives, over the back of the island, until, looking down, we could see the seal-carcasses on the beach lying a little south of the stream at Zapadnie, and about 100 yards from the rookery. Round them was a cloud of "glaucous gulls," who had already breakfasted, also a blue fox. We descended the steep cliff by the Zapadnie Drive-way, only just in time to save the carcasses from the advancing tide.

Most of the seals killed were good big bachelors, enough almost for a man to drag up the beach, and most of them had large testes, larger than the large eye of this animal. They are, I should think, virile, at least to a certain extent. I kept two specimens of the male organs.

In the stomach of the first one which I examined, and in the intestine below the

pylorus, was much bilious stuff of a deep yellow colour, and the stomach contained also two pebbles. There was yellow matter in the intestine at the several places where we made incisions. The rectum contained some dirty yellow fluid excrement of the same colour as the stuff found in some of the other stomachs examined. The cæcum was full of yellow excrement. The intestine at the cæcum contained two flat worms (*Tænia*).

Zapadnie Rookery.

After having pulled up the carcasses out of reach of the incoming waves, I went to see the rookery. The first patch of seals I found to consist of a few cows and black pups, and there was no excrement but greasy looking patches on the rocks, which I took to be caused by renal excretions. There were many small black flies on the rocks, and these, no doubt, would help to remove traces of excrement and urine.

There was here a largish seal, long dead, and with the head smashed. It had probably been left from some previous drive as useless.

Dead pups.

There were here also three dead pups, of which one had been long dead, one had been dead for a moderately long time, while the third was fresh. We opened this one and found that there was no layer of fat between the skin and the body—so conspicuous as a rule. The stomach was conspicuously less muscular than that of an adult, and contained only a little mucus. There was some solid (partly dried) yellow excrement exuding from the anus, and fluid (black stuff) in the rectum and intestine.

Next we came to a large patch of bulls, cows, and pups. Some of the pups were asleep, and exceedingly fat. We made them awake with our feet, and they ran away bleating in great confusion. I noticed one or two thin pups, and about twenty dead ones in various stages of decay. I considered that if many were dead here the surf would have washed them away.

I saw here another dead body of an older seal.

After having seen the rookery we set to work to cut up and examine the contents of the stomachs which we had saved from the sea, with the following results:—

1. Contained only bright yellow bilious-looking fluid, especially at the lower end.

2. Contained the same bilious secretion at the lower end, and a few (thirty or forty) beaks of small cuttle-fish; also a little pink stuff, apparently sea-weed.

3. Contained a little bile only, and a few small nematode worms, some of which were attached by one end to the muscular coat of the stomach.

4. Contained only thick, black, partly clotted blood, which obliterated the bile, if any was present; also a few small worms.

5. A large stomach; absolutely empty, except that it contained some small worms, and a little thick (almost transparent) fluid [? mucus].

6. As No. 5, but with a very little trace of bile in the mucus.

7. Contained much bright yellow fluid and some mucus, the former confined to the lower half of the stomach; also worms, larger than those found in the last few stomachs.

8. Contained only mucus.

9. Contained a little yellow fluid, and about ten small pebbles.

10. Contained only mucus and a few worms.

11. Contained many small pebbles and a frothy greenish-yellow mucus.

12. Contained at upper end dirty yellowish-brown mucus; at lower end bright yellow fluid.

13. Contained some pebbles and a little yellow mucus.

14. Contained two or three pebbles and worms.

15. Contained pink mucus of the same colour as the stuff which I found in the squid-containing stomachs at the South Rookery. A little yellow fluid below the pylorus.

16. Contained much yellow fluid (bile).

17. Contained much yellow fluid, and two or three beaks and eyes of a small species of squid at the lower end of the stomach; also a worm or two.

18. Contained one small pebble, and at the lower end bile; at the upper end some blood.

19. Contained a little mucus only.

20. Contained worms and mucus only; a large stomach.

21. Empty.

22. Kept for further examination, so not opened, but squeezed only, when a little mucus exuded.

While I was examining these stomachs I noticed that some of the seals were returning to the first patch, from which they had gone into the sea on our approach an hour ago.

I returned up the water-course, which is made use of for driving the seals. It is terribly steep, but easier walking up (not down) than the native track, which I found very slippery on the dry earth, and in many places a simple slide, except where the feet of the natives passing up and down in wet weather have made good deep foot-marks, which serve as steps. Up and down here the mocassined natives go easily and quickly, being thick-set, short of stature, and sturdy. The stream is very steep, and would be a waterfall were there more water coming down by it. Almost every yard is marked by the carcass of some unfortunate seal, which has either refused to go on any further, and has been killed where it stopped, or has given in completely under the strain of the terrible ascent. At one place the bed of the stream is too steep for even the seals to climb, and a bare space to the right shows that they have to be driven out of the bed, and on to the bank of the stream, which they had to follow for a few yards before returning to the stream again. After a bit the stream-bed becomes a precipice, and as it reaches the magnificent pinnacled and battlemented cliffs above, the haunt of fulmars and puffins, the drive-way leaves it and curves to the left (north) over easier ground. The remainder of the drive-way is over grass, but there is still a considerable ascent (760 feet in all, according to Dr. Stejneger), and its severity is shown by the plentiful sprinkling of rotting carcasses along its whole extent, both ascending and descending, and by which alone its course can be plainly traced.

The drive-way (compare Stejneger, p. 50).

The photographs taken by Professor D'Arcy Thompson's photographer show the Zapadnie drive-way very well. "L" shows the ascent from the beach; "I" is taken from the top of Zapadnie Cape, over which the seals have to pass, while "C" shows Zapadnie Cape on the left, taken from Sabatcha Dira. The descent is shown in the photographs taken of the Valley of the Drives (see p. 18). The height over which the seals have to climb is, however, perhaps best shown in my photograph, No. 93, which shows Zapadnie Cape from Sabatcha Dira. The drive-way ascends on the near side of the cape.

Photographs (L), (C), (I), and (F), and No. 93.

On the 17th I started for Palata Rookery.

Palata.

We had a steep climb up the mountains on the left (south) of the Valley of the Drives.

At the top of the mountain I noted a seal carcass or two, and then we descended to where, looking down into the mist, we could hear the voices of the seals bellowing and baaing at what might have been the foot of a sheer precipice, for all we could tell to the contrary, through the mist.

Then we slid down to where we found the recent killing-ground, and saw the grass marked where a drive had been made. Then, although still a good height above the sea, we could view the nearly bare "parade-ground" slightly above and north of the rookery. There were no seals on it, and none nearer than the narrow beach between the sea and the little cliff in which the parade-ground ends. Three bulls sat apart, however, and one of them seemed to smell us, and went off into the sea.

There was a big surf on the beach to-day, and many seals were playing in it; some of them were black pups, and these the sea seemed to be knocking about a good deal, and rolling them completely over and over, but they seemed to enjoy it.

On the beach were some skeletons of recently killed seals, which had either not been washed away by the surf, or else had been washed away and then thrown up again by the waves.

I walked northwards along the beach to where a few cows and pups were lying in a small gully which runs up a few yards into the cliff.

On the beach here I counted seventeen dead pups, mostly decayed and lying near the surf-line. One freshly dead one (a male) had large internal testes. I had it opened and it was very thin.

Dead pups.

Next I walked further northwards along the beach until I came to the main part of Sabatcha Dira Rookery, a big patch of seals stretching right across the beach. It was hard to see them clearly, but I saw a good many bulls on the sea-line. These seals lie very thick, and I do not think they could be thicker on the ground occupied. It was useless to photograph them in the thick mist. There was another patch of seals lying further north. I noticed a thin pup lying by himself.

I walked south and east along the beach as far as I could go without stampeding the seals and counted two more dead pups and one older seal (dead). I was finally stopped by the harems of Palata, which thickly crowd the beach between the sea and the low clay cliff, 20 or 30 feet high, in which the bare parade-ground terminates, and which is rubbed bare by seal flippers. On the escarpment above is the vast parade-ground, also bare, and a conspicuous object from the cliffs to the north even at some

distance away; now it has only a few scattered harems on it. I noted one small bull with six cows away by himself.

Yellow grass. All this is now deserted of bachelor life and left to the blue foxes, and a poa grass, which comes up yellow, is beginning to grow on its upper slopes.

Excrement I looked carefully for excrement and found three or four patches at the upper end of the parade-ground, about 150 yards from the sea, whence some seals moved off at our approach. It was exactly like what I had seen on the North Rookery of Behring Island.

Dead pups. Here were three dead pups, which had died recently, and one of which had had its eyes picked out. In the stream which forms a gully at the southern extremity of the parade-ground were several long-dead pups.

All the first twenty dead pups seen were on the beach between the places where the seals were lying, and I thought at the time that they had most of them been cast up by the surf, as they nearly all were lying quite close to it.

I noticed one or two very thin pups among the usually fat ones, but with these already mentioned exceptions, the numerous pups which I saw were healthy.

I saw some patches of fur lying about. Perhaps some of the seals are already moulting.

Bulls. The bulls are, as far as I can judge, large and healthy. They are still "chuckling" to their harems, so the season is not yet over.

I found some more excrement, all of it flattened and apparently recent, but the rain prevented it from smelling. Here I did not really go upon a main rookery, but only on outlying parts of rookeries, so that I could not expect to see excrement in the quantities which I saw and smelt on the crowded main portions of the North Rookery of Behring Island, but if there was excrement like this at a distance of 150 yards from the shore there would be much more down close to the sea and in the thick parts of the rookery.

Pups learning to feed. As I came down to the beach to-day I saw a seal (I think a pup) with a fish, or something that looked very like a fish, in its mouth, in the surf. Whatever it had it dropped it and then recaught it, and then I saw no more. Later I saw a pup with some sea-weed, with which it was either playing, or else it was eating it—I fancy the former.

Westwards of the parade-ground are fine cliffs and reefs and outlying rocks, beyond which comes Zapalata. On the reefs I could see through the mist many seals sitting. This Palata seems to be the wreck of what must have been a grand rookery—grand both in its mighty proportions and in its magnificent scenery and surroundings.

The drive-way. The drive-way from here must have been terrible, and the lot of those seals which inhabit inaccessible coves like Sikatchinskaya and Gavarushkaya, and which cannot thus be driven, is an enviable one. Dr. Stejneger (p. 50) states that the drive-way from Palata to Glinka village traverses "a distance of nearly 2 miles over a ridge more than 1,200 feet high. The slopes to be climbed, or slid down, are in places 35° to 40°. They are partly grass-clad, and then very slippery."

On the 18th I went with Mr. Lukeem and a native to Sikatchinskaya and Gavarushkaya.

To reach these rookeries we went first up the Valley of the Drives as usual, but turned almost at its commencement to the left (south), and ascended the high mountain which forms the southern barrier of the valley, *i.e.*, turning off before one does even in going to Palata. Having ascended the mountain, we found that it was the broad ridge between the Valley of the Drives and another kettle-shaped one which lies south of it, and runs down to the sea on the other side of the island. The sides of this valley are grassy but steep, and we descended along the course of a little stream, which runs down it and drops its water into the sea by a waterfall of some 200 or 300 feet in height. There is thus no way down to the sea from this valley, the final ending of it seawards being in a steep cliff. Here a small grassy cape of about the same height as the waterfall runs out a bit from the land, and on either side of it are two little coves.

We climbed out on the ridge at the summit of the little grassy cape, and looked down on both sides on to the coves where lie the seals. On the south was Gavarushkaya, on the north Sikatchinskaya.

On each side of us above these coves the cliffs rise to a height of 1,000 feet or more, and a musky smell of breeding fulmars pervades the air.

Just north of Sikatchinskaya comes the once mighty rookery of Zapalata, while to the south the coasts run on to South-east Cape. I took three photographs here to-day, all of which have turned out well. No. 79 shows the Gavarushkaya Rookery,

No. 78, the rookery of Sikatchinskaya, while No. 80 shows the little bay of the latter rookery and its junction with Zapalata on the north, all being taken from the summit of the little grassy cape which I have already described.

Both these rookeries are protected by outlying rocks, so that they are good ones for the safe growth of young pups. There were not many seals on land to-day, but a great many in the sea and on the rocks and reefs, and of these we got a splendid view.

I tried to estimate the number of seals, and counted ninety in one spot at Sikatchinskaya, and then estimated the whole number on shore there at five times that number, say 500, to which if we add at least as many for absentees on the sea, we get a total of 1,000 seals. I thought there were about the same number of seals at Gavarushkaya, and I counted twenty bulls in the part which I photographed there, but there must have been many more than that.

Gavarushkaya is inaccessible from the land side, but I saw a rough path leading down to Sikatchinskaya, and there were some skeletons on the beach there, as they told me that they had killed 400 seals there in June, carrying the skins over to the village.

By the time we had ascended the high cliff to our north in order to look down on Zapalata the mist was thick, but I could see a few seals—apparently much fewer than at either of the two other rookeries. There were, however, many seals lying under the immediate foot of the cliffs, which one could not see well from the top of the cliffs.

Zapalata is now accessible by a very rough track, more fit for a fox to descend by than for a man.

There were very few bachelors to be seen to-day, but Mr. Lukeem pointed out to me one or two yearlings with conspicuous white breasts. The bulls are still lording it over their harems.

On the 19th I walked to Pagani with a native. At the cape we had heavy rain, but I climbed down the cliff and got close to two lots of seals which were lying a little north of the small cape there, one bunch north of the stream and the other south of it. The lot on the north of the stream consisted of about sixty bulls, half bulls and young bachelors, a good many of them, however, being big bulls. I photographed both groups in the rain, the former while running to the sea from the native whom I sent to stir them up, as when asleep they would not have showed up well in a photograph. These photographs turned out well and are Nos. 82 and 83.

These bulls were not fighting, although several of them were lying quite close to each other, but the younger bachelors were sparring at each other in play.

These are the "tired Sikatchi" of Dr. Mallinoffski, but I think that there were among them some of Dr. Stejneger's "lonesome, patiently waiting" bulls or half bulls, and that they consist of old and young males mixed.

Here was fresh yellow excrement, dog-like, but less in diameter than that of a large dog; it was fresh and not squashed as is the case on a rookery.

