C3.2 Hylebos Colony - Productivity and Forage Site Selection

Confirmation of the new heron colony above the Chinook Marina on the Hylebos Waterway was established in early March 1997. Twenty-one nests were located and eggshell fragments found beneath the nests confirmed that the colony had nested at this location in the previous year. Herons began occupancy late in the nesting season, with 11 birds established in the colony by early April. A large increase in birds nesting in the colony was noted about the time when the Dumas Bay colony became abandoned. Of 30 nests observed, 26 were active and 25 were successful (able to produce young). The mean productivity for the colony was 2.26 young per active nest. Eagles were observed nearby but harassment or incursion into the colony was not observed.

By mid-April, it was determined that the newly-formed Hylebos colony was going to be viable and incubation was taking place in large enough numbers to commence forage site selection observations by nest (i.e. recording arrivals and departures). Asynchronous nesting in the colony made the determination of pre-clutch completion difficult. By estimating and using the seven day rule, the range for clutch completion for a majority of the birds in the colony was determined to be between April 21, 1997 and May 27, 1997. After reviewing mean and mode values from the range, May 1, 1997 was selected to represent the end of the pre-clutch completion phase for the Hylebos colony.

Observations of arrivals and departures was reported by colony and by nest. No significant differences were noted between the two data sets, and since most nests were successful in producing young, no correlation could be drawn between failed nests and forage site selection. Over 140 observations were recorded between April 2, 1997 and May 1, 1997 during the pre-clutch phase. Approximately 76 of these recorded arrival and departure observations received the high confidence data qualifier (birds were observed with a clearly known origin or destination into or out of a foraging site location). Of these observations, 44.7% could be linked to forage sites within Commencement Bay.

From May 1, 1997 to July 19, 1997, arrival and departure observations were recorded 627 times during the incubation and chick present stage. Of these observations, 323 were designated with the high confidence data qualifier and 71.2% were linked with forage sites within Commencement Bay. Due to data collection complications resulting from the failed Dumas Bay colony and the asynchronous nesting exhibited in the Hylebos colony, no attempt was made to further separate the observation data into other nesting time periods (i.e. 1 chick present at nest versus 2 or more). **Figure 16** illustrates the patterns of arrival and departure observations during the pre-clutch completion and incubation/chick present nesting phases for the Hylebos colony. Numbers and percentages depicted in **Figure 16** represent an approximation of what was observed using both the high confidence qualified data and data qualified as being a lower confidence level quality[5]. Correlation of nest

[5]Arrivals or departures were clearly seen along with flight direction, but no determination could be made whether the bird came directly from or landed in a specific foraging site location.

