North Pacific Pelagic Seabird Database: Progress and Prospects

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INTRODUCTION

Data on the pelagic distribution and abundance of seabirds are critical for understanding the basic ecology of marine birds, monitoring population trends, assessing impacts of human activities, identifying critical marine habitats, and educating the public about seabird conservation. To address these needs, the U.S. Geological Survey and U.S. Fish and Wildlife Service have undertaken the task of consolidating and providing comprehensive geographic data on the pelagic distribution of seabirds in Alaska and the North Pacific.

The need for comprehensive geographic data on the pelagic distribution of seabirds in Alaska and the Northern Pacific has long been recognized. During the Outer Continental Shelf Environmental Assessment Program (OCSEAP) of the 1970's, millions of dollars were spent to gather these data in advance of oil development on Alaska's continental shelves. Ancillary data were routinely collected on environmental conditions (e.g., ice, temperature, salinity) and on marine mammals. This work culminated in an atlas on the "Pelagic Distribution and Abundance of Seabirds in the Gulf of Alaska and Eastern Bering Sea" (Gould et al. 1982) that documented the at-sea distribution and abundance of 16 common seabird species in Alaska. In addition to this work, extensive reports by other key investigators (e.g., Hunt et al. 1981) laid the foundation for our understanding of the pelagic biology and distribution of seabirds around the Northern Pacific.

The North Pacific Pelagic Seabird Database (NPPSD) currently consists of historical data collected primarily in the 1970s, but is being updated with more recent data from Cook Inlet, Prince William Sound, and Glacier Bay. The NPPSD will be an ongoing project that will serve as a repository and server for future pelagic survey data from the North Pacific.

Since the collection of the OCSEAP data, an enormous number of surveys have been conducted to determine the pelagic distribution of seabirds in Alaska (e.g., Hunt & Harrison 1990, Piatt et al. 1991, 1993, 1997; Schauer 1992, Elphick & Hunt 1993, Hunt et al. 1993, Gould & Piatt 1993, Klosiewski & Laing 1994, Agler et al. 1998, 1999). These data exceed the original OCSEAP database in size (Table 1), and include extensive new data sets from areas that were poorly sampled in OCSEAP studies (e.g., SE Alaska, Prince William Sound, Cook Inlet, western Aleutians, western Bering Sea), as well as systematic and repetitive surveys in some of these areas. The conceptual model for the NPPSD illustrates how we are integrating datasets and the outputs that we have built into the project (Fig. 1).

Table 1. Summary of primary pelagic seabird datasets that may be incorporated in the pelagic seabird atlas. Area surveyed (km^2) was estimated from the numbers of transects conducted times transect area (length times width).

Source	Type	Years	Square km	Area
OCSEAP	Ship/Aerial	1976-1984	63,100	Northern Pacific (All Areas)
Hunt et al.	Ship	1976-1998	20,000	Bearing Sea, Aleutians
Irons et al.	Smallboat	1984-1995	2,520	Prince William Sound, Gulf of Alaska
Kodiak NWR	Ship	1984-1998	8,100	Kodiak
Laing et al.	Smallboat	1989-1991	1,700	Prince William Sound
Gould et al.	Ship	1989-1992	3,350	North Central Pacific, Gulf of Alaska
Day et al.	Ship	1980-1988	10,160	Bearing Sea, North Central Pacific
Schauer et al.	Ship	1988-1991	1,630	Bearing Sea, Chukchi Sea
Piatt et al.	Ship	1988-1999	9,800	Alaska (All Areas)
Byrd & Piatt	Ship	1995-1999	2,600	Bearing Sea
Lindell	Ship	1993-1998	1,700	Southeast Alaska
TOTAL			125,890	