South of the stream the bunch of seals was larger, and there were more smaller seals, but still many large ones.

Above the stream and escarpment here is the usual killing-ground, dotted with the white forms of glaucous gulls.

Decrease of the seals.

There can be no doubt whatever that there has been a large decrease in the seals at the Glinka Rookeries since 1883, when Dr. Stejneger first visited them (see pp. 114 to 116 of his Report). "In those days the capacity of Glinka used to be more than double that of Karabelni, having in good years yielded over 20,000 skins."

The rookery in 1896.

In 1896 the conditions of the rookeries were probably very similar to those of 1895, although in the former year I arrived on Copper Island too late in the season to be able to compare the rookeries very closely with what Dr. Stejneger has said about them in 1895.

The rookery in 1895.

In that year he says that he "saw breeding seals in most of the places where" he "formerly saw them, but in vastly reduced numbers. Bachelors were also seen, but they were few and far between."

"Superabundance" of bulls,

The interesting feature of the rookeries, however, in contrast to that of the Behring Island Rookeries was the "superabundance of vigorous mature males." The natives also informed Dr. Stejneger "that on account of the still greater number of bulls earlier in the season, the fighting had been violent and incessant on the rookeries. This abundance of bulls, Dr. Stejneger was told, had "been noticed for several years."

And half bulls.

In addition to these "hundreds of. . . . nearly mature young bulls (or probably

mature, though not strong enough to fight the older ones) skirted the breeding-grounds, hauling out on outlying rocks and paying attention to the females coming out for a swim or a trip to the distant feeding-grounds."

Skins shipped in 1895.

"The total number of skins shipped from Glinka in 1895 was 4,809 (including a few hundreds of the autumn catch of 1894), a trifle more than one-half the catch of the previous year."

Lightness of the skins.

Another curious feature of the Glinka Rookeries in 1895 was the lightness of the skins taken, and with regard to which "there was a great complaint" made by the natives. Of 228 skins taken in a drive at Glinka on the 8th August, 1895, the average was only 7·6 lb. Yet in 1883, when Dr. Stejneger visited Copper Island, "the Company refused every skin under 8 lb." (p. 116).

The condition of the Copper Island Rookeries in recent years has been, therefore, strikingly different from that of those on Behring Island, as described above. Yet we have evidence that the killable seals on the island have not been treated with any more leniency than those of Behring Island. In fact, we know that in 1890, as is stated by Dr. Stejneger (pp. 117 and 135), there was already a difficulty "experienced in obtaining the requisite, though now limited, number of bachelors;" and the result was what Dr. Stejneger graphically calls "some active work," in fact, it appears to have been so active that no less than 32,338 skins were obtained, which quantity "appears to have been the largest ever shipped from Copper Island." By this same "active work" the number of skins for the combined catch of the two islands was kept up to its previous figure, although the catch on Behring Island was showing a marked decrease (see p. 37 of this Report).

I must point out that, in view of the "active work" which took place on Copper Island in 1890, and the great fall in the number of skins shipped from that island in every succeeding season, whether before or after the commencement of pelagic sealing, and the fact that "in 1892 the decrease in the number of females on Copper Island became serious enough to cause public comment," it is at least extremely probable that the "active work" was sufficient cause for the decrease of seals, apart from the effects of pelagic sealing.

This year M. Grebnitski, finding that killable seals were very scarce, very wisely stopped the killing in August on his arrival at Copper Island.

Pestshani Mys.

Next we walked on to Pestshani Mys, where a lot of thirty-one male seals was lying on the sand among rocks. The native counted seven bulls among them, but I did not count these, only I know that the bulls were less numerous than the smaller seals here.

We passed the body of a dead cow lying near the stream at Pagani.

Next, as we walked along the beach, we came on the body of a long-dead pup, which had been washed ashore. There is a heavy surf here and much driftwood on the beach.

Then at the next point was a small lot of about a hundred females and one bull, and some pups lying close to the Orilli Kameni, inside the shelter of which some hundreds of seals, females, pups and young seals, were sitting on the boulders and rocks or playing in the water.

On land I saw one piece of excrement, many flies, and (the rocks having now dried after the rain) some drops of a more oily liquid than water, which I take to be urine.

About 200 yards north of us stretched the larger part of the rookery, occupying the whole breadth of the beach.

Where the thirty-one males were before, we found now on shore two large bulls, two smaller bulls and several still smaller animals, which had already returned to land; the smaller ones were sparring on the beach.

Of the males which we had disturbed from their resting-ground on the boulders north of the stream at Pagani, two (both bulls) were on the beach on our return, and others in the sea were craning their necks to see if the coast was clear; the rest may possibly have landed at the other resting-place south of the stream, which we had not disturbed.

I looked at the southern patch with my glasses from above and counted sixty seals, but there were probably more, as I made my count so as to underestimate wherever there was a doubt, it being impossible to count all the sleeping ones, especially as there were some small ones here.

Karabelni Rookery.

I regret to say that various circumstances combined to prevent me from making a close examination of this rookery. I must, therefore, be content with accepting what Dr. Stejneger says about it.

He has described the rookery very fully at pp. 45 to 47 of his Report.

The cliffs here are very steep, and it is very hard to obtain the skins which are needed. In some parts of the rookery the seals have to be killed on the beach, whence their carcasses are allowed to be washed away by the waves.

From other parts of the rookery the seals are driven for a distance of 2½ miles (Stejneger) to the village at the other side of the island. I walked over this drive-way, and have described it at p. 20 of my narrative.

The salt-house is near the village.

In 1883 this rookery was, according to Dr. Stejneger, in a very flourishing condition; "in fact, there was unquestionable proof that the rookery was increasing." In that year it was curious that, owing to the increase of the breeding seals, which had spread on to ground which was formerly occupied by the bachelors, the latter were forced to change their ground to such an extent that it was exceedingly difficult for the natives of Karabelni village to get all the skins they wanted, and so they had to go over to the Glinka Rookeries for them (p. 113).

In 1895 Dr. Stejneger "found that while on the whole the breeding-grounds had retained their former shape—necessarily because of the natural conditions of the beach—there was a great thinning out of the ranks of the females. At the same time a large area at the north-western end had become nearly depopulated" (p. 114).

Bachelors were exceedingly scarce, but what struck Dr. Stejneger mostly with surprise was "the great number of bulls and half-bulls. This abundance of old males was particularly interesting" as compared with the state of things at Behring Island.

"The decrease of the yield of this rookery has been considerable. While, as far back as 1881, 6,500 skins were secured without trouble, it was impossible for the men in 1895, try as hard as they might, to secure more than 2,000. They were given full swing, and encouraged to take as many as possible, though they needed no special encouragement, for the decrease in skins meant a corresponding decrease in food and comfort during the following winter. Moreover, the season was extended to the first week of September, and yet with no better results. Between the 12th August and the 10th September they could scrape together only 188 skins."

I can only attribute the number of old bulls to the extreme difficulty here in obtaining every seal and scraping the rookery clean.

In 1896, too, bulls seem to have been plentiful, for M. Grebnitski allowed 172 to be killed for the use of the natives. He also told me that he had seen several old bulls lying dead on the rookery, and that there were a great number of old animals belonging to it.

I was told by Mr. Lukeem that earlier in the season than the time at which I visited Copper Island there had been about 1,000 bulls altogether on the island.

It is strange that M. Grebnitski told me that when he visited Karabelni Rookery in August, although old bulls were plentiful, pups were scarce.

Comparison of the different Rookeries of the Commander Islands.

Dr. Stejneger has given in his Report such a careful comparison of each individual rookery, accompanied by photographs, that I think no one can possibly have any doubt that there has been a very great decrease of the seals on the islands as a whole; in fact, my own observations alone, without any previous knowledge of the condition of things in earlier years, would probably have led me to that conclusion. I do not think it necessary here to go into the minute comparisons which Dr. Stejneger has made between the various rookeries; the photographs which I took, when compared with his plans and maps, will show the difference between the rookeries in 1882–83 and 1895–96 much better than could ever be done on paper, and I think we may accept it as a fact that there *has* been a very great diminution in the number of seals since the former date.

The catches on the islands for the various years will alone show this: in 1882, 40,514 skins were shipped from the islands, while in 1895, even by the help of the system of "raking and scraping" the North Rookery of Behring Island, which has

been described both by Dr. Stejneger and by myself, the catch for the two islands amounted to only 16,419 skins.

The remarkable thing about the rookeries, and the one to which I wish to draw particular attention, is that, as Dr. Stejneger points out at p. 117 of his Report, but does not attempt to explain, "whatever the cause of the recent disturbance of the equilibrium of the rookeries on the Commander Islands, each island has been affected differently, and the conditions to-day of the rookeries on Copper Island deviate radically from those of Behring Island."

Although this is the case now, and I do not think there is any difference to be noted in this respect between the conditions prevalent in the year 1895 and those of 1896, it has not always been so, for Dr. Stejneger states that at least in 1882–83, and, so far as he could ascertain, up to 1890, the conditions, apart from the difference in the physical aspect of the rookeries, were the same on both islands constituting the group.

In 1890, however, according to Dr. Stejneger, "it is said the bachelors were becoming scarce on Copper Island, and some 'active work' had to be done in order to secure the desired quantity, but inasmuch as this quantity appears to have been the largest ever shipped from Copper Island, the falling off cannot have been excessive though it may have been apparent on the hauling-grounds" (p. 117).

"In 1892, however, the decrease in the number of females on Copper Island became serious enough to cause public comment, while on Behring Island difficulty was experienced in obtaining the requisite, though now limited, number of bachelors."

In this connection it will be well to consider the several rookeries on the Commander Islands and their different conditions; such a consideration, I think, throws a good deal of light on the causes of the decrease of the seals.

It should be noted that, "prior to 1892 the Commander Islands seals' had suffered but little from pelagic sealing in general, and practically nothing from preying upon the feeding-grounds of the female seals" (Dr. Stejneger, p. 134), and even in 1892 the combined catch of the Canadian and American schooners on the Asiatic side only amounted to 26,752, a number which could hardly have shown any effect on the Copper Island Rookeries in the same year.

Dr. Stejneger contrasts the rookeries of Behring Island with those of Copper Island, with the result of showing that in 1895 those of Behring Island were remarkable for—

1. A "marked decrease in killables."
2. A "notable scarcity of old bulls."
3. "Decrease in breeding females less apparent."
4. "Killable males are of great size" (p. 117).
5. Yearlings almost entirely absent.
6. "A considerable mortality due to starvation among the pups."

(Pp.107 to 111, and 117.)

While, on Copper Island, it was noticeable that—

1. The "number of killables was small."
2. "Sexually mature male seals were plentiful."
3. "Females decreased enormously."
4. "Lack of older bachelors."
5. "Great bulk of skins from the younger classes."
6. "No mortality of pups observed, but it may have been present."

Pups were "abundant in proportion to the females on both islands."

With regard to the pups the observations made during the past season at the Pribiloff Islands prove that all previous estimates of pups based on their apparent proportion to the females are necessarily erroneous, and we can therefore make no use of such statements.

The only respect, therefore, in which the rookeries of the two islands agree is in the scarcity of killable seals. I may add that this year's observations on Copper Island show that there is there also a mortality of pups from starvation, but to exactly what extent this occurs is uncertain. It is extremely unlikely in view of the insignificant pelagic catch this year in the neighbourhood of the islands, that this mortality could have been due to pelagic sealing, and it seems probable that the

whole question of the mortality which occurs among the pups in the latter end of the season may have to be reconsidered.

We may regard the general condition of the rookeries in 1896 as identical with that in 1895, with the exception that there seems to have been a general decrease at least in killable seals, the number of skins shipped falling from 16,419 skins in 1895 to about 13,000 in 1896.

The very marked differences in the different rookeries on the Commander Islands is striking, and I wish to draw particular attention to them, as Dr. Stejneger, while blaming pelagic sealing, "*and pelagic sealing alone*," (p. 135) for the decrease, makes no attempt whatever to explain the striking differences in the general conditions of the various rookeries in regard to old bulls, killable seals, females and yearlings.

The decrease in breeding females as a whole he attributes to the inroads of the Canadian sealing fleet in 1892 "upon the unprotected feeding-grounds of the Copper Island female seals" (p. 135), in which year "the decrease in the number of females on Copper Island became serious enough to cause public comment" (p. 117). The less apparent decrease in the Behring Island females he puts down to the fact that their feeding-ground had not yet been tapped by the fleet.

I doubt, however, whether the effect of the pelagic catch of 1892 could have been evident on the Copper Island Rookeries in the same year, and it should be remembered that the catch of killables on Copper Island had fallen off since 1890, as it has done in every succeeding season, and that a decrease of females is only the natural concomitant of the decrease in killables.

The considerable mortality of the pups on the North Rookery of Behring Island he considers to be due to the finding of the feeding-ground off the Kamtchatka coast by some vessels of the sealing fleet (pp. 87, 128, 129 and 135).

It appears to me that Dr. Stejneger entirely omits one of the most important causes and one which has been thoroughly insisted upon by the British Commissioners of 1891 and 1892 as being a most potent cause of the decrease of the seals. I allude to over-killing by the lessees of the islands.

He states (pp. 134 and 135), that "three different causes, either of them alone or in combination with the others, have been generally regarded as responsible for the undeniable decline of seal life on the seal islands of the Behring Sea and North Pacific Ocean, viz., excessive driving of the male seals, raids on the rookeries, and pelagic sealing."

After dealing with these causes successively, and rejecting the two former as inapplicable to the conditions prevailing on the Russian Islands, he quietly goes on to declare that he has "*been unable to resist the force of the logic which places the blame for the decrease of the Commander Islands' seals upon pelagic sealing and upon pelagic sealing alone.*"* A reader would conclude that no other cause had ever been alleged for the decrease of the seals.

Yet in 1892 the British Commissioners (p.), and 1893 Mr. R. N. Venning (p. 63) thought that the decrease might be due to over-killing by the outgoing Company in 1888, 1889 and 1890, and their opinion is at least worth quoting, and, as we shall see, has at least some foundation upon fact.