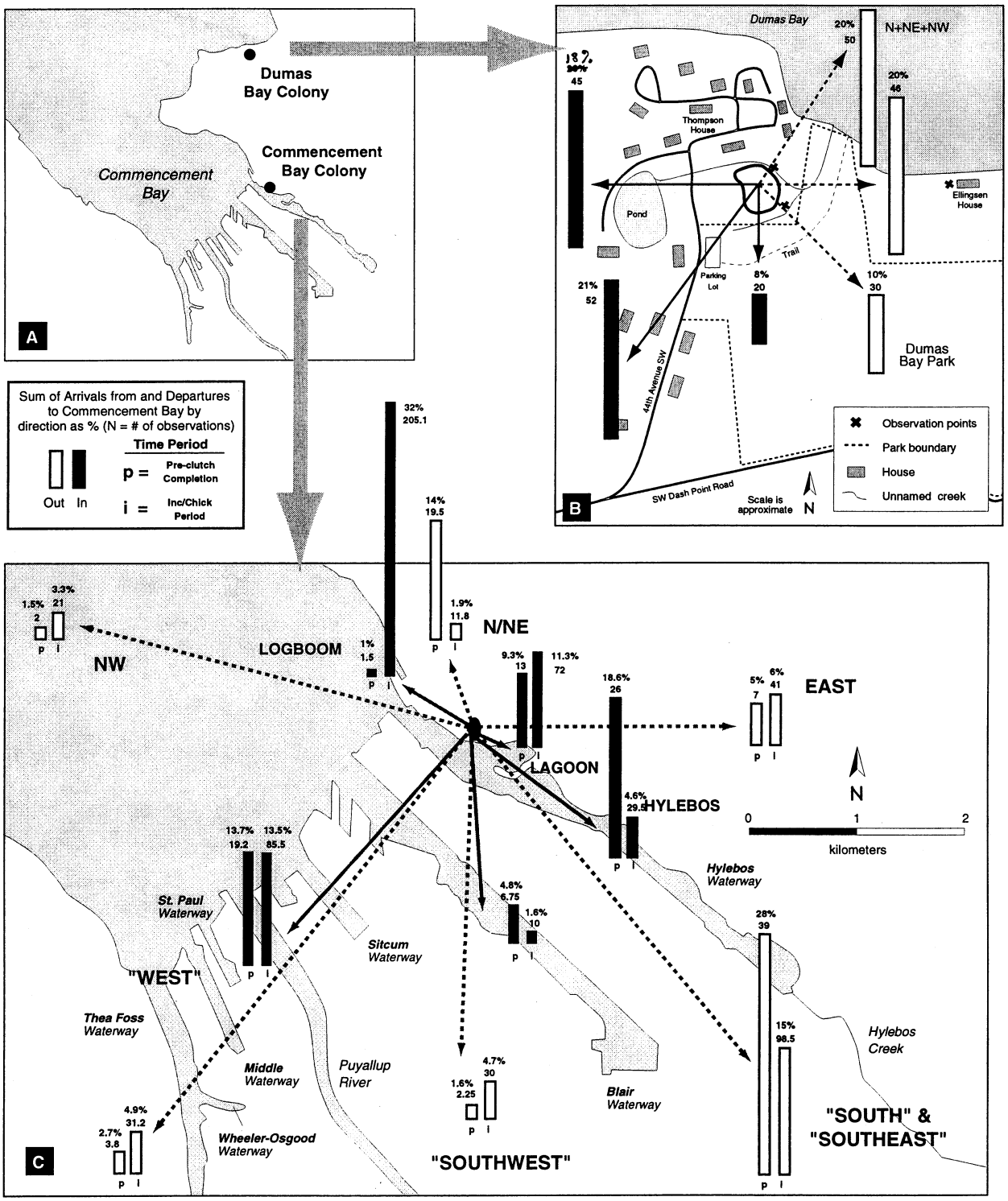

Figure 16. Arrival and departure data results from the Dumas Bay (B) and Hylebos (C) great blue heron great blue heron colony in 1997.

failure and the selection of foraging locations inside Commencement Bay was not meaningful since very few nests failed at the Hylebos colony and most birds were found to be foraging in Commencement Bay.

C3.3 Comparison Colonies at Auburn and Nisqually

The Peasley Canyon colony at Auburn had nearly 60 nests before being abandoned at the end of May 1997. Continuous bald eagle harassment and incursions similar to what was observed at the Dumas Bay colony most likely contributed in the colony's failure. The Nisqually colony was also subjected to eagle incursions but continued to be successful with approximately 68 nests fledging young at rates within a normal distribution. Nesting also appeared to be synchronous.

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Appendix A

Morphological measurements of eggs collected in Commencement Bay, WA

Table A-1 Morphological measurements of eggs collected in 1996 from Commencement Bay, WA

Date	*Species*	*Sample ID*	*General Condition*	*Float Stage/ Approx. Age (days)*	*Whole Egg Weight (gms)*	*Length (mm)*	*Width (mm)*
11apr96	Great Blue Heron	GBH96-1	fresh/good	0/1-5	71.12	64.34	45.20
11apr96	Great Blue Heron	GBH96-2	fresh/hairline crack	--/11-12	70.91	66.10	46.10*
11apr96	Great Blue Heron	GBH96-3	fresh/good	0/1-5	66.22	61.32	45.26
11apr96	Great Blue Heron	GBH96-4	fresh/good	5/14-15	63.88	62.74	45.62
11apr96	Great Blue Heron	GBH96-5	fresh/good	5/17-20	64.22	60.16	46.58
05jun96	Mallard	MAL96-1	fresh/good	3/10-11	26.84	46.38	33.65
05jun96	Mallard	MAL96-2	fresh/good	2/7-8	24.25	45.30	31.92

