Habitat Use, Movement, and Residence of Sub-adult Striped Bass

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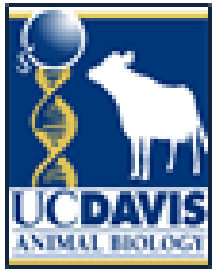
Animal Biotelemetry

LeDoux-Bloom, C.M., M.L. Johnson, A.P. Klimley, S. Fan and J.J. Isely. (in prep). Movement Patterns of sub-adult striped bass Morone saxatilis related to temperature and salinity in the San Francisco Estuary Watershed, California. Journal of Animal Biotelemetry. (Submit July 2013)

Acknowledgements

Funding



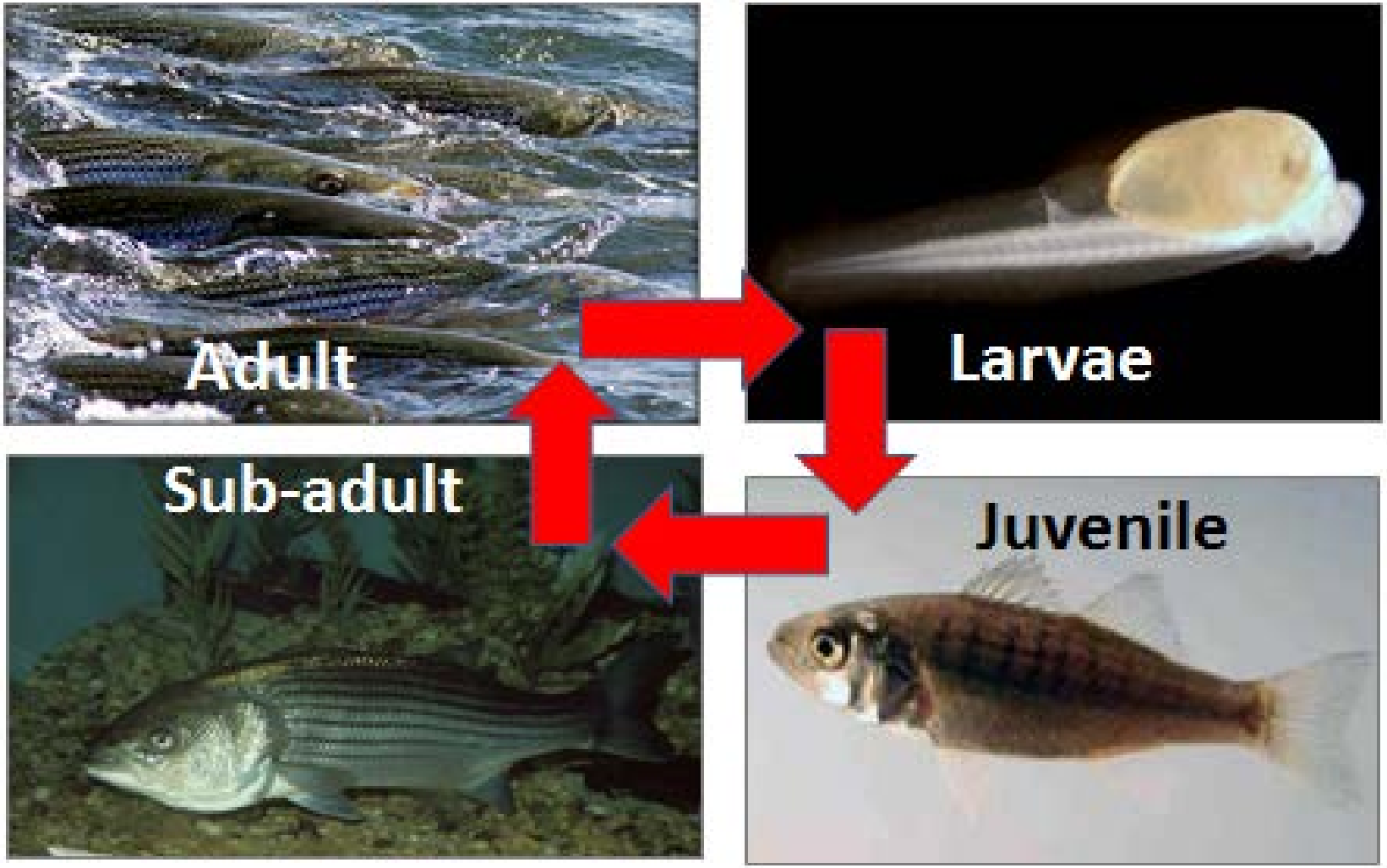
Data

♥ Volunteers & Interns ♥

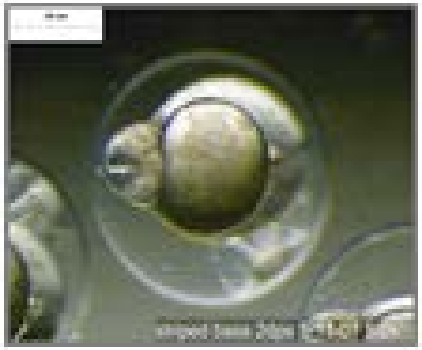
Plastic Life History

- Euryhaline
- Eurythermal
- Anadromous
- Bi-Maturation
- Iteroparous
- Skip spawn
- Long-lived

