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Northern Fur Seal Rookery Photo Archive: Aerial and Ground-Level Photos, Pribilof Islands, Alaska, 1895 - 2006

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Northern Fur Seal Rookery Photo Archive: Aerial and Ground-Level Photos, Pribilof Islands, Alaska, 1895 - 2006

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Preface

The northern fur seal (*Callorhinus ursinus*) has been the subject of recorded history for more than two centuries (Scheffer et al. 1984, Scott et al. 2006). It has a long history of being commercially harvested for its valuable pelts (Roppel 1984). Recently, however, fur seals are being seen as one of many species reflecting the conditions of their environment, especially an environment increasingly altered by human influence. The Pribilof Islands fur seal population is currently listed as depleted under terms of the U.S. Marine Mammal Protection Act owing to numbers greatly reduced from those observed historically (National Marine Fisheries Service 1993). As such, information that helps characterize, measure, and understand fur seal population change is valuable. This includes photographic records of fur seal rookeries showing their location, size, shape, and density of seals.

In 1895 (Townsend 1896a), ground-level photographs were taken from vantage points overlooking selected areas of most of the fur seal rookeries on the Pribilof Islands of the eastern Bering Sea. This was a remarkable feat in view of the state of photography at that time and the logistical difficulty of getting to and working on these islands. Since that time, scientists and managers have returned to the same spots from which these early photos were taken and photographed the same views. The addition of aerial photography further enhanced perspective by adding images that displayed entire rookeries. This report documents the digital archival of most of the photographs and images/illustrations of the fur seal rookeries on the Pribilof Islands maintained by the National Marine Mammal Laboratory, Alaska Fisheries Science Center, in Seattle, Washington. Our primary objective was to preserve these historic photographs in digital form to make them widely available and reproducible. Scientists, historians, and others now have the option of making use of these records to take advantage of the information they contain without posing risk to the original materials.

This project was supported by NOAA's Preserve America Initiative Grant Program, part of Preserve America, a White House initiative aimed at preserving, protecting and promoting our nation's rich heritage.

Contents

Northern Fur Seals and the Pribilof Islands, Alaska

Northern fur seals (*Callorhinus ursinus*, previously referred to as the Alaska fur seal) spend a majority of the year at sea. They are found in the North Pacific and Bering Sea and, as they mature, show an increasing tendency to return to the rookeries where they were born. After wintering at sea, seals return to breeding colonies on islands in Russia and the United States. The largest portion of the worldwide population returns to the Pribilof Islands, Alaska, in the eastern Bering Sea during the breeding season. Within the Pribilof Islands, there are 20 rookeries or breeding grounds: 14 rookeries on St. Paul Island and 6 rookeries on St. George Island.

The luxurious pelt of northern fur seals led to the commercial harvest of this species, which started in the 1700s and ended in 1984. The associated fur seal harvesting and pelt processing industry was extremely lucrative for the nations involved. To put this into perspective, the U.S. government purchased what is now the state of Alaska from Russia in 1867 for 7.2 million dollars. Based on the gross income from fur seal pelts, the United States recovered this cost within 5 years (Fowler 1998). Managers quickly recognized that scientific information on the species was needed to manage fur seal harvests to maximize revenue and meet the demand for furs. Initial estimates of seal abundance and distribution were based on counts, charts, drawings, and photographs. Research has expanded on these beginnings to emphasize the status, population dynamics, and ecology of the fur seal population.

Pelagic sealing in the late 19th and early 20th century included the harvest of lactating females and reduced the population of fur seals to an extreme low. International protection allowed the population to increase to a peak in the 1940s and early 1950s. The Pribilof Islands population at that time was approximately 2.2 million. Following this peak, there has been an overall decline (as reflected in the numbers of pups born, Fig. 1 for St. Paul; a similar decline occurred in the smaller population on St. George) only partially explained by a commercial harvest of females (1956-1968; York and Hartley 1981) and entanglement in marine debris (Fowler 2002). In 1988, the eastern north Pacific (Pribilof) population of northern fur seal was designated as "depleted" under the Marine Mammal Protection Act after population levels continued to decline and reached numbers less than 50% of those observed in the late 1940s and early 1950s (National Marine Fisheries Service 1993) despite the absence of commercial harvesting. This portion of the overall population of northern fur seals continues to decline (Towell et al. 2006) as the fur seals' ecosystem changes and is now less than 30% of the population observed roughly 60 years ago.

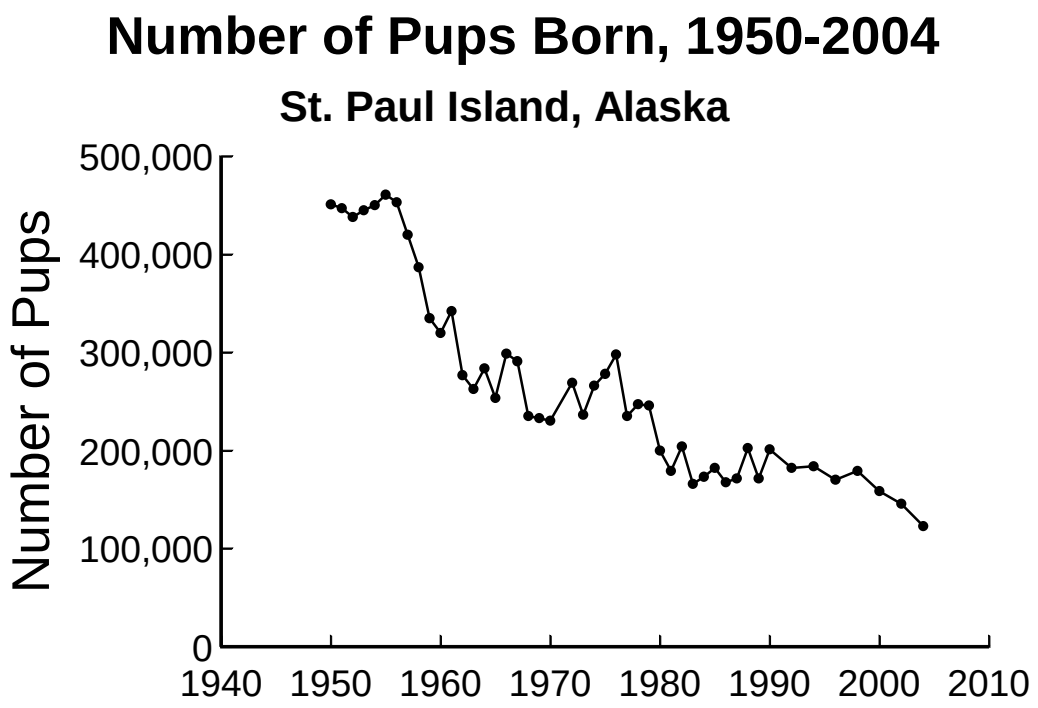

Figure 1.-- The estimated number of northern fur seal pups born during 1950-2004 on St. Paul Island, Alaska.

Northern Fur Seal Photography

Before photography became a common and practical technology, researchers made sketches to document northern fur seals – specifically their distribution on rookeries. One of the earlier students of northern fur seals was Henry Wood Elliott. As a talented artist, he sketched portraits and rookery maps to show the distribution and abundance of the fur seals in the Pribilof Islands during the late 1800s and early 1900s (e.g., Elliott 1882). Because Elliott's work was not photographic, it was not included in the archives of this project. However, anyone interested in rookery images earlier than the photographs archived in our northern fur seal rookery photo archive should review his work.

Ground-level photographic images of northern fur seal rookeries on the Pribilof Islands are part of the historical record since the late 1800s. Initially, such images were taken to show the location of seal concentrations following the fur seal population decline in the late 19th century – photographs exemplified by C.H. Townsend's 1895 series (Townsend 1896a). More recently, ground-level images were not only taken to continue recording location and concentrations of seals, but also to document the location of photographic stations and numbered rocks used to identify specific areas within each rookery. In 1948, Edward C. Johnston, the general manager of the fur seal administration in the Pribilof Islands, led another effort to photograph each rookery for a comprehensive sweep of the islands (Scheffer at al. 1984). Starting in 1948, and again in 1960, 1988, and 2005/2006, images were taken with the intent to replicate prior photographs for comparative value. As a result, there are numerous spots

represented by photographs that can be used to illustrate time-lapse changes in seal distribution and terrain.

Photographs of fur seal rookeries have also been taken from the air, starting in 1938, although the quality of early photos made them useless (Scheffer et al. 1984). We included aerial photographs from 1948, 1967, and 1988 in the archive. With good resolution, aerial photographs show the distribution of animals more visibly and accurately than ground-level photos; aerial photos can also be used to measure the area occupied by seals in the rookeries. Area measurements can be compared to provide a quantitative measure of the population changes.

Developing the Photo Archive and Database

Innumerable photos have been taken of northern fur seals by scientists and others since their "discovery" in the 1780s. The images archived and reported here contain only those that were readily available from the files of the National Marine Mammal Laboratory (NMML) Library in Seattle, Washington (hard-copy materials are stored in what are often referred to as the 'Fur Seal Archives'). Not all images were included in the digital archive; some were excluded either because they lacked the potential for comprehensive year-to-year comparison or they were redundant in content. For a more descriptive list of photos excluded, see below, National Marine Mammal Laboratory (NMML) Library.

The archive produced by this project contains more than 2,100 scanned digital images of materials found in the NMML Library. The variety of hard-copy materials include photo prints, black-and-white negatives, color transparencies, 35 mm slides, unpublished materials, and graphic materials in published books. Other images in the archive are digital photo files taken in 2005 and 2006. All of the original materials were converted (scanned) to digital format and all pertinent information was embedded into the metadata associated with each image. Such information includes, but is not limited to, the location of the photograph (island name, rookery name, etc.), name of the photographer and affiliation, date of the photograph, and altitude for aerial photographs. If the affiliation was not indicated, historical records were used to determine the photographer's affiliation at that time.

Hard copy materials were scanned using commonly accepted procedures. Three scanners at the Alaska Fisheries Science Center (AFSC) were used to digitize the hard-copy originals. The AFSC Graphics Unit's Epson Expression 1680 flatbed scanner was used for basic scanning. The Polar Ecosystem Program (NMML) provided an Epson Expression 1640 XL flatbed scanner with a larger scanning window used for larger hard-copy materials. A Nikon Super Coolscan 4000 ED slide scanner was used to scan 35 mm slides to produce high resolution images (4,000 dpi).

We used four desktop computer workstations and two versions of Adobe Photoshop (versions 7.0 and CS) in the digitizing process. Extensis Portfolio (version 8.1) was used for managing and editing the metadata embedded in each image. The variety of hardware and software used in this project was chosen to optimize our progress based on the proper combination of the availability, location, and speed of the equipment, while taking into account the type of the original media.

Despite using different scanners and photographic software for this project, the highest priority was the maintenance of quality and integrity of each image. Digital adjustments to the images, if any, were made to improve the visibility of seals or improve the color of the image.

Images were scanned at high resolution (400 – 4,000 dpi) and saved as TIFF files to produce the best replica of the original.

Organizing the Photo Archive

The organization of the northern fur seal rookery photo archive involves several important components (Fig. 2). The next two sections of this report provide information useful for understanding and using the archive. The first section, titled *Northern Fur Seal Rookery Photo Archive*, provides an overview of how the archive was organized and then focuses on the four sub-categories of images that are represented within the archive. The second section, titled *Photo Archive Catalog*, provides a more detailed account of the photo archive in the form of a list to help guide the reader through the photo archive and aid in understanding its organization.

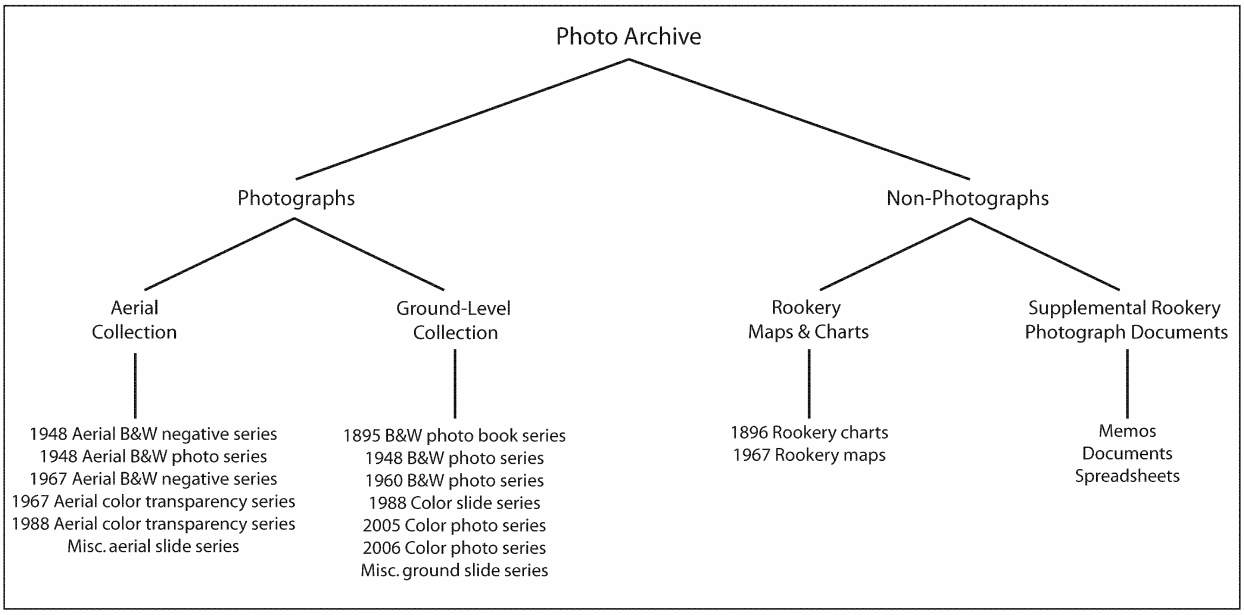

Figure 2. -- A diagram showing the general organization of northern fur seal rookery photo archive.