Date	*Species*	*Sample ID*	*Volume (Mean of 3 reps.) (ml)*	*Jar Weight (gms)*	*Jar/egg contents Weight (gms)*	*Egg Contents Weight (gms)*	*Shell Weight (fresh/dry) (gms)*
11apr96	Great Blue Heron	GBH96-1	68.15	201.21	264.50	63.29	7.74/6.22
11apr96	Great Blue Heron	GBH96-2	--	201.29	265.20	63.91	6.91/5.67
11apr96	Great Blue Heron	GBH96-3	62.99	201.88	259.20	57.32	8.75/5.94
11apr96	Great Blue Heron	GBH96-4	65.80	200.38	258.13	57.75	6.07/6.15
11apr96	Great Blue Heron	GBH96-5	65.99	201.29	259.19	57.90	6.12/5.95
05jun96	Mallard	MAL96-1	29.23	110.85	135.42	24.57	2.22/ --
05jun96	Mallard	MAL96-2	26.37	110.59	132.59	22.00	2.18/ --

** Approximated value. Volume calculated by formula (USFWS 1990).*

Appendix B

Data validation report - Avian tissue analysis 1995 and 1996

EcoChem, Inc.

Environmental Science and Chemistry

DATA VALIDATION REPORT
AVIAN TISSUE ANALYSIS 1995 and 1996

Prepared for:

U.S. Fish and Wildlife Service
Division of Environmental Contaminants
North Pacific Coast Ecoregion
Western Washington Field Office
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September 16, 1998

DATA VALIDATION REPORT
EGG RESIDUE ANALYSIS 1995 AND 1996

Introduction

This report summarizes results from a review of analytical data for 8 avian eggs collected in 1995 and 7 avian eggs collected in 1996 by the U.S. Fish and Wildlife Service. Analyses for polychlorinated biphenyls (PCBs), polychlorinated dibenzodioxins/furans (PCDDs/PCDFs) and percent lipids were performed by Alta Analytical Laboratory (El Dorado Hills, CA). Analyses for pesticides, semivolatile organics, butyltins, and metals were performed by ToxScan, Inc. (Watsonville, CA). A list of samples reviewed is provided in **Table 1.**

Basis for Data Review

Data packages were received from the laboratories for each year of samples submitted. The package consisted of sample results with a summary of associated quality control (QC) information. Data packages did not include sample preparation information, instrument calibration data, run logs, or instrument printouts. Thus, only summary information could be assessed, and calculation checks could not be performed.

Data were reviewed by EcoChem, Inc. using criteria as specified in the method referenced in the laboratory report or the laboratory method (if provided), and general guidelines as presented in US EPA Functional Guidelines (US EPA, 1994). Qualified data are summarized in **Table 2.**

Completeness

The laboratory did not provide a case narrative which describes the analyses and any anomalies found during analysis. A chain of custody (COC) form was not included by Alta Analytical with the 1995 data, but the laboratory's check-in form noted that a COC accompanied the samples. The requested analytical results were provided by both laboratories for all samples.

The 1995 PCB analyses did not include results for several individual PCB congeners, which were provided with the 1996 PCB results (congeners 105, 114, 123, **156, 157, 167, 189).** The 1995 total PCB results included these congeners, but the individual congener results were not recorded by the laboratory.

Overall Assessment

Quality control (QC) information which was reported indicated good analytical recovery and precision. Some results for octachlorodibenzodioxin (OCDD) and octachlorodibenzofuran (OCDF) are recommended to be qualified as not detected (U) because the laboratory blank results indicated possible cross contamination. Method criteria for the butyltin analyses were not provided and no QC information was provided with the trace metals report. Thus no assessment of the precision or accuracy of the butyltin or metals data could be made. Because the data quality could not be assessed, these data are recommended to be estimated. However, the

information on methods, and the results reviewed, indicate that the metals and tributyltin data would be appropriate for screening purposes.

The laboratory reported different detection limits for some analytes for the 1995 samples than for the 1996 samples. The trace metal detection limits were higher in 1996 than in **1995,** which could affect the comparability of the metal results within 5 times the detection limit. The detection limits for the semivolatile organic analyses were significantly higher in 1995 than in 1996. Because of these higher detection limits, less semivolatile compounds were detected in the eggs collected in 1995 than 1996.

The specific technical items assessed for each laboratory report, and data qualifications are summarized in the following sections.