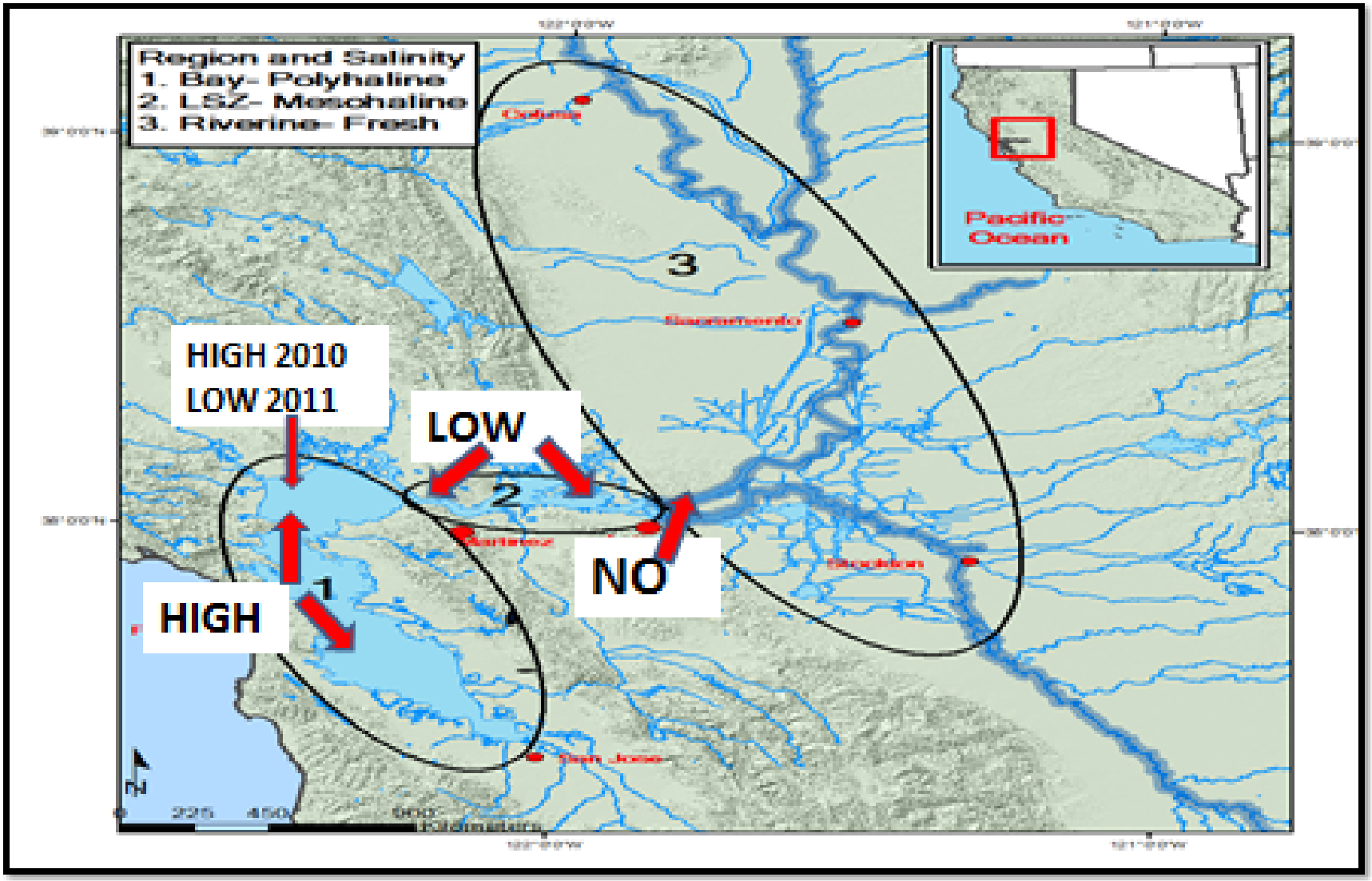
Life Cycle of Striped Bass

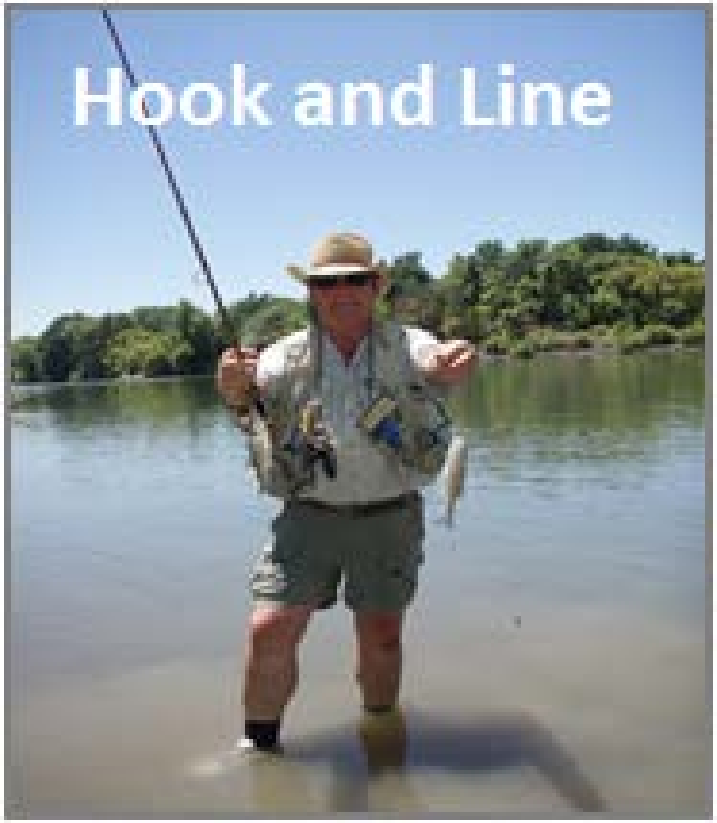


Knowledge of Striped Bass in SFEW