Northern Fur Seal Rookery Photo Archive

Before providing details regarding each type of image, it is important that the terminology used in this report and in the archival process be clear.

The *northern fur seal rookery photo archive* includes the full set of digitized images (photos and maps) with supplemental documents (Fig. 2); all images in the archive are accessible online at http://access.afsc.noaa.gov/furseal/rookeryimages/ (see below, Northern Fur Seal Rookery Photo Website*)*. Each image's *metadata* includes information relevant to that specific image (i.e., date of photograph, rookery name, photographer's name, etc.) and is embedded within the image file. The metadata was based on information provided by the photographer and/or researcher as described in the Supplementary Rookery Photograph Documents section of this report. For a complete listing of all metadata, please refer to the two Excel spreadsheets described in the Supplementary Rookery Photograph Documents section of this report.

The contents of the northern fur seal rookery photo archive are organized into four categories: aerial photograph collection, ground-level photograph collection, rookery maps and charts, and supplemental rookery photograph documents (Fig. 2). The primary components of the archive are the two *collections* of northern fur seal rookery photographs; one collection contains aerial photos (i.e., taken from an aircraft) and the other collection contains ground-level photos (i.e., taken by photographers on or near the ground). Each of these collections contains multiple *series* of photos. A "series" typically refers to photos taken in the same year by the same photographer, or photographs taken in the same year during the same research effort. The third section of the archive includes maps and charts, also in digital form, and the fourth section involves information characterizing the images of the archive.

The filename of each image is based on the series to which the photo belongs and usually includes the number assigned to the photo by the original photographer(s). The photo number typically corresponds to the sequence in which the photo was taken. The primary exception to this rule is the 1960 ground-level photo series which was numbered to correspond to the photo numbers of the 1948 series (rather than being numbered chronologically).

Individual images may be missing from a particular series (seen as a skip in numerical sequence). In the aerial collection, a handful of originals are missing from the Fur Seal Archives at the NMML Library. In the mid-century ground-level series (i.e., 1948 and 1960), skips in numerical sequence involve photos that were rejected by the original investigators (e.g., due to weather or because they were of unacceptable quality). In the more recent ground-level series (i.e., 1988, 2005/2006), skips in sequence within a series are common because multiple shots of the same perspective/panorama were taken to ensure photo quality (e.g., adjustments in camera settings), and the redundancy allowed for selecting the images of highest quality.

Aerial Photograph Collection

Documentation for the procedures used in earlier aerial photography surveys (e.g., Fig. 3) is unavailable. However, assumptions concerning how the aerial photographs were taken can be made. Aerial photos were undoubtedly taken from an aircraft modified to attach the camera in a stationary position, as is known to be the case for the aerial series taken in 1988. In all cases the camera was probably mounted in a specially constructed opening in the floor of the aircraft.

Figure 3. -- A section of the image, *1967 Aerial Rookery 4670.tif*, as an example of an aerial photograph showing part of Tolstoi rookery, St. Paul Island (Unknown 1967).

There are three important points to note regarding the photographs in the aerial collection. First, overlapping aerial photographs typically cover an area of roughly several hundred meters in length and often include portions of more than one rookery. Each rookery is divided into sections; some rookeries are small enough to be only a single section. Each section is numbered to enable researchers to refer to a specific area within a particular rookery. Both rookery names and rookery section numbers are provided for each aerial photograph's metadata. Rookery maps (see below, Rookery Maps and Charts) should be used to clarify the dividing lines between rookery sections. Table 1 specifies the number of sections within each rookery and the direction in which the sections are numbered as one moves either clockwise or counter-clockwise around the islands. Second, some photos show the adjacent coastline between two neighboring rookeries; these portions of the coastline are not usually considered to be part of either rookery. These photos were included to avoid excluding useful imagery, even though they may show few, if any, fur seals. For example, the *1967 Aerial Rookery 4582* image shows the coastline between Staraya Artil and North rookeries on St. George Island without the presence of fur seals. Lastly, aerial photographs are chronologically organized. It appears that each aerial photograph was assigned a number in relation to the order in which the photo was originally taken. If a skip in numerical sequence occurs within a particular photographic series, this indicates an image is missing and is not available.

Table 1. -- The number of sections within in each rookery and the direction (clockwise or counter-clockwise) in which the rookery sections are numbered when traveling around the island.

Island	Rookery name	Number of sections	Direction in which rookery sections are numbered
St. Paul	Vostochni	14	counter-clockwise
St. Paul	Morjovi	6	counter-clockwise
St. Paul	Little Polovina	1	N/A
St. Paul	Polovina Cliffs	7	counter-clockwise
St. Paul	Polovina	2	counter-clockwise
St. Paul	Lukanin	2	clockwise
St. Paul	Kitovi	5	clockwise
St. Paul	Reef	11	counter-clockwise
St. Paul	Ardiguen	1	N/A
St. Paul	Gorbatch	6	counter-clockwise
St. Paul	Tolstoi	8	clockwise
St. Paul	Zapadni Reef	2	counter-clockwise
St. Paul	Little Zapadni	6	counter-clockwise
St. Paul	Zapadni	8	counter-clockwise
St. George	Staraya Artil	2	counter-clockwise
St. George	North	5	counter-clockwise
St. George	East Reef	1	N/A
St. George	East Cliffs	2	clockwise
St. George	South	3	counter-clockwise
St. George	Zapadni	3	counter-clockwise

Within the 1948 aerial photograph series, a group of black-and-white negatives are missing. The original negatives were sent to Washington D.C. in 1949 and not returned. After digitizing the remaining black-and-white negatives from this series, 20 black-and-white printed photographs from the missing set were found in the Fur Seal Archives at the NMML Library. These prints were scanned and made part of the digital archive. These 20 photos do not have the same resolution as the images scanned from the original negatives, but they were included to minimize the number of missing images from this series.

Ground-Level Photograph Collection

Ground-level photographs (e.g., Fig. 4) were taken by researchers standing near or among the seals of the rookery, or occasionally from catwalks elevated above (~2.5 m) the seals. Since these photos were taken on-foot, they are less comprehensive and do not have the relatively uniform scale of aerial photographs. Instead, they show the seals close enough to distinguish between males, females and pups, but only when they are in the foreground. Adult males are distinguishable from females on the basis of their larger size and color; the pelage of males ranges from a reddish brown to black. Adult females have a more grey, or grey-brown coloration to their backs and lighter brown on their chests. Pups are born with a black coat and molt to a silver-grey appearance in the first autumn of their lives.

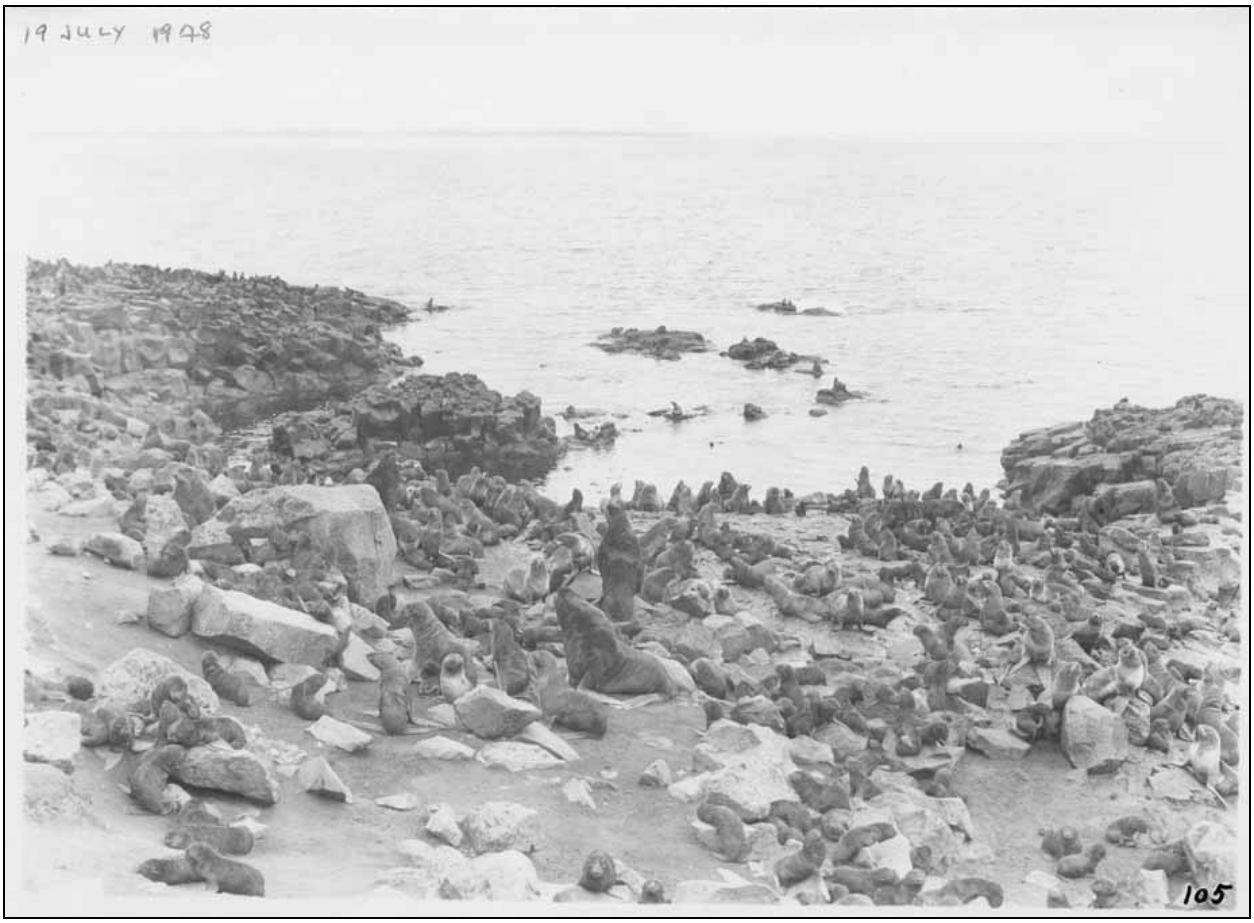

Figure 4. -- A ground-level photograph, *1948—Plate 55_Photo #105.tif*, showing part of Kitovi rookery on St. Paul Island. This section of Kitovi rookery is commonly referred to as "Kitovi Amphitheater" (E.C. Johnston 1948).

There are four things to note about the collection of ground-level photos. First, the 1895 ground-level series and the 1896 rookery charts were scanned from two books published by the U.S. government (Townsend 1896a, b). Second, the 1895 ground-level photographs and 1896

rookery charts include rookeries named Lagoon and Little East; these are rookeries that are now extinct. The images and maps for these rookeries were included in the archive to provide a complete series of images. Third, the rookery names provided in the 1895 ground-level photographic series and 1896 rookery charts may be spelled differently from the names used today. For example, the rookery known as Kitovi rookery today was labeled as "Ketavie" rookery in 1895; this is explained more in depth later (see below, How to Use the Photo Archive Website). Last, the ground-level photo series taken in 1960 was based on the 1948 ground photo series (an apparent attempt to duplicate the 1948 series). As such, the photo numbers and panoramic perspective of the 1960 series reflect the 1948 ground-level series. Thus, notes provided for the 1948 ground-level photo series will often describe the corresponding photo in the 1960 ground photo series.

Rookery Maps and Charts

Rookery maps (e.g., Fig. 5) were created from the 1967 aerial color transparencies series by Laura Johnson for the Pribilof Islands rookery mapping project (Johnson et al. in prep). These maps show the locations of boundaries between neighboring rookeries and rookery sections that are used in annual northern fur seal research. The image files for these maps are stored in three formats: JPEG, PSD, and MrSid. The PSD files are the original Adobe Photoshop files used to create the rookery maps in JPEG format. The compressed MrSid files were registered using ArcView software and may contain GPS information utilizing GPS sidecar files (e.g., .aux, .sdw); if available, the GPS sidecar files are located under the "Related Files" field on the details page of its respective rookery map. All types of files are available on the northern fur seal rookery photo archive website (see below, Northern Fur Seal Rookery Photo Archive Website).

There are three types of images in the 1967 rookery maps section of the archive. One type is a set of maps (JPEG and PSD format) in which the top of the photograph is seaward; this set of maps present the clearest visualization of each rookery section. These rookery section maps are used by researchers (e.g., during annual counts of adult male northern fur seals) on the Pribilof Islands, and were oriented in this manner for the benefit of researchers navigating through the rookeries on foot. The second type is a group of MrSid format images in which the maps are oriented so that the top of the map is geographic north; these images may have GPS sidecar files that provide GPS information. The third type is a set of JPEG images that were scanned from the original hard-copy transparencies with an emphasis on rookeries for the rookery mapping project. This subset of the original transparencies (scanned in its entirety as the 1967 aerial color transparencies in this archive; the original hard-copies are available at the NMML Library) were used to generate the seaward-oriented and magnetic north-oriented maps. These types of images are similar to those produced specifically for the archival project of this report. Thus, Image ID #866 (Tolstoi rookery from the 1967 Aerial Color Transparencies) is a scan of the same transparency as Image ID #2169 (Tolstoi rookery from the 1967 Rookery Maps series); differences result from scanning equipment and techniques.