I have no wish to minimise the effects of pelagic sealing, and I think that its influence on the breeding seals should be properly understood, but I must protest against Dr. Stejneger's treatment of the subject.

In my opinion, and I hope to make my view clear, we have in the rookeries of the Commander Islands an object lesson of the evil effects upon the rookeries of over-killing, both on land and at sea. Every incident and every difference in the conditions of the several rookeries, including those which Dr. Stejneger is unable to explain, points to the same conclusion and fits in with the action of a double cause, viz., the combined effects of over-killing both on sea and on land.

To go back to the individual rookeries, there are on the Commander Islands four rookeries, of which two—the North and the South—are on Behring Island, and the other two—Karabelni and Glinka—are on Copper Island.

These rookeries include many distinct sections, but for purposes of comparison I propose to divide them into three groups, in each of which the conditions are very different. These are—

1. North Rookery (Behring Island).
2. South Rookery (Behring Island).
3. Karabelni and Glinka Rookeries (Copper Island).

* The italics are Stejneger's.

The topographical characters, as well as the conditions of the seals, on these rookeries are very different, and I give them here concisely, in order to save the trouble of referring back for them later.

		Group I (North).	Group II (South).	Group III (Copper Island Rookeries.)
	Ground .. .	Low and accessible ..	At foot of a cliff, but accessible	At base of cliffs and precipices, often inaccessible.
	Drive-ways ..	Easy	Easy	Very difficult.
Differences ..	*Feeding-ground.** .	[?] North of Islands..	[?] South of Islands	[?] Same as Group II.
	Bulls	"Notable scarcity" ..	Very few.. ..	Comparatively "plentiful."
	Females	Decrease "less apparent"	Decrease great ..	Decrease great.
	Bachelors ..	Of great size ..	[?]	"Lack of older;' bulk of skins from younger classes.
	Yearlings ..	"Almost entirely absent"	..	
	Pups	Mortality early and late in season	[?]	Mortality late in season; no opportunity to make earlier observations.
Resemblances .	*Killables* ..	Very scarce ..	Very scarce ..	Very scarce.

* I have put a query mark to the feeding-grounds, since a little more evidence is needed on this point to confirm Dr. Stejneger's suggestion, but I do not think there can be much doubt about what I have put down above.

Yet in spite of the present differences in the condition of the rookeries, they are stated to have been "practically alike" up to about 1888 or 1889 (Stejneger, p. 134).

In order, however, to thoroughly understand the present condition of the rookeries it will be necessary to go back a little and to consider what has happened to the rookeries during the past years, and I have found it sometimes advantageous to compare also the history of the seals of the Pribiloff group with that of the Commander Islands' herd.

The following Table represents graphically the catches on the two groups of islands, together with the pelagic catch when known, from the interregnum of 1868 to 1870, to the present time. The authorities for the figures used are given at the heads of the columns, and where any corrections have been made, or any additions used, these are given in a foot-note. Whenever possible I have, however, taken Dr. Stejneger's figures, and it should be added that he states in a foot-note to p. 129 of his Report that he has been informed by Mr. Townsend that the loss to the Commander Islands' herd from pelagic sealing "is to be increased by at least 10,000 seals, as shown by reports from Consuls, &c., recently received."

	Year.	Pribiloffs.		Commander Islands.		Kommandorskis.	
		Island Catch. (Brit. Com. Rep., p. 132.)	Pelagic Catch. (Brit. Com. Rep., pp. 112 and 207.)	Total Number of Skins shipped. (Stejneger, p. 99.)	Pelagic Catch. (Stejneger, p. 129.)	Behring Island Catch. (Stejneger, pp. 99, 122-23.)	Copper Island Catch. (Stejneger, pp. 99, 122-23.)
Interregnum	1868	242,000	..	..	..	..	..
	1869	87,000	..	..	..	..	..
	1870	23,773	..	..	..	..	..
	1871	97,002		3,658	..	..	3,658
	1872	101,698		29,356	..	14,392	14,964
	1873	101,555		27,705	..	13,044	14,661
	1874	107,932		28,886	..	13,406	15,480
	1875	101,249	? 2,000	33,152	..	12,712	20,440
	Years of rest 1876	*89,478*		*25,432*	..	*10,358*	*15,074*
	Years of rest 1877	*77,956*		*18,584*	..	*7,192*	*11,392*
	1878	107,394		28,200	..	8,130	20,070
February 1871 to February 1891. H. K., P. and Co., succeeded by Alaska Company	1879	106,908	? 4,800	38,738	..	13,572	25,166
	1880	100,634	? 4,800	45,174	..	15,160	30,014
	1881	101,734	? 6,000	39,315	..	16,078	23,237
	1882	101,736	? 12,000	40,514	..	18,512	22,002
	Year of rest 1883	*77,063*	? 13,500	*26,650*	..	*13,480*	*13,170*
	1884	101,013	? 16,500	49,444	..	21,384	28,060
	1885	101,509	21,189	41,737	..	20,996	20,771
	1886	100,772	24,344	54,591	..	24,555	30,036
	1887	100,795	20,266	46,347	..	21,298	25,049
	1888	100,450	24,329	47,362	..	26,456	20,906
	1889	100,135	27,368	52,859	..	23,783	29,076
	1890	20,995	39,555	52,324	..	19,996	32,328
	1891	12,071	49,615	36,365	*[? 5,847]	17,884	18,065
	1892	7,500 (approx.)	..	31,244	26,752	16,590	14,654
	1893	7,500 „	28,000 (C. H. T., pp. 25-6)	31,286	63,082	13,992	17,294
Modus vivendi in 1891, 1892, and 1893. R. F. S. Company and N. A. C. Company	1894	16,000 „	45,897	26,287	90,067	13,165	13,122
	1895	15,000	55,674 (C. H. T., p. 47)	16,419	38,732	9,526	6,893
	1896	30,000	..	..	..	..	..

* This figure is purely conjectural, *vide* Stejneger, *loc. cit.*

The pelagic catch in the above Table was made up as follows (Stejneger, p. 129) :—

Year.	Nationality of Vessels.	Japan Catch.	Russian Catch.	Totals.	Grand Total.
1891	.. .. ..	..	..	..	5,847*
1892	Canada	[?]	17,222	..	26,752†
	United States	[?]	1,224	..	
1893	Canada	29,270	12,013	41,283	63,082
	United States and Hawaii ..	..	..	21,799	
1894	Canada	49,483	7,437	56,920	90,067
	United States	31,376	1,771	33,147	
1895	Canada	18,686	6,605	25,291	38,732
	United States	12,362	1,079	13,441	

* From the Report of Hon. C. S. Hamlin, Assistant Secretary United States' Treasury (Doc. 137, Senate, 54th Cong., 1st Sess., Part I, p. 6). During the year 18,000 skins are recorded from "undetermined localities," some of which are probably "Asiatic" in their origin.

† This total is derived from Mr. Hamlin's Report (*loc. cit*). The "Japan catch" of 1892 was therefore over 8,300.

During the interregnum of 1868, 1869, and 1870 such wanton killing took place on the Commander Islands rookeries that, when Hutchinson, Kohl, and Co., of San Francisco, obtained a lease of the islands for a period lasting from the 18th February, 1871, to the same date in 1891, the rookeries had been nearly ruined (Stejneger, p. 91). From 1872 the management of the affairs of this Company (who now trade under the name of Hutchinson, Kohl, Philippeus, and Co.) both on the Commander Islands and on Robben Island were in the hands of the well-known Alaska Commercial Company of San Francisco, who also had the management of the Pribiloffs at the same time, so that we may assume with some reason that the same methods of killing the seals and of preserving the rookeries were in force on both groups of islands.

The control of both groups remained in the same hands until 1891, when the Russian Fur-Seal Company secured a lease of the Commander Islands, while the North American Commercial Company became the lessees of the Pribiloff Islands.

With regard to the Commander Islands, it should be noted that, although there was no apparent decrease in the total catch of the two islands taken together up to 1890, yet the Behring Island decrease in killables began in 1889, and has since continued steadily, though gradually, the numbers of the total catch being kept up to the mark by extra drains on the Copper Island seals, on which island the large catches of 1889 and 1890 were followed by a startling decrease in 1891. After 1890 there was not much difference in the catches of the two islands, but both dropped greatly in 1895, especially Copper Island.

Any one who will take the trouble to study my Table (p. 33) may readily satisfy himself that the figures there given show that the years—as far as concerns the seals—commencing with 1870 down to the present time may be divided into three distinct periods, viz. :—

1. That in which, evidently under careful management, the rookeries were recovering from the evil effects of the drains made upon their resources during the interregnum, until the catch reached its average maximum of about 45,000 skins for the nine years 1881 to 1890 inclusive. It is to be noted that during the last three years of this period the average number of skins shipped from the islands was over 50,000. It is alleged that there was an increase of the seals on the Commander Islands until 1889, and in proof of that statement it has been pointed out that 50,000 skins were taken in 1890, but I very much doubt whether there was any real increase after 1879 or 1880. I consider that 50,000 and 100,000 skins may be regarded as an extreme catch for the Commander and Pribiloff Islands respectively, and that such a high catch could not be continued for more than a very short time without decreasing the numbers of the seals, in fact, that such a high catch should never again be permitted.

2. A period during which there was practically no increase of the seals, and in which it may be assumed that they had reached their maximum limit of number under the conditions and management then prevailing.

On the Commander Islands we find that the average catch was as follows:—

From 1872 to 1880 (inclusive)	..	..	..	..	..	30,580
„ 1881 to 1890	„ ..	..	..	..	..	45.114
„ 1888 to 1890	„ ..	..	..	..	..	50.848
„ 1891 to 1893	„ ..	..	..	..	..	33,000 (approx.).

In 1876, 1877, and 1883 the figures were low, corresponding to those of the same years on the Pribiloffs, and these pull the averages down considerably. The figures for these years were 25,432, 18,584, and 26,650 respectively. There were much larger catches in the years immediately following and preceding them, and Dr. Stejneger states that the decrease in the catch in these years was "due not to a lack of seals on the rookeries, but to the fact that the Company did not desire more" (p. 98). If this was so, the average catch for the years from 1872 to 1880 and from 1881 to 1890 might perhaps have been higher than they actually were.

Without wishing to throw any doubt upon Dr. Stejneger's statement that the decrease in the catch on the Commander Islands in the years 1876, 1877, and 1883—the "years of rest" was "due not to a lack of seals on the rookeries, but to the fact that the Company did not desire more"—I should like to call attention to the fact that on the Pribiloff Islands where, as I have stated, the management was in the hands of the same Company as that which had the lease of the Commander Islands, the same "years of rest" were found to be desirable, and follow in the one case a complaint by Mr. Bryant that the number 100,000 fixed for killing was too high, and in the other case a very similar complaint by Dr. H. H. MacIntyre (see British Commissioner's Report, pp. 138 and 139).

Considering then that (1) there was a distinct increase in the annual catch from 1871 to 1884, or, possibly, only until 1880 (see the Table), and that (2) from 1884 (or 1880) the catch practically remained stationary, with an average (excluding 1883) of about 45,000, it seems that we may regard 45,000 skins as about the maximum output of the islands under the system of management and conditions then prevailing, or, in other words, that a catch of this magnitude was kept up by leaving only a bare minimum for breeding purposes. This, however, is most strenuously denied by the Russians, who declare that there ought to be no difficulty whatever in keeping up the annual yield of skins on the islands at 50,000, and the present Company state that they acccepted their lease thinking that they would get that number of skins annually.

We should expect that such a maximum killing, if long continued, would by itself result in the decrease of the herd, though not for a period of four or more years, *i.e.*, at such time as the 3-year old males killed on land should in the ordinary course of events have taken their places on the rookeries. Every year a certain number of old males must be unable to return to their former stations on the rookeries, and there should always be a surplus of young male life to take the places of these old animals. If then the killing on land is so close that this surplus is destroyed or decreased to a dangerous extent, the effect of the over-killing will show itself on the whole herd in about six or seven years after the commencement of the period of continued over-killing.

We actually find, however, that this maximum rate of killing never was continued long enough to reveal itself in a diminution of the rookeries until the year 1890. From 1872 to 1875 (four years only) we have a constantly increasing catch of 29,356, 27,705, 28,886, and 33,152 skins. This was followed by two "years of rest" in 1876 and 1877, when only 25,432 and 18,584 skins were taken (respectively). These were followed by five years of increased catch (1878 to 1882), when the skins taken numbered 28,200, 38,738, 45,174, 39,315, and 40,514, respectively. Then came another year of rest in 1883, when only 26,650 skins were taken; and lastly, from 1884 to 1890 (seven years), the figures are 49,444, 41,737, 54,591, 46,347, 47,362, 52,859, and 52,324, respectively.

Thus the extreme rate of killing from 1872 to 1875 (inclusive), and from 1878 to 1882 (inclusive) was never continued long enough to do any permanent injury to the rookeries, and the number of males spared in the three years of rest recruited and made up for the losses of previous years.

I am aware that it will be objected to this line of argument, that the number of males thus spared was far too small to do the good which I have attributed to them, but any one who cares to look at the figures representing the total number of males

present on the Pribiloff Islands this year, where it is admitted on all hands that they are sufficient for breeding purposes, and to remember that the natural proportion of males to females is small, will understand what will be the good effect upon the herd of even a few hundred young bulls added to the male strength of the rookeries, whereas the numbers spared in the years 1876, 1877, and 1883 must have amounted in each case to several thousands.

From 1884 to 1890, inclusive, the rate of killing was higher than it had ever been before, and increased rather than diminished, the males spared in the three "years of rest" probably sufficing to keep things going. It was certain then, if what I have said be correct, that a collapse must come if such a rate of killing were continued, and about the years 1889 or 1890 would be the first time when we should expect to see such a collapse, at which time begins my third period, during which the herd has constantly decreased (*i.e.*, from 1890, and probably from 1889, see the decrease in the Behring Island catch in that year).