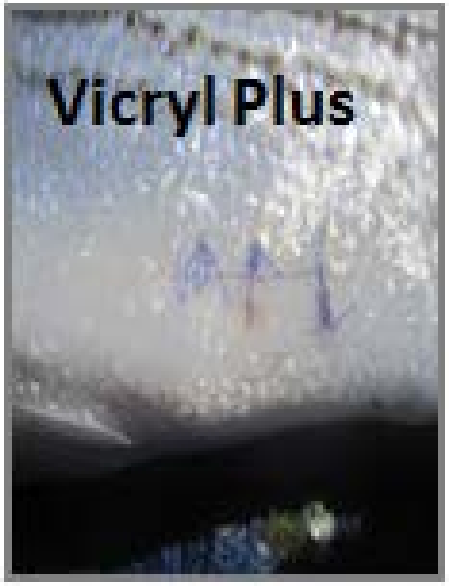
Study Site and Salinity Gradient



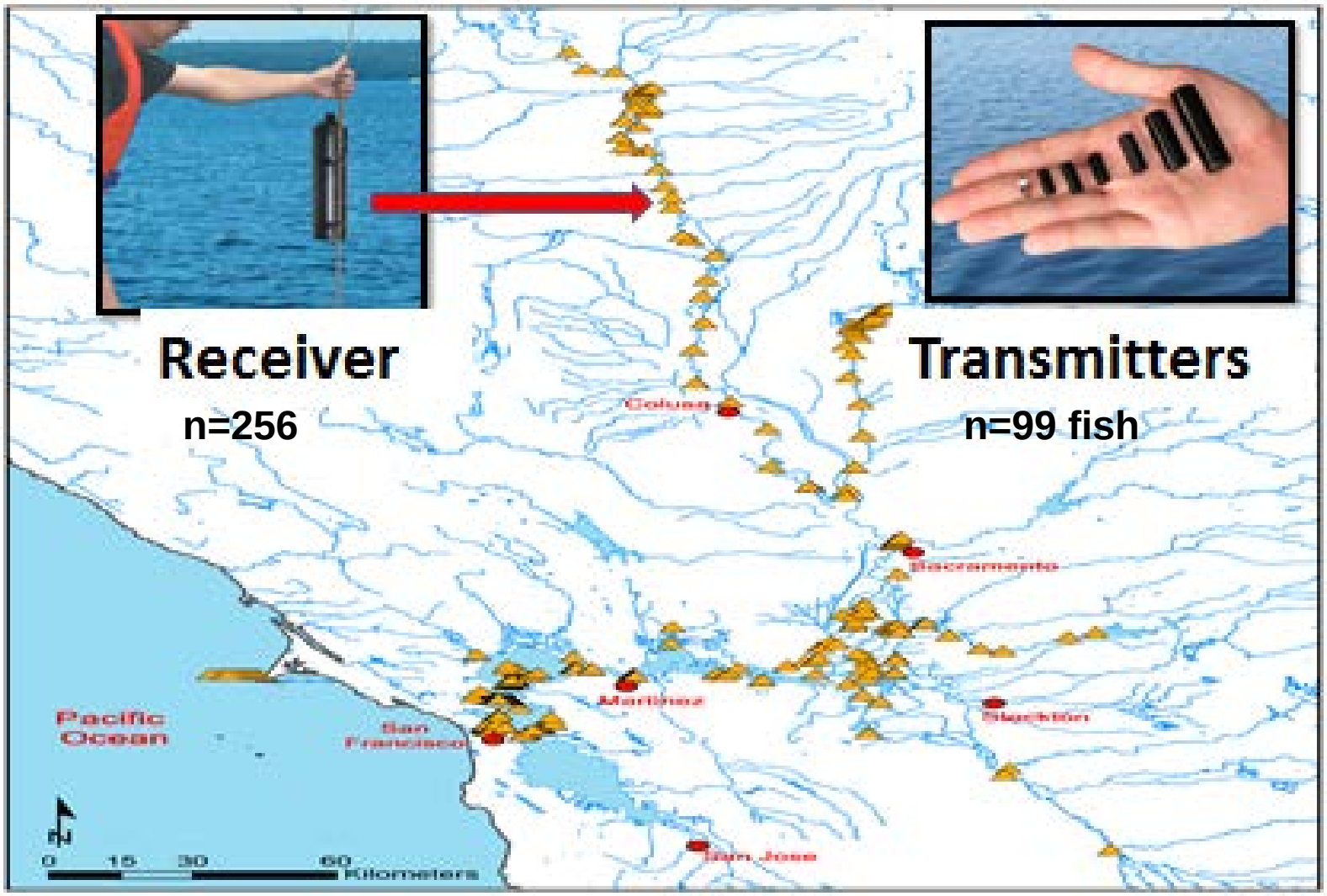