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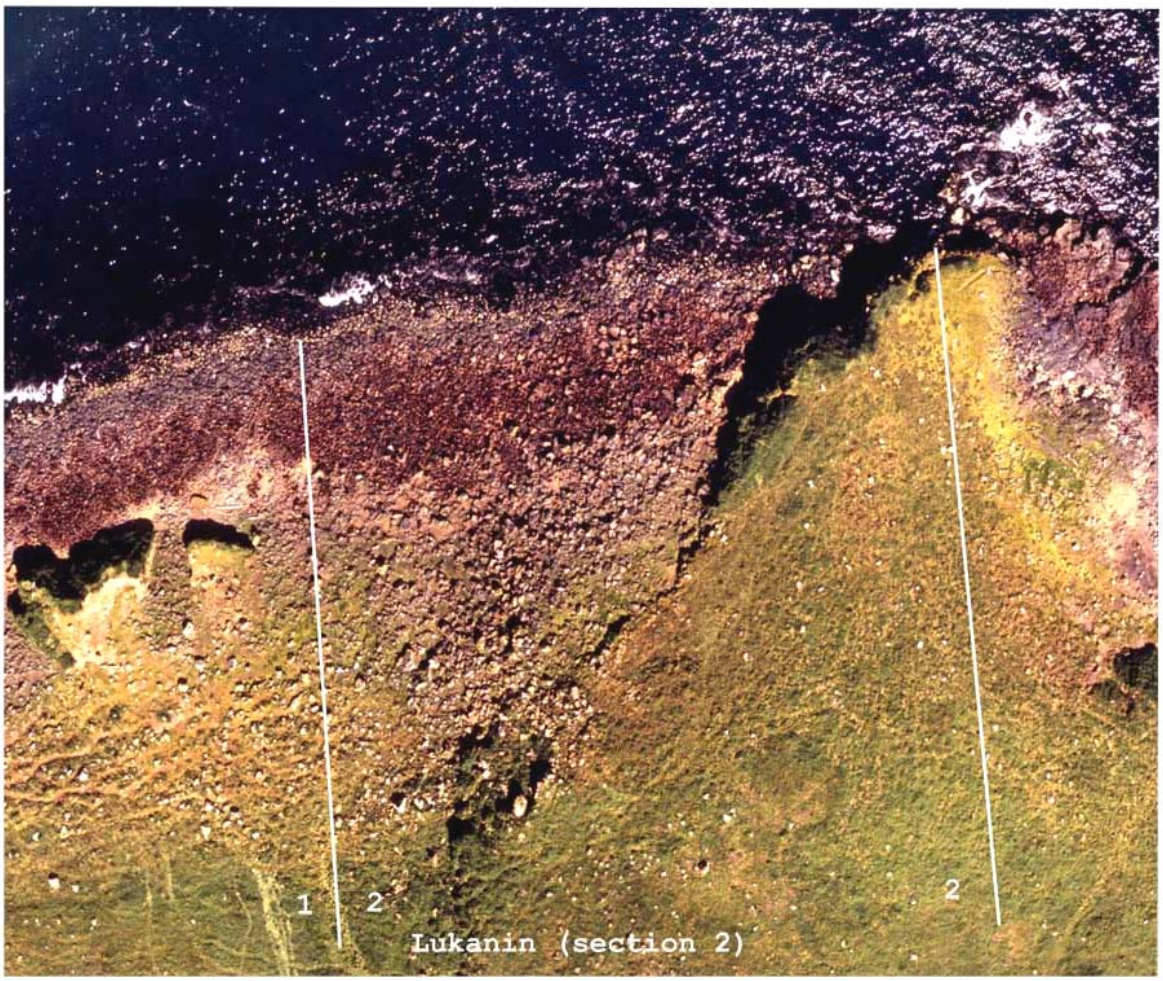


Figure 5. -- An example of a rookery map, *L2 (edited – disc 16).psd*, that shows sections 1 and 2 of Lukanin rookery on St. Paul Island. The rookery maps were created from the 1967 aerial surveys (Unknown 1967).

The 1896 rookery charts series were scanned from charts found in Townsend (1896b). These charts (e.g., Fig. 6) show the basic distribution of seals in each rookery on both St. Paul Island and St. George Island from maps made in 1893-1895.

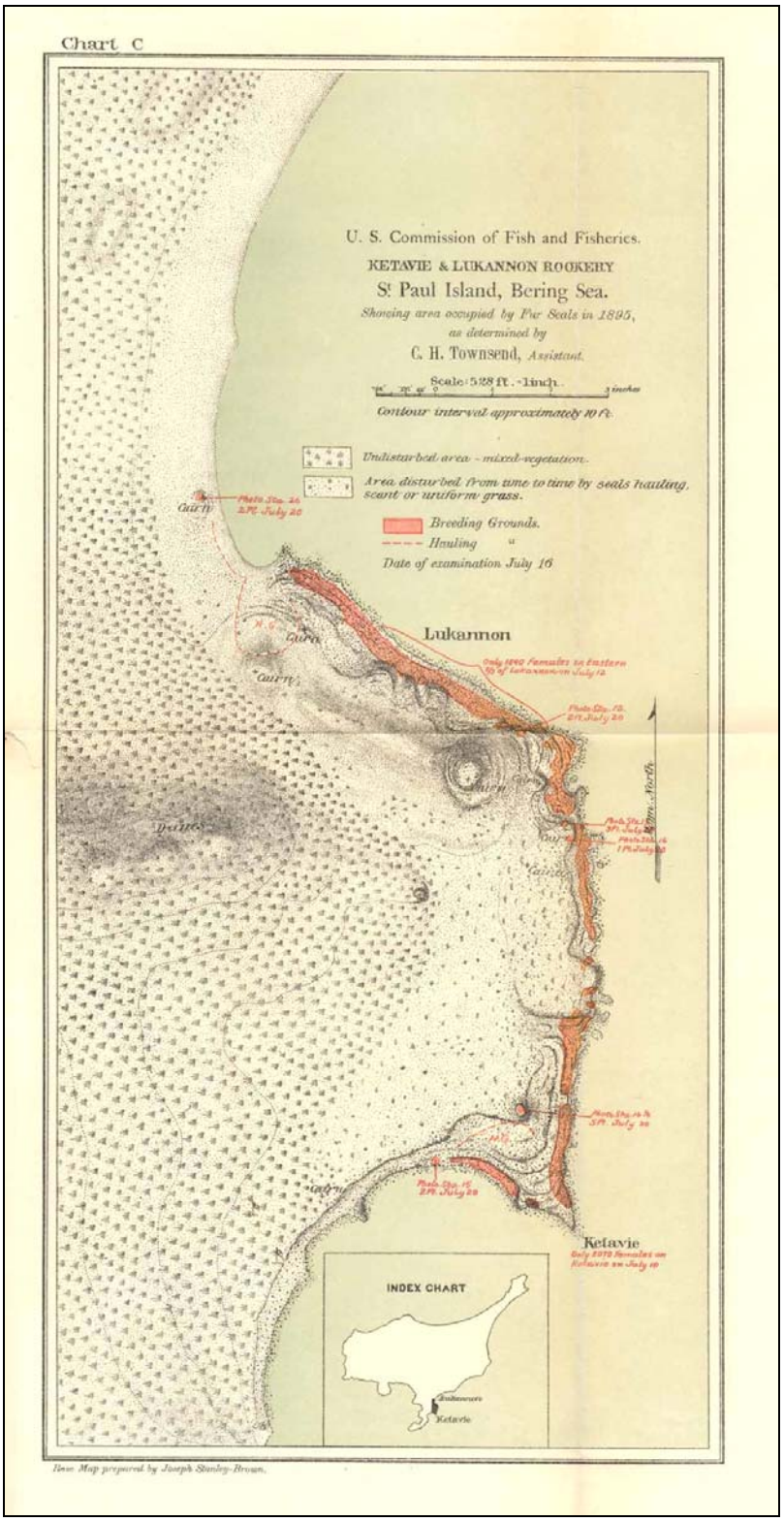


Figure 6. -- *1896 Chart C.tif*, as an example of a rookery chart of Lukanin and Kitovi rookeries on St. Paul Island as found in Townsend (1896b).

Supplemental Rookery Photograph Documents

In addition to photographs, maps, and charts, the Northern Fur Seal Rookery Photo Archive contains three types of supplemental documents that are useful resources. The supplemental documents provide information about a particular series, a particular photograph, or the entire photographic archive.

The first type and majority of these documents provide information from the original photographer regarding a particular photographic series. Depending on the photographer, these documents may include information about what is shown in a particular photograph, descriptions of where the photograph was taken, and/or other information regarding the photograph. As an example, the *1948 Memo* contains detailed information about each ground-level photograph taken by E.C. Johnston in 1948 (see Fig. 7). These documents are provided in Adobe Acrobat PDF format. Some were produced by digitally scanning the original document then converted to PDF format. Others were transcribed to Microsoft Word then converted to PDF.

MEMORANDUM TO ACCOMPANY THE GROUND PHOTOGRAPHS OF THE FUR-SEAL ROOKERIES, 1948.

The regular series, negatives nos. 1-132 inclusive was taken on St. Paul Island, July 15-19 and on St. George, July 21-24, 1948. Negatives 1, 2 and 6 were retaken on Reef Rookery, St. Paul, August 1, 1948. Sivertch Rookery could not be photographed from the ground due to weather conditions when time was available.

The equipment used was the old 5 x 7 Press Graflex and Tri-X Panchromatic Film.

In the absence of any information regarding the taking of this series since 1925, it was found advisable to add a number of new photographic stations in order to show all major sections of harem areas. The locations of these new stations are indicated in the descriptions following. Two old stations on North Rookery on St. George have been surrounded by the harem area.

On the set of photographs which will be filed for use when the series is next taken the locations of all stations which appear in the photograph are shown-old stations in black and new stations in red. Most of the new stations are located on the tripods or counting towers. The elevation thus gained gives a more comprehensive view of the harem areas.

1-2. Two exposure panoram. Location Photographic Station G, near Rock No. 38 Reef Rookery, St. Paul Island, facing West, August 1, 1948. The original exposures taken July 15 were not satisfactory making a retake necessary. The location of new Photographic Station E1 is indicated on Photo 1. The locations of Photographic Stations E and F are shown on 2.

3-5. Location-New Photographic Station E1 on top of tripod on rocky outcropping near Rock No. 30, Reef Rookery, St. Paul Island, July 15, 1948, Photograph 3 facing East. The location of Photographic Station G is shown on 3. Photographs 4-5 make a two exposure panoram, facing West. The location of photographic Station D is shown on 5.

6. Location-Photographic Station F about 100 yards Southeast of Castle Rock, the top of which is Photographic Station E. Reef Rookery St. Paul Island, July 15, 1948.

7-10. Four exposure panoram. Location-Photographic Station E on Castle Rock in rear of Rocks nos. 26 and 27 on Reef Rookery, St. Paul Island, July 15, 1948.

11-14. Four exposure panoram. Location-Photographic station D on line between Rocks Nos. 3 and 8 on Reef Rookery, St. Paul Island, July 15, 1948.

15-16. Two exposure panoram. Location-Photographic station C on Rock No. 3 on Ardiguen Rookery St. Paul Island, July 15, 1948.

Figure 7. -- *1948 Memo.pdf* [Page 1], as an example of a supplemental rookery photograph document (E.C. Johnston 1948).

The second type of document includes two useful memorandums. One titled, *1965 Memo (Scheffer suggestions)*, lists Dr. Victor B. Scheffer's suggestions for improving the methods in producing rookery photographs for comparison. Scheffer's memo may be useful to anyone interested in duplicating this type of work or applying this methodology to another species. The *1971 (Rookery Coordinates)* document lists the latitude and longitude coordinates and approximate sizes for rookeries on St. Paul and St. George islands. These two documents are available in PDF format.

The third document type includes two Microsoft Excel spreadsheet files that provide comprehensive information for all rookery photographs included in the archive. The *Northern Fur Seal Rookery Photo Archive.xls* allows the reader to browse the information regarding each photo (e.g., rookery name, section number, altitude of plane, photographer, date of photograph, etc.) using Microsoft Excel. The other - *NFS Related Groups.xls* - is essentially a cross-reference file listing photographs that are comparable by general location (see below, How to Use the Photo Archive Website and Using the Northern Fur Seal Images).

All supplemental documents are provided as Appendices A – H, except for the two spreadsheets which are available at the archive website (see below, Northern Fur Seal Rookery Photo Archive Website).

Photo Archive Catalog

The catalog presented below provides a detailed list specifying which photographic series are included and where each series is located within the photo archive. The structure of the catalog reflects the organization of the archive and is intended to facilitate navigation through the archive.

Aerial Collection

- 1948 Aerial Black-and-White Negatives Series
- 1948 Aerial Photos Series
- 1967 Aerial Black-and-White Negatives Series
- 1967 Aerial Color Transparencies Series
- 1988 Aerial Color Transparencies Series
- Misc. Aerial Slides Series

Ground-Level Collection

- 1896 Photo Book Series
- 1948 Photographs Series
- 1960 Photographs Series
- 1988 Slides Series
- 2005 Photographs Series
- 2006 Photographs Series
- Misc. Slides Series

Rookery Maps and Charts

- 1896 Rookery Charts
- 1967 Rookery Maps (labeled with section numbers)

Supplemental Rookery Photograph Documents

- 1895 Photo Book (Title Page and Table of Contents).pdf
- 1896 Rookery Charts (Title Page and Index).pdf
- 1948 Aerial Photo Archival Info.pdf
- 1948 Memo.pdf
- 1960 Memo.pdf
- 1965 Memo (V.B. Scheffer suggestions).pdf
- 1967 Aerial Photo Notes.pdf
- 1967 Aerial Photo Archival Info.pdf
- 1967 Memo.pdf
- 1971 Memo (Rookery Coordinates).pdf
- 1988 Aerial Photo Archival Info.pdf
- Northern Fur Seal Rookery Photo Archive.xls
- NFS Related Groups.xls

Northern Fur Seal Rookery Photo Archive Website

As mentioned earlier, all materials found in the northern fur seal rookery photo archive are available in the Fur Seal Archives maintained at the NMML Library in Seattle, Washington. All photos and charts included in this photo archive are of the Pribilof Islands, Alaska, and focus on the northern fur seal species. Most photos were taken during the breeding season, between June and August, when peak numbers of seals appear on the rookeries, or breeding colonies.

