Mercury and Selenium in Wintering Waterfowl from the Great Salt Lake

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GSLEP
Great Salt Lake Ecosystem Program

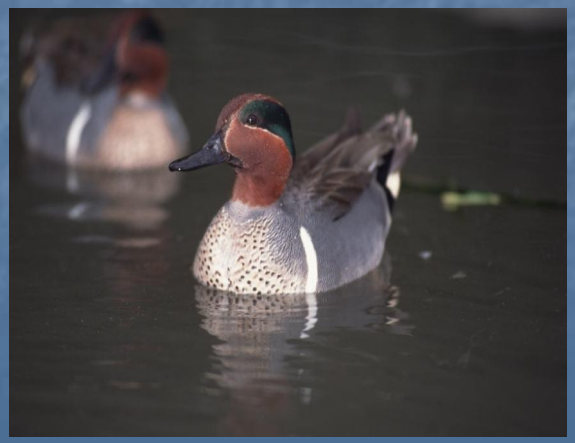
Waterbirds

MIGRATION CORRIDORS
PACIFIC FLYWAY
CENTRAL FLYWAY
MISSISSIPPI FLYWAY
ATLANTIC FLYWAY

WINTER

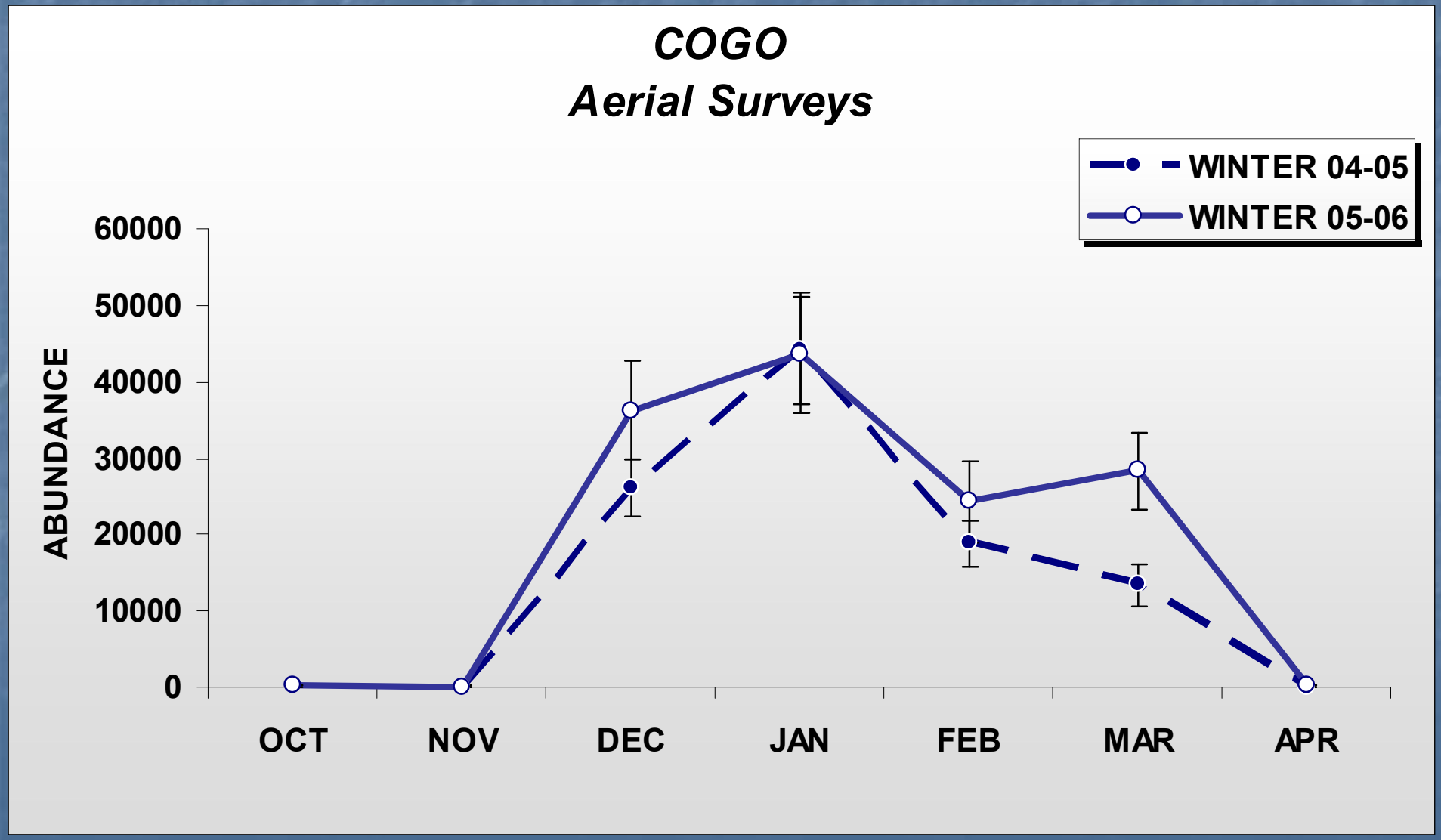
Objectives

1. What's out there?
2. Do birds use GSL food resources?
3. What kind of "condition" are birds in?
4. Contaminants



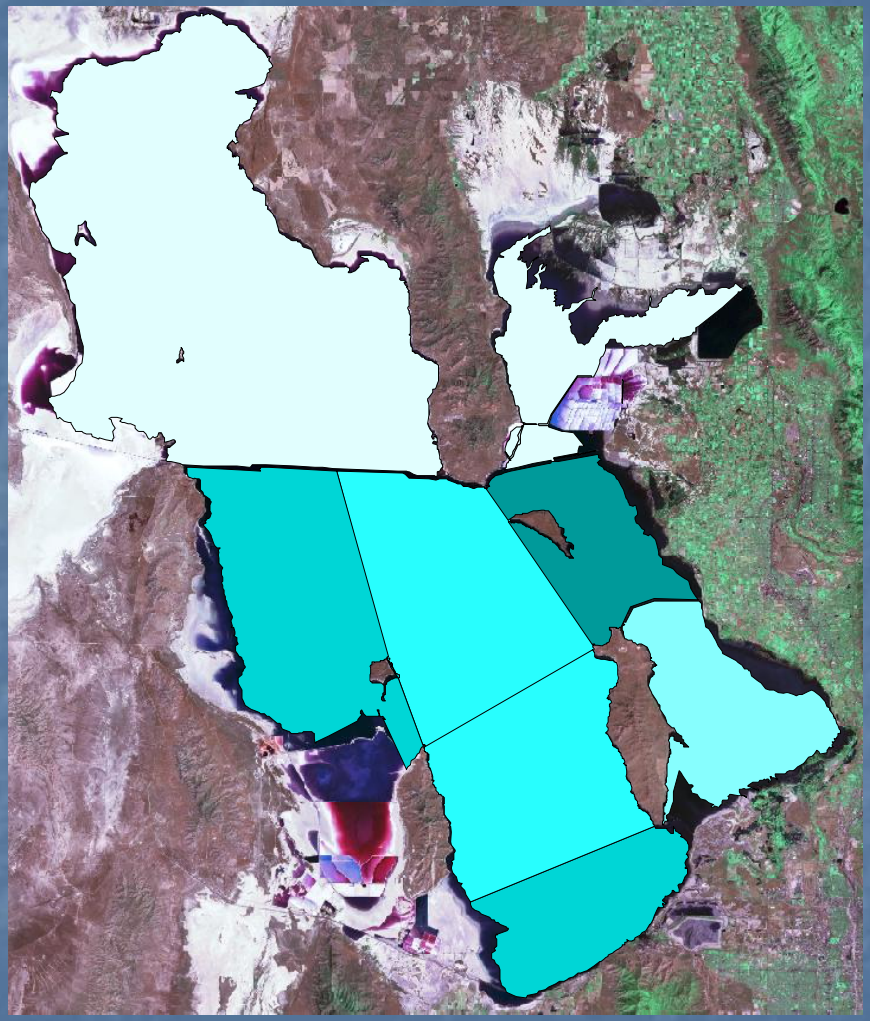
AERIAL SURVEYS

Aerial Survey



COGO

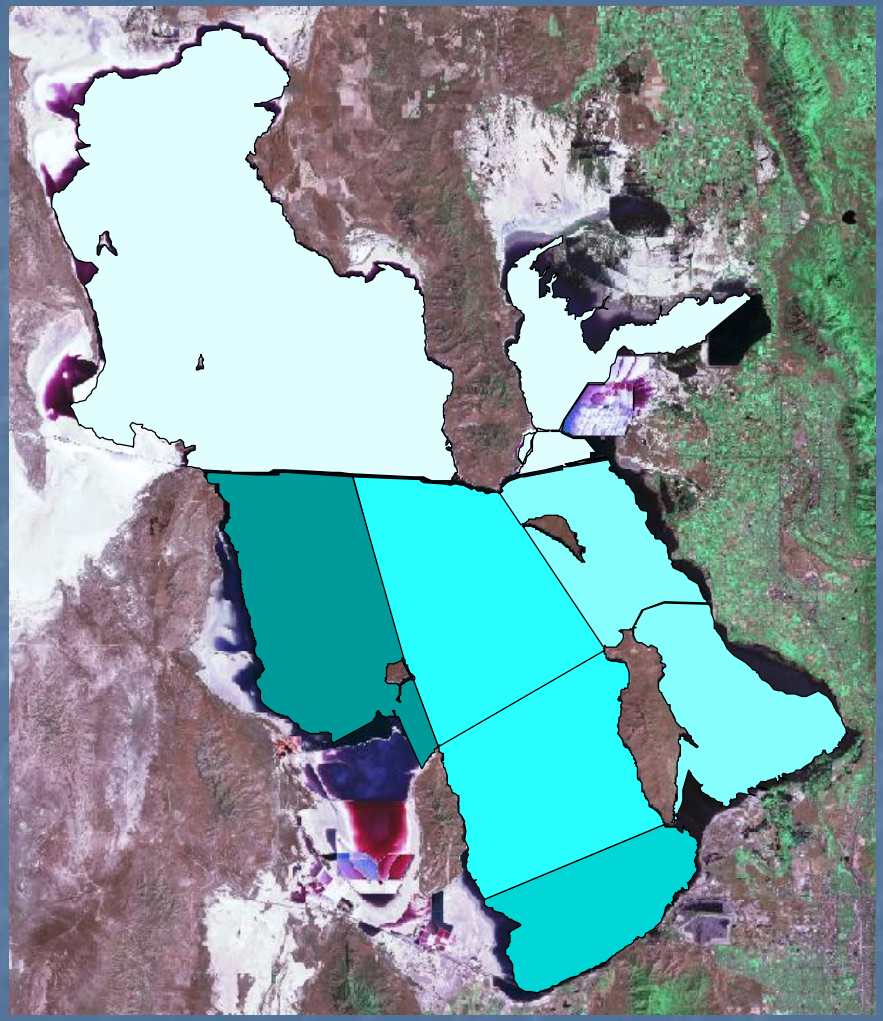