I. DATA REVIEW OF PCB RESULTS

The tissue samples were analyzed for PCBs by gas chromatography/high resolution mass spectrometry/selective ion monitoring (GC/HRMS/SIM) using a combination of features from EPA Method 680 to measure PCB homologues, and Method 1668 to extract, cleanup sample extracts, and measure specific PCB congeners. The laboratory modified their PCB method between the 1995 and 1996 sample analyses, thus different internal standards and PCB congeners were reported for each of the years.

The quality control (QC) requirements that were reviewed are listed below.

Blanks (Method)
In tern al Standards
* Laboratory Control Sample
* Matrix Spikes
* Laboratory Duplicates
Reported Detection Limits

Those items marked with an asterisk (*) may not meet all specified QC criteria and are discussed below. QC items not marked with an asterisk meet all QC criteria.

Laboratory Control Sample

Recovery results from a Laboratory Control Sample (LCS) and a duplicate LCS analysis were reported indicating good recovery for individual PCB congeners. The concentration of the analytes in the LCS were not stated, thus it is not possible to evaluate how comparable these recoveries may be to the recovery of PCBs in the actual samples.

Matrix Spikes

No matrix spike results were provided. As the analysis was performed by isotope dilution, the samples were spiked with similar compounds, which provides excellent recovery information for each sample extracted. The isotopic recovery results indicated good recovery was obtained.

Duplicates

No sample duplicate results were reported. Thus, precision of the overall subsampling and the analytical method could not be evaluated.

II. DATA REVIEW OF PCDD AND PCDF RESULTS

The 1995 and 1996 tissue samples were analyzed for PCDDs and PCDFs by GC/HRMS/SIM using EPA Method 8290. The 1995 data summary lists the sample matrix as "fish" rather than "egg" for some of the samples and associated quality control.

The quality control (QC) requirements that were reviewed are listed below.

* Blanks (Method)
  internal Standards
* Laboratory Control Sample
* Matrix Spikes
* Laboratory Duplicates
  Reported Detection Limits

Those items marked with an asterisk (*) may not meet all specified QC criteria and are discussed below. QC items not marked with an asterisk meet all QC criteria.

Blanks

OCDD (1.3 pg/g) and OCDF (3.6 pg/g) were detected in the 1995 method blank, and OCDD (5.4 pg/g) only in the 1996 method blank. Validation guidelines recommend that data within ten times a reported OCDD blank result and five times a reported OCDF blank result should be qualified as "non-detected" **(U).**

Laboratory Control Sample

Recovery results from a Laboratory Control Sample (LCS) and a duplicate LCS analysis were reported indicating good recovery for PCDD and PCDF. The concentration of the analytes in the LCS were not stated, thus it is not possible to evaluate how comparable these recoveries may be to the recovery of these compounds in the actual samples.

Matrix Spikes

No matrix spike results were provided. As the analysis was performed by isotope dilution, the samples were spiked with similar compounds, which provides excellent recovery information for each sample extracted. The isotopic recovery results indicated good recovery was obtained.

Duplicates

No sample duplicate results were reported. Thus, precision of the overall subsampling and the analytical method could not be evaluated.

III. DATA REVIEW OF PESTICIDE AND HERBICIDE RESULTS

The 1995 and 1996 tissue samples were analyzed for chlorinated pesticides by EPA Method 8080 and chlorinated herbicides by EPA Method 8150. Both methods are using gas chromatography with a electron capture detector (GC-ECD).

The quality control (QC) requirements that were reviewed are listed below.

Blanks (Method)
Surrogate Recovery
* Laboratory Control Sample
* Matrix Spikes
* Laboratory Duplicates
Reported Detection Limits

Those items marked with an asterisk (*) may not meet all specified QC criteria and are discussed below. QC items not marked with an asterisk meet all QC criteria.

Laboratory Control Sample

Recovery results from a Laboratory Control Sample (LCS) were reported indicating good recovery for pesticides and herbicides. The concentration of the analytes in the LCS were not stated, thus it is not possible to evaluate how comparable these recoveries may be to the recovery of the compounds in the actual samples.

Matrix Spikes

No matrix spike results were provided. Thus, it is not possible to assess if sample interferences may cause problems in achieving analytical accuracy.

Duplicates

No sample duplicate results were reported. Thus, precision of the overall subsampling and the analytical method could not be evaluated.