The archive's website address is http://access.afsc.noaa.gov/furseal/rookeryimages/. For convenience, it accommodates a wide range of computer capabilities with varying connection speeds. The images are available in JPEG and TIFF format. The JPEG files are lower resolution files (96 dpi) that were converted from the original TIFF files. The decision to use this file format and resolution was driven by the need to provide decent quality images with a reasonable download time. The higher quality TIFF images are also available on the website; however, downloading these much larger files will require a more powerful computer with a higher speed connection. The quality of the images provided on the website should be adequate for most common uses, (e.g., reports and presentations). The hard-copy materials, rookery maps in MrSid format, and other historical documents regarding northern fur seals are available at the NMML Library (see below, National Marine Mammal Laboratory (NMML) Library).

How to Use the Photo Archive Website

The archive's website's search page was developed to enable basic and advanced searches. Thus, the user can search for a few keywords or terms of interest as a basic search, or specify multiple parameters (i.e., island name, rookery name, rookery section number, year of

photograph, name of photographer, etc.) in an advanced search. In addition, the search page provides a link to useful search tips.

Should the user need to search for specific rookery sections (only available within the aerial collection), this can be done with the use of rookery identifiers (Table 2). Rookery identifiers were created to enhance searches within the aerial photograph collection, such that using the identifiers with the rookery section number enables clear searches for a specific area (e.g., "k1" refers to Kitovi rookery, section 1). In a more complicated example, an image with "r1, a1, g1, g2" as its rookery section numbers indicates that the photograph shows Reef rookery (section 1), Ardiguen rookery (section 1), and Gorbatch rookery (sections 1 and 2).

Table 2. -- The rookery identifiers used in the photo archive to specify the rookery shown in each photograph. To conduct clear searches within the aerial photography collection, the user should indicate the rookery name (via the rookery identifier) and the desired rookery section number.

Identifier	Island	Rookery name
a	St. Paul	Ardiguen
ec	St. George	East Cliffs
er	St. George	East Reef
g	St. Paul	Gorbatch
k	St. Paul	Kitovi
l	St. Paul	Lukanin
lp	St. Paul	Little Polovina
lz	St. Paul	Little Zapadni
m	St. Paul	Morjovi
n	St. George	North
o	Otter Island	Otter Island
p	St. Paul	Polovina
pc	St. Paul	Polovina Cliffs
r	St. Paul	Reef
s	Sivutch	Sivutch or Sea Lion Rock
so	St. George	South
st	St. George	Staraya Artil
t	St. Paul	Tolstoi
v	St. Paul	Vostochni
w	Walrus Island	Walrus Island
z	St. Paul	Zapadni
zr	St. Paul	Zapadni Reef
zsg	St. George	Zapadni

The archive allows for comparisons of photographs taken of the same location on similar dates in different years to illustrate long-term changes. To find comparable aerial images, the user needs to search for a specific rookery name and rookery section using the rookery identifiers, as described earlier. However, if the user wants to find comparable ground-level photographs, a different approach is necessary. In addition to using the spreadsheet, *NFS Related Groups.xls*, the user can browse the *Related Groups* category on the website to view images of similar locations taken in different years. The related groups were named in the following manner: the first part is the rookery name portrayed in the ground-level photographs and the second part of the name is an arbitrary number assigned to the images. One exception to this naming convention is Zapadni rookery on St. George Island, where the first part is "Zapadni Rookery (St. George Island)" followed by the arbitrary number assigned to the related images. These related images may not be similar enough to be an "exact" comparison, meaning they may have been taken from slightly different viewpoints; however, the related images included in the

website include all ground-level photo matches comparable by general location, should the user wish to compare photographs. A few examples of the more "exact-matched" related images are provided below (see below, Using the Northern Fur Seal Images). In addition to the examples illustrated in this report, posters and PowerPoint presentations were created utilizing the images categorized in related groups and/or according to rookery identifiers; the posters and presentations are available on the website for viewing and downloading.

A few points of clarification regarding the names of rookeries, groups of rookeries, rookeries on small isolated islands, and extinct rookeries must be addressed to prevent confusion. First, as mentioned earlier, alternative spellings of rookery names may exist. For example, the 1895 ground-level photograph series and the 1896 rookery charts provided a few rookery names that were different from the current spelling. What is now known as Kitovi rookery was labeled as "Ketavie rookery", Lukanin as "Lukannon", and Polovina as "Polavina". Second, both St. Paul Island and St. George Island have a rookery named Zapadni. In order to distinguish the two, the rookery identifier is "z" for the Zapadni rookery on St. Paul Island and "zsg" identifies Zapadni rookery on St. George Island. Third, any mention of "Northeast Point", "Reef Point", or "English Bay" refers to a specific combination of rookeries on St. Paul Island. Northeast Point includes Vostochni and Morjovi rookeries. Reef Point includes Reef, Ardiguen, and Gorbatch rookeries. English Bay refers to Tolstoi, Zapadni Reef, Little Zapadni, and Zapadni rookeries. Fourth, three "remote island rookeries" were included as part of the aerial photograph collection: Otter Island, Sivutch (sometimes referred to as Sea Lion Rock), and Walrus Island. All three involve islands offshore from the two main islands in the Pribilofs. These three locations were added to aid in searching and should not be confused with the 20 rookeries located on the two main islands of the Pribilofs (St. Paul and St. George). Last, Lagoon and Little East, now extinct rookeries, could only be included within the 1895 ground-level series.

All images provided in this photo archive are available at the National Marine Mammal Laboratory (NMML) Library in Seattle, Washington. A compilation of the images (JPEG, TIFF, PSD, and MrSid files on CD or DVD discs) is stored in the Fur Seal Archives at the NMML Library. Hard-copy originals are also available at NMML.

Using the Northern Fur Seal Images

Images from the northern fur seal rookery photo archive are very valuable and have many uses aside from standard visual aids. Below are a few examples that use images from both the aerial photograph collection and ground-level photograph collection; these examples provide a glimpse into the contents of the Power Point presentations and posters (mentioned above, How to Use the Photo Archive Website) that are available on the archive's website.

Photographs can be stitched together, or digitally merged, to create a panoramic image of an area as shown in Figure 8.

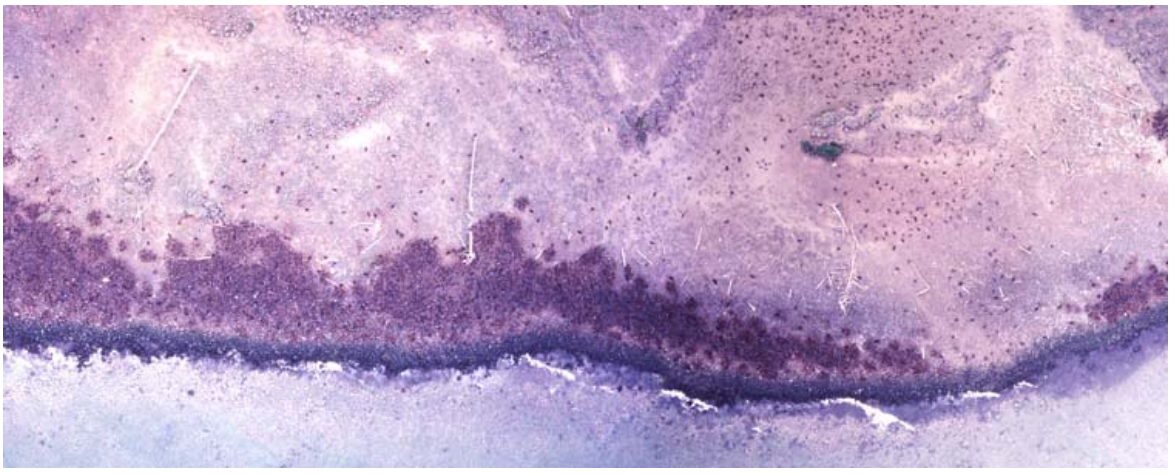
Figure 8. -- A ground-level photograph of Polovina rookery, St. Paul Island, created by stitching together four images, *2005—Plate 5a (1 of 4)__Photos #20-23.tif*, *2005—Plate 5b (2 of 4)__Photos #20-23.tif*, *2005—Plate 5c (3 of 4)__Photos #20-23.tif*, and *2005—Plate 5d (4 of 4)__Photos #20-23.tif*. (C.W. Fowler 2005)

Single- or panoramic-framed photographs of similar-perspectives can be placed in sequence to show changes in the fur seal population over time, as shown in Figure 9, panels a, b, and c.

Figure 9. (On following page). Three aerial panoramic images of Zapadni rookery on St. Paul Island, each created by stitching together two images. Collectively, panels a, b, and c show the change in northern fur seal distribution in 1948, 1967, and 1988:
(a) An aerial image created from *1948 Aerial Rookery 205.tif* and *1948 Aerial Rookery 207.tif* (V.B. Scheffer and K.W. Kenyon 1948).
(b) A panoramic aerial image generated from *1967 Aerial Rookery 4617.tif* and *1967 Aerial Rookery 4618.tif* images (Unknown 1967).
(c) A photograph produced from *1988 Aerial Rookery 618.tif* and *1988 Aerial Rookery 620.tif* (M.S. Lowry 1988).

a

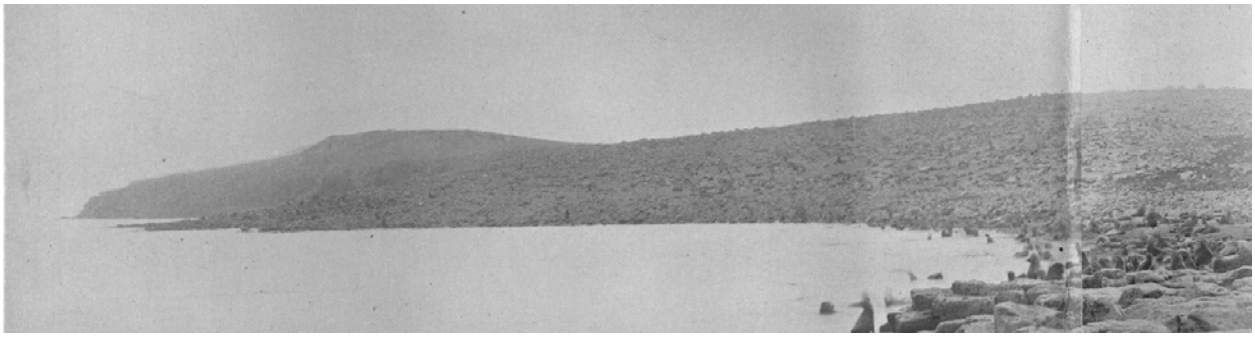
b



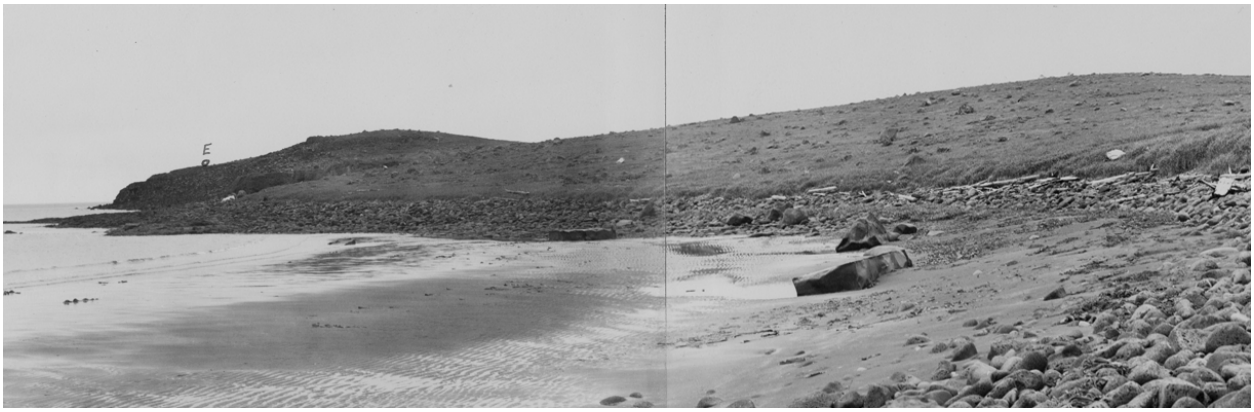
c

Single- or panoramic-framed photographs of similar-perspectives can be placed in sequence to show changes in the terrain over time as shown in Figure 10, panels a, b and c.

Figure 10. (On following page). Three ground-level photographs of Lukanin Sands on St. Paul Island, showing the change in terrain from 1895 to 2006:
(a) A ground-level photograph created from *1895—Plate 12a (1 of 2).tif* and *1895—Plate 12b (2 of 2).tif* (C.H. Townsend 1895).
(b) A panoramic ground-level image, *1948—Plate 52__Photos #100-101.tif* (E.C. Johnston 1948).
(c) A photograph produced from *2006—Plate 2a (1 of 2)__Photo #9.tif* and *2006—Plate 2b (2 of 2)__Photo #6.tif* (C.W. Fowler 2006).



a



b

c

Aerial photographs can be used to measure the area occupied by seals as demonstrated in Figure 11 (showing an area occupied by seals as outlined by the yellow dashed line). This can be done by taking advantage of software that makes digital measurements of area based on information regarding scale (known distances between points included in the image). With independent information on numbers, it then is also possible to estimate seal density (e.g., numbers of adult males holding territory [with females in their territory] per 100 square meters). If the images are of sufficient clarity, counting seals may be an option (e.g., adult males). This is an option explored in the past (Scheffer et al. 1984) and to be considered for future photographic work in view of improvements in technology (e.g., resolution in digital formats, color separation, use of spectral signatures for fur seals, and infrared radiation).