DECEMBER 2004



Gslstrata4202.shp

- 0
- 1 - 106
- 107 - 3678
- 3679 - 5757
- 5758 - 10247

JANUARY 2005

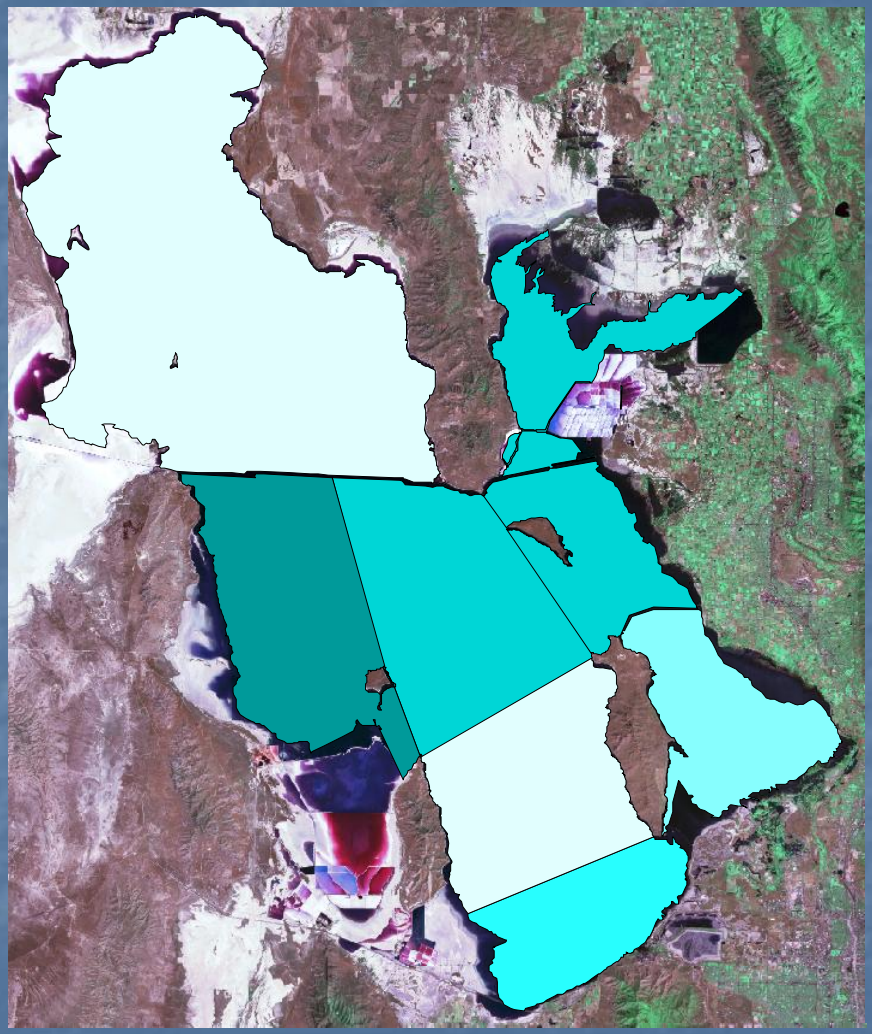


Gslstrata4202.shp

- 0
- 1 - 169
- 170 - 4517
- 4518 - 7670
- 7671 - 29450

COGO

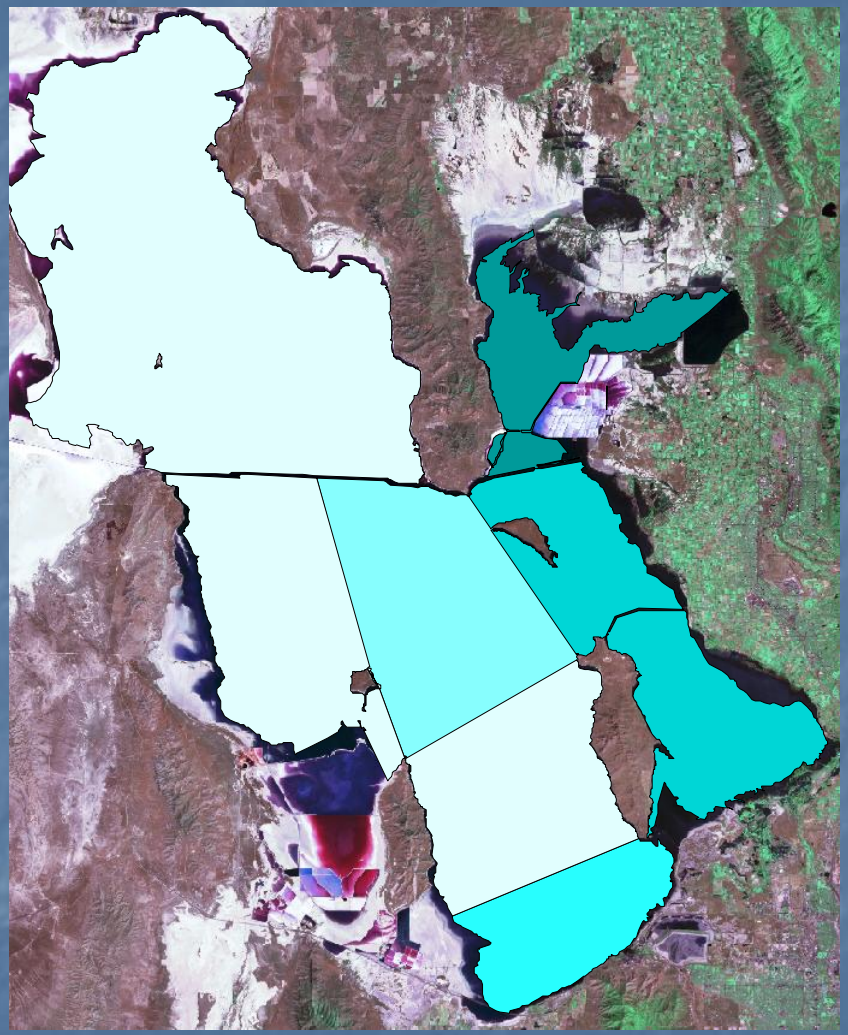
FEBRUARY 2005



Gslstrata4202.shp

- 0
- 1 - 82
- 83 - 2132
- 2133 - 2869
- 2870 - 8569

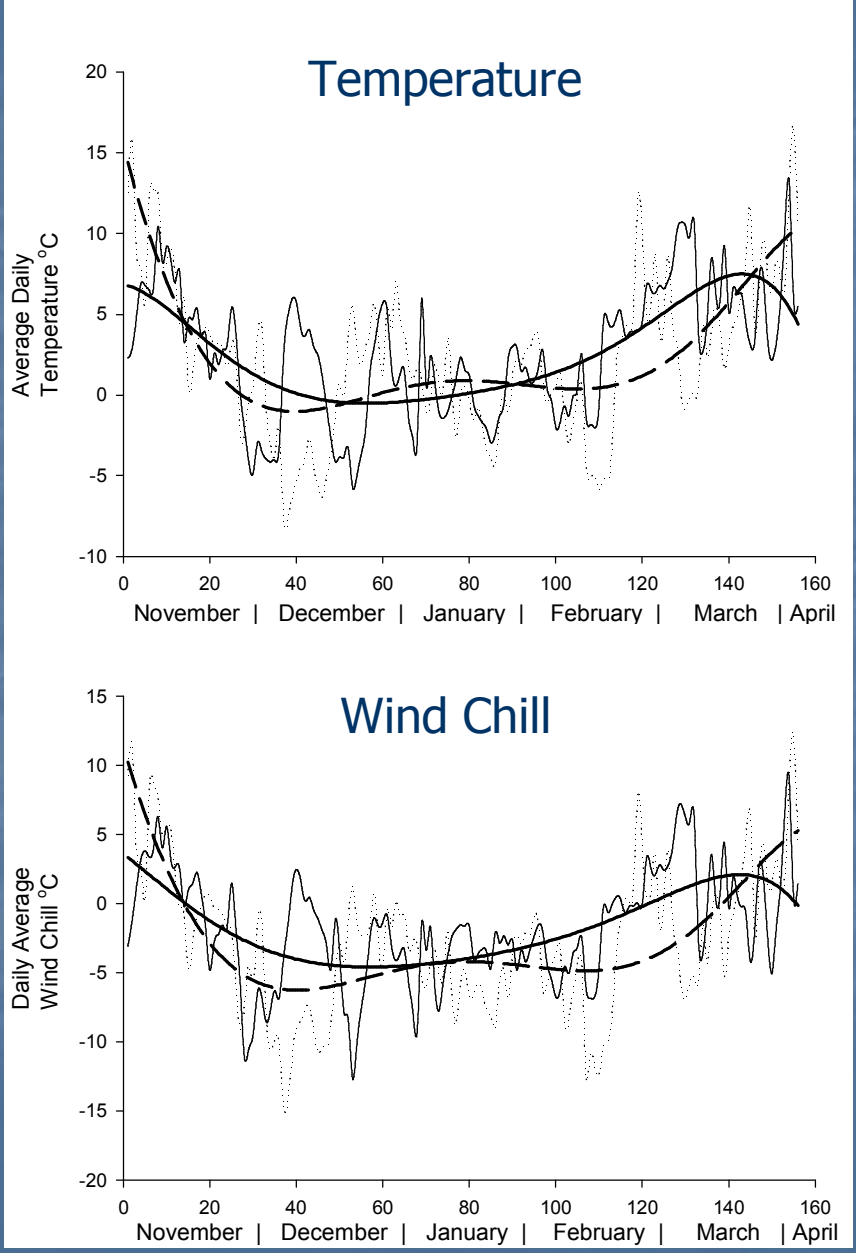
MARCH 2005



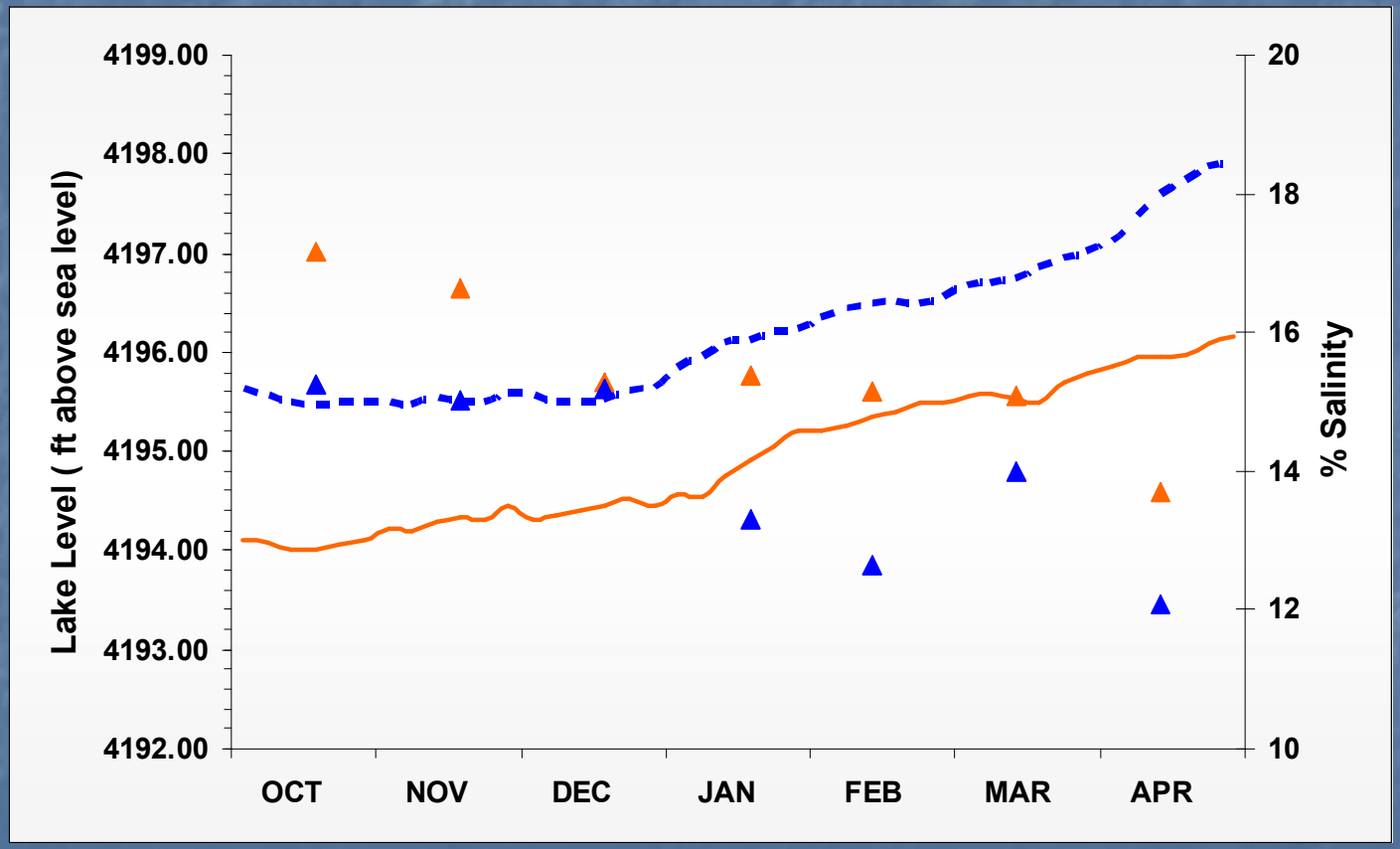
Gslstrata4202.shp

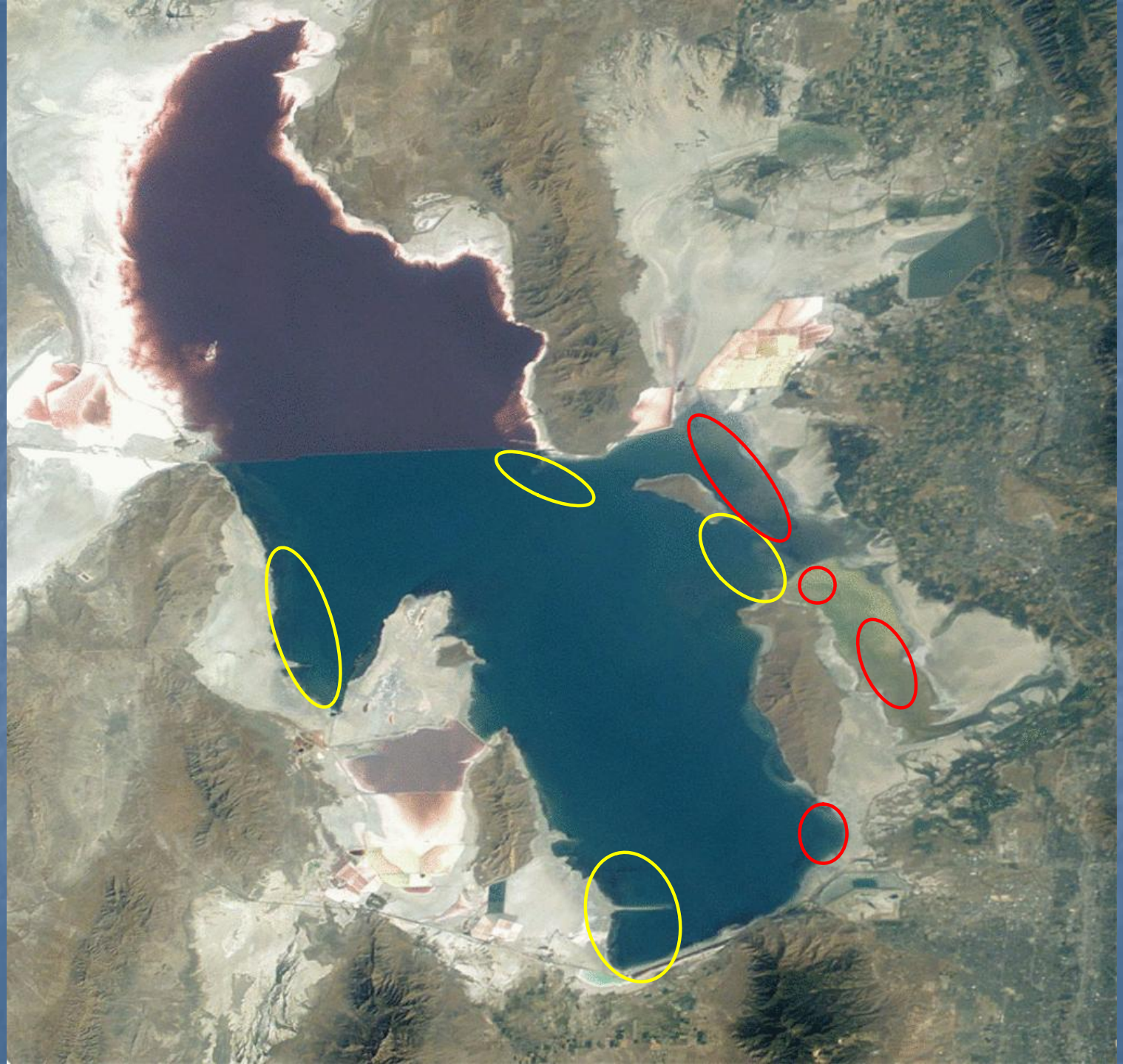
- 0
- 1 - 1891
- 1892 - 2380
- 2381 - 3031
- 3032 - 3275

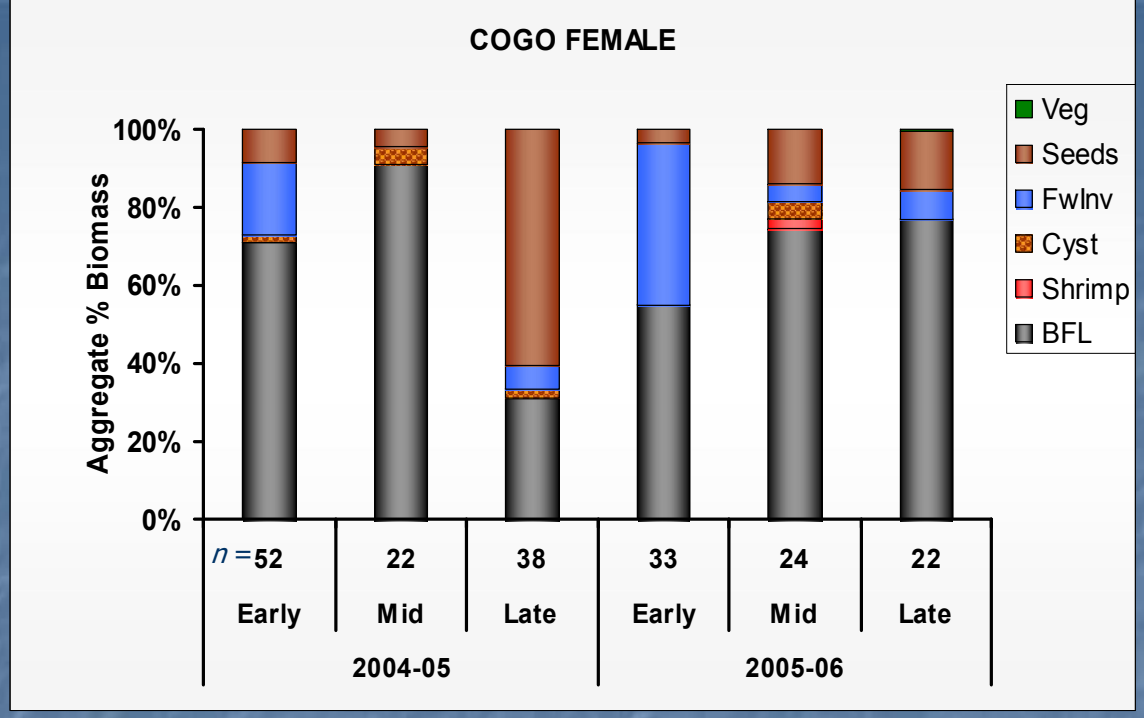