That the killing, if not excessive, was, at least, quite up to the limit which the herd could safely stand seems certain, for we read that "up to 1892 there had been no startling decrease of the female seals on the Commander Islands' rookeries, while there had been for a couple of years some difficulty in getting the former number of killables" (Stejneger, p. 135), in other words, there was a difficulty in getting the former number of killables in 1890 and 1891, or for two years before pelagic sealing, which began seriously in 1892, could possibly have affected the herd.

That this difficulty could be "attributable to the increase in the winter and spring catch off Japan" is a statement, in support of which Dr. Stejneger brings neither argument nor fact (p. 135), for he neither quotes any facts to show that there was such an increase in the winter and spring catch off Japan, nor that, if there had been any such increase, it would have shown itself on the herd in a decrease of killables. In fact, on p. 134, he states that, "prior to 1892, the Commander Islands' seals had suffered but little from pelagic sealing in general, and practically nothing from preying upon the feeding-grounds of the female seals."

It seems, then, that the undoubted and increasing diminution in the Commander Islands' seal-herd cannot have had its *origin* in pelagic sealing. There must have been some other cause at work, to which it was primarily due.

I have tried to find evidence of some destructive agency at work upon the rookeries other than over-killing, but have completely failed to do so. In fact, it was admitted to me in conversation on the seal islands during the past summer by an American, to whom I put the point, that the decrease in killable seals on the Commander Islands was due to over-killing on land, but this gentleman tried to minimize the importance of his admission by declaring that the decrease was only in killable seals, and, therefore, of no importance to the general welfare of the whole herd.

To my mind, however, a decrease in killable seals on a rookery is as serious to the welfare of a herd as a decrease in female seals. It may be well to consider for a moment what a decrease in killable seals on a rookery really means.

A decrease in killable seals may be due to one of several causes. Either there may have been a lack of females three years previously, or of males to fertilize the females four years previously, leading to a scarcity of yearlings in the following year; or it may have been due to an exceptional mortality among the pups, yearlings, or two-year-olds, or even among the killable seals themselves, in previous years; or, finally, to the fact that all the two-year-olds had been killed for their skins in previous years, so that none were left to grow up into older killables. To the latter cause, if my arguments be sound ones, we know that it must have been, at least, partly due, and if you kill all your two-year-olds for two years (or more) running, you will impoverish the herd every whit as surely, as the pelagic sealer is alleged to have done.

As to the other possible causes, there could not well have been a dearth of breeding males in 1885, for in that year the survivors of the males which had been spared in 1883, in which year only 26,650 seals were killed, as against 40,514 in 1882, and 49,444 in 1884, would return to the islands as bulls and half-bulls, some, at least, of them fit to do their work on the rookeries. And certainly, even if these youngsters were of no use in 1885, they would have been fully mature in 1886 or 1887, yet, in 1889 and 1890, when the progeny of these seals should have returned to the islands as killables, the Behring Island catch decreased by about 3,000 and 4,000 skins respectively.

It seems to be impossible to find any cause for this decrease other than a too close system of killing in the previous years, and we have no evidence of any other cause having been at work; in fact, we have little or no reliable information as to the state

of things on the Commander Islands in past years, with the exception of the years 1882 and 1883, for which years we have the statement of Dr. Stejneger, from personal experience (p. 106), that "the rookeries were in excellent condition both as to quantity and quality. All classes of seals were well represented, and only skins of standard size were taken. This was particularly the case in 1883, when the Company's representatives had very strict orders not to accept a single skin under 8 lb. During that year 50 per cent. more skins could easily have been taken, but for business reasons the Company wished to reduce the catch as much as possible, and it was only after some pressure was brought upon Captain Sandman by M. Grebnitski that he agreed to take as many as he did."

No doubt the herd was in a dangerous condition before 1889 and 1890, and the fact that 52,324 skins were obtained in the latter year, in no way implies a flourishing state of things. For, besides Dr. Stejneger's admission, quoted above, that there was "some difficulty in getting the former number of killables," an inspection of the numbers caught on each island, as given above, gives us an inkling as to the true state of things. We find that the Behring Island catch reached its maximum of 26,456 skins in 1888, from which date until the present time, there has been a regular annual decrease of from 1,000 to 4,000 skins. In spite of this, however, the "quota" of 50,000 skins for the two islands together, was kept up for two years longer, until 1890, by dint of what Dr. Stejneger calls "active work" (p. 117) on Copper Island, and by working the rookeries of that island, to the extent of 29,076 and 32,328 skins respectively in these years. Then came an inevitable and sudden drop in the Copper Island catch to 18,065 skins in 1891, and in the whole catch on the two islands to 36,365. From that date onwards the Copper Island catch has decreased more rapidly than that of Behring Island, where the decrease, although constant, has been gradual, so that in 1895, it was only 6,893 to Behring Island's 9,526.

I think then that a good case has been made out for over-killing on land as the cause of the decrease of the Behring Island killables in 1889 and 1890, and in those of Copper Island in 1891; and I have also shown that a decrease in killables for two or three years successively, necessarily implies a decrease of the whole herd. Finally, when the effects of the over-killing on land would by themselves have led to a rapid decrease of the herd, there came upon it the drain upon its resources of the pelagic catches of 26,752, 63,082, 90,067, and 38,732, in the years 1892, 1893, 1894, and 1895, so that the already enfeebled herd could not but decrease at a rapid rate.

What has made matters much worse than they might otherwise have been, is that the lessees of the rookeries, instead of reducing their catch in proportion as they found killable seals getting scarce, are hunting the few that remain with redoubled energy, in so much that on Behring Island the whole North Rookery is now driven to the killing-ground—bulls, females, and pups, and, in fact, every seal that can be cut off from the sea—in order that the few bachelors who now mix with the females on the rookery, probably owing to the scarcity of old bulls, and the inability of those that remain to keep them away, may be weeded out and killed.

The inaccessibility of the majority of the Copper Island rookeries, and the length of the drive-ways, has rendered this impracticable, and the result is that we have, as I have already stated, a most interesting difference in the conditions of the rookeries on the two islands, which will be explained fully below.

There is one point which cannot be too often repeated in connection with pelagic sealing, namely, that the pelagic sealer kills at least as many females as males. I do not here go into the exact proportions of the sexes in the pelagic catch, but whether they are equal, as some Canadian writers would claim, or whether females preponderate in the proportion of 60 or 80 in the 100, as has been claimed by Americans, the fact is unaltered that no one has ever yet claimed that the pelagic sealer kills more males than females, so that the effect of pelagic sealing upon a herd can only be to decrease its numbers all round. Under no possible circumstances could a dearth only of killable or male seals be laid to the charge of the pelagic sealer, and least of all by those who put the percentage of females in the pelagic catch as high as do the agents of the United States; in fact, where the strength of a rookery is being sapped by over-killing the males, the pelagic sealer may even be said to help the rookery by removing the surplus females which are the result of that over-killing, and by allowing the few males which remain to do their duty better. The effect of over-killing on sea is to act directly on the herd, and, if carried too far, to decrease the numbers of all classes of seals. The effect of over-killing on land is to first reduce the male stock of the rookeries, and thus to act indirectly on the herd, and not at once, but none the less surely, when

sufficient time has gone by to allow the dearth of males to show its effect upon the herd. But in regard to the Commander Islands, apart from all these arguments, the main point, and it is one which cannot be too often insisted upon, is that the decrease of killable seals began here before the serious commencement of pelagic sealing.

The Dead-pup Question.

Dr. Stejneger, was not the first to report the presence of dead pups on the rookeries of the Commander Islands, although he was the first to draw special attention to the fact that many of these dead pups had died from starvation, whence he argued that they must have, without doubt, owed their death to the murder of their mothers at sea by the pelagic sealers.

It is important to consider what other visitors to the Commander Islands who noted the presence of dead pups on the rookeries there previous to 1895, have said on the question.

In 1893, Mr. J. M. Macoun wrote ("Appendix to Counter-case of Her Majesty's Government before the Behring Sea Tribunal," p. 148), that "Special inquiry was made by "him" at the Commander Islands during the first week of September as to whether young seals had been found dead in 1892, in larger numbers than usual, and several of the oldest natives were questioned by "him" on this point." He was told by them that "none have been seen there, but a few that have been killed by the surf, or had wandered away from the rookery-grounds, and yet there were many schooners sailing from United States' ports sealing in the vicinity of these islands during the whole season, and in July and August a great many schooners came from the American coast, and sealed in Asiatic waters; many thousand skins were taken there, probably more than in any one season on the American side of Behring Sea, but no increased mortality was noticeable in the number of dead pups on the rookeries. The skins of the dead pups that die on the Commander Islands are taken off by the natives, and a small price is paid for them at the Company's store. The men examined by Mr. Macoun had been recently at the rookeries for the purpose of procuring such skins, and reported that they had got no more than usual, and the agent of the Company corroborated their statements."

Mr. Macoun's remarks evidently refer to the North Rookery of Behring Island, to which as far as I am aware, is confined the practice to which he alludes of utilizing the skins of some of the pups which die on the rookery.

In 1892, the pelagic catch in the neighbourhood of the islands amounted to a total of 18,446 skins in all, but probably no great proportion (see Stejneger, p. 87) of these skins were taken in the region where the female seals from the North Rookery of Behring Island are believed to feed, so that it would hardly be expected that there should have been any abnormal mortality of pups on that rookery in 1892.

From the remarks of the natives it is to be gathered, then, that the death-rate of pups on the rookery was about what it was in ordinary years, and did not exceed the number which the natives are accustomed to consider normal, and to have no fear of reporting.

In 1893, Mr. R. N. Venning made some inquiries among the people of the Commander Islands on this subject, but could get no satisfactory answers to his questions, so that he remarks (p. 58, paragraph 437), that "the evidence as to the extent of mortality among pups, cannot be regarded as at all conclusive, nor in fact can any reliance be placed upon it. The lack of knowledge displayed by those permanently residing upon the island on this point, is remarkable, because of all questions affecting seal life, this is perhaps the easiest to solve, involving as it does the mere counting of carcasses. It (paragraph 438) is simply established that there are some dead pups on the islands, and some of those consulted expressed the opinion that there were a greater number in 1892 than in 1891 and 1893. These statements, however, are so evidently conjectural, that no weight could attach thereto." Later on in paragraph 444, Mr. Venning very properly insists on the fact that "apart entirely from any destructive agencies which might be particularized, there must, where so many thousands of animals are born, be a large number of deaths for which no explanation need be sought, as would be the case where any large body of mammals congregate to reproduce their species." He adds (paragraph 445), that his own observations led him to the conclusion that the percentage of dead pups upon the

rookeries, is much larger than those residing upon the islands seem to have any appreciation of. "They admit that no measures have been taken to establish the facts of the case, either during the time the seals are on the islands, or after they have left." Mr. Venning finally concludes with the suggestion that a count of all dead pups should be made annually, as "the number of seals which had actually died each and every year, could thus be established with the utmost exactness."

The observations alluded to by Mr. Venning are recorded by him on pp. 11 to 12 of his Report, where he states that on the 28th August he counted 285 dead pups on the "reef" section of the North Rookery of Behring Island, of which 150 had certainly died that year, the remainder presenting an appearance of having been dead a long time. At the Maroshnik section of the same rookery, he counted 205 dead pups, about a-third of which he thought were of that year's mortality. The majority of these pups were found on the outer parts of the rookery, and not on the more crowded portions of it.

Mr. Venning was probably mistaken in thinking that some of the pups whose carcasses he saw had died during the previous year; and Dr. Stejneger remarks (p. 81) that "the bodies of even grown seals disintegrate and disappear with amazing rapidity. The combined efforts of the birds, the staphylinid insects, and the fly larvæ reduce a carcass in a very short time to a skeleton. During the winter the bones become scattered. If they are lying on or near the beach, the furious surf sweeps them away; if they are further away, the decaying rank vegetation covers them up. During the winter the waves wash over the entire 'reef' and the 'sands' as well, and not a trace of the starved pup carcasses will be found on the beaches the next season."

In 1893 the number of seals killed by pelagic sealers in the neighbourhood of the islands is stated to have been 12,013, but probably none of these were taken from the Behring Island feeding-grounds, for it was only in 1895 that "the extension of the hunt to the Behring Island feeding-grounds took place" (Stejneger, p. 135).

Dr. Stejneger has devoted more than three pages of his Report (pp. 78 to 82) to this question. Here he states that on his arrival on the islands in 1895, he had at once inquired whether any unusual mortality of pups had been observed, and had been answered in the negative, and to the effect that a few pups "are killed on the rookeries by the old bulls stepping on them or otherwise, and others are caught in the breakers and surf and thrown on the beaches. The skins of these are all utilised, and their number on each island averages about 200 a-year." Later, when he visited Karabelni Rookery, on Copper Island, in company with M. Grebnitski, on the 1st and 2nd August, a few dead pups were noticed, but the number, however, was "plainly insignificant."

On the 22nd August there was a drive on the North Rookery of Behring Island, at which Dr. Stejneger was present, as well as the Captain and several officers of Her Majesty's ship "Porpoise." In this drive all the seals, *i.e.*, females as well as males, were driven off the rookery, so that Dr. Stejneger was able to go on to the ground where the seals had been lying, and to look for dead pups. He states that "on the rookery-ground" he "was startled by the great number of dead pups. . . . . Those lying in a wind row along the high-water margin of the rookery were most conspicuous. These had evidently been washed ashore. A good many of them were in an advanced stage of putrefaction; some entirely flattened out and without hair. But an equal number had evidently died more recently, being in good condition. There was another class of pup-carcasses, viz., those which were lying dead upon the higher portion of the breeding-ground, away back from the water's edge. These were mostly all in good condition, and appeared as if they had died within a few days."

Besides these there remained on the rookery, after the other seals had been driven off, a considerable number of pups "which, upon our approach, made but feeble attempts at getting away. . . . . Upon a closer examination they were found to be very weak, and their thin pinched appearance was at once noticeable. They were starving. . . . . Upon handling the carcasses, both in the wind row and on the higher ground, the same state of things was apparent, viz., extreme leanness and emaciation."