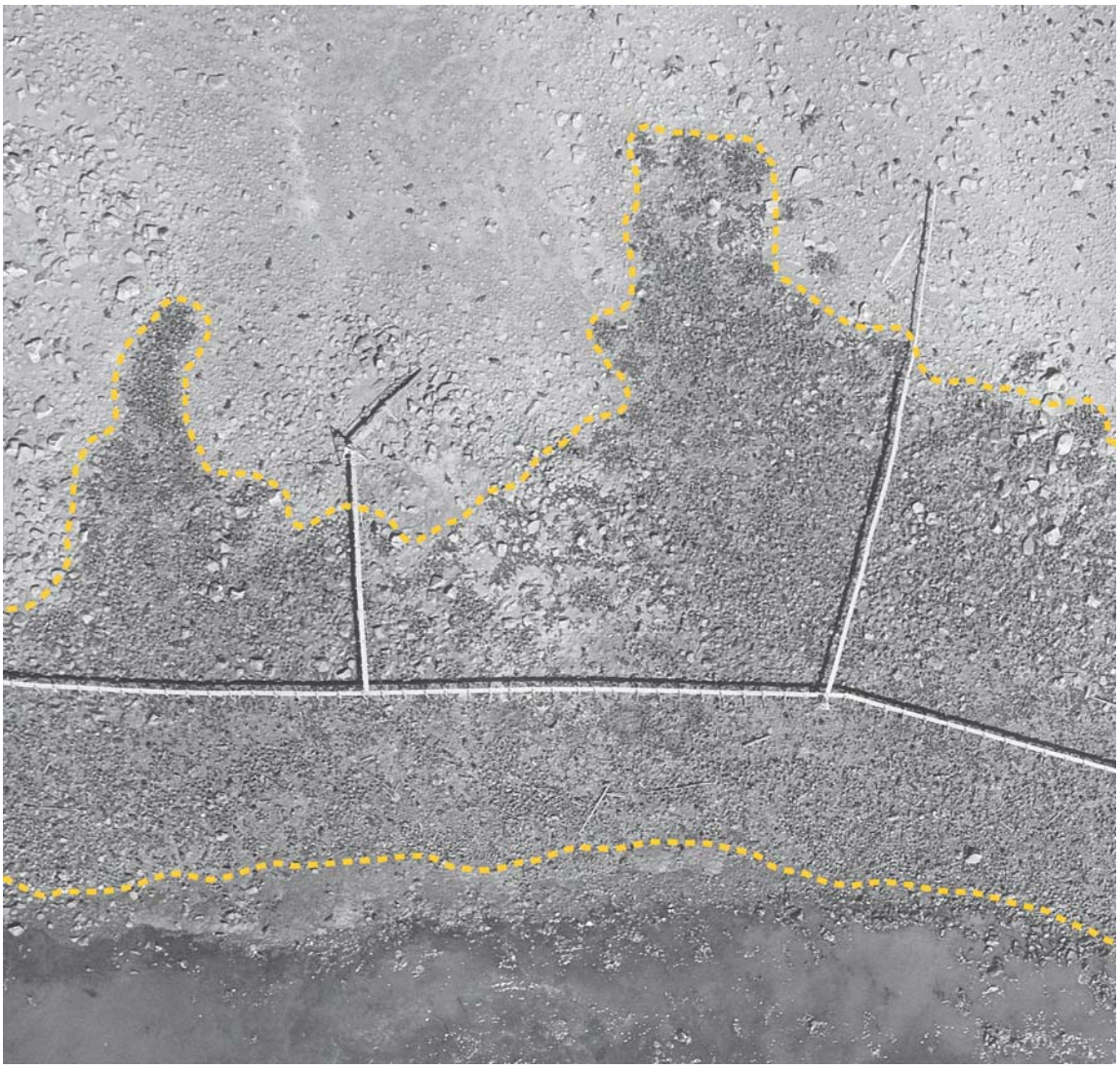


Figure 11.-- A portion of Reef rookery, St. Paul Island. The yellow dashed line indicates the edge of the area occupied by seals shown in this image (*1948 Aerial Rookery 167.tif*; V.B. Scheffer and K.W. Kenyon 1948).

National Marine Mammal Laboratory (NMML) Library

The National Marine Mammal Laboratory (NMML) Library is located within the Alaska Fisheries Science Center (AFSC) in Seattle, Washington. The NMML Library holds the Fur Seal Archives which contain a wealth of historical documents regarding the fur seal industry, seal counts, international research, photography, etc. The photographs and documents included in the northern fur seal rookery photo archive are only a tiny fraction of materials in the Fur Seal Archives. The immense wealth of historical printed text documents (e.g., memos, letters, and reports) represent a digitizing project much larger than that undertaken in our photo archival project. Their volume prevented their being digitized as part of this project. Aside from these materials the following non-textual materials (charts and photographic series) were not included, owing to constraints of time and resources:

- 1898 rookery charts produced by the Treasury Department, U.S. Coast and Geodetic Survey. The NMML Library has a copy from The National Archives. These rookery charts are also referred to as the "Duffield rookery charts".
- 1915 St. Paul Island rookery charts by Osgood, Preble, and Parker. This series of rookery charts show the locations of harems and numbered rocks in 1915.
- 1945 aerial photographs taken by the U.S. Navy (79 photos).
- 1949 aerial photographs taken by the U.S. Army Air Force (62 photos).

Disclaimers

Producing, organizing, and managing a digital photograph database of the magnitude of this project emphasizes the complexity of such a task and the potential for error. The information provided throughout the northern fur seal rookery photo archive, metadata, and documents are based on notes of photographers and/or researchers as found in the historical record. Errors were noted and corrected when possible, but some undoubtedly still exist; every effort was made to maintain accuracy. Most photos were assumed to contain northern fur seals because the photo archive was created primarily for the benefit of northern fur seal research. Thus, data for some images (aerial imagery, in particular) may indicate that a "northern fur seal" is included in the image (listed under the animal's *common name* field within the metadata), even though fur seals do not appear in the image. To remedy this issue would require that each image be subjected to detailed inspection to search for individual seals, a task beyond the scope of this project.

Acknowledgments

This report is to inform the public of invaluable historical images stored at the NMML Library and provide a user-friendly interface to use the images. First and foremost, we would like to thank the Preserve America Initiative Grant that made this project possible. It is also important to thank the numerous photographers who preserved a piece of history and provided the material to make this project possible. We are grateful to Karna McKinney, Graphics Designer in the AFSC Graphics Unit, for sharing her expertise in photography, scanning and digital imaging processes, and the archival process. We are very grateful to the Polar Ecosystem

Program and the AFSC Graphics Unit for the use of their scanning equipment. Sonja Kromann, Tom Gelatt, John Lindsay, and Mike Williams reviewed earlier drafts of this report and provided very helpful comments and suggestions and we thank them all. Gary Duker and Jim Lee provided their usual invaluable editorial comments in review of this report. We thank Mike Brown and Gary Shaw for their extensive work in developing the website that makes the archive openly available. We thank Laura Johnson for her work in the production of the rookery section maps.

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Townsend, C.H. 1896a. Illustrations Showing Conditions of Fur-Seal Rookeries in 1895 and Method of Killing Seals. To accompany report of C.H. Townsend, Assistant, United States Fish Commission. U.S. Gov. Print. Off., Washington, DC.

Townsend, C.H. 1896b. Reports of Agents, Officers, and Persons, Acting under the Authority of the Secretary of the Treasury, in relation to the Condition of Seal Life on the Rookeries of the Pribilof Islands, and to Pelagic Sealing in Bering Sea and the North Pacific Ocean, in the years 1893-1895. Part Two. U.S. Gov. Print. Off., Washington, DC.

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Appendices: Rookery Photograph Documents, Table of Contents, and Indexes

Appendix A is a memo written by William L. Peck in 1971 that lists the approximate coordinates of the rookeries on St. Paul and St. George islands. The index for the 1896 rookery charts are shown in Appendix B. Information regarding the 1967 aerial imagery and 1988 aerial color transparency series is listed under Appendix C and D, respectively. Appendices E, F, and G offer notes provided by the photographer and/or researchers for the 1895, 1948, and 1960 ground-level photograph series, respectively. Appendix H is a memo written by Victor B. Scheffer in 1965 that offers suggestions of improvements for ground-level photography.

- Appendix A: 1971 memo (rookery coordinates, 5 pages)
- Appendix B: 1896 rookery charts index (1 page)
- Appendix C: 1967 memo (6 pages)
- Appendix D: 1988 aerial photo archival info (4 pages)
- Appendix E: 1895 table of contents (3 pages)
- Appendix F: 1948 memo (6 pages)
- Appendix G: 1960 memo (2 pages)
- Appendix H: 1965 memo (V.B. Scheffer suggestions, 4 pages)

Appendix A: 1971 Memo (Rookery Coordinates)

Dec. 2, 1971

FNW6 Program Director, MMRP, NMFS, Seattle, Wash.
Rookery areas – Pribilof Islands

F3 Attn. Robert Balkovic, NMFS, Washington, D.C.

On November 29 you asked for some general information on locations utilized by fur seals on the Pribilofs. I asked Roy Hurd, Bert Johnson, and Dick Frazier to develop some approximations and this information is attached should you have need for it. The locations listed indicate beach-line distances only – not total areas.

William L. Peck
Attachments (4)
cc: MMBL w/ attachments

WLPeck:mlc

ST. PAUL ISLAND 57° N Latitude 170°15’ W Longitude

Total land area	44.0 square miles
Circumference (approx.)	43.5 miles

Rookery, hauling ground, beach locations utilized – linear distances (approx.)

Polovina	3.40 miles
NE Point	5.00 miles
Zapadni/Tolstoi	3.75 miles
Reef/Gorbatch	2.30 miles
Kitovi/Lukanin	1.25 miles
Total	15.70 miles (approx.)

Percentage of total linear 36

ST. GEORGE ISLAND 56°35’ N Latitude 169°35’ W Longitude

Total land area	33.5 square miles
Circumference (approx.)	30.7 miles

Rookery, hauling ground, beach locations utilized – linear distances (approx.)

North	3.00 miles
East	4.40 miles
Zapadni	5.10 miles
Tolstoi Bluffs	2.10 miles
Total	14.60 miles (approx.)

Percentage of total linear 47.6

Note: The locations listed for St. George Island may appear disproportionate to St. Paul but include sections heavily utilized by sea lion colonies.