Weather

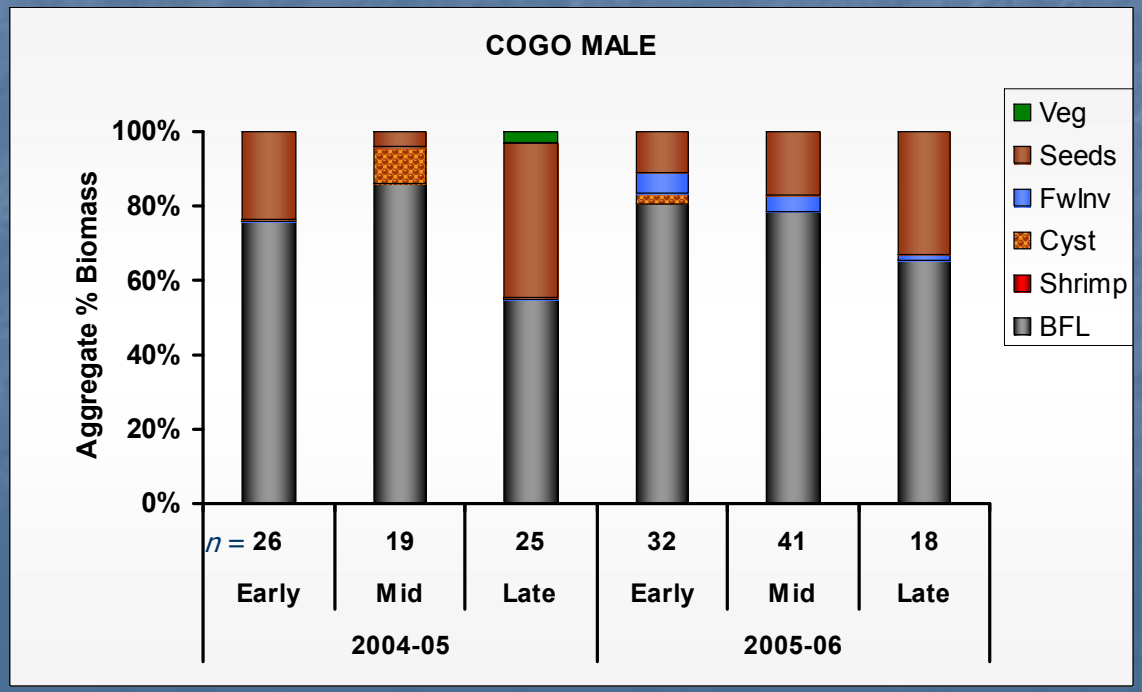

Temperature
Average Daily Temperature °C
20
15
10
5
0
-5
-10
0
20
40
60
80
100
120
140
160
November | December | January | February | March | April
Wind Chill
Daily Average Wind Chill °C
15
10
5
0
-5
-10
-15
-20
0
20
40
60
80
100
120
140
160
November | December | January | February | March | April

Lake Dynamics

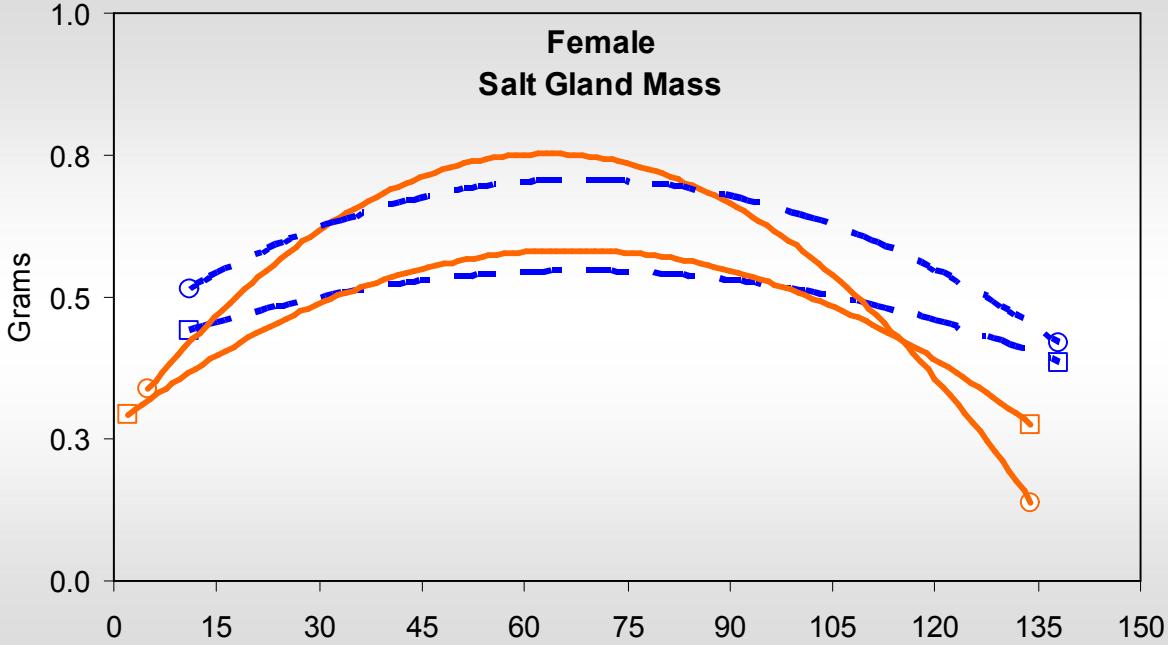


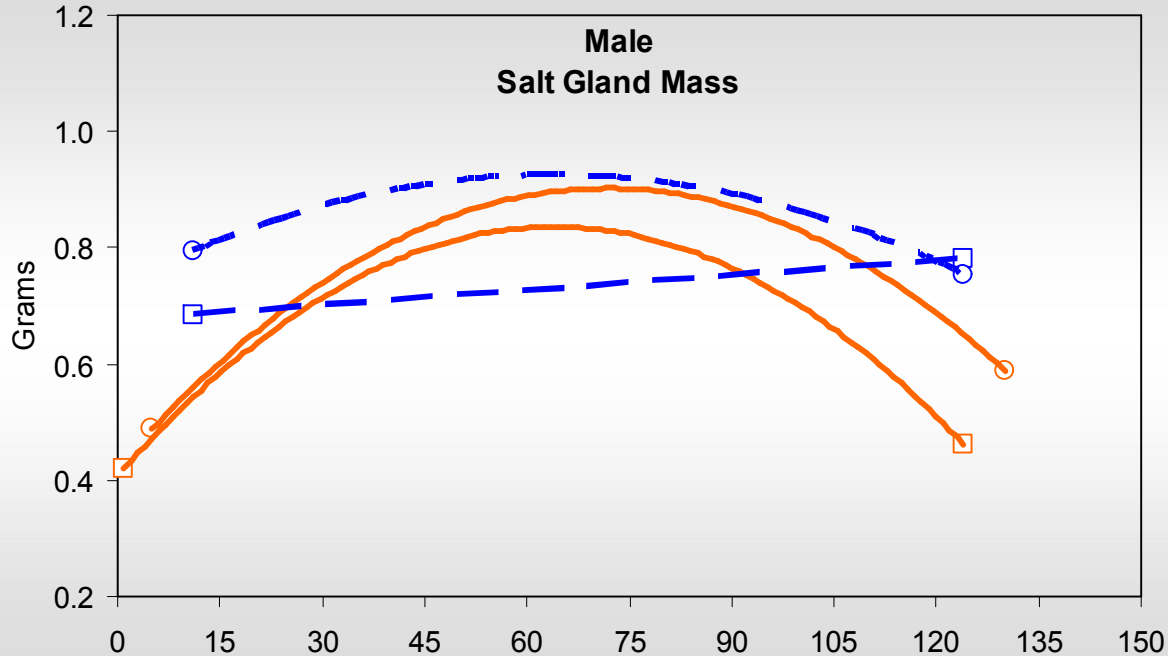



COGO FEMALE
Aggregate % Biomass
100%
80%
60%
40%
20%
0%
n = 52
22
38
33
24
22
Early
Mid
Late
Early
Mid
Late
2004-05
2005-06
Veg
Seeds
Fwlnv
Cyst
Shrimp
BFL