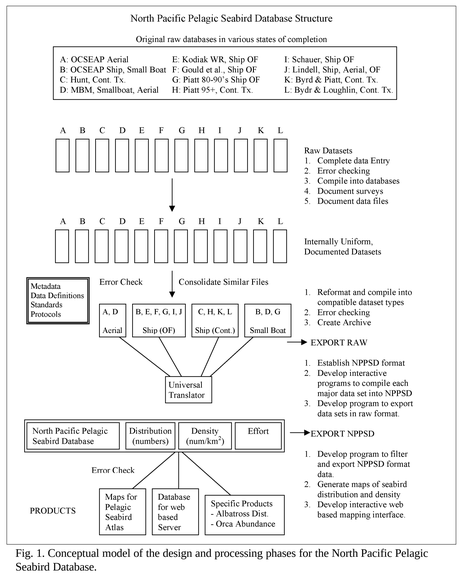
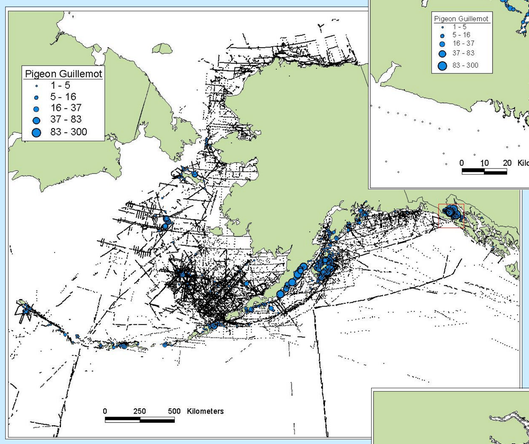


Fig. 1. Conceptual model of the design and processing phases for the North Pacific Pelagic Seabird Database.

The core of the NPPSD remains the OCSEAP dataset (242 surveys), comprising >60,000 standard transects with >325,000 records that document the environment, distribution and group size of >4,000,000 animals (Table 1). During the process of importation to the Access relational database, numerous entry and cataloging errors were discovered in the digital data obtained from NOAA. We have since verified through careful cross-checking of original data sheets, we have removed all identified errors and duplications and documented the data.



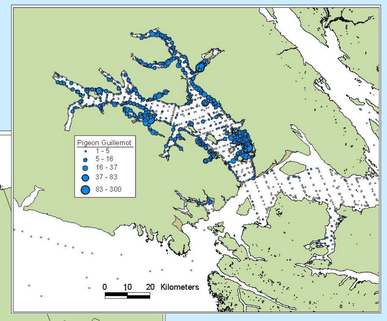
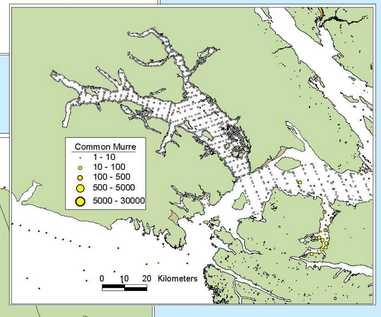


Fig.2. Distribution of Pigeon Guillemots around Alaska, and Glacier Bay, AK (Inset). Numbers are based on 10 min. counts.



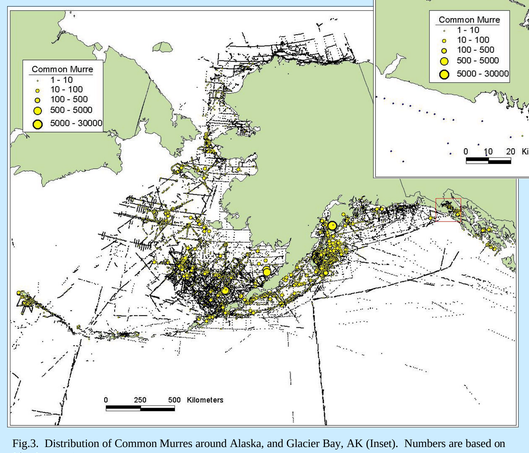


Fig.3. Distribution of Common Murres around Alaska, and Glacier Bay, AK (Inset). Numbers are based on 10 min. counts.

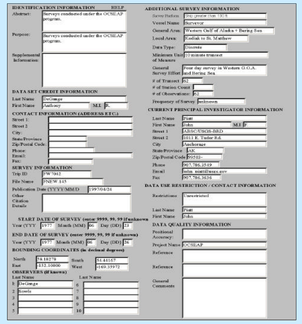


Fig. 8. Screen shot of the "NPPSD Metadata Entry Form".