ROOKERY LOCATIONS

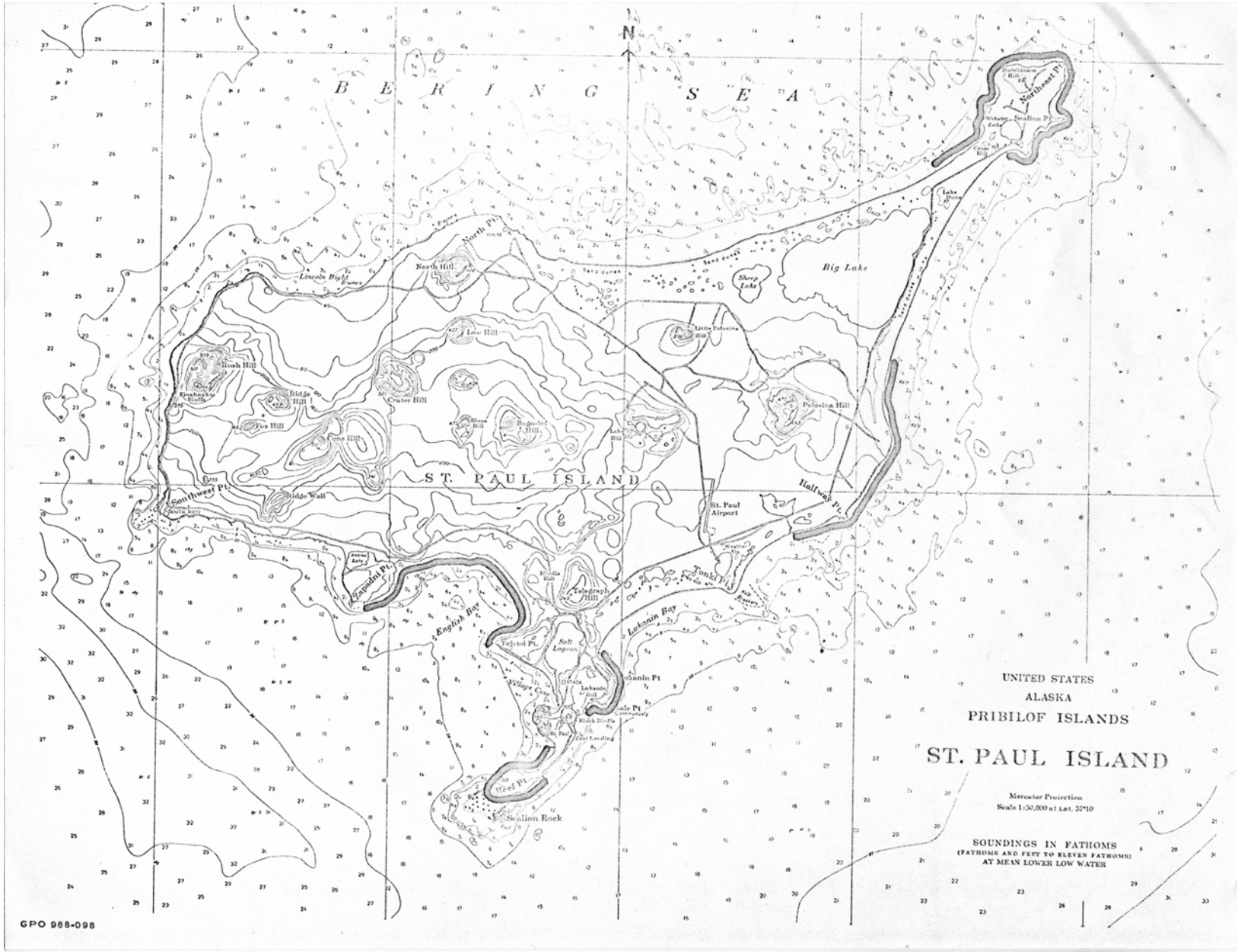
St. Paul Island

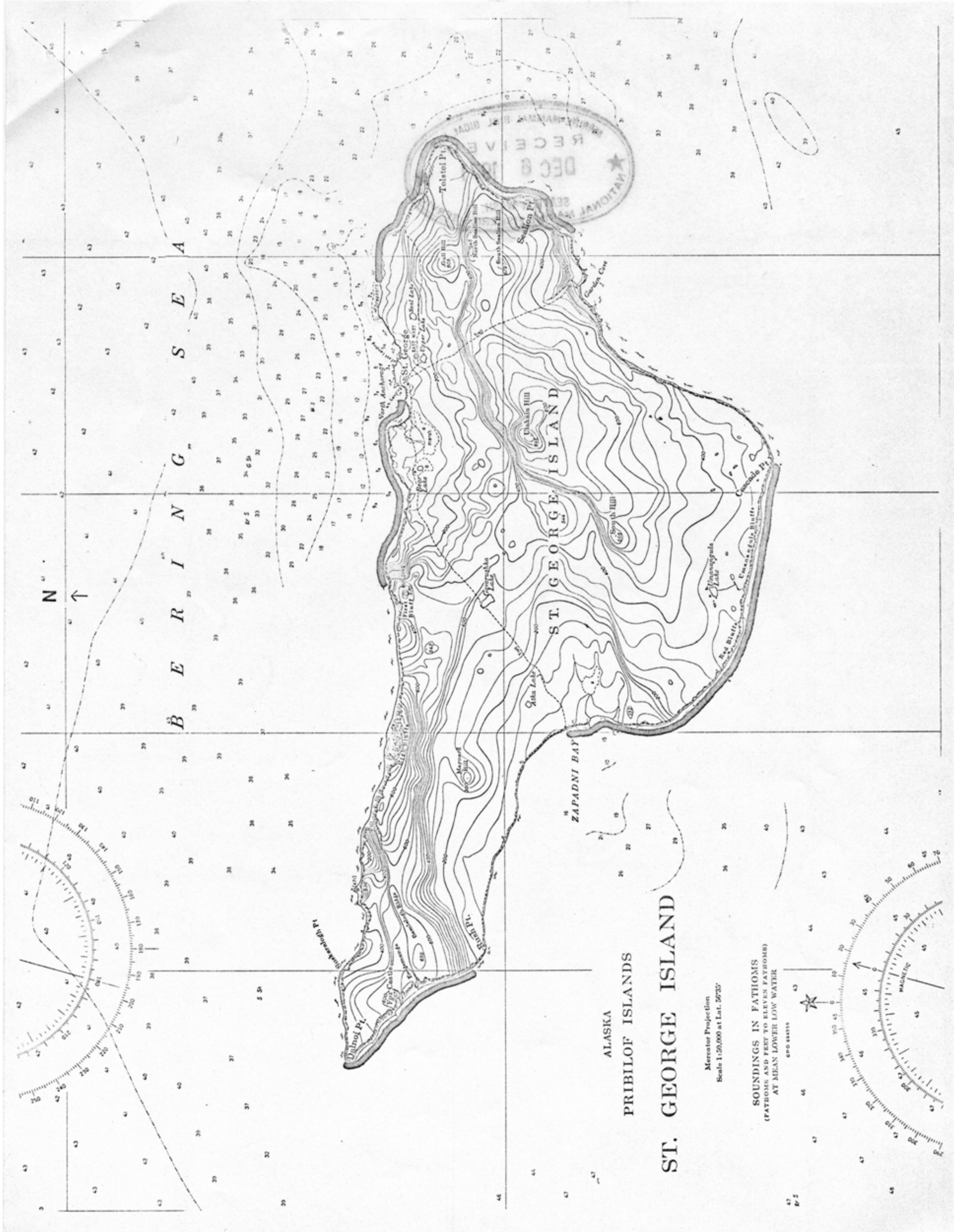
Reef Rookery	All land south of 57°07’ N Latitude
Kitovi/Lukanin Rookery	Beach on the southeast of the island between 57°08’03” N Latitude and 170°15’43” W Longitude
Zapadni/Tolstoi Rookery	Beach on the southwest of the island between 57°08’10.5” Latitude and 170°20’50” Longitude
Polovina Rookery	Beach on the east of the island between 170°11’20” W Longitude and 57°11’47” N Latitude
Northeast Rookery	The beach on the northeast point of the island from 170°06’45” W Longitude on the south side of the point to 170°08’15” W Longitude on the northeast of the point.

St. George Island

North Rookery	Beach on the north of the island between 169°37’05” and 169°32’55” W Longitude.
East Rookery	Beach on the east of the island between 169°30’30” W Longitude on the north side and 169°29’30” W Longitude on the south side.
Zapadni Rookery	Beach on the south of the island between 169°34’15” and 169°39’38” W Longitude
Dalnoi Bluffs Rookery	Beach on the west of the island between 56°35’24” and 56°36’54” N Latitude

[*The following two pages are scanned versions of the navigational charts of St. Paul and St. George islands that were included in the original document]*


N
B E R I N G S E A
ST. PAUL ISLAND
Northeast Pt.
Big Lake
Sheep Lake
North Pt.
North Hill
Lincoln Bight
Low Hill
Rush Hill
Ridge Hill
Crater Hill
Fox Hill
Cone Hill
Polovina Hill
Little Polovina Hill
Southwest Pt.
Ridge Wall
St. Paul Airport
Halfway Pt.
Tonki Hill
Telegraph Hill
Zapadni Pt.
English Bay
Telebei Pt.
Salt Lagoon
Lukanin Bay
Lukanin Pt
Scale Pt
Village Cove
Lukanin Hill
Reef Pt.
Sealion Rock
UNITED STATES
ALASKA
PRIBILOF ISLANDS
ST. PAUL ISLAND
Mercator Projection
Scale 1:50,000 at Lat. 57°10
SOUNDINGS IN FATHOMS
(FATHOMS AND FEET TO ELEVEN FATHOMS)
AT MEAN LOWER LOW WATER
GPO 988-098


ALASKA
PRIBILOF ISLANDS
ST. GEORGE ISLAND
Mercator Projection
Scale 1:50,000 at Lat. 56°35'
SOUNDINGS IN FATHOMS
(FATHOMS AND FEET TO ELEVEN FATHOMS)
AT MEAN LOWER LOW WATER
BERING SEA
ST. GEORGE ISLAND
ZAPADNI BAY
Tolstoi Pt.
Staraya Artil Pt.
Dalnoi Pt.
Garden Cove
Cascade Pt.
South Hill
Ulakaia Hill
North Anchorage
St. George
Red Bluffs

Appendix B: 1896 Rookery Charts Index

Reports of Agents, Officers, and Persons, Acting Under the Authority of the Secretary of the Treasury, in Relation to the Condition of Seal Life on the Rookeries of the Pribilof Islands, and to Pelagic Sealing in Bering Sea and the North Pacific Ocean, in the Years 1893-1895.
In Two Parts. Part II.
[With maps and illustrations. Results of investigations under the direction of the U.S. Commissioner of Fish and Fisheries.]

Senate. 54th Congress, 1st Session. Document 137, Part 2.
Washington: Government Printing Office. 1896.

List of the maps showing the outlines of the rookeries on the Pribilof Islands, 1893.[1]

St. Paul Island

Northeast Point rookery	Chart A
Polavina rookery	Chart B
Ketavie and Lukannon rookeries	Chart C
Reef and Garbotch rookeries	Chart D
Tolstoi and Lagoon rookeries	Chart E
Zapadnie and English Bay rookeries	Charts F and G

St. George Island

Starry Arteel rookery	Chart H
North rookery	Chart I
East and Little East rookeries	Chart J
Zapadnie rookery	Chart K

[1]This set of maps not transmitted for publication, the accompanying set for 1895, showing more reduced area of rookeries, being deemed sufficient.

Appendix C: 1967 Memo

7.04.04/MMBL-UNIV WASH/67

16 Nov. 1967

FILES

Aerial photography of Pribilofs: MMBL and University of Washington

Dr. John C. Sherman (Chairman) and Dr. Willis R. Heath (Associate Professor), Department of Geography, University of Washington, met with MMBL staff members on 24 October 1967. Two proposals were discussed: (1) preparation of a map of the rookeries and hauling grounds based on photographs taken by BLM on 8 and 9 July 1967, and (2) an overflight by a National Air and Space Administration (NASA) crew in which infrared radiation detection devices would be used in an attempt to map the distribution of individual seals or groups of seals.

<u>The Map</u>

Heath would assign a graduate student with skill in cartography, under his supervision, to map the rookeries and hauling grounds and the distribution of seals thereon as of 8 July 1967. The maps would be based on:

a. 222 color positive transparencies (Eastman Ektachrome Aero Film Type 8442; 9.5 × 9.5 inches) of the rookeries, taken with a 6-inch lens at 1,200 ft. with 60 percent overlap.

b. 76 black-and-white negatives (emulsion? 9.5 × 9.5 inches) of St. Paul Island taken with a 6-inch lens at 6,000 ft.; and 7 taken at 1,200 ft.

c. 20 black-and-white negatives (emulsion? 9.5 × 9.5 inches) of St. George Island taken with a 6-inch lens at 6,000 ft.; and 10 taken at 2,100 ft.

d. 15 charts, U.S. Coast and Geodetic Survey 1898; the "Duffield" charts. (A list is attached.)

With memo of 31 October 1967, MMBL sent to Heath source materials for mapping Reef Peninsula (Reef, Ardiguen, and Gorbatch Rookeries and adjacent isthmus toward the village). The labor and cost of making a map of Reef Peninsula will determine the cost estimate for mapping all rookeries.

On 2 November 1967, two blue-line copies of Coast and Geodetic Survey chart no. 3215 (Reef, Ardiguen, and Gorbatch) were sent to Heath.

Heath said that two levels of mapping accuracy are possible. He will aim to provide a workable field map rather than a legally acceptable map. "Uncontrolled mosaics," he said, will be tied in to the Coast and Geodetic Survey charts. Contour lines can be shown in gray or black on a transparent overlay, or "continuous shading relief" can be done. A preliminary suggestion is that the final map will be twice the size of the proposed reproduction for publication.

NASA Overflight

Sherman is interested in a more theoretical use of the seals on land as subjects for an experiment in remote sensing. The proposal would require that a NASA plane carry photographic and infrared sensing instruments over the Pribilofs for the purpose of detecting the seals, preferably as individuals or measurable units. Clear weather would not be necessary for all

the instruments, though it would be for conventional photography. Suggested dates for the flights are 10 June and 10 July. The ceiling of the craft is about 16,000 feet. (How about “ground truth counts” about 23 June and 14 July to coincide with bull counts?)

A preliminary step is to measure the radiation from captive seals with a radiometer to find out whether this approach has promise,

For the purpose of a NASA experiment the Pribilof Islands have important advantages: the MMBL biologists could furnish information on the numbers and distribution of seals during the flights. There are no populations of other mammals (large enough to be important) that would confuse the results. The fact that Pribilof studies are under an international arrangement might also be of some help in obtaining national research funds.

THE "DUFFIELD" ROOKERY CHARTS

U.S. Coast and Geodetic Survey charts nos. 3214 to 3228 were published May to July 1898, on the basis of surveys by Will Ward Duffield in 1897. No. 3214 represents St. Paul Island and no. 3224 St. George Island, both at scale 1:20,000. The other 13 charts are of individual rookeries or groups of rookeries on these islands, scale 1:2,000. The Marine Mammal Biological Laboratory has photo negatives (8 × 10 inches), obtained from the National Archives, of all 15 charts, and 12 of the actual charts. Lacking are no. 3214 (St. Paul Island), no. 3222 (Vostochni Rookery), and no. 3225 (Zapadni Rookery, St. George). As of 2 October 1967, an effort is being made to locate the missing charts through inquiry of the office manager on St. Paul Island.

3214 St. Paul Island

3215 Reef, Gorbatch and Ardiguen Rookeries (with red ink outline of areas occupied by seals. Pencil note says "On account of lack of transportation I did not reach the Pribilofs in 1898 until July 19—too late to find the rookeries at their regular breeding size. The 'spreading back' had already commenced and is necessarily shown in all charts for this year. C. H. Townsend (per H.)." On the back of this chart is another pencil note "Copies of 1898 charts, with rookeries outlined, by C. H. Townsend & James Judge.")

3216 Lukanin and Kitovi Rookeries (with red ink outline of areas occupied by seals. Pencil note says "July 20, 1898, C.H.T.")