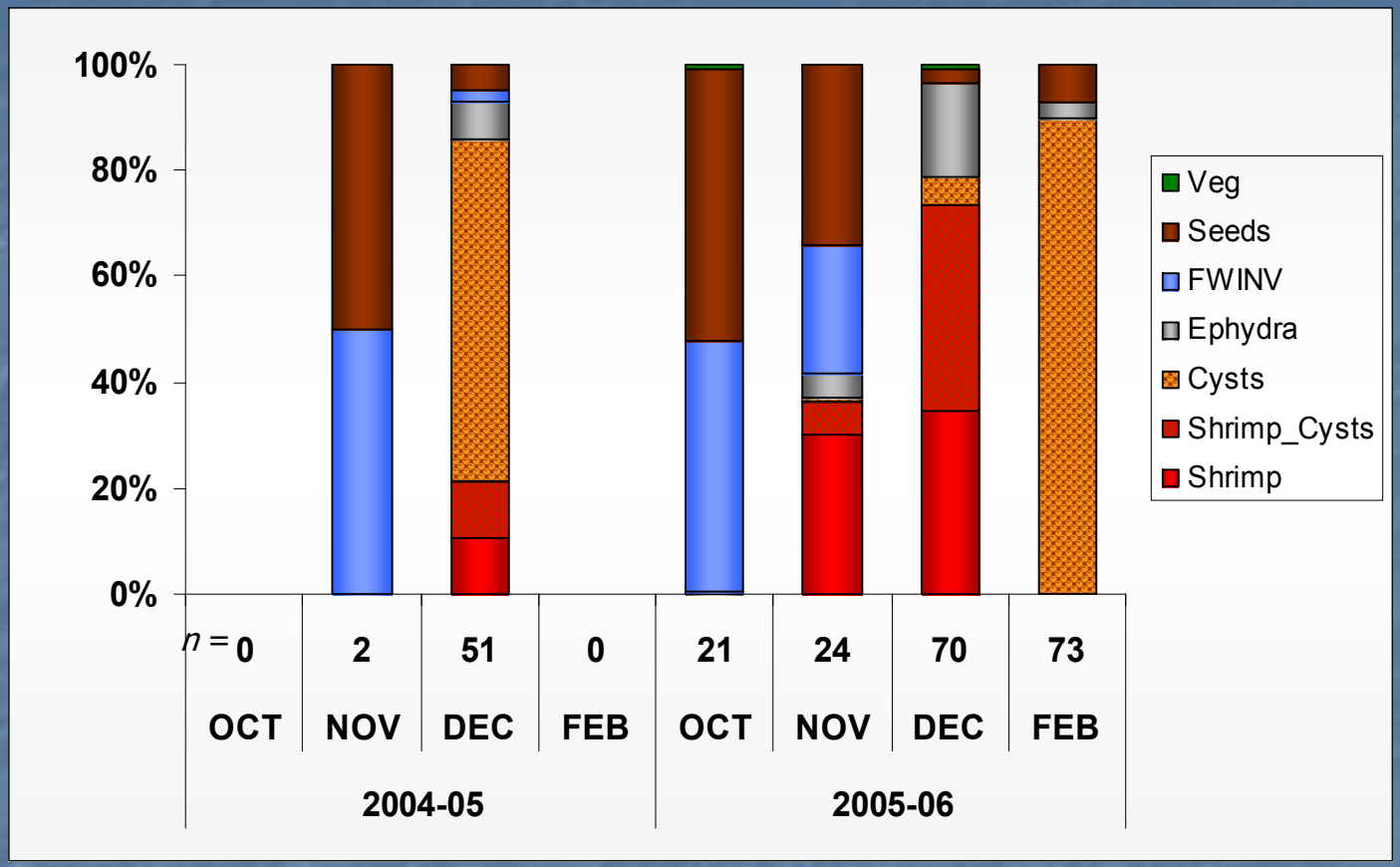

COGO MALE
Aggregate % Biomass
100%
80%
60%
40%
20%
0%
n = 26
19
25
32
41
18
Early
Mid
Late
Early
Mid
Late
2004-05
2005-06
Veg
Seeds
Fwlnv
Cyst
Shrimp
BFL

Stromatolites

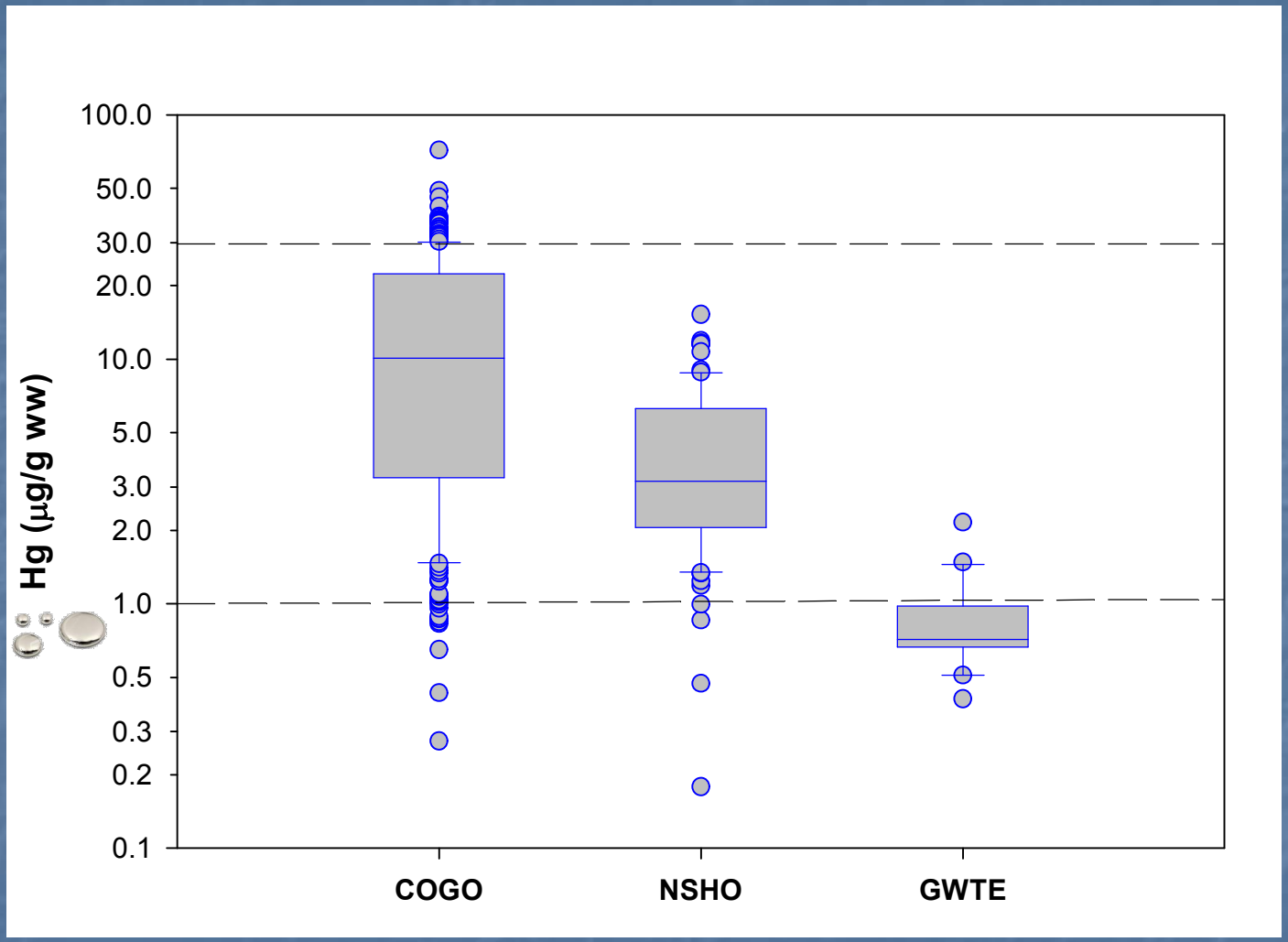

Female
Salt Gland Mass
Grams
1.0
0.8
0.5
0.3
0.0
0
15
30
45
60
75
90
105
120
135
150

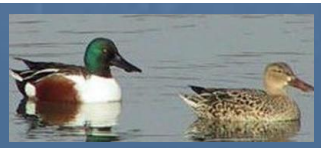

Male
Salt Gland Mass
Grams
1.2
1.0
0.8
0.6
0.4
0.2
0
15
30
45
60
75
90
105
120
135
150

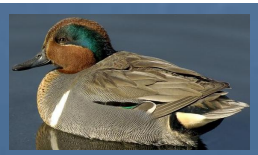
Northern Shoveler



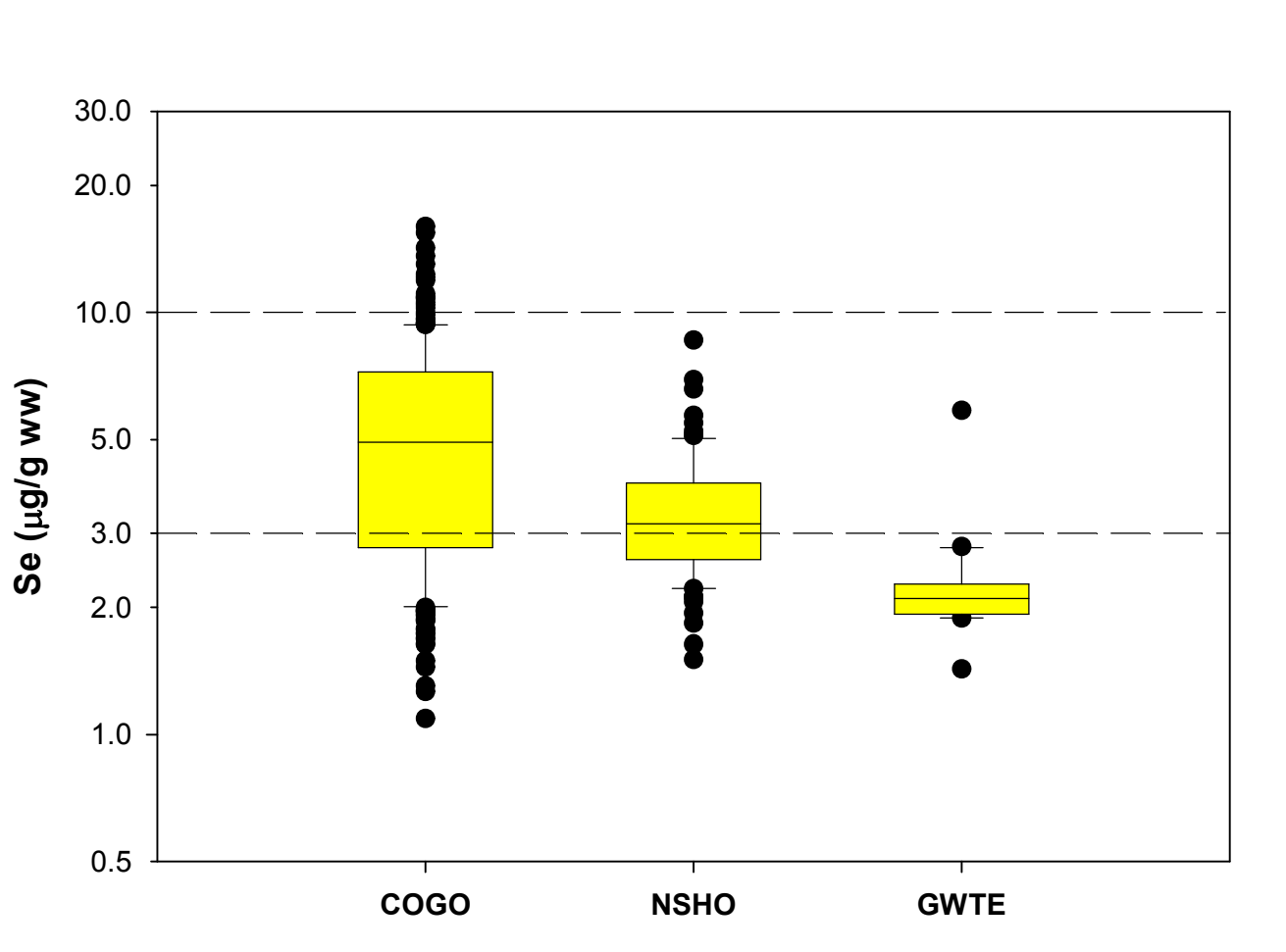
Mercury

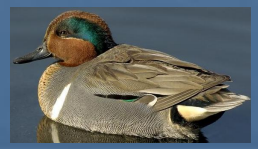

100.0
50.0
30.0
20.0
10.0
5.0
3.0
2.0
1.0
0.5
0.3
0.2
0.1
Hg (µg/g ww)
COGO
NSHO
GWTE