Hook and Line


Surgically implanted


Released

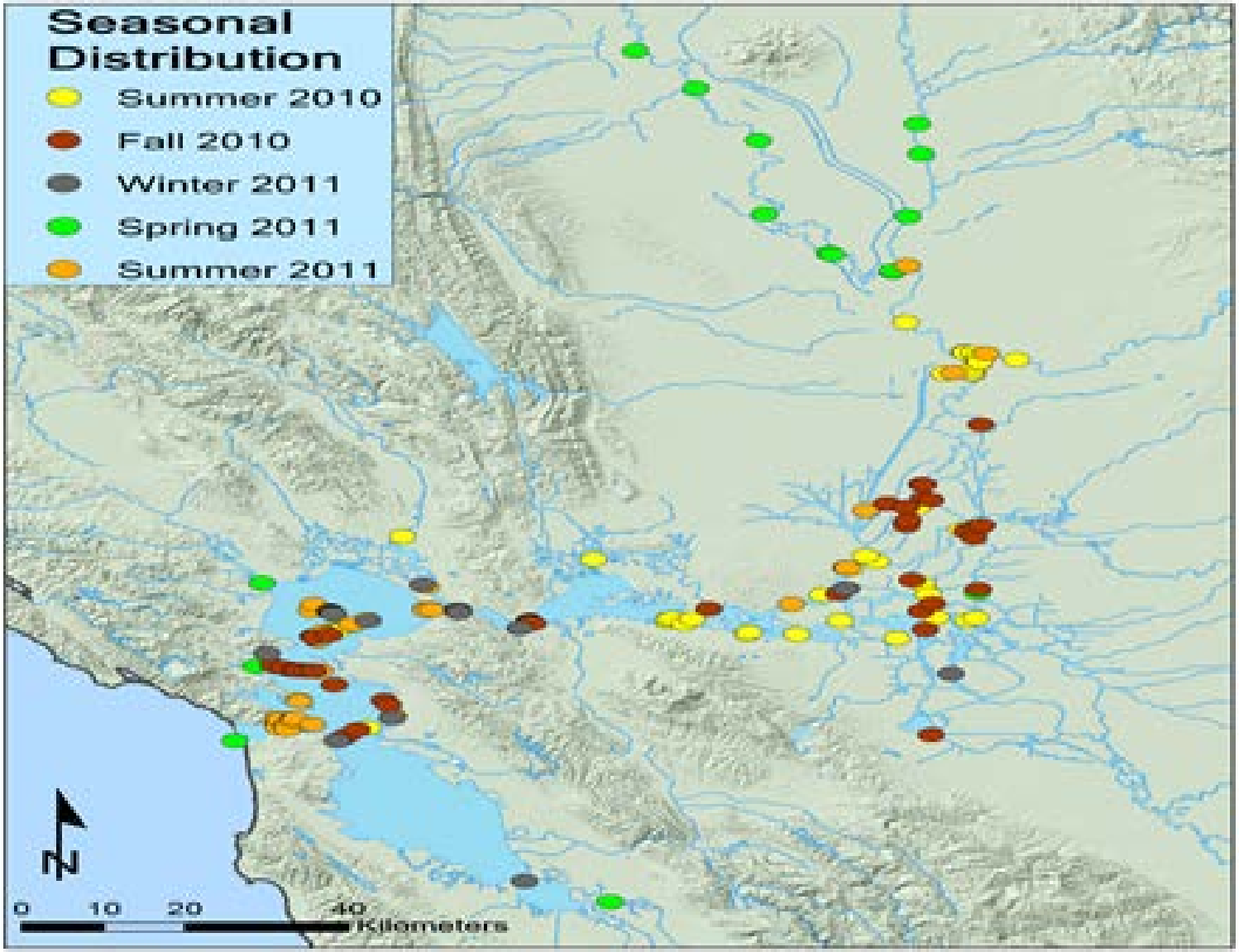

Vicryl Plus

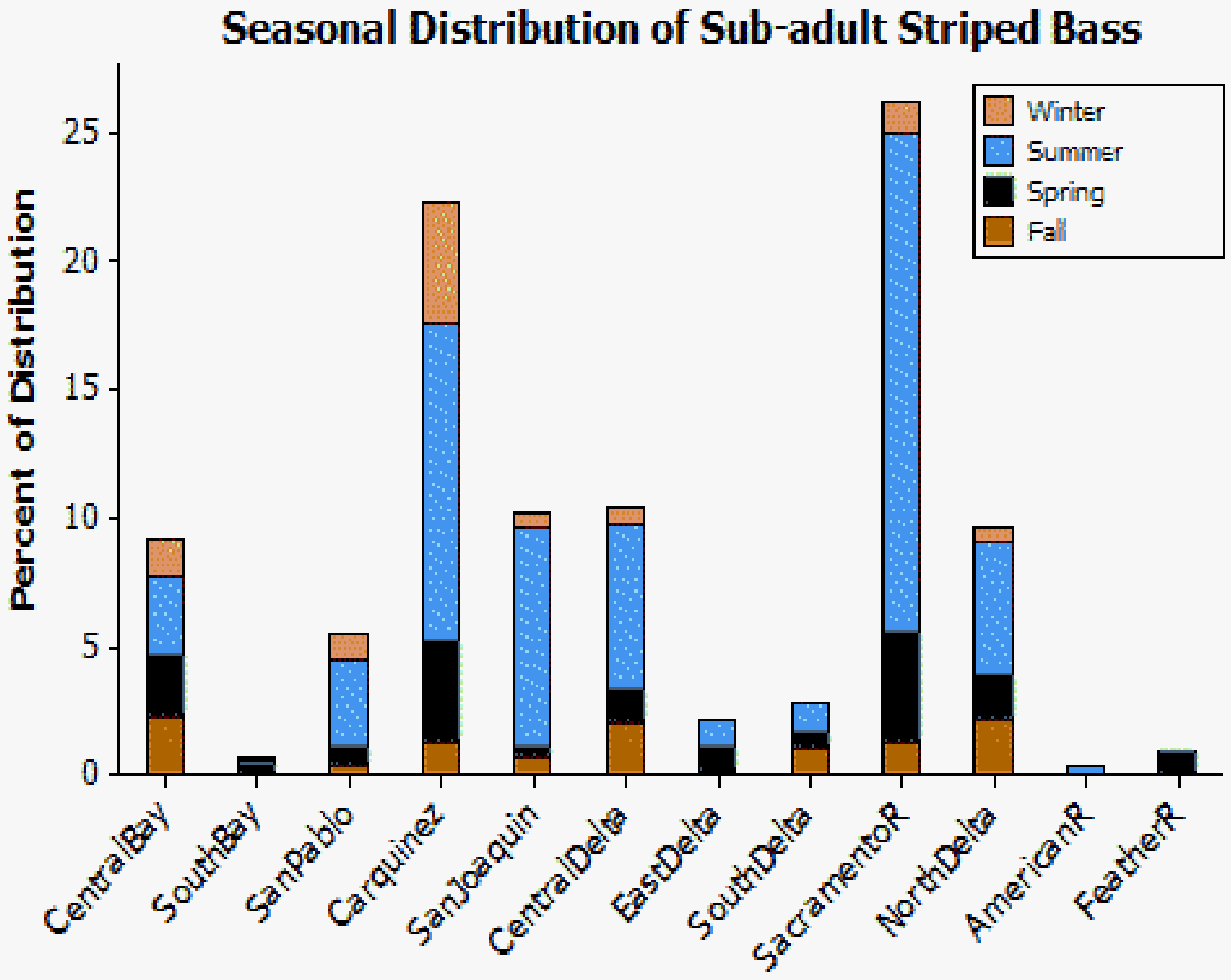
Methods


Receiver
n=256
Transmitters
n=99 fish
Pacific Ocean
San Francisco
Martinez
Sacramento
Stockton
San Jose
0 15 30 60
Kilometers

