

PHOTO-IDENTIFICATION AND HAUL-OUT COUNTS OF PINNIPEDS IN NARRAGANSETT BAY, RHODE ISLAND AND CHESAPEAKE BAY, VIRGINIA

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INTRODUCTION

- Harbor seal (*Phoca vitulina concolor*) and gray seal (*Halichoerus grypus*) distribution along the U.S. Atlantic coast has shifted in recent years, with an increased number of seals reported in southern New England and the mid-Atlantic region [3]; [6]. New Jersey has been considered the southern extent for harbor and gray seals [4], with occasional sightings and strandings reported as far south as Florida and North Carolina for harbor and gray seals, respectively [6]. NOAA now reports that a small group of harbor seals may haul out seasonally in the Chesapeake Bay [6].
- During the winter of 2014-2015, we began a preliminary study to investigate seal presence at select haul-out locations in Narragansett Bay, RI (Figures 1 and 2) and Chesapeake Bay, VA (Figures 3 and 4). The study is ongoing in 2015-2016 with the following objectives:
 - assess seal occurrence, movement and haul-out patterns in areas adjacent to Navy training and testing areas, and
 - using photo-identification methods, identify and compare individual seals to assess site fidelity and movement among haul-out locations in the study areas.



Figure 1: Haul-out location in Rhode Island.



Figures 2 and 3: Haul-out locations in Rhode Island (top) and Virginia (bottom).



Figure 4: Haul-out locations in Virginia.

METHODS

- Following NOAA seal watching guidelines [5], a series of systematic, land-based counts of all seal species (hauled out and in the water) were conducted at one haul-out location in Narragansett Bay and four in the lower Chesapeake Bay.
- Photographs of seals were collected between counts. Multiple photos of each seal, which focus on the profile (e.g. neck region), dorsal, lateral, and ventral side, were taken when possible in order to obtain a good image of the pelage pattern.
- We are currently using WILD-ID software ([1]; Figure 5) and Extract-Compare ([2]; Figure 6) to compare and identify individual seals for a mark-recapture study.

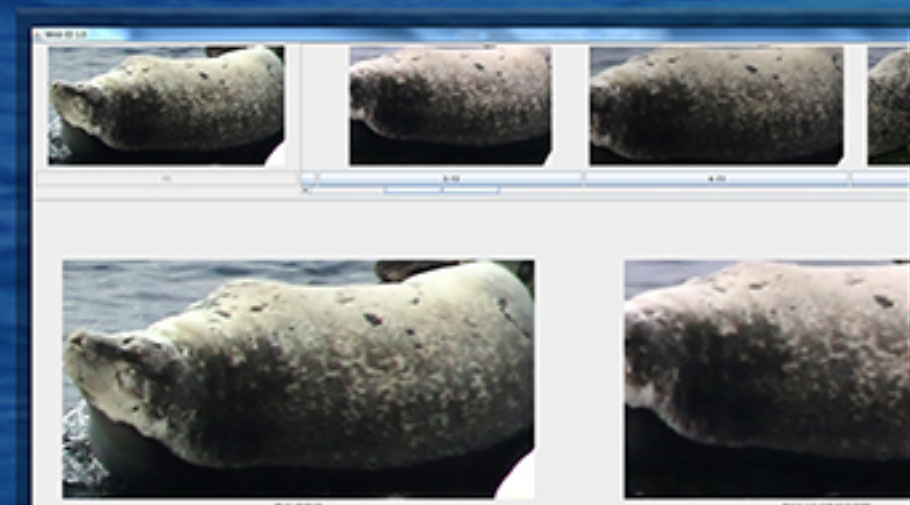


Figure 5: A screen shot of photo analysis in WILD-ID.