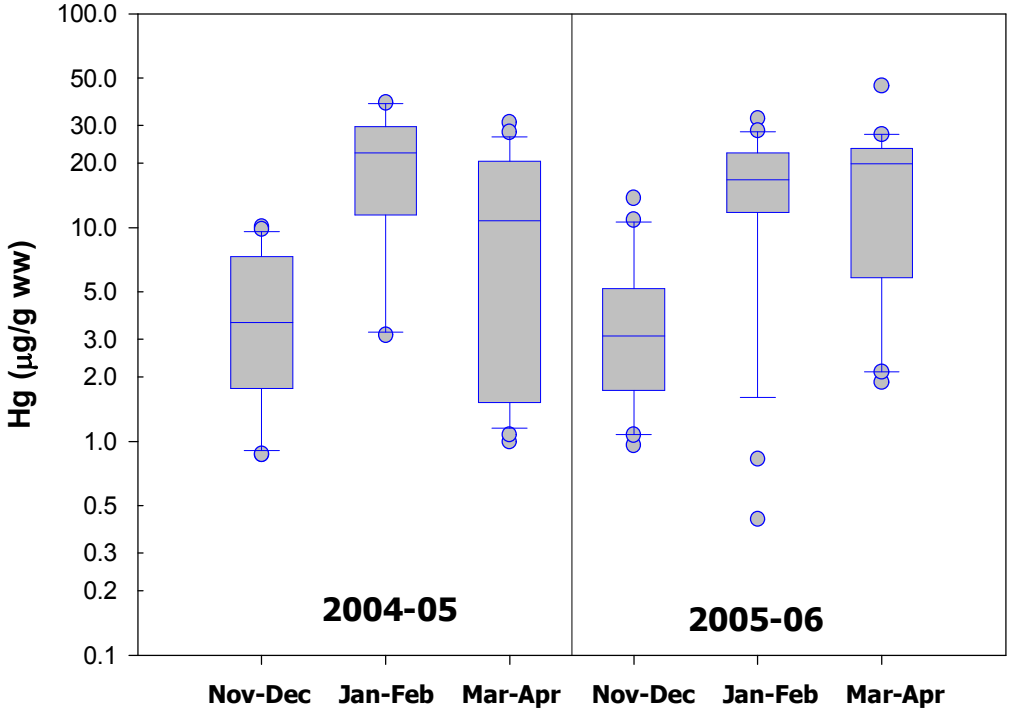


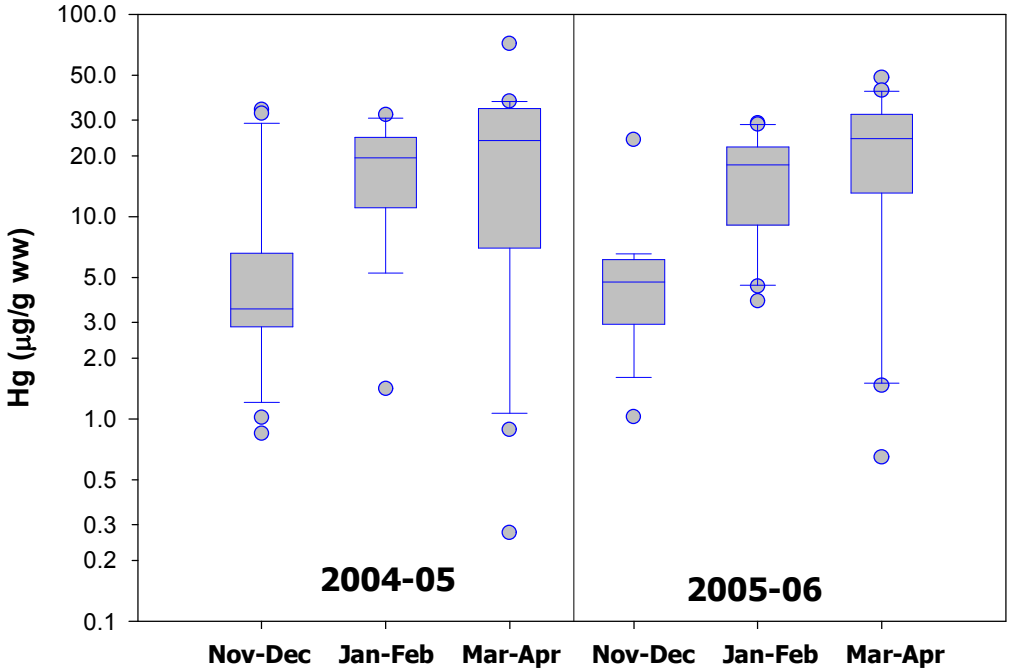
Selenium

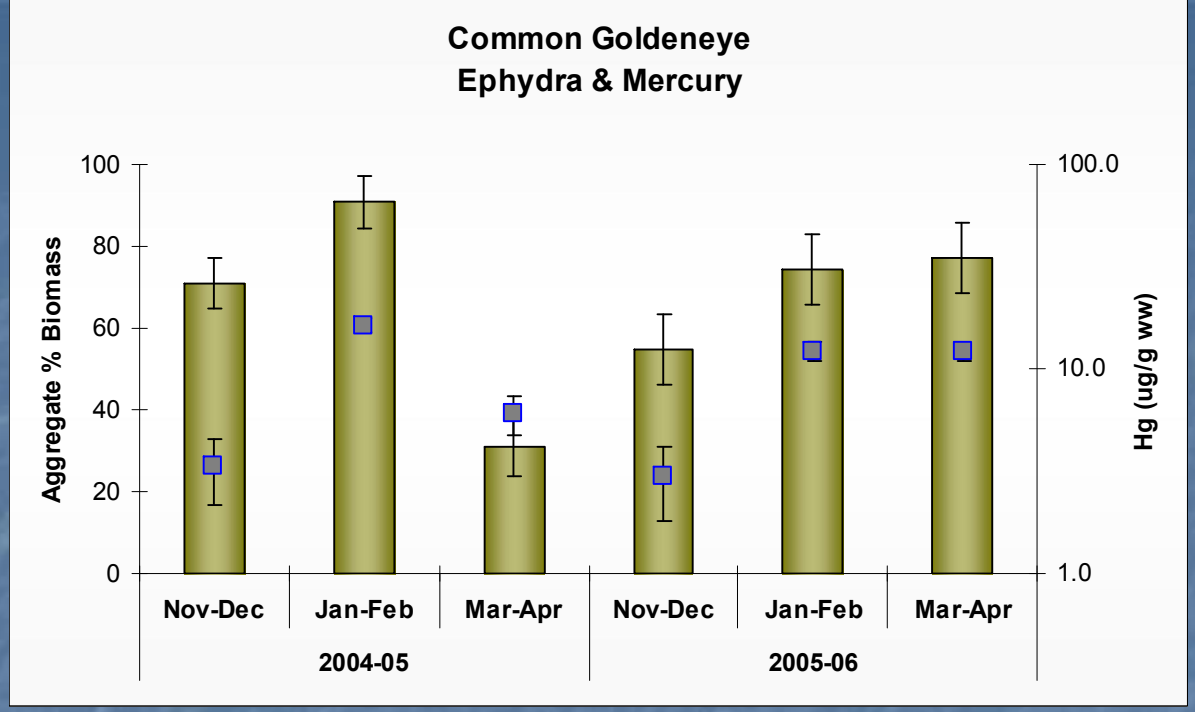


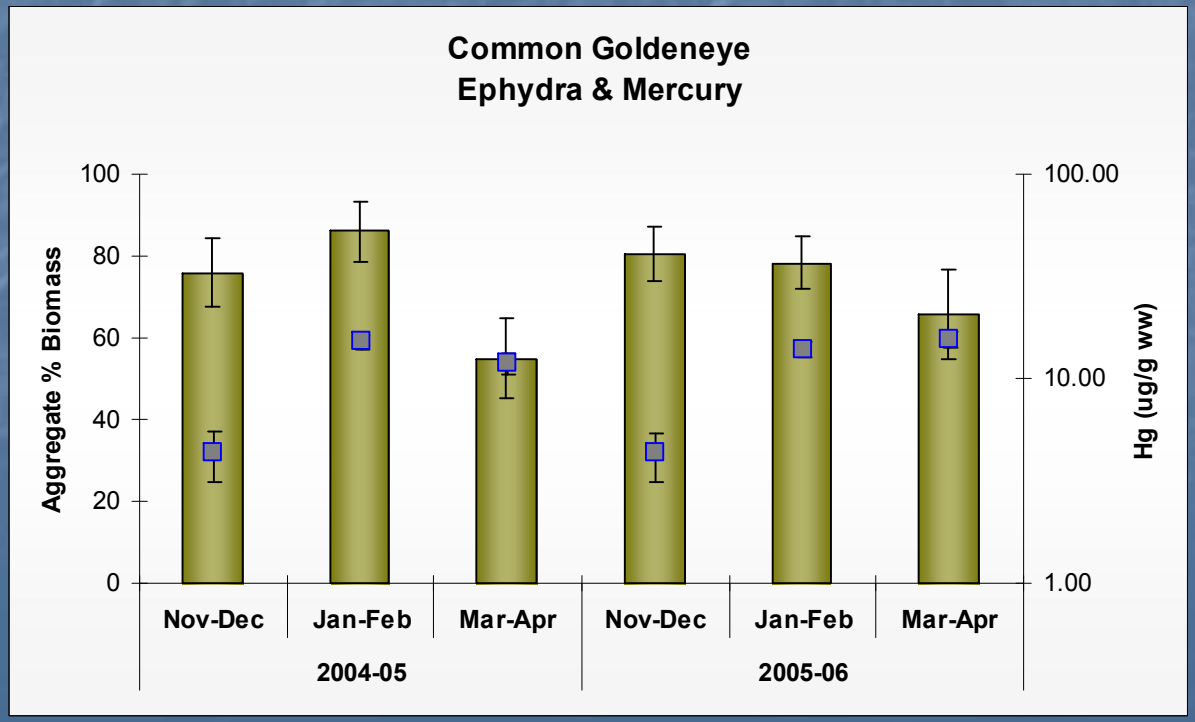


Mercury

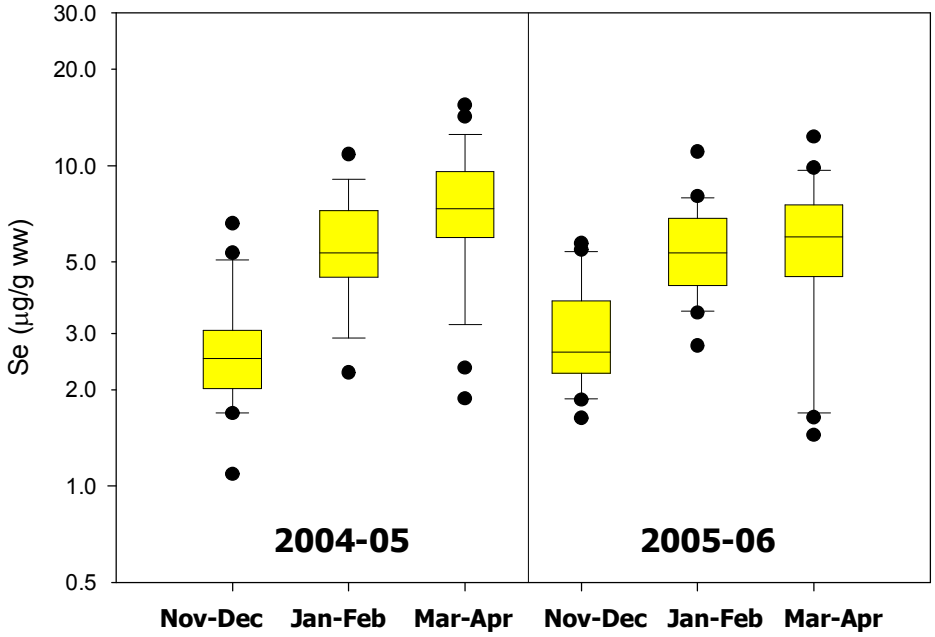

Hg (µg/g ww)
100.0
50.0
30.0
20.0
10.0
5.0
3.0
2.0
1.0
0.5
0.3
0.2
0.1
2004-05
2005-06
Nov-Dec
Jan-Feb
Mar-Apr
Nov-Dec
Jan-Feb
Mar-Apr