IV. DATA REVIEW OF SEMIVOLATILE ORGANIC RESULTS

The 1995 and 1996 tissue samples were analyzed for semivolatile organics by EPA Method 8270 using gas chromatogrtiphy with mass spectroscopy (GC/MS).

The quality control (QC) requirements that were reviewed are listed below.

- Blanks (Method)
- Surrogate Recovery
- * Laboratory Control Sample
- * Matrix Spikes
- * Laboratory Duplicates
- * Reported Detection Limits

Those items marked with an asterisk (*) may not meet all specified QC criteria and are discussed below. QC items not marked with an asterisk meet all QC criteria.

Laboratory Control Sample

Recovery results from a Laboratory Control Sample (LCS) were reported indicating good recovery for a subset of semivolatile compounds. The concentration of the analytes in the LCS were not stated, thus it is not possible to evaluate how comparable these recoveries may be to the recovery of the compounds in the actual samples.

Matrix Spikes

No matrix spike results were provided. Thus, it is not possible to assess if sample interferences may cause problems in achieving analytical accuracy.

Duplicates

No sample duplicate results were reported. Thus, precision of the overall subsampling and the analytical method could not be evaluated.

Reported Detection Limits

The sample detection limits are high for the results reported in 1995. In the 1995 data summary, only one positive result was reported in a single sample. Thus, the high detection limits resulted in limited positive results. Commonly, detection limits in tissue can be obtained which are an order of magnitude lower than those reported. In 1996 better detection limits were obtained, and more positive results were obtained.

REFERENCE

US Environmental Protection Agency. 1994. *National Functional Guidelines for Organic Data Review.* EPA-540/R94/0 12. Washington, D.C.

Table 1 Avian Egg Sample Results Reviewed

Field ID	Date Collected
HBS-1	4/7/95
HBS-2	4/7/95
BGD-1	4/7/95
BGD-2	4/7/95
SIM-1	5/5/95
SIM-2	5/5/95
SIM-3	5/5/95
SIM-4	5/5/95
GBH96-1	4/8/96
GBH96-2	4/8/96
GBH96-3	4/8/96
GBH96-4	4/8/96
GBH96-5	4/8/96
MAL96-1	5/1/96
MAL96-2	5/6/96

Table 2 Summary of Qualified Data

Field ID	Lab ID	Analysis	Analyte	Qualifier	Reason
HBS-1	1826-0001-SA	Dioxin	OCDD	U	Blank contamination
HBS-2	1826-0002-SA	Dioxin	OCDF	U	Blank contamination
BGD-1	1826-0003-SA	Dioxin	OCDD	U	Blank contamination
BGD-2	1826-0004-SA	Dioxin	OCDF	U	Blank contamination
SIM-1	1826-0005-SA	Dioxin	OCDF	U	Blank contamination
SIM -2	1826-0006-SA	Dioxin	OCDD	U	Blank contamination
SIM-2	1826-0006-SA	Dioxin	OCDF	U	Blank contamination
SIM-3	1826-0007-SA	Dioxin	OCDD	U	Blank contamination
SIM-3	1826-0007-SA	Dioxin	OCDF	U	Blank contamination
SIM-4	1826-0008-SA	Dioxin	OCDD	U	Blank contamination
SIM-4	1826-0008-SA	Dioxin	OCDF	U	Blank contamination
GBH96-1	2629-0001-SA	Dioxin	OCDD	U	Blank contamination
GBH96-2	2629-0002-SA	Dioxin	OCDD	U	Blank contamination
GBH96-3	2629-0003-SA	Dioxin	OCDD	U	Blank contamination
GBH96-4	2629-0004-SA	Dioxin	OCDD	U	Blank contamination
GBH96-5	2629-0005-SA	Dioxin	OCDD	U	Blank contamination
MAL96-1	2629-0006-SA	Dioxin	OCDD	U	Blank contamination
MAL96-2	2629-0007-SA	Dioxin	OCDD	U	Blank contamination
All Samples	Tox Scan T-12800; Tox Scan T-13734	Trace Metals	Antimony, Arsenic, Cadmium, Copper, Lead, Mercury, Nickel, Selenium, Silver, Zinc	J	QC results not provided
All Samples	Tox Scan T-12800; Tox Scan T-13734	Tributyltin	Monobutyltin, Dibutyltin, Tributyltin, Tetrabutyltin	J	Method criteria unspecified