"After the rookery had been completely cleared" Dr. Stejneger made an attempt to count the number of dead pups, "making a distinction between those in good condition and those in an advanced stage of decay." He "had gone about half-way round and counted about 200 of the former class and 150 of the latter," when he was

ordered to leave the rookery by the Cossack in charge, so that he was unable to finish his count; but he gives the following estimate of the number of dead pups on the rookery (p. 80), remarking that he is "pretty positive" that it "is not much out of the way. . . . . The number of dead bodies on the east side appeared to be about double that on the west side."

Dead pups on west side, counted about	350
,, on east side, estimated about	700
,, on high ground, estimated about	200
Total	1,250

Two freshly-dead bodies were taken from the rookery and examined by Dr. Stejneger in the presence of the surgeon of the "Porpoise," who agreed with him that the cause of death was starvation, and I have no reason to doubt their conclusion.

On the 16th September Dr. Stejneger again visited the rookery, and "found a great number of dead pups; there were at least twice as many as on the 22nd August. All, or nearly all, were lying in wind rows. Curiously enough, there were no very fresh bodies which might have been killed by the recent northerly swell; all I saw were dead at least one week. It is also notable that nearly all were black, only here and there a grey one."

Dr. Stejneger does not regard the absence of fresh bodies as of importance, and has no doubt that most of them were eaten by the blue foxes, or disposed of by the flock of large glaucous gulls which are always present on the rookery. He thinks also, as stated above, that "the combined efforts of the foxes, the birds, the staphylinid insects and the fly larvæ, reduce a carcass in very short order to a skeleton," which, during the winter, will be washed away by the surf, "and not a trace of the starved pup carcasses will be found on the beaches the next season."

I have quoted Dr. Stejneger's remarks extensively, because the subject is a very important one. It will be, perhaps, best to give the result of my own experience first, before making some remarks about Dr. Stejneger's statements.

My only opportunity of going right on to the breeding-ground at the North Rookery was on the 25th July, when, as in Dr. Stejneger's case, there was a drive of the whole rookery to the killing-ground at the village. The seals on the two sections of the rookery were driven at the same time, so that I had no opportunity of seeing both sections, and I went with the Cossack in charge of the rookery to the portion known as "Na Rifoo" ("The Reef"). I had not at this time seen Dr. Stejneger's Report, and, as this was my first close view of the seals, I was more occupied in observing them, and in learning the differences between females and young males, as well as in observing and taking notes on the unexpected sight of a whole rookery, females, bulls, pups, and bachelors, driven in one dense mass to the killing-ground, than in looking for dead pups.

I had no opportunity of counting dead pups on the rookery, but I noticed that there were a number of flattened pup carcasses on the ground over which I passed. Whether these met their death by being trampled on or not I cannot say, but any pup which had died from starvation or other causes, would certainly have been trampled flat after death by the great mass of seals lying close together on the rookery. What did strike me, however, and I have a note to that effect in my diary, was that the number of dead pups on the rookery, though probably not in itself insignificant when considered as a mere number, was quite a small one considering the number of young pups on the rookeries. At this early date the effects of pelagic sealing could not have been visible on the rookeries, and the blue foxes could certainly not have penetrated into the inner and more crowded part of the rookery, and, as already stated, I never saw a blue fox on the rookery, or near it, so that I think we may regard the dead pups which I saw as having come by their deaths through purely natural causes, or, at all events, as not owing their death to pelagic sealing. I never had another opportunity of going on to the thick parts of this rookery.

I do not propose to question Dr. Stejneger's figures for the North Rookery, but, they should be about halved before they will stand as correct for the losses due to starvation, whether that starvation was due to pelagic sealing or to other causes, so that we may say that about 1,000 pups met their death from starvation, due to all causes combined, on the rookery in 1895, and possibly about an equal number in 1893 and 1896, which is not a very large number if we consider the number of seals which were here congregated together.

The large rookery of Behring Island is, as from its formation I should expect it to be, the chief sufferer from pup mortality of any of the Commander Islands' rookeries. On the other rookeries, at least in their present scattered condition, there is probably no serious loss from this cause.

In connection with Dr. Stejneger's remarks it may perhaps be worth noting, that he particularly states that, on the occasion of his second visit to the North Rookery, on the 16th September, 1895, it was "notable that nearly all the bodies he saw were black, only here and there a grey one." This is quite different from what occurred on the Pribiloff Islands late in the season of 1896, for the dead pups there included both grey and black ones in their number, and I was particularly astonished at some of the large grey pups which were found dead, and which had apparently met their death from starvation. Is it too much to suggest that the fact that Dr. Stejneger saw so many black carcasses and so few grey ones may be due to the fact that on this rookery, where the bulls are admittedly scarce, many of the cows are served late in the season, and their pups being born later than they normally would be, die, as I have suggested on p. , in greater numbers than the pups which are born earlier in the season?

At any rate I think I have shown from the observations of both Mr. Venning and myself, that on this rookery there is a considerable mortality of pups both in the early and also, with or without pelagic sealing, in the later parts of the season. It seems to me probable, therefore, that the mortality of pups in 1895 on this rookery may not have been abnomal as Dr. Stejneger suggests.

With regard to the pelagic catch in the neighbourhood of the islands in 1895, the total number of skins taken by both the Canadian and the American fleet is given by Dr. Stejneger as 7,684; and as far as I can make out, he can only state that of that number 245 were killed on the feeding-grounds of the North Rookery (pp. 128 and 129), being the catches of the schooners "Jane Grey" and "Ida Etta," and of the catch of the latter vessel 36 were secured in September (Dr. Stejneger's second visit to the rookery was on the 16th September). In the logs of the other schooners, as given by Dr. Stejneger, I can see no entry that any seals had been caught north of the islands, nor has a study of Mr. C. H. Townsend's Report on Pelagic Sealing in 1895 added to that number. In fact, if we follow Dr. Stejneger, the "abnormal" mortality of pups which he reports from the North Rookery of Behring Island for 1895 was due entirely to the fact that two schooners between them made a catch of 245 skins, of which it must be remembered that 36 having been caught only fifteen days before Dr. Stejneger's visit to the rookery must probably be subtracted, since there would hardly have been time for this part of the catch to have caused the deaths of any pups.

Nor does Dr. Stejneger's supposition explain the fact that a very similar mortality was noticed by Mr. Venning in 1893, in which year, he states, "the extension of the hunt to the Behring Island feeding-grounds" (p. 135) had not taken place.

A consideration of the facts observed in connection with the Copper Island pups will, however, throw some further light upon Dr. Stejneger's remarks, and, indeed, upon the whole subject of the dead-pup question.

At the Glinka Rookeries, up to the time I left, there were a few dead pups to be seen, and also some very thin ones, which were probably starving, but in my opinion the number was wholly insignificant. Thus at Zapadnie there were, on the 16th August, on the outer parts of the rookery (I did not go on to the thicker parts), twenty-three dead pups in various stages of decay, and some very thin ones among the living ones. A recently dead one, which was opened and roughly dissected on the ground, presented all the symptoms of starvation, viz., absence of fat under the skin, empty stomach, and presence of fluid black stuff in the rectum and intestines. Curious enough, although the contents of the rectum and intestine were black, there was some solid yellow (partly dried) excrement exuding from the anus.

At Sabatcha Dira on the 17th August I counted twenty dead pups, mostly decayed and lying near the surf-line. One freshly dead one was opened and found to be extremely thin, and had probably died from starvation. On Palata Parade-ground were a few more dead ones, some recently, others long dead, and one of the former had had its eyes picked out. On the same day some thin pups were noticed among the ordinary fat ones. Observations made on later days are very similar to the above, but I do not think that there was any noteworthy recent mortality among the pups up to the 25th August, the last day on which I visited the rookery, when the symptoms of starvation in pups were first explained to me by Dr. Jordan; but on that day there was certainly an increased number both of starved and starving ones, and I think that there can be no doubt whatever that the phenomena of dead and dying

pups as seen at the Pribiloff Islands late in the season is also to be found on the Commander Islands, though to what extent I cannot say.

Jordan, p. 56.

One thing seems certain, namely, that there could this year have been no great loss of pups on Copper Island, caused by starvation due to the killing of their mothers at sea by the pelagic sealers, for Dr. Jordan tells us on pp. 63–64 of his Report, that the total pelagic catch in the neighbourhood of the Commander Islands was only 1,028, and it is also probable that all, or nearly all, of these 1,028 skins were taken from the seals of the North Rookery of Behring Island, for the Commander of Her Majesty's ship "Swift" (see his Report) was informed that "all the sealing was being carried out near the mainland, about 90 miles from Behring Island," and I was myself informed at Hakodate that no sealers were going to the neighbourhood of Copper Island.

With regard to the other rookeries which I examined, I saw only one dead pup on Robben Island, and this was in good condition, and seemed to have owed its death to a bite on the head, on which there were two punctures as of two canine teeth, and the greater part of the head was in a rotten and putrid condition as if erysipelas had set in from the bite. There was also on Robben Island a pup which was at a distance of 100 yards or so from the rookery, and which is shown in my photograph, No. 21, and which was in a very weak and probably starving condition, and which no doubt was very near its death. On this rookery, where the pups were still quite young when I saw them, and where one could get a very good view of them, I was very much struck by the cruel way in which the little pups were being treated by the cows. It seems to be a rookery where there is a considerable loss of life from overcrowding even in its present depleted condition, and if it were ever to regain its former crowded state, I expect the loss would be enormous.

On the South Rookery of Behring Island I saw no dead pups when I visited it, but, as at Robben Island, I did not disturb the seals, so that there may have been a few which I could not have seen without driving the seals off, but there could not have been many on either rookery at the time when I visited them. On the South Rookery the blue foxes were very numerous, and would probably remove some or all the carcasses of pups which might perish outside the thicker parts of the rookery.

On Copper Island blue foxes are numerous, and may possibly remove the carcasses of the dead pups, but I saw no evidence that they were doing so as I did later on in the season at St. George Island, and there were no cleaned skulls lying about, so I can only conclude that up to the time I left the island the blue foxes had plenty of other food, and there were certainly a great quantity of sea-birds still at their nesting haunts in the cliffs when I left.

It is said that on the North Rookery of Behring Island a certain number of grey pups—I believe about 200—are killed annually in the fall of the year by the surf. These pups are allowed to be sold at Nikolski by the natives, and I saw several of their skins for sale. To prevent unlawful sales of skins there is a regulation whereby no skin can be sold until it has affixed to it the official seal of the Governor.

The Size of the Harems.

The older authorities are practically agreed that in a properly managed rookery, where over-killing does not exist, the number of females in each harem does not average more than from ten to twenty-five, though it was known that in exceptional cases a single male might, in a suitable position, "round up" and cut off from the sea a very much greater number. (Report of British Commission, p. 32, and Appendix I to British Counter-Case—Macoun's Report.)

In later years it has frequently been stated that the number of females in the harems has greatly increased, and that over-killing has at times reduced the number of available males to such an extent that there have not been enough to fertilize all the females.

On the Pribiloff Islands investigations carried on during the past two seasons show that the average number of females present in the harems and on the shore at the same time has been 17·3, and it was one of the discoveries of 1896 that to the number of females present in any harem at any one time must be added a percentage of 75 to allow for absent females. The true number of females in any harem can only be ascertained after making this correction, and it has been found that the average number of females in the harems on the Pribiloff Islands has remained during 1895

and 1896 at 30·3 to each male, to which number must, of course, be added the number of later arriving virgin females, were there no reserve bulls to attend to them.

This average agrees very closely with the estimates made by the older observers, only their figures must be corrected in a similar manner to allow for the absent females, and as there were in 1896 plenty of reserve bulls on the Pribiloff Islands which did not get a place on the rookeries during the first and major part of the breeding season, I think we may very fairly assume that the figure of 30 about represents what the proper number of females should average to each harem in a state of nature.

With regard to the Commander Islands, I have very little published information on this point to go upon, though M. Grebnitski, the Administrator of the Islands, is quoted in the Report of the British Commissioners of 1891, p. 52, as saying, as the result of his prolonged experience, that the proportion of one adult male to ten females should not be overpassed, and that one to twenty should be considered as a maximum limit.

Dr. Stejneger, in his Report (pp. 63 to 67) states that "during the visit to Kishotchnaya Rookery, Behring Island, on the 9th July (1895), M. Grebnitski counted several harems which contained all the way from twelve to ninety-three females, or more"; while on pp. 108 and 109 he states that at the same place, on the 16th July, he, himself, "averaged at the south end of that rookery about fifty females to a bull, while at the northern end the harems appeared smaller, most of those counted containing fifteen to twenty-five females. A great many females were in the water that day, however; so in all probability the whole rookery averaged no less than forty females to the bull. This proportion did not seem to be the result of or to have caused any lack of vigour in the males, for there were quite a number of large *half bulls* skirting the rookery or hauled out on the outlying rocks, looking longingly toward the breeding-grounds."

On the South Rookery of Behring Island Dr. Stejneger states that in 1895 there were only five bulls, while he estimates "the number of the females at about 600, possibly only 500" (p 64), "the number of females to each bull was, therefore, probably nearly 100. There were plenty of pups when I visted the rookery, and no barrenness of the females was suggested." These bulls had left the rookery when Dr. Stejneger visited it on the 17th August, so that there were then no bulls on the rookery.

Dr. Stejneger very rightly mentions the very great difficulties which, for various reasons, interfere with a correct estimate of the average proportions of the bulls and females on the larger rookeries, and particularly so on Behring Island, where the bachelors to so great an extent haul out among the breeding females. Not only is it quite impossible to tell these different classes of seals at a distance even after years of experience, but the nature of the ground is such that one cannot always get a good view of the rookeries. I have therefore preferred not to give any figures at all, rather than put in figures which could be no better than mere guess-work, and might be very misleading.

The figures already given for Robben Island and the small South Rookery of Behring Island are, however, different, and may be regarded as reliable, and taking the whole number of breeding females in the former rookery as about 1,000, it gives an average of one bull to something like thirty-five females, but the average number of females to each bull was in reality smaller than this, as several of the bulls were lying outside the rookery, and I believe they were old and impotent animals. (See notes on Robben Island, p. 3.)

On Copper Island there seem to have been enough bulls to do the work required of them, but I should not like to assert that there were on this island as large a proportion of reserve bulls as on the Pribiloff Islands.