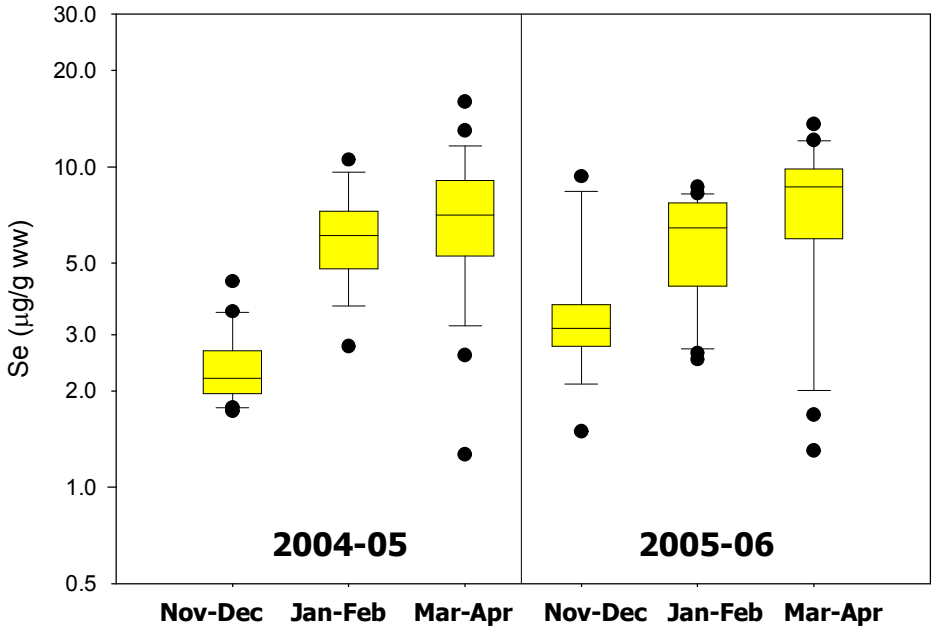

Hg (µg/g ww)
100.0
50.0
30.0
20.0
10.0
5.0
3.0
2.0
1.0
0.5
0.3
0.2
0.1
2004-05
2005-06
Nov-Dec
Jan-Feb
Mar-Apr
Nov-Dec
Jan-Feb
Mar-Apr


Common Goldeneye
Ephydra & Mercury
Aggregate % Biomass
Hg (ug/g ww)
100
80
60
40
20
0
100.0
10.0
1.0
Nov-Dec
Jan-Feb
Mar-Apr
Nov-Dec
Jan-Feb
Mar-Apr
2004-05
2005-06


Common Goldeneye
Ephydra & Mercury
Aggregate % Biomass
Hg (ug/g ww)
100
80
60
40
20
0
100.00
10.00
1.00
Nov-Dec
Jan-Feb
Mar-Apr
Nov-Dec
Jan-Feb
Mar-Apr
2004-05
2005-06

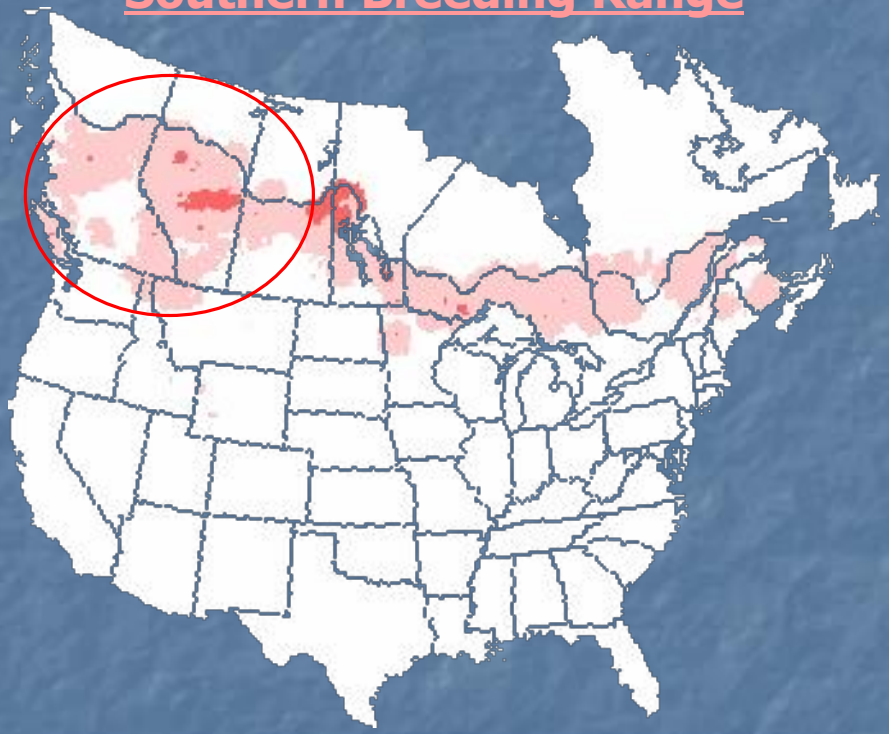
Selenium


30.0
20.0
10.0
5.0
3.0
2.0
1.0
0.5
Se (µg/g ww)
2004-05
2005-06
Nov-Dec
Jan-Feb
Mar-Apr
Nov-Dec
Jan-Feb
Mar-Apr

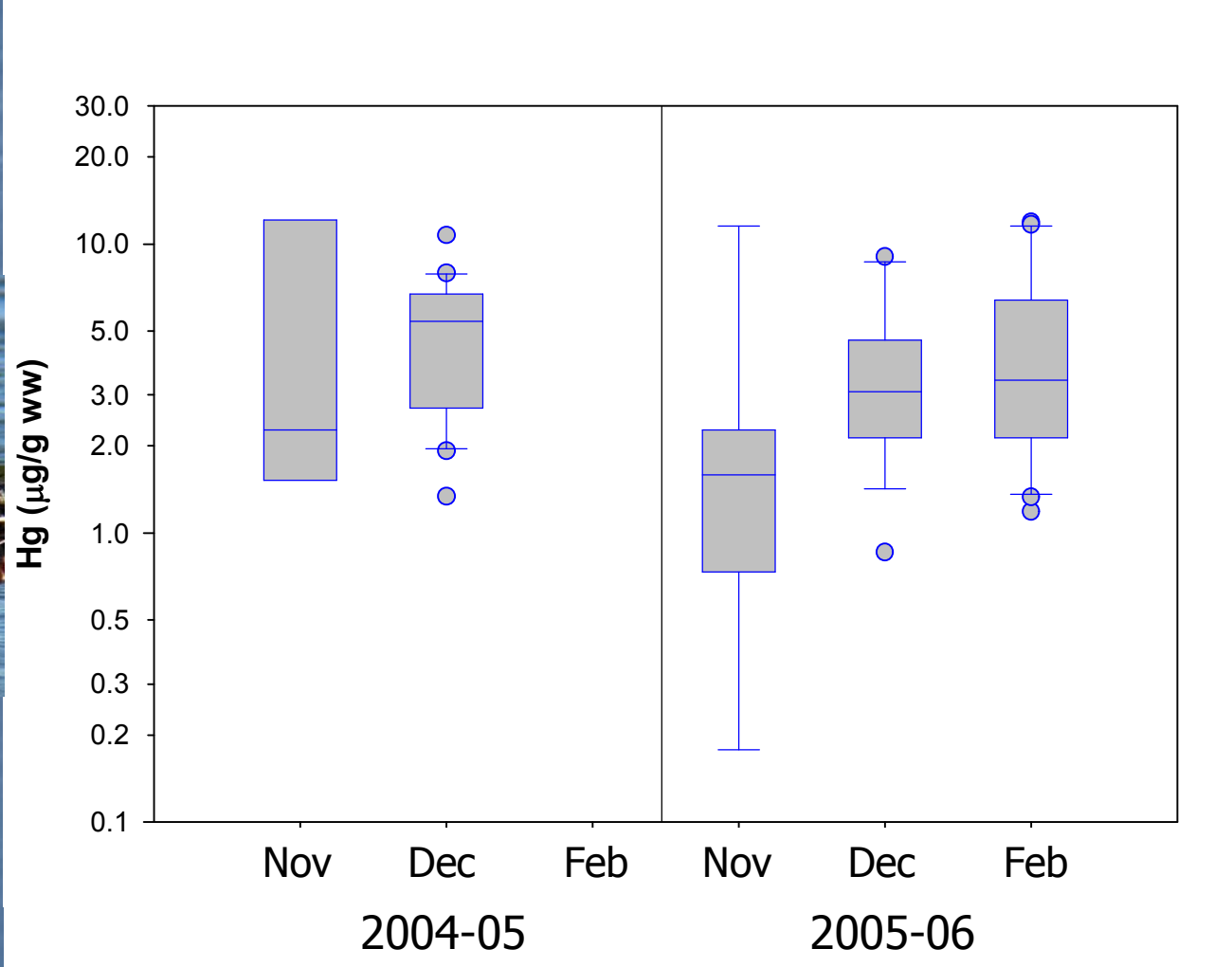

30.0
20.0
10.0
5.0
3.0
2.0
1.0
0.5
Se (µg/g ww)
2004-05
2005-06
Nov-Dec
Jan-Feb
Mar-Apr
Nov-Dec
Jan-Feb
Mar-Apr