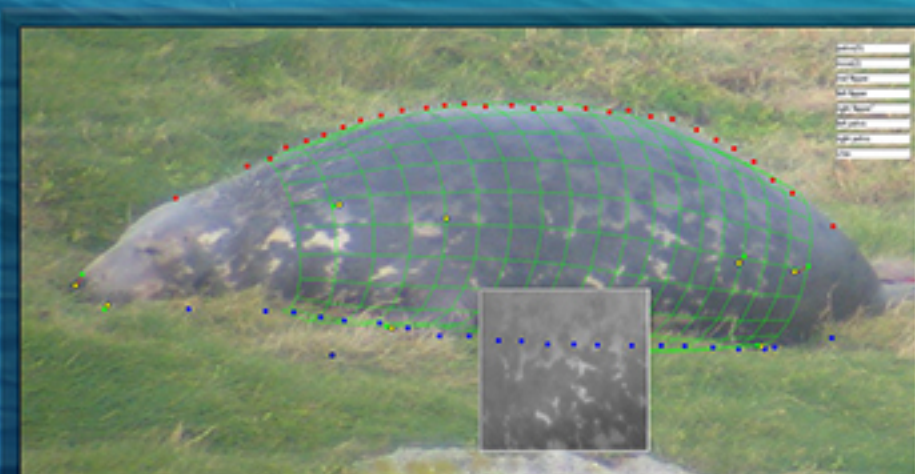


Figure 6: A screen shot of photo analysis in Extract-Compare.



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PHOTO-IDENTIFICATION METHODS

- Based on preliminary assessments in WILD-ID, a threshold similarity score cutoff of 0.01 (Figures 7 and 8) will be used for this study to minimize false positives. Across the range of thresholds, the false negative rate remains high, which could introduce bias if these data were used to estimate the population in the future.

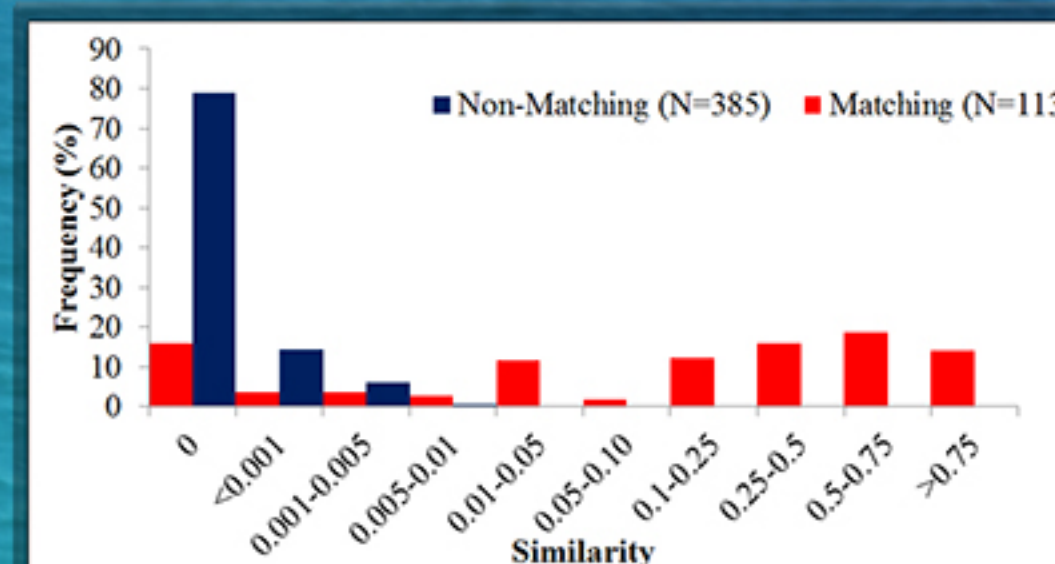


Figure 7: Frequency distribution of WILD-ID correlation coefficients for known matching and non-matching seals in Rhode Island. 99.5% of known non-matches scored below 0.005 and 93% below 0.001, while 62% of known matches scored above 0.1 and 74% above 0.001.