3217 Tolstoi Rookery

3218 Zapadni Rookery, St. Paul

3219 Little Zapadni and Zapadni Reef Rookeries

3220 Polovina, Polovina Cliffs, and Little Polovina Rookery

3221 Morjovi Rookery

3222 Vostochni Rookery

3223 Lagoon Rookery (last occupied as a rookery in 1940)

3224 St. George Island

3225 Zapadni Rookery

3226 North Rookery

3227 Staraya Artil and Little East Rookeries

3228 East Rookery

Appendix D: 1988 Aerial Photo Archival Info

Data and Archival Information
Aerial Photography of Northern Fur Seal Rookeries
Pribilof Islands, Alaska, July 1988

Charles W. Fowler and Mark S. Lowry

Photographer: Mark S. Lowry, Southwest Fisheries Center, La Jolla, CA
Pilot:

Plane:

Camera: KA/45-2 (for photos 1-) and KA/51-1 (for photos -)

Notes from film as recorded by ML:
Roll #1

July 11-12 (1988) St. Paul Is.
July 17 (1988) St. George Island (plane was not on Pribs on 17th – cwf, probably meant 12th)
Camera: KA/45-2 f 4.0 1/800 sec.
Film: Kodak Aerochrome MS 2448
Processing: pushed 3/4 stop

Roll #2

July 12, 1988 St. George Is.
Camera: KA/45-2 f 4.0 1/800 sec.
Film: Kodak Aerochrome MS 2448
Processing: pushed 3/4 stop

Roll #3

St. Paul Island
July 12, 1988 f 4.5 1/600 sec.
July 13, 1988 f 4.5 1/800 sec.
Camera: KA/51-1 with 3" lens cone
Film: Kodak Aerochrome MS 2448
Processing: pushed 3/4 stop

Altitude of plane during aerial photography on Pribilof Islands, 1988

Sequence	Altitude (feet)
1-12	800
13-18	800
24-29	800
30-38	800
39-52	800
53-59	800
60-70	800
71-78	800
79-86	800
87-98	800
99-111	800
112-123	800
124-131	800
132-140	800
141-147	800
148-172	800
173-185	800
186-196	800
198-220	800
221-235	800
236-248	800
249-258	800
259-272	800
273-281	800
282-299	800
300-305	800
306-320	800
321-345	800
346-352	800
353-362	800
363-379	500
380-411	500
412-439	500
440-452	450
453-466	450
467-488	450
489-501	500
502-529	500
530-546	500
547-567	500
568-587	400
588-590	Unknown
591-605	700
606-614	800
615-621	775
622-627	800
628-637	700

List of rookeries with corresponding photos, 1988

ST. PAUL

Ardiguen	60-70, 306-320 (see also 53-59)
Gorbatch	53-59, 39-52
Kitovi	71-78, 87-98 (see also 79-86)
Little Zapadni	273-281, 606-614
Little Polovina	353-362
Lukanin	79-86
Morjovi	198-220
Polovina Cliffs	321-345
Polovina	346-352
Reef	1-12, 30-38, 300-305, 628-637
Sea Lion Rock	13-18, 24-29
Tolstoi	99-111, 622-627
Vostochni	112-123, 124-131, 132-140, 141-147, 148-172, 173-185, 186-196, 568-587, 588-590, 591-605
Walrus Island	221-235, 236-248
Zapadni	249-258, 259-272, 615-621
Zapadni Reef	282-299

ST. GEORGE

East Cliffs	412-439
East Reef	530-546, 547-567 (see also 412-439)
North Rookery	467-488, 489-501, 502-529
South	380-411
Starya Artil	440-452, 453-466
Zapadni	363-379

July 11, 1988	Reef	800
July 11, 1988	Reef	800
July 11, 1988	Sea Lion Rock	800
July 11, 1988	Sea Lion Rock	800
July 11, 1988	Reef (South of bird cliff)	800
July 11, 1988	North end of Gorbatch	800
July 11, 1988	Middle of Gorbatch and North end of Ardiguen	800
July 11, 1988	Ardiguen	800
July 11, 1988	Kitovi	800
July 11, 1988	South end of Kitovi	800
July 11, 1988	North end of Lukanin	800
July 11, 1988	Kitovi	800
July 11, 1988	Kitovi	800
July 11, 1988	Tolstoi	800
July 11, 1988	North Tolstoi	800
July 11, 1988	Part of SW Vostochni	800
July 11, 1988	Part of SW Vostochni	800
July 11, 1988	Part of SW Vostochni	800
July 11, 1988	Part of SW Vostochni	800
July 11, 1988	Vostochni – Hutchinson Hill	800
July 11, 1988	SW of Hutchinson Hill	800
July 11, 1988	SW of Hutchinson Hill	800
July 11, 1988	Eastern part of NEP	800
July 11, 1988	Walrus Island	800
July 11, 1988	Walrus Island	800
July 12, 1988	Main Zapadni	800
July 12, 1988	Main Zapadni	800
July 12, 1988	Little Zapadni	800
July 12, 1988	Zapadni Reef	800
July 12, 1988	Ardiguen	800
July 12, 1988	Ardiguen	800
July 12, 1988	Polovina Cliffs	800
July 12, 1988	Polovina Cliffs	800
July 12, 1988	Polovina	800
July 12, 1988	Little Polovina	800
July 12, 1988	Zapadni	500
July 12, 1988	South	500
July 12, 1988	East Cliffs	500
July 12, 1988	East Reef	500
July 12, 1988	Eastern part of East Reef	500
July 12, 1988	North	500
July 12, 1988	Eastern part of North Rookery	500
July 12, 1988	Western part of North Rookery	450
July 12, 1988	Starya Artil	450
July 12, 1988	Starya Artil	450
July 12, 1988	Part of NEP	400
July 13, 1988	Part of NEP	700
July 13, 1988	Little Zapadni	800
July 13, 1988	Zapadni	775
July 13, 1988	Tolstoi	800
July 13, 1988	Reef	700

Appendix E: 1895 Table of Contents

Illustrations of Fur Seal Rookeries in 1896
and Method of Killing Seals

To accompany report of C.H. Townsend, Assistant, United States Fish Commission
Senate. 54th Congress, 1st Session. Document 137, Part 2—Atlas.
Washington: Government Printing Office. 1896.

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Plate 3	Northeast Point Rookery, St. Paul Island, July 24, 1895	Station 2 (South)	1
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Plate 5	Northeast Point Rookery, St. Paul Island, July 24, 1895	Station 4	1
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Appendix F: 1948 Memo

MEMORANDUM TO ACCOMPANY THE GROUND PHOTGRAPHS OF THE FUR-SEAL ROOKERIES, 1948.

The regular series, negatives Nos. 1-132 inclusive was taken on St. Paul Island, July 15-19 and on St. George, July 21-24, 1948. Negatives 1, 2 and 6 were retaken on Reef Rookery, St. Paul, August 1, 1948. Sivertch Rookery could not be photographed from the ground due to weather conditions when time was available.

The equipment used was the old 5 × 7 Press Graflex and Tri-X Panchromatic Film.

In the absence of any information regarding the taking of this series since 1925, it was found advisable to add a number of new photographic stations in order to show all major sections of harem areas. The locations of these new stations are indicated in the descriptions following. Two old stations on North Rookery on St. George have been surrounded by the harem areas.

On the set of photographs which will be filed for use when the series is next taken the locations of all stations which appear in the photograph are shown-old stations in black and new stations in red. Most of the new stations are located on the tripods or counting towers. The elevation thus gained gives a more comprehensive view of the harem areas.

Photo #'s (indicated on photo)	Notes (provided by Memo)
1-2	Two exposure panoram. Location Photographic Station G, near Rock No. 38 Reef Rookery, St. Paul Island, facing West, August 1, 1948. The original exposures taken July 15 were not satisfactory making a retake necessary. The location of new Photographic Station E1 is indicated on Photo 1. The locations of Photographic Stations E and F are shown on 2.
3-5	Location—New Photographic Station E1 on top of tripod on rocky outcropping near Rock No. 30, Reef Rookery, St. Paul Island, July 15, 1948, Photograph 3 facing East. The location of Photographic Station G is shown on 3. Photographs 4-5 make a two exposure panarom, facing West. The location of Photographic Station D is shown on 5.
6	Location—Photographic Station F about 100 yards Southeast of Castle Rock, the top of which is Photographic Station E. Reef Rookery St. Paul Island, July 15, 1948.
7-10	Four exposure panoram. Location—Photographic Station E on Castle Rock in rear of Rocks Nos. 26 and 27 on Reef Rookery, St. Paul Island, July 15, 1948. E1 shown on 7.
11-14	Four exposure panoram. Location—Photographic Station D on line between Rocks Nos. 3 and 8 on Reef Rookery, St. Paul Island, July 15, 1948.

15-16	Two exposure panoram. Location—Photographic Station C on Rock No. 3 on Ardiguen Rookery, St. Paul Island, July 15, 1948.
17-18	Two exposure panoram. Location—New Photographic Station B2 at top of first sandy dome west of Rock No. 1 on Gorbatch Rookery, St. Paul Island, July 15, 1948. Facing East.
19-20	Two exposure panoram. Location—New Photographic Station B1 on top of tripod on hauling ground near Rock No. 7 on Gorbatch Rookery, St. Paul Island, July 15, 1948. Facing West.
21-22.	Two exposure panoram. Same location and date as 19-20 above. Facing East. Between panorams 19-20 and 21-22 and directly below the tripod the seals have left a roadway or channel through the harem area to permit the bachelors to reach the hauling ground. This can be seen on the following panoram (23-24). The location of Photographic Station B is shown on 21.
23-24	Two exposure panoram. Location—Photographic Station B near Rock 23 on Gorbatch Rookery, St. Paul Island, July 15, 1948. Facing West. The new location of Photographic Station B1 is shown at apex of tripod on Gorbatch hauling ground on 24. The location of Photographic Stations D and E are shown on 23.
25-26	Two exposure panoram. Location—Photographic Station A at Rock No. 5 (near hauling ground at Southwest end of rookery), on Polovina Rookery, St. Paul Island, July 16, 1948. Facing Northeast. The locations of New Photographic Stations A1 and A2 are shown on 25.
27-30	Four exposure panoram. Location—New Photographic Station A1 on small rocky dome halfway between and to the rear of the first and second tripods from Southwest end of Polovina Rookery, St. Paul Island, July 16, 1948. The location of Photographic Station A is shown on 27. First tripod is near Rock No. 7, second tripod is near Rock No. 8.
31-34	Four exposure panoram. Location—New Photographic Station A2 on low rocky blister halfway between second tripod (near Rock No. 8) and third tripod (near Rock No. 9) but well to the rear. Polovina Rookery, St. Paul Island, July 16, 1948. The location of Photographic Station B is shown.
35-36	Two exposure panoram. Location—Photographic Station B on Polovina Rookery, St. Paul Island, July 16, 1948. At high tide the reef in the background at left is covered with water. The seals in the foreground are about fifty (50) feet above the reef.
37-38	Single exposures. Thirty seven (37) faces Northeast and Thirty eight (38) faces Southwest. Location—Photographic Station C but on tripod on Polovina Cliffs Rookery, St. Paul Island, July 16, 1948. The location of Photographic Station D and new station D1 is shown on exposure 37. Photographic Station B is shown on exposure 38.

39-40	Two exposure panoram. Location—Photographic Station D but on tripod facing Northeast, on Polovina Cliffs Rookery, St. Paul Island, July 16, 1948. Thirty nine (39) had to be retaken on July 18 and does not overlap 40. The location of new Photographic Station D1 is shown on 40. Note cave on line with right leg of tripod. A harem has been in this cave annually for 28 years at least.
41	Location—new Photographic Station D1 on tripod near Rock No. 15 Polovina Cliffs Rookery, St. Paul Island, July 16, 1948. Facing Northeast.
42	Location—Photographic Station E on Little Polovina Rookery, St. Paul Island, July 16, 1948, facing Northeast. The location of new Photographic Station E1 is shown.
43-44	Location—new Photographic Station D1 on the tripod near Rock No. 22 and the end of the cliffs on Little Polovina Rookery, St. Paul Island, July 16, 1948. Forty three (43) faces Southwest. The location of Photographic Station E is shown. Forty four (44) faces Northeast.
45	Location—Photographic Station F near Rock No. 89 on Vostochni Rookery, St. Paul Island, July 17, 1948. The location of Photographic Station E is shown.
46	Location—Photographic Station E near Rock No. 81 on Vostochni Rookery, St. Paul Island, July 17, 1948. Hauling ground seals are visible at right center.
47-50	Four exposure panoram. Location—new Photographic Station D2 on ridge in rear of Rock No. 67 on Vostochni Rookery, St. Paul Island, July 17, 1948.
51-54	Four exposure panoram. Location—new Photographic Station D in rear of Rock No. 57 on Hutchinson Hill, Vostochni Rookery, St. Paul Island, July 17, 1948. The location of the new Photographic Station D1 is shown on 54. Exposures do not overlap.
55-56	Single exposures, 55 facing West and 56 facing East. Location—new Photographic Station D1 halfway between Rocks Nos. 46 and 47 and to the rear, on Vostochni Rookery, St. Paul Island, July 17, 1948. The location of Photographic Station D is shown on 55.
57-59	Two exposure panoram (57-58). Location—new Photographic Station B2 on tripod near Rock No. 35 on Morjovi Rookery, St. Paul Island, July 17, 1948. Facing North. Fifty nine (59) single exposure facing South. The location of new Photographic Station B1 is shown on 59.
60	Location—New Photographic Station B1 on tripod near Rock No. 25 on Morjovi Rookery, St. Paul Island, July 17, 1948. Facing North.
61	Location—Photographic Station B on Morjovi Rookery, St. Paul Island, July 17, 1948. Facing North. The location of new Photographic Station B1 is shown.