Common Goldeneye

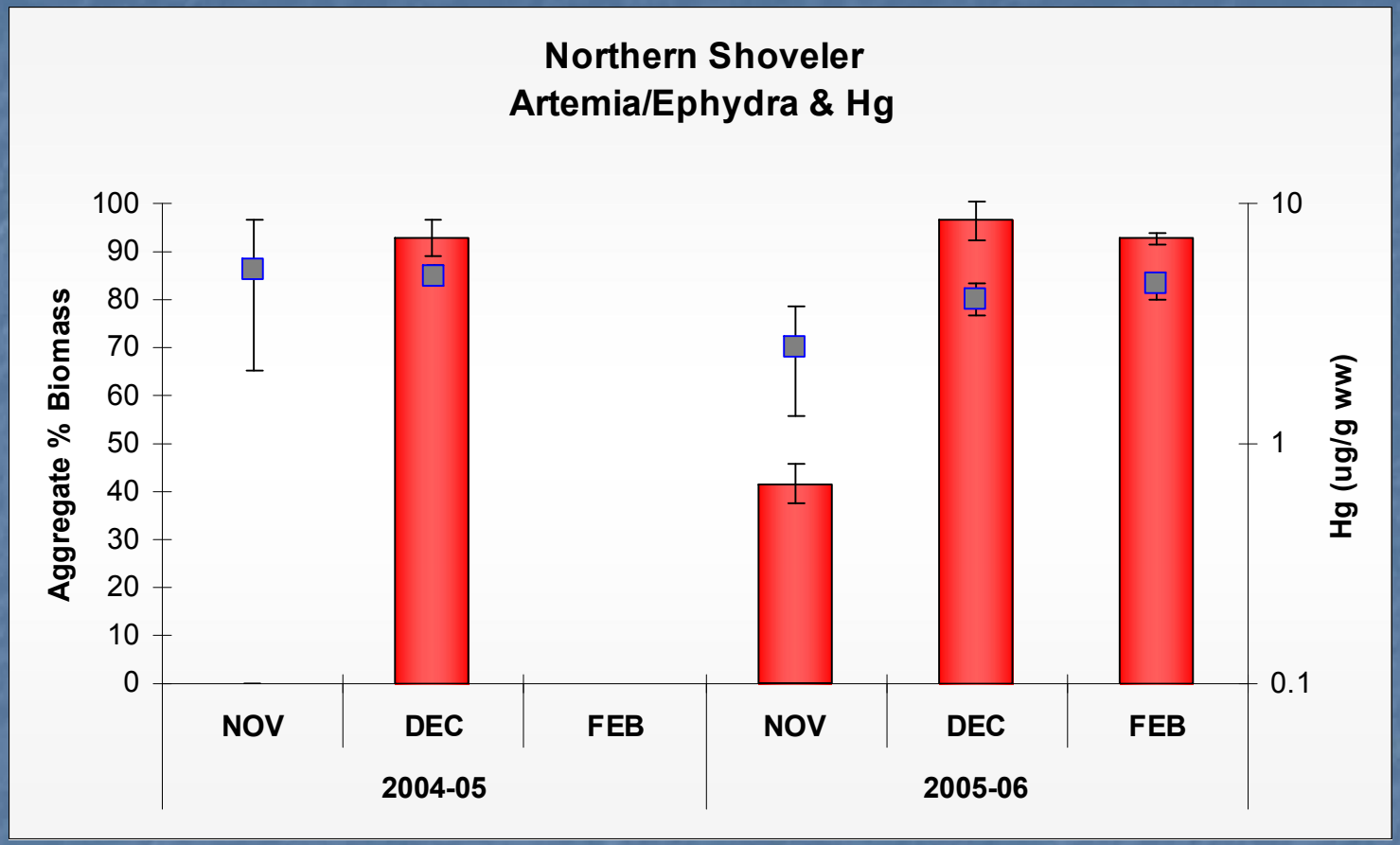
Southern Breeding Range



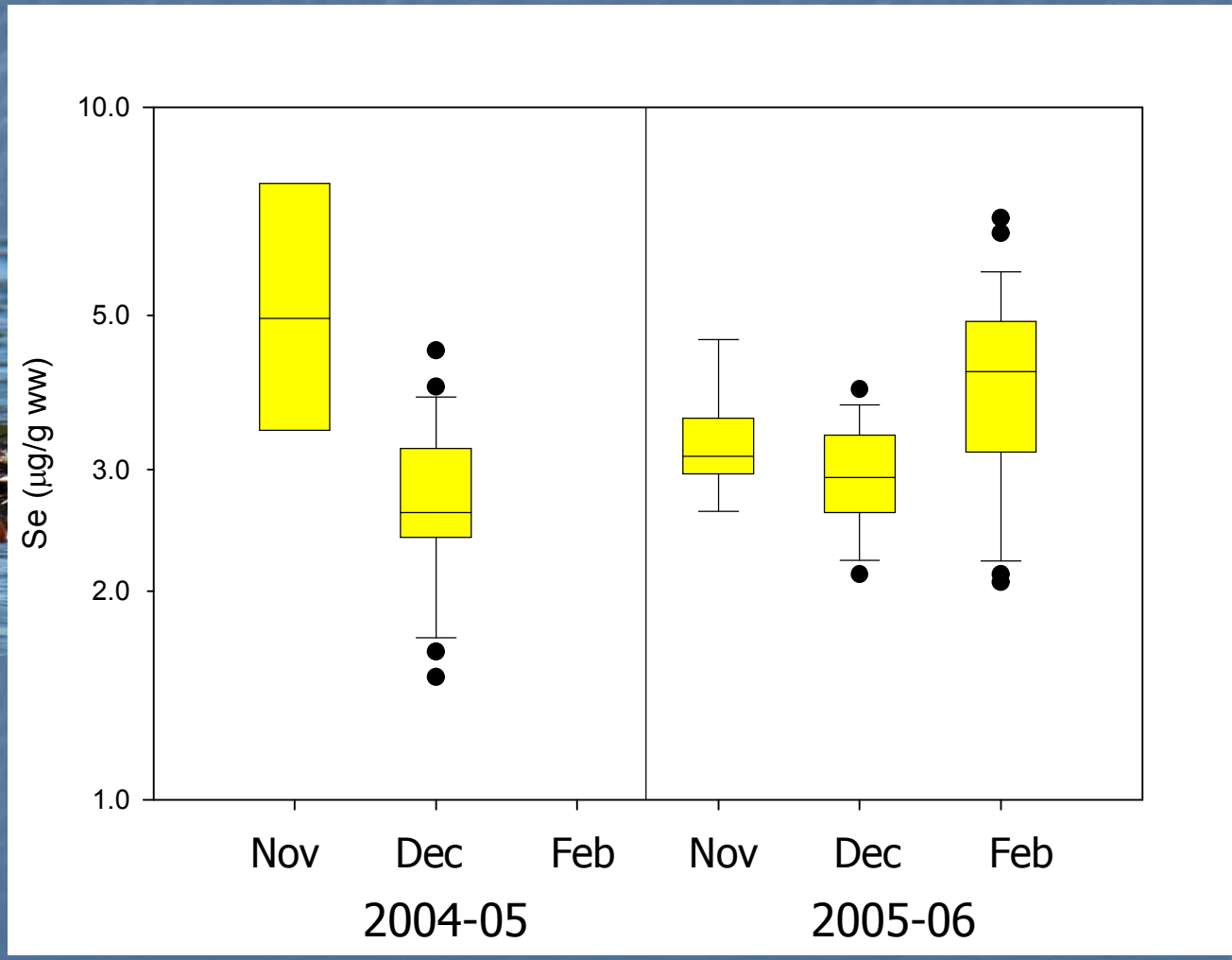
Northern Shoveler



Northern Shoveler



Northern Shoveler

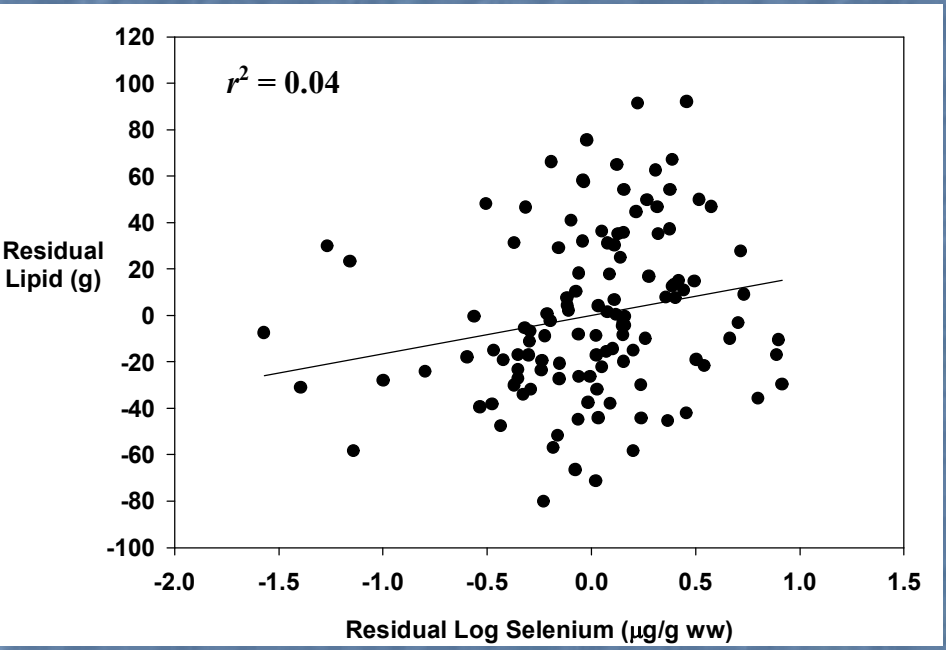


How do Contaminants Influence Ducks?