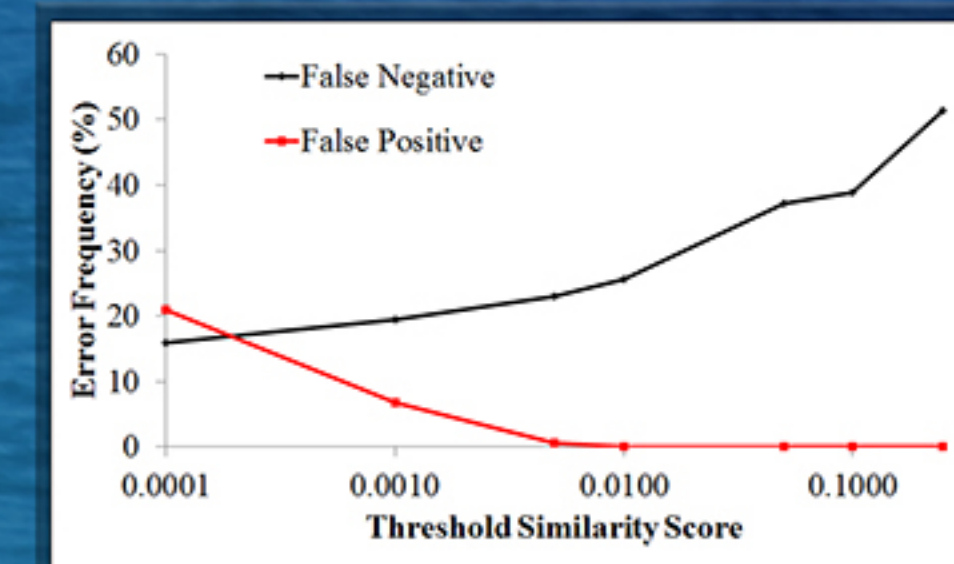


Figure 8: Type 1 and Type 2 error rates across a range of potential acceptance thresholds for a WILD-ID correlation coefficient.

- We have not been able to successfully match seals with Extract-Compare due to issue with the program's coding, but a comparison is provided in Table 1 to show the strengths and weaknesses of each program.

Table 1: A comparison of WILD-ID and Extract-Compare photo-identification software programs.

Program	WILD-ID	Extract-Compare
Speed	Quick	Not Applicable
Pre-Processing Requirements	High	Low
Population Tracking	Limited	Built in
Lighting/ Photo Angle	Sensitive	Not sensitive
Matching different body aspects	No	Yes
Multiple Image Tracking	No	Yes

PRELIMINARY RESULTS

- Seals were observed at the RI and VA haul-out sites between November 2014 and May 2015. Arrival and departure seemed to coincide with changes in air and sea surface temperatures.
- Narragansett Bay: Seals were observed hauled out at low tide during 24 of the 46 (52%; range=0-44) survey days.
- Lower Chesapeake Bay: Seals were observed on 11 of the 12 (92%; range=0-26) survey days at various tidal states and seen hauled out on 7 survey days.

Table 2: Preliminary analysis from Rhode Island photos in WILD-ID.

Outcome	Number
Observed	156
Captured	102
Matched	13
Multi-Recapture	1

DISCUSSION

- Preliminary analysis confirms the presence of matches in the photo database, indicating some degree of site fidelity (Table 2).
- Information gathered from this study will help to reduce the gap in documented sightings for RI and VA.
- Although WILD-ID may not be the best software to make population level assessments (Table 1), it will answer some questions regarding site fidelity and preference.
- Selection of software is dependent on quality and quantity of available images and overall goals of the study design.

FUTURE WORK

- This study will continue at least through the 2015-2016 season, with the goal of developing a long-term dataset. We will continue to evaluate the available software to determine the best approach for photo-ID.
- Photographs will be compared or added to existing regional photo databases, with additional photo-ID work with photos obtained from other research partners or citizen photos.

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