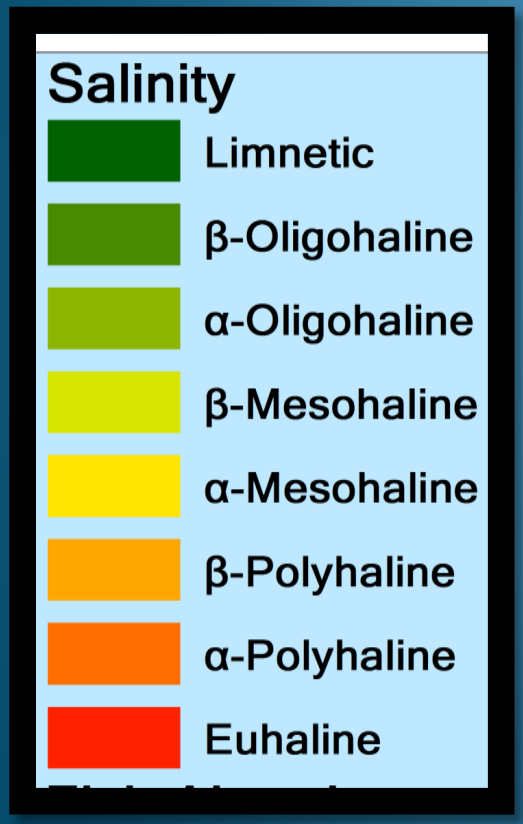
Results & Products

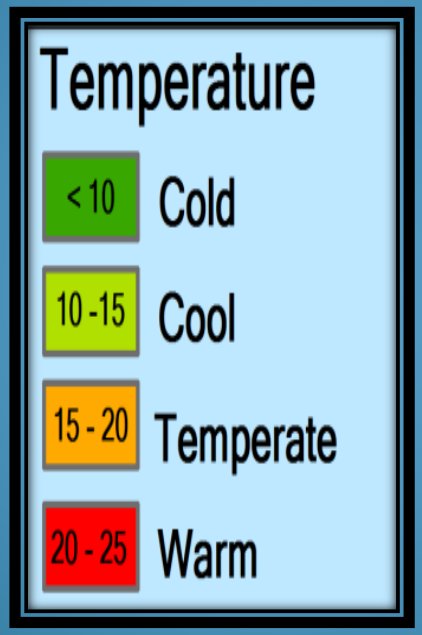
- Seasonal Distribution
- Seasonal Habitat Use
  (salinity, water temperature, and depth)
- Seasonal Movement and Residence

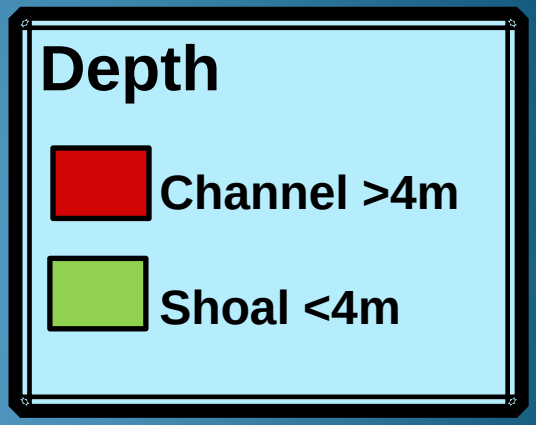

Seasonal Distribution
Summer 2010
Fall 2010
Winter 2011
Spring 2011
Summer 2011
N
0
10
20
40
Kilometers