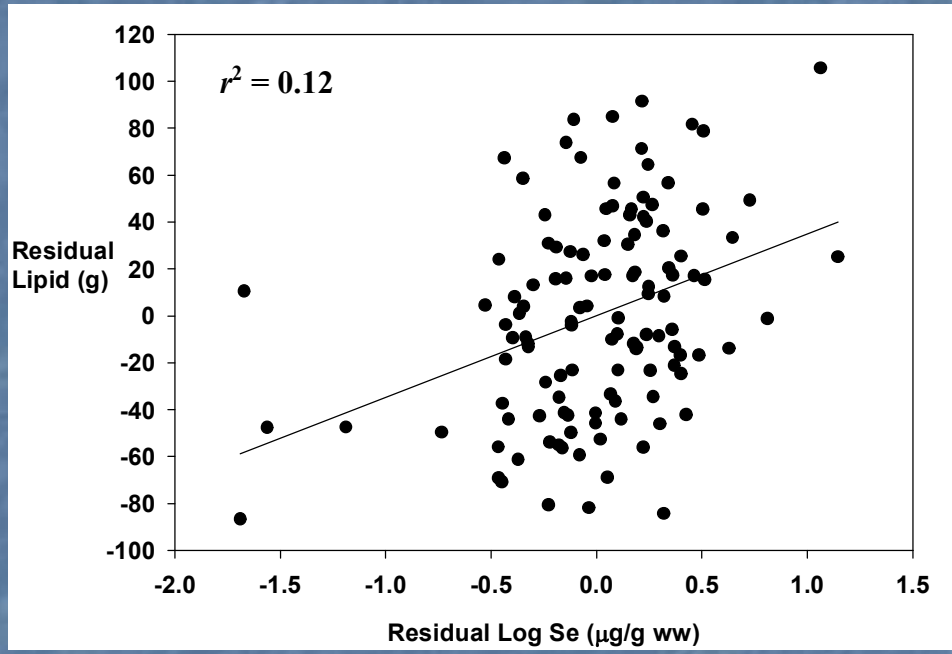
Common Goldeneye

Selenium x Lipid Mass

Female



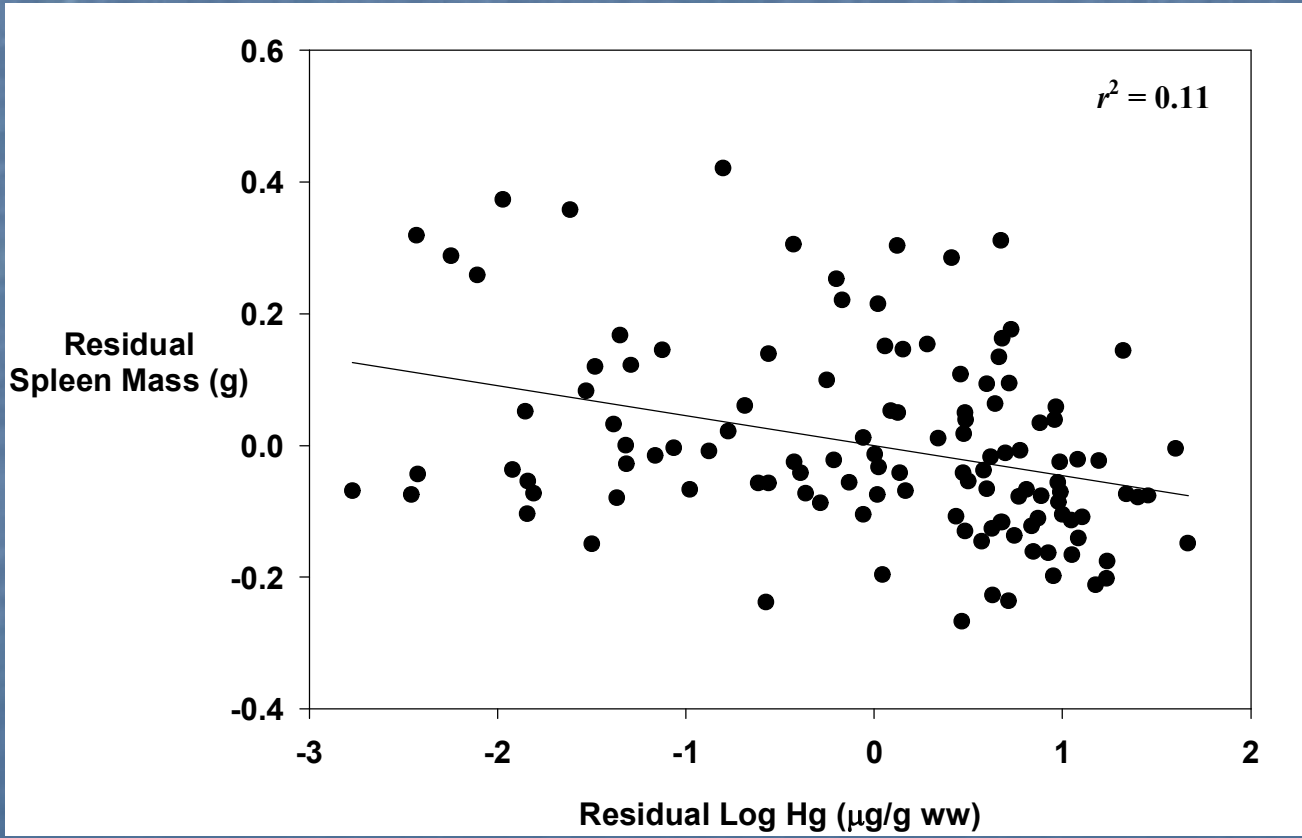
Male



Common Goldeneye

SPLEEN x Hg

Female

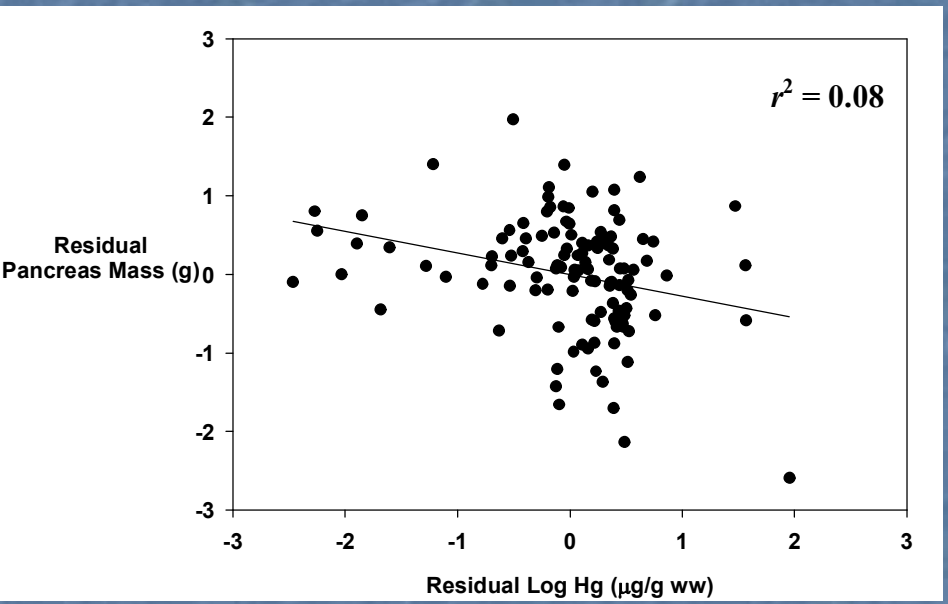


Common Goldeneye

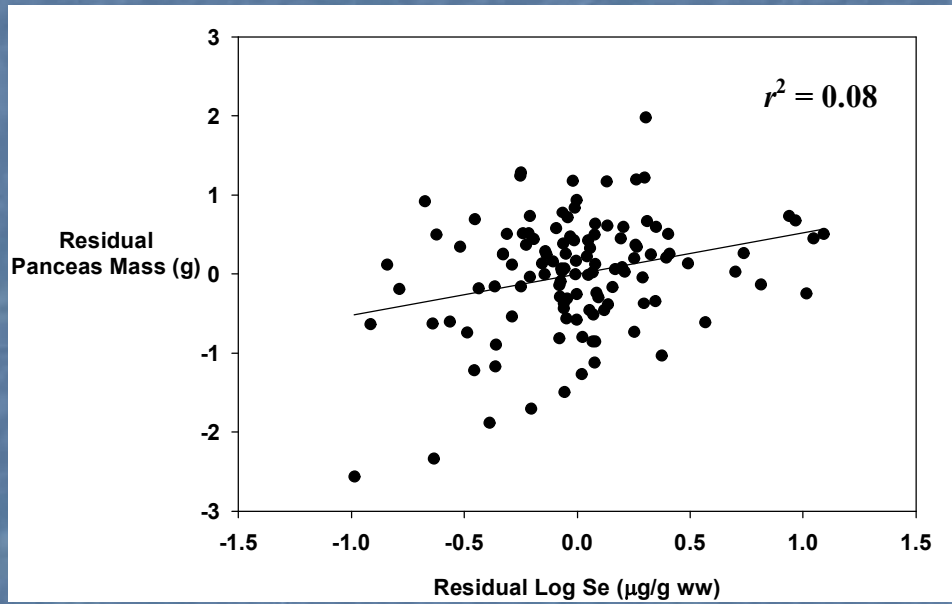
Pancreas

Male

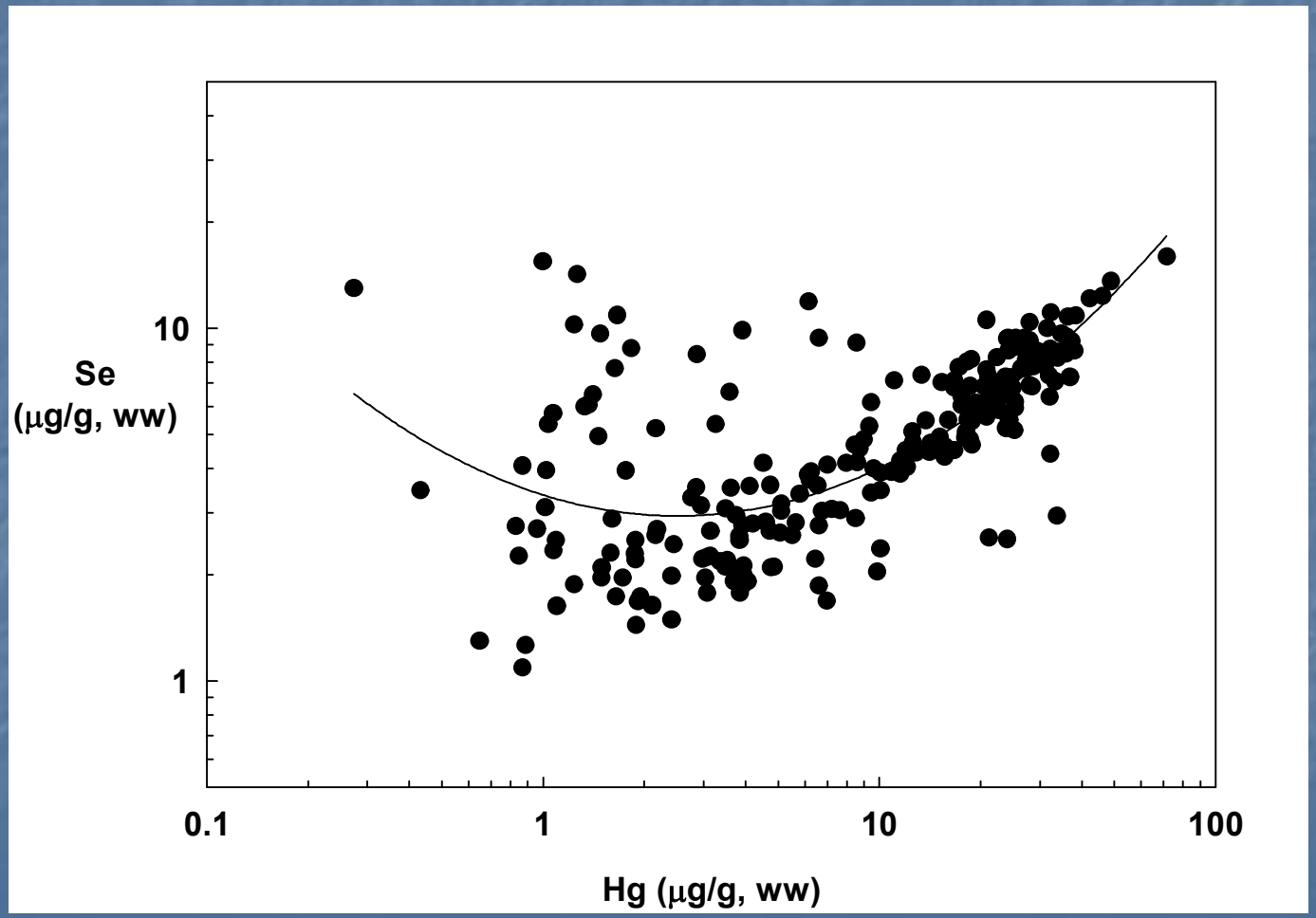
Mercury



Selenium



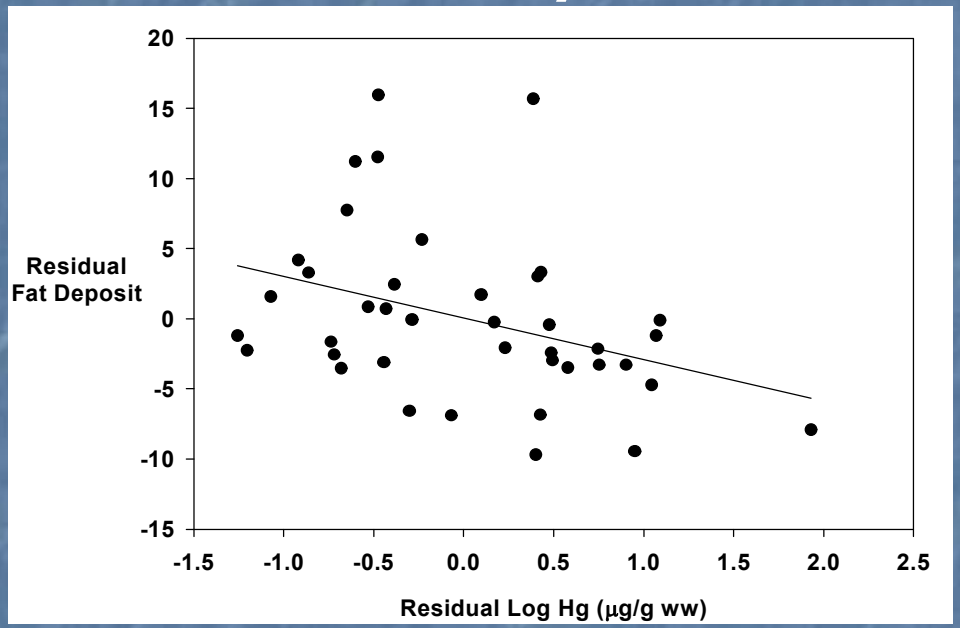
Common Goldeneye
Hg x Se



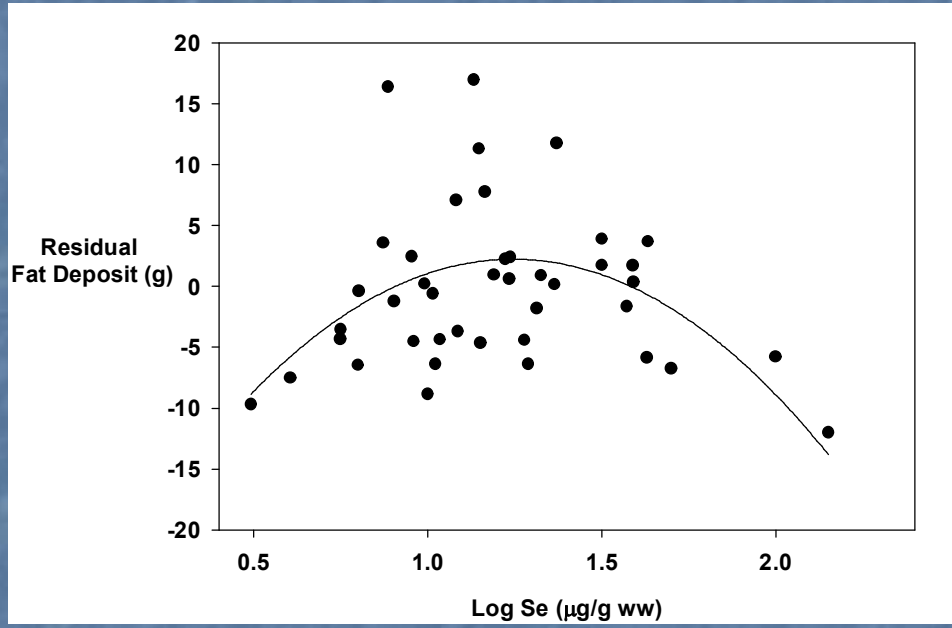
Northern Shoveler Fat Deposit

Female

Mercury



Selenium



Conclusions

- Waterfowl likely accumulate Hg from GSL
- Hg concentrations at levels of concern
- Influence of Hg on COGO moderate
  - Hg*Se interaction
  - Life History Traits
  - MeHg ?
- Likely stronger influence of Hg on NSHO

Acknowledgements

UTAH DNR WILDLIFE RESOURCES

GSLEP GREAT SALT LAKE ECOSYSTEM PROGRAM

UtahState UNIVERSITY

COLLEGE OF NATURAL RESOURCES

WILDLIFE RESTORATION

U.S. FISH & WILDLIFE SERVICE DEPARTMENT OF THE INTERIOR

Sea Duck Joint Venture

Photo courtesy R. Mosley