On the Behring Island rookeries there were certainly not enough bulls to perform these duties with certainty, and I should not be at all surprised to find that on these rookeries many females went away unserved.

On the North Rookery I only saw a very few bulls outside the harems, and these had all the dejected appearance of worn-out animals. Although there may very possibly have been others which had their positions near parts of the rookery to which I had no means of access, still there could not have been many of them, and although the bulls which were on the rookery seemed to be vigorous, I have not the least hesitation in stating my opinion that the above state of things must be a most serious menace to the welfare of the rookery, especially as we know that the whole rookery was being constantly driven to the killing-ground, and that every available male

was there slaughtered, so that we cannot expect any improvement while the present system of driving and killing is continued, but rather the reverse.

On the little South Rookery things were very much worse, and when I got there on the 5th August there was not a single bull, old or young, on the rookery, a state of things which was identical with that reported by Dr. Stejneger for the preceding year, yet this year every available bachelor was being hunted for his skin, so that we cannot expect that there will be any young bulls growing up to take the place of the few now available for duty.

We have, then, for at least two years, such a state of things on this rookery that each bull has about 100 cows to manage, that by the 17th August in the one case (probably earlier), and by the 5th August in the other, there was not a single one of them able to remain on the rookery, nor was there a single young bull, or half-bull, to take their place, while every available youngster was being driven to the killing-grounds, for, as Dr. Stejneger himself states (p. 112), "by dint of hard scraping no less than 564 skins were secured in 1895, 159 of them, however, between the 17th August and the 9th September;" in fact, the number of bachelors killed in that year was at least about equal to Dr. Stejneger's estimate of the total number of breeding females comprising the rookery! These facts cannot be too strongly insisted upon.

As compared with the state of things during the past season on the Pribiloff Islands, too, these facts are exceedingly instructive, for there, right up to the time when I left the Islands near the end of October, there were bulls on the rookeries bullying and annoying the cows.

It may be well to consider for a minute what the work of a bull actually is on the rookeries. Let us suppose that we consider the case of one of the bulls on the South Rookery of Behring Island, where the harems, as Dr. Stejneger tells us, averaged about 100 females each. The majority of these females land within a few days of each other, bear their pups, and begin to tease the bull as soon as they require his services, for observation very soon shows one the fact that the bulls have very little real power to keep the females on shore, and that they practically only remain with him until he has satisfied their wants. These females then will all require his services within a period which may vary from a few days to not more than probably two or three weeks, in other words he will have to serve at least 30 females in a week, and probably sometimes more than that number.

The female always seems much the more ardent in courting the bull, and the time of the latter is very largely taken up in "rounding up" his harem rather than in attending to the wants of any particular female. It is, therefore, I think, very unlikely that any bull should be able to undertake successfully a task such as he would have to face on the South Rookery, and I should not be at all surprised if a great many cows missed being fertilized altogether there on their first coming into heat.

In that case a female on a properly regulated rookery, would no doubt seek another bull, but in this case, there being none to seek, she could only do one of two things, viz., go to another rookery, in my opinion a most unlikely thing, or else miss being impregnated.

In the latter case I imagine that, like other animals, she would again come into heat at some later time in the season, but even then there would be on this rookery no bull to meet her, and even if she were met and impregnated, it would mean that her pup, on the following year, would be a late one, and so less able to survive the autumn storms and the undoubted difficulties which young pups must meet with after (and probably before) they finally leave the islands at the approach of winter.

One of the most striking things on the seal islands is the great difference between the ages of the pups, and to the very last day on which I was on the Pribiloff Islands, there were with the large fat pups any number of quite small ones which could certainly not have an equal chance of surviving the winter as the larger ones, and which I imagine must form a large proportion of those who help to swell the death-rate of pups in their first year.

Contents of Stomachs.

In addition to the supposed absence of excrement on the rookeries, the allegation that no food could be found in the stomachs of seals killed on the rookeries or hauling-grounds, whether females or bachelors, has been cited in support of the theory that the females while rearing their young, and, in fact, all classes of seals during the time they frequent the land, abstain entirely from food.

That the bulls undoubtedly do not eat while on the rookeries has never, I believe, been denied by anyone, but to state that growing animals like the bachelors and mothers suckling their pups should undergo a long fast was a very different thing. Nevertheless, it was thus contended and with some show of reason, seeing that food was but rarely found in the stomachs of seals of either sexes when killed on land.

My experience in this respect tallies with that of other observers. On the 25th July I was present at a drive at the North Rookery of Behring Island, when 710 bachelors were killed; and although I constantly kept a look-out for anything that might be found in their stomachs, all that I saw were empty, with the exception of two, one of which contained a little fish and fish-bones, and the other some yellow matter (see *supra*, p. 11).

On the 16th August, with the assistance of a native, I examined and made notes of the contents of the stomachs of twenty-three bachelors which were killed in a drive on that day at Zapadnie (Copper Island) with a very similar result. I give here a summary in the shape of a Table, which I think shows clearly all that is required.

No. of Stomach.	Bile.	Mucus.	Blood.	Pebbles.	Round (Nematode) Worms.	Food.	
						Squid.	? Seaweed.
•	+	..	..	+ (2)	..	..	..
1	+	..	..	..	..	..	..
2	+	..	..	..	..	+ (a little)	+ (a little)
3	+	..	..	..	+	..	..
4	..	..	+	..	+	..	..
5	..	+	..	..	+	..	..
6	+	+	..	..	+	..	..
7	+	+	..	..	+	..	..
8	..	+	..	..	..	..	..
9	+	..	..	+ (about 10)	..	..	..
10	..	+	..	..	+	..	..
11	+	+	..	+ (many)	..	..	..
12	+	+	..	..	..	..	..
13	+	+	..	+	..	..	..
14	..	..	..	+ (2 or 3)	+	..	..
15	..	+ (pink)	..	..	..	..	..
16	+	..	..	..	..	..	..
17	+	..	..	..	+	+ (a very little)	..
18	+	..	+	+ (1)	..	..	..
19	..	+	..	..	..	..	..
20	..	+	..	..	+	..	..
21	Absolutely empty	..	..	..	..	..	..
22	..	+	..	..	..	..	..
Total ..	13	12	2	6	9	2	1

On the other hand, I was interested, as already stated, to find food in the stomachs of some seals killed at the South Rookery of Behring Island. The results of my examination are given on pp. 16 and 17.

An examination of the bachelors' stomachs shows us that, while in the majority of them there is undoubtedly no trace of food, a certain small proportion of stomachs show traces of fairly recent meals; and I can only conclude with Dr. Stejneger that the food has left the stomachs before they come ashore. Certainly there was no lack of matter in the intestines of any seal that I have examined, and, as I have already shown, there is abundant evidence in the shape of excrement, urine, and pellets of regurgitated food, that the rookery population does feed. Possibly the food is very rapidly digested, and, the indigestible bones and, in the case of squid, beaks and eye-lenses, having been regurgitated from the mouth, the animal may obtain nourishment for a long time from the semi-digested matter in its enormously long intestine. The latter, in the case of one of the bachelors which I examined at Copper Island, reached a length of 42 ft. 2 in.; and in the case of an adult female, measured by Mr. Lucas and myself at the Pribiloffs, of 68 ft. 1 in., measured from the pyloric end of the stomach to the anal end of the rectum.

Females.—On the 2nd September, by kind permission of Captain Roberts, I went to sea in the United States' revenue-cutter "Rush," partly with a view to examine the contents of the stomachs of the females caught by the pelagic sealers.

While on the "Rush" we examined twenty-six females and two males, all of which had been caught by the "Dora Sieward" on the 3rd September, with the following result:—

Contents of Stomachs (Female).

12	stomachs	were more or less full.
8	,,	contained a little fish remains or bones.
4	,,	(of which one contained gas) were empty.
2	,,	were damaged and not examined.
26		Total number examined.

Pollack occurred in		9 stomachs.
Squid occurred in		7 ,,
Fish (unidentified) in		7 ,,
Cottoid	,, ,,	2 each (possibly in 3).
Sculpin	,, ,,	
Gadoid	,, ,,	
Salmon	,, ,,	1 stomach.

One, otherwise empty, stomach contained gas (No. 73), and another (No. 58) contained water in addition to a little remains of digested fish. Of the two males examined one stomach contained mucus and one vertebræ, while the other contained squid. Both these males were young.

Pollack and squid are evidently the two chief components of the seal's diet on the east side of the Pacific. It is indeed very unlikely that they should be able to dive deep enough to feed on cod. As we lay in the "Rush" in about 60 fathoms, on the 3rd August, we caught any amount of cod. Mr. Lucas tells me that the name of the squid on which the seals feed is probably *Gonatus amoenus* of Gray.

Thus the female stomachs were in every stage and intermediate condition, from fulness to emptiness, yet on the rookeries it is probable that no trace of food would be found in any of them.

Dr. Stejneger gathers from the fact that the stomachs are usually empty that the feeding-grounds of the seals are, as a rule, at such a great distance from the rookeries, that their food is digested before they can get to land (p. 69). There is, however, another factor to be considered, namely, the fact that, as a rule, a seal seems to go to sleep on the water after a meal, and we know that it is while thus sleeping, that they are generally speared by the sealers, and that no one could spear a travelling seal. To this habit as much as to the distance from the rookeries, is, I fancy, due the emptiness of the seals' stomachs when on shore, and it is possible that even had the seals a feeding-ground in the immediate vicinity of the rookery, they would still come on shore with empty stomachs, as may be the case at the South Rookery.

The conclusion, then, is that while on the rookeries all classes of seals except breeding bulls feed. Even the latter feed at the end of the season, as in the case of the little bull* whom I have photographed on plates 153 to 157, and whom every one on St. Paul's knew very well. This bull was easily recognized by a mark on his left fore-flipper, and he got quite used to being looked at. Although he was on his station to the end of the season when we left the island, yet he was at that time in very good condition, and evidently went away to feed, as I caught him coming back from the sea on two occasions when I had gone to the "slide" to look at him and his harem.

Feeding-grounds of Commander Islands' Seals.

It can no longer be denied that the female seals, while suckling their pups, travel great distances from the rookeries in search of their food. The fact that they should do so—in some cases travelling to a distance of some 200 miles from the rookeries—is, however, so astounding that it is easy to understand the feeling of those who refused to believe it, without some ocular demonstration. Fish occur in abundance in the neighbourhood of the Islands, and it is certainly astounding that the seals should pay so little attention to their presence, in proof of which I may quote the presence of the Saranna Salmon River on which the inhabitants of Behring Island depend so largely for their winter food, taking there between 20,000 and 100,000 salmon annually, and which is less than 7 miles from the Great North Rookery of Behring Island; yet the seals do not go there to feed on the salmon (Stejneger, p. 70).

* This was Dr. Jordan's "Bull A" of Ardiguen Rookery. See his Report, p. 55.

The fact is that the food of the seals, in the breeding season at least, has this year been pretty clearly shown to consist chiefly of pollack, squid, and a hitherto unknown species of fish, which I believe Mr. Lucas is going to describe. These are all surface fish, and it is to these that the seal looks chiefly for its food, and not as has been so frequently stated, to cod and salmon. Not that a seal confines itself entirely to surface fish, for a certain proportion of cod, and perhaps other bottom fish are found in their stomachs, but the proportion is quite a small one.

It is then very satisfactory to find that the enormous quantities of valuable food-fishes which the seals were formerly stated to consume are largely exaggerated.

There can be no doubt that the feeding-grounds of the female seals are preyed upon by the pelagic sealers, but the extent to which this is so on the western side of the Pacific is far less known than on the eastern side. Dr. Stejneger, in his Report (p. 87), seems to have made out a good case for placing the Copper Island feeding-grounds in a "comparatively limited area south of Copper Island, approximately bounded by 52° 30′ and 54° 30′ north latitude, and by 165° and 170° east longitude. The richest hauls, however, (in 1892) were made within a much more restricted area south and south-west, and on the line between this area and the rookeries of that island."

It is probably, as already stated, that the feeding-ground of the South Rookery of Behring Island is the same as that of the Copper Island seals (p. 32).

Dr. Stejneger thinks that the Behring Island feeding-grounds are "somewhat more distant and more extensive than the Copper Island ones, for the 'Jane Grey' took sixty-five seals between the 16th and 21st August, about 25 miles from the Kamtchatkan coast, east of Cape Afrika, while the 'Ida Etta' obtained 180 skins between the 20th August and the 4th September, 20 to 30 miles north-east and east from Cape Nagikinski, as detailed elsewhere in this Report" (p. 87).

With the exception of the small South Rookery of Behring Island, I think that Dr. Stejneger is very probably right in what he says about the position of the feeding-grounds of the Commander Islands' seals. At all events, if we accept the positions as stated by him, then the present state of the rookeries and their varying conditions as being due partly to over-killing on land, and partly to pelagic sealing, admit of a ready explanation.

It is possible that some of the Copper Island seals feed near the Islands; at all events they may be found in August in the positions kindly sent me by Captain MacAlpine, of Her Majesty's ship "Swift," and which are marked on the map which accompanies this Report.

Migration Routes, Winter Habitats, and Distribution at Sea.

The map attached to the Report of the British Commissioners and numbered II gives an excellent idea of the migration routes and of the distribution at sea in summer of the fur-seal, but the Commissioners had little information relative to the winter haunts of the animal, and, like most diagrams, the above one is a little too diagrammatic, for there is, as with other animals, a considerable latitude in the events of seal life.

At pp. 7 to 10 of their Supplementary Report the Commissioners give some further information, the main result of which was to show that (1) "in addition to the main bodies of seals following the several migration routes, smaller numbers of fur-seals occur in all parts of the North Pacific to the north of the Sandwich Islands, the connection of which with these main bodies cannot be certainly ascertained," and (2) "that while the great majority of the seals follow pretty definite routes, and return to the same places on their migration routes with considerable regularity, there are smaller bodies of seals and individual seals to be found at all seasons of the year off the American coast to the northward of the Straits of Fuca, as well as in the ocean to the westward, far to the south of the Aleutian chain. These," the Commissioners thought, "may possibly be mere stragglers or strays from the larger main migratory bodies, such as occur in the case of all migratory animals, but the Commissioners thought there was reason to believe that at least some of them are seals which resort for breeding sporadically to other isolated breeding-places along the American coast or in the Aleutian islands, and have no intention of travelling to the Pribiloff or to the Commander Islands.