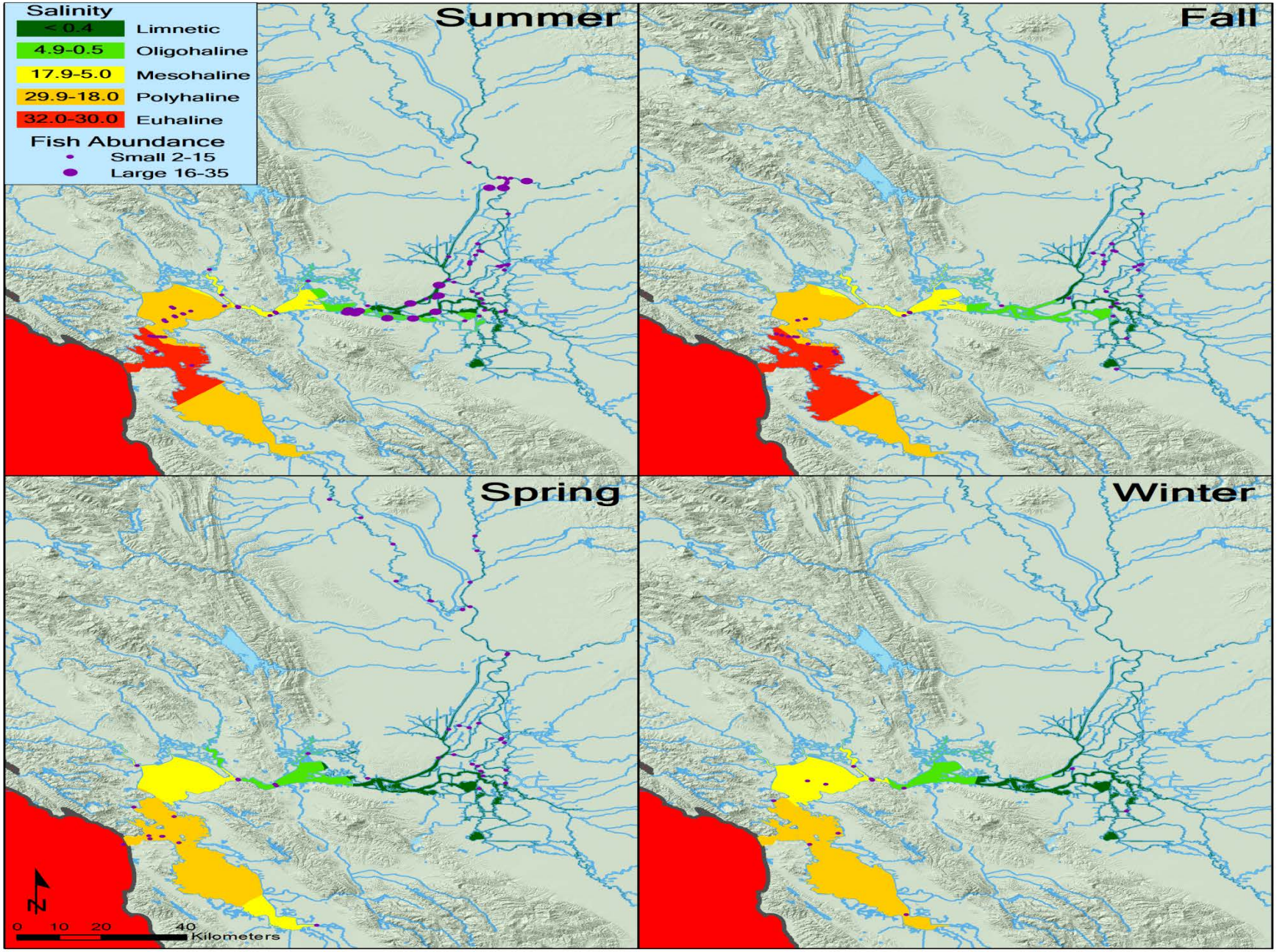

Seasonal Distribution of Sub-adult Striped Bass
Percent of Distribution
0
5
10
15
20
25
Winter
Summer
Spring
Fall
CentralBay
SouthBay
SanPablo
Carquinez
SanJoaquin
CentralDelta
EastDelta
SouthDelta
SacramentoR
NorthDelta
AmericanR
FeatherR