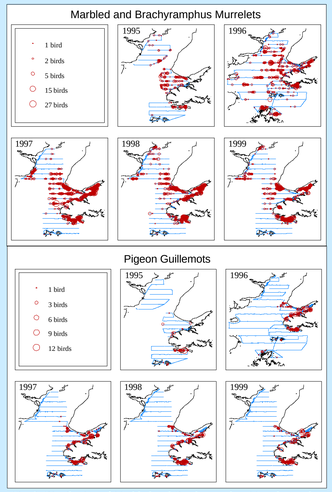
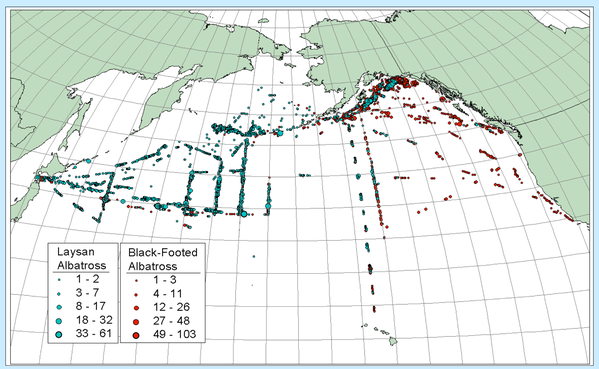


Fig. ? Distribution of Marbled and Brachyramphus Murrelets and Pigeon Guillemots in Cook Inlet 1995-1999 from Piatt et al 1997.



Distribution of Laysan and Black-Footed Albatross in the North Pacific. Counts were based on data from the

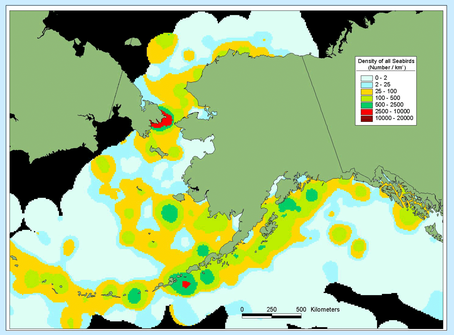


Fig. 6. Density of all seabirds (number per km^2) around Alaska. Note, densities were calculated using only the OCSEAP dataset.

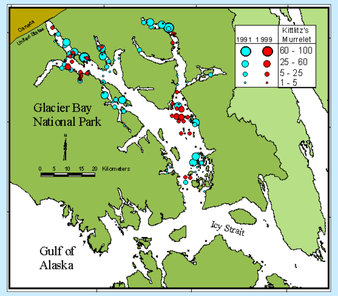


Fig. 5. Comparison of Kittlitz's Murrelet sightings in Glacier Bay 1991 and 1999.

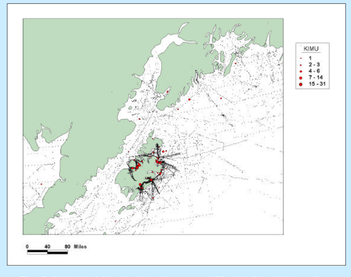


Fig. 6. Kittlitz's Murrelet sightings around Kodiak Island (from the OCSEP dataset).

Maps of species distribution show patterns that are scale dependent (Figs. 2-3). Simple counts can be used to identify a species range and understand relationships of scale, however, variable methodologies limit comparability between datasets. Variable speeds, time blocks, and transect widths on these datasets has required that we calculate a density for each species using a similar time (10 min.) or sample area (approximately 1km^2).

Given that the NPPSD remains a work in progress, we have nonetheless been able to supply useful information on seabird distribution to the U.S. Fish and Wildlife Service and the Minerals Management Service. The U.S. Fish and Wildlife Service used information about at sea distribution of Black-Footed and Laysan albatross in developing fishing regulations (Fig. 4). We provided distribution data of Kittlitz's Murrelet to the USFWS to assist in the proposal for listing this species(Fig. 5). We also calculated summer seabird density for the Minerals and Management Service using the OCSEAP dataset (Fig. 6 and 7).

Documentation of the NPPSD will take on various forms including a users guide. The NPPSD Metadata database (Fig. 8) will be am integral tool to document and provide advanced tools for querying the data.

In total, the pelagic survey data in our archive represent 30 years of information on the distribution and density of seabird and marine mammal abundance. By combining all available datasets, it will be possible to conduct a variety of analyses as described above. Furthermore, it will be possible to assess whether patterns of seabird distribution or species composition have changed as food supplies and marine climate fluctuated during the past 30 years (Ainley et al. 1995, Viet et al. 1996). The NPPSD represents a dynamic tool that will provide access to an archive of past, present, and future surveys.

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