Since the publication of the above information, Mr. C. H. Townsend has made

a special study of the question for the United States' Government, and the result of his work will be found in his Report to the Secretary of the United States' Treasury for 1895 and on p. 62 of Dr. Stejneger's Report. Mr. Townsend's work appears to confirm that of the British Commissioners, and he states that (*Op. cit.*) "in the Japan region proper, sealing is carried on from the coast out to a distance of about 300 miles, while in February straggling seals have been taken as far south as the Bonin Islands. Seals occur in the Sea of Japan, catches having been made at several points there and in La Perouse Straits by the schooner 'Penelope' in a voyage around Yezo Island during the past season (1895). Sealers crossing the Pacific in the latitude of Yezo Island pick up seals at many points between Japan and the longitude of 180°. In June and July scattered bands of seals, presumably of the Commander Islands' herd, occur 500 or 600 miles south of the western Aleutian Islands."

Through the kindness of an officer on one of the mail-steamers which cross the Pacific, I am able to give the following interesting series of notes on fur-seals as observed at sea. The officer most kindly allowed me to copy these notes from his log and to make use of them for any purpose :—

NOTES on Fur-Seals as observed at Sea.

	Date.	Latitude.	Longitude.	Temperature of—		
				Air.	Water.	
		° ′	° ′	Degrees.	Degrees.	
1891.	July 9, 1891	41 30 N.	138 56 W.	58	59	Seals seen every day (9th to 20th). First sighted on 9th, and appeared to be going to westward.
San Francisco to Yokohama	„ 14, „	42 30 „	164 30 „	57	56	Seals close to steamer, some asleep, others playing and going to westward. Have seen them the last three days, but they were not numerous till to-day.
	„ 15, „	42 30 „	172 15 „	56	55	Passed one fur-seal asleep, close alongside. Plenty of seals in sight going in a north-westerly direction.
	„ 18, „	42 00 „	175 50 S.	57	55	Plenty of seals in sight going in a north-westerly direction.
	„ 18, „	42 03 „	174 43 E.	57	55	Saw a few seals to-day for the last time this passage.
	Aug. 26, „	45 14 „	168 27 „	54	56	Saw a few seals on the beam ; appear to be going in a north-westerly direction. On the Great Circle Tract in this passage, and saw seals all the time in east longitude, but not many in sight at one time. Did not see any in west longitude.
1892.	Jan. 10, 1892	36 34 N.	143 30 „	46	58	Seals in sight, going different directions. Have seen them at various times, on this passage on the Great Circle Tract, from Yokohama to San Francisco, but not numerous. Have not seen any on the California coast this passage. Have seen the seals going in a south-westerly direction in the fall of the year. I did not make a note of it, and cannot remember the positions.
1893.	May 15, 1893	42 25 „	133 25 W.	50	51	A good many seen on this track, but the weather was rough.
	„ 16, „	44 06 „	138 48 „	49	48	
	„ 17, „	45 32 „	145 49 „	48	47	
	„ 18, „	45 54 „	151 46 „	46	47	
	„ 19, „	45 52 „	158 08 „	48	46	
	„ 21, „	45 44 „	162 40 „	44	45	
	„ 21, „	45 40 „	168 22 „	44	48	
	„ 22, „	45 35 „	175 30 „	43	45	
	„ 24, „	45 04 „	176 33 E.	43	45	
	„ 25, „	44 28 „	169 15 „	42	42	
	„ 26, „	43 37 „	161 55 „	48	45	
1894.						
San Francisco to Yokohama	Mar. 4, 1894	36 08 „	155 34 „	58	55	To port passed a few seals.
	May 6, „	35 13 „	145 13 „	52	62	Passed three seal schooners, laying to, hunting seals.

	Date.	Latitude.	Longitude.	Temperature of—		
				Air.	Water.	
		° ′	° ′	Degrees.	Degrees.	
Yokohama to San Francisco	Apr. 3, 1894	34 59 N.	140 16 E.	..	..	"April 3, from Yokohama, to April 5. Saw a few seals. On the 3rd instant passed the Victoria schooner 'Aurora' going to the north-east. On the 5th instant saw a few seals, and passed ten schooners. Some had their boats out, and killed three seals alongside of the steamer. One boat had 3* in her sails. Did not know the schooners' names. Seals and vessels were most plentiful from latitude 38° 38′ N., longitude 151° 45′ E., to latitude 38° 43′ N., longitude 152° 46′ E. The seals appear to keep in the Kuro Siwa or Japan Stream, where the water is warm."
	,, 4, ,,	37 15 ,,	145 33 ,,	59	63	
	,, 5, ,,	38 38 ,,	151 45 ,,	56	61	
						* *I.e.*, the numeral III, G.E.H.B.H.
San Francisco to Yokohama	,, 30, ,,	41 18 ,,	132 33 W.	48	52	Saw a few seals going north.
	May 12, ,,	38 22 ,,	150 25 E.	51	58	Seals very numerous, playing and leaping out of the sea. The water is 10 degrees warmer than on the 11th instant. All the seals I see are always in warm water.
	,, 13, ,,	36 17 ,,	144 43 ,,	60	60	Passed one schooner. Boat came alongside, and gave him some newspapers. Had three seals in the boat. Did not get her name.
Yokohama to San Francisco	June 25, ,,	46 46 ,,	165 31 W.	50	50	Saw a few seals going north. Weather foggy. Could not see far. Saw only one herd for about ten minutes.
San Francisco to Yokohama	July 17, ,,	45 28 ,,	177 24 E.	52	53	Saw one seal. Kept ahead of us for fifteen minutes. Calm, foggy weather. Water 53 degrees.
	,, 18, ,,	44 45 ,,	172 15 ,,	54	53	Saw one seal asleep. Passed over him.
	,, 21, ,,	38 45 ,,	151 33 ,,	68	72	Saw large herds of seals. Some playing, others going north-west. Water 73 degrees. Smooth sea. Calm weather.
Yokohama to San Francisco	Aug. 31, ,,	46 50 ,,	157 31 W.	51	55	Saw one seal going northward. Moderate sea. Cloudy weather. Water 56 degrees.
San Francisco to Yokohama	Sept. 26, ,,	45 40 ,,	175 38 E.	55	58	Saw a large herd of seals playing, going in no particular direction. Light breeze, fine clear weather, small air. Air 54 degrees; water 55 degrees.
1895.						
Yokohama to San Francisco	Jan. 15, 1895 (noon)	40 23 ,,	168 50 W.	48	52	A few seals in sight.
	,, 15, ,,	40 30 ,,	168 00 ,,	49	52	Numerous seals in sight. Light breeze, smooth sea. Passing fog banks. Water dense with Portuguese men-of-war. Seals kept in sight till dark. We were steering about east. Speed about 13 knots per hour.
San Francisco to Yokohama	Feb. 4, ,,	37 37 ,,	134 24 ,,	47	55	Saw a large herd of seals. Cloudy, misty weather. Light breeze; small sea; westerly swell.
	Apr. 14, ,,	39 12 ,,	124 05 ,,	51	52	Saw one herd of seals. Moderate breeze, cloudy and misty.
	,, 29, ,,	36 20 ,,	150 00 E.	56	65	Saw one seal.
	,, 30, ,,	35 30 ,,	146 30 ,,	54	65	A few seals in sight.
Yokohama to San Francisco	June 1, ,,	41 05 ,,	155 44 ,,	50	55	Saw one seal. Later, seals in sight till dark. One at odd times.
	,, 9, ,,	43 36 ,, to 41 55 ,,	140 53 ,, to 138 34 ,,	51	51	Numerous seals.

	Date.	Latitude.	Longitude.	Temperature of—		
				Air.	Water.	
		° ′	° ′	Degrees.	Degrees.	
San Francisco to Yokohama	„ 27, 1895	43 30 N. to 43 52 „	140 02 W. to 141 62 „	52	56	Saw seals in various directions, in small lots of one dozen, going in various directions. Appeared to be young seals.
	Sept. 15, „ (4 P.M.)	43 33 „	164 26 E.	56	56	Numerous seals going in various directions. Could not tell if they were large or small. This is the only time I saw seals this passage.
Yokohama to San Francisco	Dec. 31, „ (4 P.M.)	38 48 „	163 20 „	58	60	Saw about twenty seals under the bow, and dispersed in various directions. Appeared to be pups.
1896.	Jan. 1, 1896 (noon)	39 04 „	168 40 „	49	58	Saw about ten seals going in a southerly direction, close to steamer. Appeared to be small.
Yokohama to San Francisco	Mar. 8, „ (4·30 P.M.)	40 00 „	164 00 „	50	50	Saw one large seal asleep in the sun. Was close to it.
	„ 18, „ (noon)	39 02 „	128 44 W.	56	54	Numerous seals in sight all day. Appear to be full grown, the largest I have seen.
	Apr. 13, „	35 48 „	162 14 „	..	..	One seal seen by purser of steam-ship "Peru."
	May 26, „	42 00 „	157 00 E.	49	49	Saw numerous seals beaching to south-west. Appeared to be small. Were about 1 mile distant.

Dr. G. M. Dawson has also most kindy given me the following notes on seals observed at sea by the officers of the Canadian Pacific Railway Company's steamers (the "Empress" line) between Vancouver and Yokohama; these notes were transmitted to Dr. Dawson by Sir W. C. Van Horne, the President of the Canadian Pacific Railway Company, and are in continuation of the letters published in the British Counter-Case before the Paris Tribunal of Arbitration, p 213, and the Supplementary Report of the British Commissioners at p. 9.

The Canalian Pacific Railway Company, Montreal,
February 28, 1893.

Dear Sir,

IT is some time since any seals have been observed by our Pacific steamers; but on the last voyage home of the "Empress of China" on the 14th February, at 10·15 o'clock, off Vancouver Island numerous seals were reported to have been seen. The position of the ship at the time would be about 120 miles from Victoria.

Yours truly,
(Signed) A. PIERS.

W. C. van Horne, Esq., President.

The Canalian Pacific Railway Company, Montreal,
June 1, 1893.

Dear Sir,

I beg to report that on the 6th and 15th of April seals were observed by the "Empress of India" moving in a north-easterly direction. The positions were about—

6th April, 51° north, 146° west.
15th April, 38° north, 145° east.

Yours truly,
(Signed) A. PIERS.

W. C. van Horne, Esq., President.

The Canadian Pacific Railway Company, Montreal,
June 19, 1893.

Dear Sir,

The Commander of the "Empress of Japan" reports having observed seals on his last voyage as follows:—

At noon, 3rd June, latitude 37° 15′ north, longitude 144° 32′ east, several seals playing about. Temperature of sea 65°.

On the 6th June, 3 P.M., latitude 46° 29′ north, longitude 166° 48′ east, several young seals playing. Sea temperature 40°.

Yours truly,
(Signed) A. PIERS.

W. C. van Horne, Esq., President.

The Canadian Pacific Railway Company, Montreal,
July 14, 1893.

Dear Sir,

The Commander of the "Empress of China" reported the following observations of seals:—

1893—

On the 16th May, in 48° 43′ north, 125° 34′ west, saw several seals, also a schooner sealing with her boats out.

On the 26th May, in 44° 28′ north, 151° 17′ east, saw some seals.

On the 28th June, in 48° 1′ north, 174° 10′, passed a number of seals.

On the 30th June, in 50° 5′ north, 158° 49′ west, saw a number of seals.

Yours truly,
(Signed) A. PIERS.

W. C. van Horne, Esq., President.

The Canadian Pacific Railway Company, Montreal,
August 2, 1893.

Dear Sir,

The Commander of the "Empress of India" reported having passed "quantities of kelp and various seals" on the 11th June in 51° 46′ north, 173° 51′ west, and again on the 16th June, in about 44° 6′ north, and 153° 34′ east, a "number of fur-seals and quantities of kelp" were seen.

Yours truly,
(Signed) A. PIERS.

W. C. van Horne, Esq., President.

The Canadian Pacific Railway Company, Montreal,
August 22, 1893.

Dear Sir,

The Commander of the "Empress of Japan" reports having observed several seals on the 6th July in 46° 9′ north, and 155° 50′ east.

Yours truly,
(Signed) A. PIERS.

W. C. van Horne, Esq., President.

The Canadian Pacific Railway Company, Montreal,
January 27, 1894.

Dear Sir,

On the 8th January, in latitude 40° 51′ north, longitude 152° 34′ east, the "Empress of Japan" reports having passed a seal; weather at the time fresh gale, heavy rain, lightning and thunder.

On the same voyage on the 17th January, when off Vancouver Island, the same ship passed a number of seals.

Yours truly,
(Signed) A. PIERS.

W. C. van Horne, Esq., President.

The Canadian Pacific Railway Company, Montreal,
April 18, 1894.

Dear Sir,

The "Empress of Japan" on the 6th April, in 49° 17′ north, 159° 49′ west, passed several seals with birds hovering about them.

Yours truly,
(Signed) A. PIERS.

W. C. van Horne, Esq., President.

The Canadian Pacific Railway Company, Montreal,
May 29, 1894.

Dear Sir,

The Commander of the "Empress of Japan" reports that at 10 A.M. on the 24th April, in latitude 48° 58′ north, longitude 127° 55′ west, he passed through a number of seals heading to the northward.

Yours truly,
(Signed) A. PIERS.

Sir Wm. C. van Horne, K.C.M.G., President.

The Canadian Pacific Railway Company, Montreal,
August 12, 1894.

Dear Sir,

On Saturday, the 26th May, the "Empress of China" sighted numerous fur-seals in about 40° 14′ north, 144° 40′ east.

Yours truly,
(Signed) A. PIERS.

Sir Wm. C. van Horne, K.C.M.G., President.

The Canadian Pacific Railway Company, Montreal,
August 11, 1894.