62-63	Two exposure panoram. Location—Photographic Station F near Rock No. 30 on Zapadni Rookery, St. Paul Island, July 18, 1948. Weather foggy.
64-66	Three exposure panoram. Location—Photographic Station E on Zapadni Rookery, St. Paul Island, July 18, 1948. Weather foggy.
67-72	Two panoram, three exposures each. 67-69 facing South and 70-72 facing North. Location—New Photographic Station D2 on tripod near Rock No. 21 on Zapadni Rookery, St. Paul Island, July 18, 1948. On 68 the locations of Photographic Stations E and F are shown. On 71 the locations of the new Photographic Station D1 and the old station D (on Little Zapadni Rookery) are shown.
73-77	Two panoram. 73-74 two exposures facing South and 75-77 three exposures facing North. Locations—New Photographic Station D1 on tripod near beach opposite Rock No. 16 on Zapadni Rookery, St. Paul Island, July 18, 1948. The location of new Photographic Station D2 is shown on 73.
78	Location—Photographic Station D on Little Zapadni Rookery, St. Paul Island, July 18, 1948. Facing South and showing North end of Zapadni Rookery.
79-82	Four exposure panoram. Location—New Photographic Station C1 at Rock No. 11 on Little Zapadni Rookery, St. Paul Island, July 18, 1948.
83-85	Three exposure panoram. Location—Photographic Station C on Little Zapadni Rookery, St. Paul Island, July 18, 1948. The location of Photographic Station B is shown on 85.
86-87	Two exposure panoram. Location—Photographic Station B on Little Zapadni Rookery, St. Paul Island, July 18, 1948. The approximate location of Photographic Station C is shown on 87.
88	Single exposure. Location—Photographic Station A on Zapadni Reef Rookery, St. Paul Island, July 18, 1948. The location of new Photographic Station A1 is shown.
89-92	Single exposures. Location—New Photographic Station A1 on tripod between Rocks Nos. 30 and 31 on Zapadni Reef Rookery, St. Paul Island, July 18, 1948. 89 looking East, 90 looking Southeast, 91 looking Southwest, 92 looking West.
93-95	93-94 a two exposure panoram facing West, 95 a single exposure facing East. Location—New Photographic Station B1 near Rock No. 18 on West end of Tolstoi Rookery, St. Paul Island, July 19, 1948.
96-97	Two exposure panoram. Location—near Photographic Station B but on end of runway on Tolstoi Rookery, St. Paul Island, July 19, 1948. Note that nearly all cows have gone to the water. When the next series of photographs are taken another new station should be established at one of the two places marked “X”.

98-99	Two exposure panoram. Location—Photographic Station A on Tolstoi Rookery, St. Paul Island, July 19, 1948. The location of Photographic Station B is shown on 98 and the approximate location of the new Photographic Station B1 is shown on 99.
100-101	Two exposure panoram. Location—Photographic Station F, Lukanin Rookery, St. Paul Island, July 19, 1948. The location of Photographic Station E is shown on 100.
102-103	Two exposure panoram. Location—Photographic Station E, Lukanin Rookery, St. Paul Island, July 19, 1948. The location of Photographic Station F is shown on 102.
104-105	Single exposures. Location—Photographic Station D (105) on Kitovi Rookery, St. Paul Island, July 19, 1948. 104 taken from top of large rock at left center of 105 in order to get a better viewpoint.
106	Location—Photographic Station C on Kitovi Rookery, St. Paul Island, July 19, 1948. Facing South.
107-110	Four exposure panoram. Location—Photographic Station B on Kitovi Rookery, St. Paul Island, July 19, 1948. FWS Penguin can be seen on 110.
111-112	Two exposure panoram. Location—Photographic Station A on Kitovi Rookery, St. Paul Island, July 19, 1948. The location of Photographic Station B is shown on 112.
113-114	Two exposure panoram. Location—Photographic Station A on Staraya Artil Rookery on St. George Island, July 21, 1948. Weather rainy and foggy.
115-116	Two exposure panoram. Location—Photographic Station A on Zapadni Rookery, St. George Island, July 22, 1948.
117	Location—New Photographic Station A on a projecting point of cliff near the only place of descent to beach at north end of rookery. Facing South.
118	Location—New Photographic Station B on a projecting point of cliff at the South end of the rookery. Facing North.
119-120	Two exposure panoram. Location—Photographic Station A on East Cliffs Rookery, St. George Island, July 23, 1948. Facing Southeast.
122	Single exposure same location as 119-120 but facing Northwest.
121	Location—New Photographic Station A1 near Rock No. 9, facing West on East Reef Rookery, St. George Island, July 23, 1948.
123	Location—New Photographic Station A1 on a projecting point of cliff South of Rock No. 1 and forming the East bank to the hauling ground creek emptying into Village Cove. North Rookery, St. George Island, July 24, 1948.

124-125	Two exposure panoram. Location—New Photographic Station A2 at cairn and navigational beacon at top of ridge above Rock No. 4 on North Rookery, St. George Island, July 24, 1948. Facing Northwest. The location of Photographic Station A is shown on 124.
126-127	Single exposures. 126 faces East and 127 faces West from Photographic Station A on North Rookery, St. George Island, July 24, 1948.
128-129	Two exposure panoram. Location—New Photographic Station A3 at cairn above Rock No. 12 facing West. North Rookery, St. George Island, July 24, 1948. Old Station C lies within the present harem area and could not be used.
130-132	Two exposure panoram. Location—New Photographic Station D1 on ridge above Terminal rock, facing East on North Rookery, St. George Island, July 24, 1948. Old Station D lies within the harem area and could not be used. 132 facing Southwest showing hauling ground seals enroute to water. This completes the regular series of rookery photographs taken in 1948.
133, 139, 140	Polovina Cliffs Rookery, taken August 6, 1948, 21 days after the regular series to show the expansion of breeding areas after harems break up.
135-138	Vostochni Rookery, Station D, taken August 6, 1948, for same purpose as above.
134	Not a fur seal rookery picture but showing drums of fur seal oil at the ByProducts Plant.

Appendix G: 1960 Memo

Office Memorandum. United States Government

To: Regional Director, BCF, Seattle 1, Washington Date: October 1, 1960

From: Director, Pribilof Fur-Seal Program, Saint Paul Island, Alaska

Subject: Comparative photographs of Pribilof rookeries

Following up on my initial forwarding, as covered by my memo to you of Sept. 10, find enclosed the following prints of St. Paul Island fur-seal rookeries assembled to correspond with the E.C. Johnson series of 1948:

Nos.	**Dates**	**Photographer**	**Rookeries**
1-24A	July 25 & 26	Ford Wilke	Reef, Ardiguen and Gorbatch, plus Zoltoi
25-44	July 25	Roy Hurd	Polovina
45-61	July 27 & 28	Ford Wilke	Vostochni and Morzhovi at N.E. Point
100-112	July 28	Roy Hurd	Lukanin and Kitovi

Series 113-132 of St. George Island and photographed by Carl Hoverson accompanied by memo of Sept. 10.

#62-92 of Zapadni Rookeries and 93-99 of Tolstoi were not printed of the 1960 series due to a combination of difficult weather and photographic misjudgement. Unsuitability of the exposures was not discovered until too late to obtain views of comparative value. However, the balance should be adequate, both for assessing the usefulness of this method to obtain whatever impressions may be gained of relative seal abundance between 1948 and 1960.

The series of photographic prints have been assembled in three sets: one accompanies this memo, another accompanies copy to the Director, and the third is being filed in the St. Paul office along with all 1960 negatives and an unassembled set of the 1948 Johnston prints. Also forwarded to Washington under the same cover is the assembled 1948 set of prints loaned to us with Ralph Baker's memo to you of July 21. Series 113-132 for 1948 of the St. George rookeries have previously been returned to Mr. Baker with our memo of Sept. 10 mentioned above.

We will be glad to have an opportunity to review these photographs with interested persons.

Encl: prints tabulated above C. Howard Baltzo

cc: Director, Wn. w. prints above and 1948 set
Hurd w. prints above, negatives, and 1948 set
Anadramous Fisheries, Wn.
General Manager
Wilke

GROUND PHOTOGRAPHS OF THE PRIBILOF FUR-SEAL ROOKERIES, 1960
St. George Island, July 28, 29 & 30

Exposures and prints by Carl Hoverson using Ciroflex 120 camera and Verichrome Pan film.
Numbers correspond to similar pictures taken in 1948 by Agent E.C. Johnston.

Photo #'s (indicated on photo)	Notes (provided by Memo)
113-114	2-exposure panorama westerly from photographic station A on Staraya Artil rookery
115-116	3-exposure panorama northerly from photo station A on Zapadni rookery
117 & 118	No pictures taken in 1960
119-120	2-exposure panorama southeasterly from photo station A on East Cliffs rookery
121	Westerly from photo station A1 near Rock #9 on East Reef rookery
122	Northwesterly from photo station A at East Cliffs rookery, like 119 & 120
123	Westerly from a point near large rock at edge of cliff about 300 yards east of Johnston's photo station A1 at North rookery. Station A1 is marked by black blob of ink at edge of cliff to left of top center.
124-125	3-exposure panorama northwesterly from photo station A2 at navigational beacon at top of ridge above Rock #4 on North rookery. Location of photo station A is marked by black blob of ink near extreme left.
126	Easterly from photo station A on North rookery.
127	Westerly from photo station A on North rookery.
128-129	2-exposure panorama westerly from photo station A3 at site of cairn above Rock #12 on North rookery.
130-131	2-exposure panorama easterly from photo station D1 on ridge above Terminal Rock on North rookery. St. George village in middle distance.
132	Southwesterly from photo station D1 on North rookery, like 130 & 131. Idle bulls at rest on hauling grounds back of cliffs.

Matched and assembled by Howard Baltzo

Appendix H: 1965 Memo (V.B. Scheffer Suggestions)

13 August 1965

Biologist in Charge, MMBL, BCF, St. Paul Island, Alaska

Biologist, MMBL, BCF, Sand Point NAS, Seattle, Wash.

Photographs of Pribilof rookeries from camera stations

I have recently studied two sets of rookery photographs, one taken in 1948 by E.C. Johnston and the other taken in 1960 by Carl Hoverson, Roy Hurd, and Ford Wilke. The areas occupied by breeding seals in the two years cannot be compared. C. Howard Baltzo (in conversation) earlier expressed the same opinion. Emphasis seems to have been placed on comprehensive coverage of the rookeries at the expense of comparative coverage. Principal criticisms of the 1948 versus 1960 sets are as follows:

1. The old 5 × 7 Press Graflex used by Johnston was in very poor condition and the pictures it took were not sharp.

2. At least two cameras (2 ¼ × 2 ¼ and 4 × 5) were used in 1960, and possibly a third. None had the same focal length as the old Graflex. As a result, the perspectives are unlike.

3. The 1948 and 1960 sets were not photographed on corresponding dates, and in some instances were 11 days apart. This is an important difference in the latter half of July when rookery patterns are changing rapidly.

4. Mediocre records were kept. The taking of the 1925 set was not mentioned in the published annual report of the fur seal industry for that year. I have found no description of the modern camera stations, though some 1898 charts show the location of a few. Photographs were evidently made in 1893, 1894, and 1895; again in 1905 and 1906; and not again until 1925.

Land photography could be worthwhile for comparative purposes and I would suggest the following changes in order to standardize and streamline the procedure:

1. Take photographs from six strategic stations only (or eight stations if St. George Island is to be included).

2. Take them every year during the bull count, starting on Reef on 10 July.

3. Take them from stations selected as being on high ground, on permanent rocks rather than on tripods, and on sites facing smooth-surface rookeries. A list of stations is appended, with 1948 photographs taken from the eight proposed stations. (These prints need not be returned; they are from a broken set.)

4. Use a tripod-mounted 4 × 5 camera with focal length of 6 inches (15 cm). This is the normal lens for many 4 × 5 cameras, including the Crown Graphic now on St. Paul Island. Take all exposures with the longer dimension of the camera vertical. Since all the photos will be panoramas, this will give wider coverage and opportunity for cropping. Ignore the horizon, which is often not visible anyway, and take all photos with the camera horizontal.

5. Use panchromatic, slow-to-medium sheet film; not film pack.

6. Carry a list of the stations and a set of previous (1965?) photos mounted in panorama form and covered with protective plastic, so that current photos can be taken of the same landscape.

7. File the negatives with the prints in Marine Mammal Biological Laboratory file No. 7.04.04. (I do not know where the 1925 or 1948 negatives are stored; presumably in Washington.)

RECOMMENDED LAND CAMERA-STATIONS[1]

Station	**Exposure numbers in 1948 and 1960 series[2]**	**Explanation**
Reef E	7-10	5-exposure pan, with left exposure centered on first (NE) Tower.
Gorbatch B_2	17-18	3-exposure pan, with left exposure centered on columnar-lava sea cliff.
Polovina A_2	31-34	5-exposure pan, with right exposure centered on first (SW) catwalk.
Vostochni D	51-54	5-exposure pan, with right exposure centered on Hutchinson Hill catwalk.
Kitovi D_1	new	2-exposure pan joining at the head of the small bight. This is a new station to be selected in 1965 at a recorded distance and direction from the Observation Hut ("Bomb Shelter").
Kitovi C	106	2-exposure pan joining at Rock 14.

[1] It is proposed that a set of photographs according to the following schedule be taken in September 1965 in order to establish a standard view from each station.

[2] For example, four exposures (nos. 7-10) covered this panorama in 1948 and 1960. With a different lens, however, fewer or more exposures might be necessary to achieve similar coverage.

ST. GEORGE ISLAND (OPTIONAL)

Staraya Artil A	113-114	2-exposure pan joining at tower.
Zapadni A	115-116	2-exposure pan with left exposure centered on E end of bay. If necessary, because of extension of seals eastward, add a third exposure at the right.

If you think it advisable to continue photography from land stations on a limited basis, I would suggest that you do the following in 1965:

1. Visit the six stations on St. Paul at any time during the summer or fall when visibility is reasonably good.

2. Photograph each station from N, E, W, or S and describe in terms such as “rock with white-painted D.”

3. Take standard reference panoramic photographs as outlined above.

4. Arrange to have station Polovina A_2 raised about 6 feet by dumping two truckloads of large bounders on it. Same for Staraya Artil A.

5. Bring to Seattle at the end of summer the Crown Graphic so that we can have it cleaned and adjusted. The present spring-held “Graflex” back is stiff and awkward; it should be replaced with a modern “Graphlok” back. A bubble-level should also be added.

Victor B. Scheffer

Attach: 8 photographs from eight 1948 camera stations

cc: R.O.