Dear Sir,

The Commander of the "Empress of Japan" reports that on the 2nd July, at about 10 A.M. when off the Aleutian Islands, in latitude 50° 20′ north, and longitude 179° 7′ west, they passed a great many seals. Some were asleep on a patch of kelp, the others were mere stragglers. The weather at the time was fine and overcast with a smooth sea.

Yours truly,
(Signed) A. PIERS.

Sir Wm. C. van Horne, K.C.M.G., President.

The Canadian Pacific Railway Company, Montreal,
August 13, 1894.

Dear Sir,

The Commander of the "Empress of India" reports having seen a number of seals on the 17th July in about 35° 12′ north, 140° 33′ east.

Yours truly,
(Signed) A. PIERS.

Sir Wm. C. van Horne, K.C.M.G., President.

The Canadian Pacific Railway Company, Montreal,
August 27, 1894.

Dear Sir,

The Commander of the "Empress of Japan" reports that on the 14th August, shortly before 8 A.M., he passed several seals, in approximately 49° 6′ north, 141° 12′ west.

Yours truly,
(Signed) A. PIERS.

Sir Wm. C. van Horne, President.

The Canadian Pacific Railway Company, Montreal,
October 4, 1894.

Dear Sir,

The Commander of the "Empress of India," on voyage 18 home, reports having observed a seal going northward at 11 A.M. on the 20th September, position being about 49° 56′ north, 167° 48′ west.

Yours truly,
(Signed) A. PIERS.

Sir Wm. C. van Horne, President.

APPENDIX.

Extracts from the Reports of the Commanders of Patrol Vessels.

1893.

Robben Island.—"I saw probably 1,500 to 2,000 seals, chiefly calves—this year 1,500 were killed. The Russians insist on 30-mile limit from all islands, not only from Commander and Robben Islands, and my informants explained that Saghalien is an island." Lieutenant and Commander J. F. W. Ingram, of Her Majesty's ship "Peacock," *in lit.* to Commander-in-chief of China Station, 16th August, 1893.

1894.

Robben Island.—"(1) on the 27th May, 1894, the seals had not arrived, but were expected. (2) they were stated to have decreased; 1,540 were killed in 1893 and 290 up to the 26th July, 1894. The tax on the island is 1 rouble a skin. Many sea birds breed here." Extracted from *litt.* of the Commander of Her Majesty's ship "Redpole" of (1) 11th June and (2) 1st August, 1894.

"Robben Island was not visited by any Russian man-of-war during the whole time I was employed on the service, and the garrison would have been in sore straits had I not conveyed 3 tons of coal for them from Korsakovsk, to be used for cooking, distilling, and warming purposes," &c. Lieutenant the Honourable F. C. B. Addington, of Her Majesty's ship "Plover," *in lit.* of the 8th December, 1894.

Commander Islands.—Commander Arthur, of Her Majesty's ship "Daphne," was informed by the Russians "that there are practically no schooners up here this year, and that there is very little use in the ship cruising any more—that most of the sealers this season are round the Japan coast, where they have already caught 75,000 seals." *In lit.* of the 31st August, 1894.

1895.

Behring Island.—200 sea otters taken to 16th August, 1895. Sealing season poor. Captain C. J. Norcock, of Her Majesty's ship "Caroline," 16th August, 1895.

"In the seal-drive witnessed at the North-west Rookery, Behring Island, a practice was pursued, which is said to be for the first time there and never elsewhere, viz., that instead of only driving up the young males which used to congregate together, the whole crowd were driven up to the slaughter-ground, and then the males were selected and clubbed, the remainder returning to the sea. This was done

because, owing to the comparative scarcity of males, they mix up with the females, and it would be impossible to sort them in the rookery. About 4,500 seals were driven up and 904 males were clubbed. There appears to be a great mortality among the pups in the rookery, due to starvation or disease, Dr. Stejneger calculated that there were over 1,000 lying about in various stages of decomposition. I am informed that the Russian Fur-Seal Company will make an attempt to buy up the seals from the schooners. The scarcity of the seals killed on the island will probably affect the food supply, as the inhabitants of Behring (350) and their dogs are dependent on seal meat chiefly." Commander F. R. Pelly, of Her Majesty's ship "Porpoise," *in lit.* of the 27th October, 1895.

1896.

1. Extract from letter of Sir A. Buller, from "Centurion" at Singapore, 3rd December, 1896:—

"The catch of seals has been very small, about 13,000 at the Commander Islands, and only 256 at Robben Island. Up to 1892 the average number of seals killed amounted to 30,000. No sealing-vessels were seen.

"No Russian man-of-war cruised on the Robben Island patrol, and the 'Yakout' was the only one which visited the Commander Islands, and then only occasionally for a few days."

2. Extract from letter of Commander MacAlpine, of the "Swift," from Hakodate, 28th August, 1896:—

"During the whole time I have been on this patrol duty, no sealers have been seen, and I heard that all sealing was being carried out near the mainland about 90 miles from Behring Island."

3. Lieutenant Bellairs reports arrival of the "Yakut" at Robben Island on the 15th June:—

"She brought one lieutenant (Kolubakin by name) and fifteen sailors armed with rifles. They did not have revolving cannon mounted on the island this year, as in former years.

"On the 15th June the first female seal arrived, and on the 24th June, when we left the cruising-ground, there were seventy-six."

He returned to the cruising-ground on the 2nd July, and found that during his absence the "Kotik" had arrived and landed on the island seven Aleuts.

"On this occasion, I spoke two Japanese schooners, one on the 8th July, apparently bound for Kuril Islands, and the other fishing 3½ miles north-west of the island."

"During the absence of the ship from the 12th to 23rd July, a Russian schooner, from Vladivostock, visited the island. One brigantine (American ?) crossed the cruising-ground on the 29th July."

"The number of old male seals is largely out of proportion to the number of females, and several are lying at some distance from the 'rookery' utterly impotent. The number of small males hardly comes up to their expectations; they were going to kill 2,000 but, up to the 4th August, the total killed was 118 only. No Russian man-of-war cruised at all the whole time."

4. Lieutenant Spencer de Horsey, Commanding the "Plover," cruised off Robben Island from the 10th August until the 28th October.

"During each cruise Robben Island was visited, and, in company with Lieutenant Kolubakin, I visited all parts of the small island, including the seal rookery which is on the north-east side of the island. Here some 1,800 seals were to be seen on the beach and in the surf, the greater proportion being females with their pups, as well as a few old males, there being, however, only twenty-eight of the latter. As regards profits, the season has been a failure, only 256 seals having been killed out of 2,000 expected by the Company, which does not pay for the expenses of the establishment."

No Russian man-of-war has been on the Robben Island patrol, but the "Tunguz" was met twice at Korsakovsk, "Kreyser" once off Robben Island, on passage from the Commander Islands, and the "Yakut" at Robben Island. The latter brought and took away the naval guard at Robben Island.

Other vessels met with were one Company's steamer, two Government schooners, and one other steamer off Robben Island; also off Cape Tonin two American whaling barques. Many whales have been seen while cruising.

List of Photographs.

Robben Island.

15. The island in the distance, from the north-west; Her Majesty's ship "Pigmy" at anchor; from Her Majesty's ship "Spartan" as she approached the island; 11th July, 1896.

16. Nearer view of the island, from the west; from Her Majesty's ship "Spartan" at anchor.

17. The top of the island (north-west end), showing Aleut's grave; clouds of sea-birds and broken eggs in foreground.

20. Same as No. 17; showing thick mass of guillemots standing; the birds in the air are chiefly kittiwakes.

18. The rookery from the beach; from the south.

19. The rookery from the top of the island.

21. The rookery from the beach, south; farther off than No. 18.

22 and 23. The rookery from the top of the island.

Behring Island.

34 to 38. Sledge-dogs and sledges.

North Rookery.

39. Basal part of Kishotchnaya—the north-west part of North Rookery; 23rd July, 1896.

40 and 41. The "reef" part of North Rookery; 23rd July, 1896; No. 40 shows the more distant parts of the rookery, with Sea Lion Rock; No. 41 shows the small lot of seals lying at the base of the reef.

42 to 46. Scenes at a drive at North Rookery; 25th July, 1896.

South Rookery.

49 and 50. The rookery from the beach, behind it; 5th August, 1896, evening, at about 20 yards distance; two plates to be joined to make one picture.

53. The rookery from about the same place; 6th August, 1896, about 7 A.M.; the tide out; strong sun.

55 to 57. Blue foxes at the South Rookery; 6th and 7th August, 1896.

51 and 52. The waterfall, South Rookery; 6th August, 1896.

58. The killing-ground, salt-house, Company's house, and my tent at the South Rookery; early morning, 6th August, 1896.

59. Killer whales between South Rookery and Nikolski, from a boat; 6th August, 1896, afternoon.

Copper Island.

61. Bobrovi Kameni, or Sea Otter Rocks, at the north-western extremity of the island; from the Russian revenue-cruiser "Yakut;" 11th August, 1896; from the north.

61 to 64. Panoramic view of the north-western coast of the island; from the "Yakut;" 11th August, 1896.

101. Coast of Copper Island, bearing north-west and west; from a boat; showing Chornie and Dovronskoi Capes; 23rd August, 1896.

102. South-east Cape from the east; from a boat; 23rd August, 1896.

113 and 114. Preobrajenski village; from the hills inland and south-east of the valley; panorama; the two plates to make one picture; 24th August, 1896.

Glinka.

103. The rookery coast from the south-east; from a boat at sea; 23rd August, 1896.

79. Gavarushkaya Rookery; from the small cape north-west of it; 18th August, 1896.

78. Sikatchinskaya Rookery; from the same position as No. 79, *i.e.*, south-east; 18th August, 1896.

80. Junction of Sikatchinskaya and Zapalata Rookeries; 18th August, 1896; same position.

86 to 88. Zapalata Rookery; from the cliffs above; 20th August, 1896.

87. North-western part, looking towards Palata.

86. South-eastern part, looking towards Sikatchinskaya.

81. Palata Rookery; from the next point north-west of it; 18th August, 1896.

109. Palata Rookery; from a boat; 23rd August, 1896.

108. Part of Zapalata Rookery, with seals in the water; 23rd August, 1896.

89. Palata Reef covered with seals; from the north-west; 20th August, 1896.

90. Palata beach; showing also the position of Palata Reef and the escarpment on which is the parade-ground; 20th August, 1896.

66 and 68. View from Zapadnie Cape, looking south-east; showing Sabatcha Dira and Palata Rookeries in the distance; 13th August, 1896.

67. View from the same position, looking north-west; showing the remainder of the coast on which the rookeries are situated; 13th August, 1896. This photograph shows in order Pagani Bay, Pestshani Cape, beyond which is Pestshani hauling-ground, Urili Kameni, Peresheyek Cape and Lebiazhi Cape, the latter marked by two outlying rocks. The most distant cape of all is at Karabelni Rookery.

110. Coast just north-west of Palata, showing Sabatcha Dira Rookery; from a boat, 20th August, 1896.

92. Sabatcha Dira Rookery; small lot of seals lying south-east of the main rookery; 20th August, 1896.

93. Sabatcha Dira from the beach on the south-east; main part of the rookery; 20th August, 1896. In the background is Zapadnie.

94 and 95. The same, showing the seals beginning to move off into the sea; 20th August, 1896.

96 and 97. Zapadnie Rookery from the beach on the south-east; two plates to be joined together to make one picture; 20th August, 1896.

83. Pagani Mys (Cape); male seals lying on the beach south of the stream; 19th August, 1896.

82. The same; another lot of male seals going into the sea from their position north of the stream; 19th August, 1896.

100. Urili Kameni (Shags' Rock) Rookery, from the "Shags' Rock" south-east of the rookery; 22nd August, 1896.

73 to 77. Panorama of the village of Glinka, from the cemetery, the five plates to be joined together; 18th August, 1896.

N.B.—Views of the drive-ways at Zapadnie and at Palata were a failure, but Sapper Marratt, Professor Thompson's photographer, obtained good photographs of these, and also of the "Valley of the Drives" at Glinka.

Karabelni.

71. The steps at Karabelni; 15th August, 1896.

69. The drive-way – the "Valley of Death"—at Karabelni; the ascent; from the summit; 15th August, 1896.

70. The same; the descent; from a few yards below the summit; 15th August, 1896.

St. Paul Island.

129, 130, 131, and 132. Branding pups; 12th September, 1896.

134. Branded pups—black and grey—to show brand; 12th September, 1896.

146. Castrating a pup; 14th September, 1896.

147. Group of villagers at St. Paul; 20th September, 1896.

St. George Island.

160 to 162. Blue foxes at Zapadnie, St. George Island; 16th October, 1896.
164 to 172. Scenes at a drive of seals for food; 20th October, 1896.

166, 169, 171, and 172. Killing seals.
164, 165, 167, and 170. Skinning the carcasses.
168. Rejected males escaping to the sea.

163. "Bidarras" (skin-boats) at the village.

Various Seal Pictures illustrative of Seal Life, &c.

84 and 85. A bull at bay, Pagani Mys, Copper Island; 19th August, 1896.
99. Sleeping bull and half-bull, Pestshani, Copper Island; 22nd August, 1896.
91. Black pups sleeping, Sabatcha Dira, Copper Island; 20th August, 1896.
106 and 107. Pups beginning to turn grey; Zapalata, Copper Island; 23rd August, 1896.
135. Two dead black pups photographed side by side to show difference of appearance between a starved and a healthy pup; St. Paul Island; 12th September, 1896.
111. Seals sleeping on the water near Zapadnie, Copper Island; 23rd August, 1896.
98. Two young male seals; Pestshani, Copper Island; 22nd August, 1896.
153 to 158. Pictures of seal-life—

153. A small harem on the "Slide,"* St. Paul Island; 27th September, 1896.
154 to 157. Bull,† females, and pups on the "Slide;" same date.
158. Seals at Garbotch, St. Paul Island.

124 to 127. Groups of males of various ages, St. Paul Island; 14th September, 1896.
137 to 139. A bull at bay at Zolotoi Sands, St. Paul Island; 14th September, 1896.

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* Dr. Jordan's newly-named "Ardiguen" Rookery.
† This is Dr. Jordan's Bull "A" (see preliminary Report, p. 55).