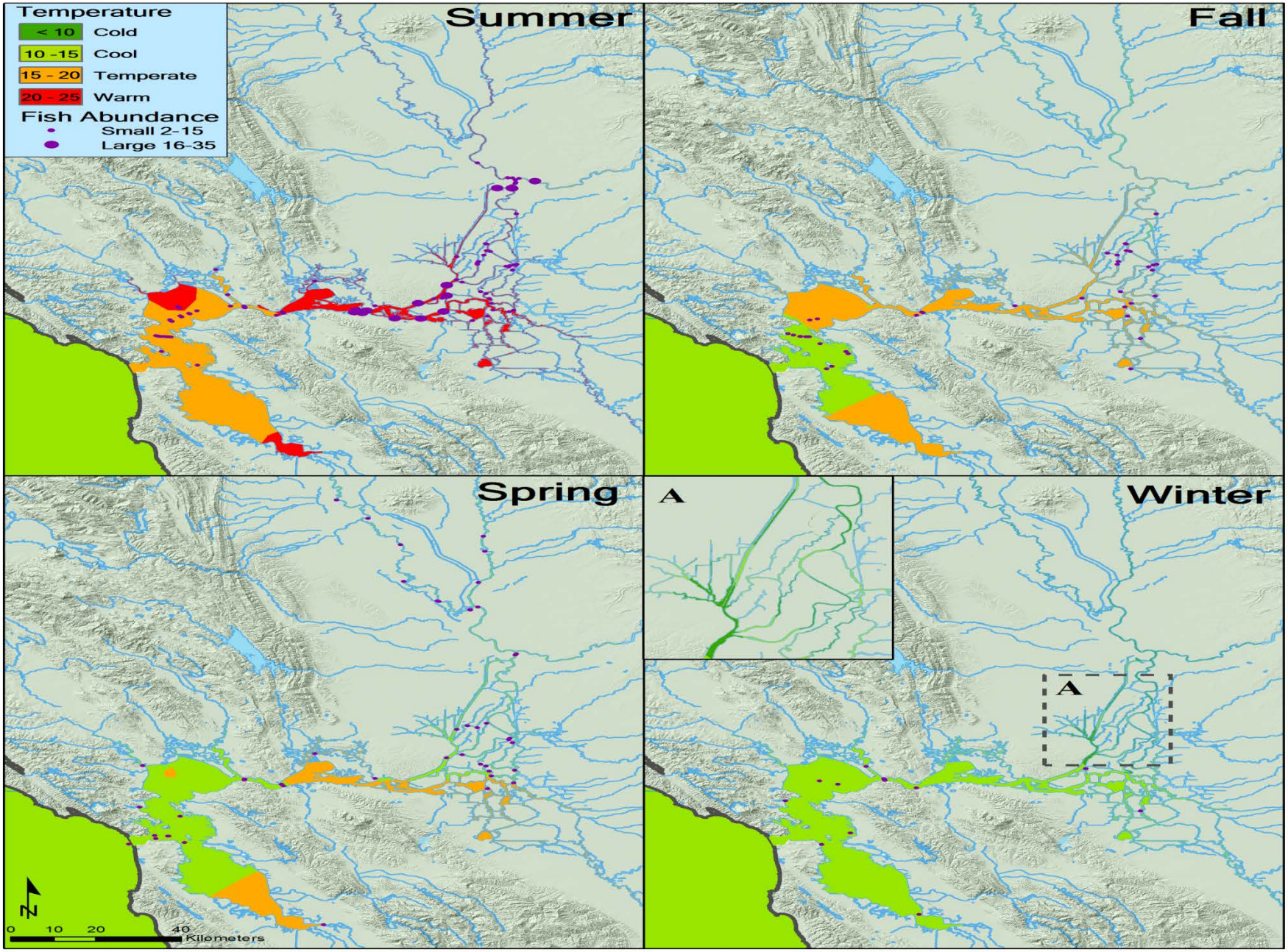
Coastal and Marine Ecological Classification Scheme for San Francisco Estuary (NOAA 2012)



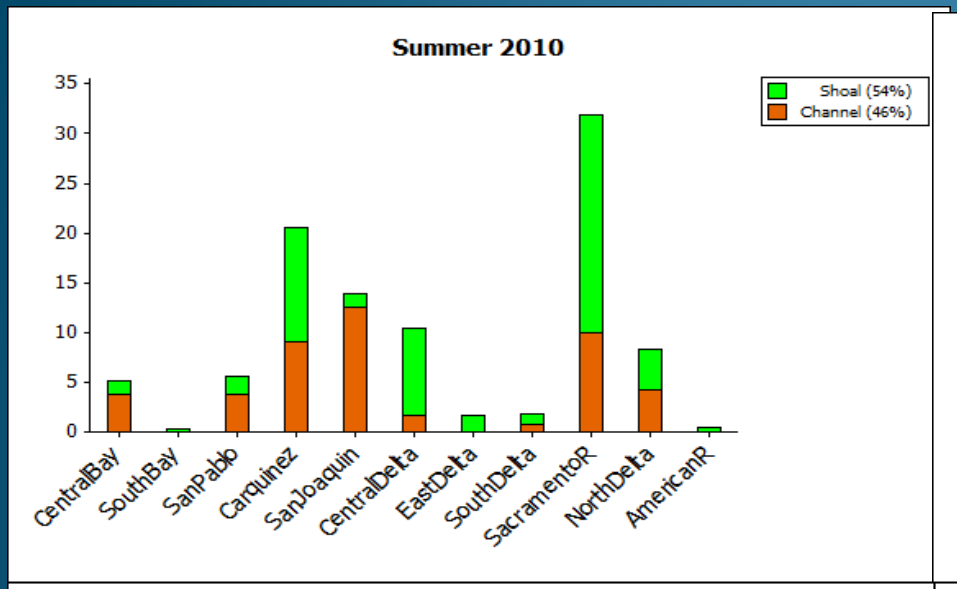


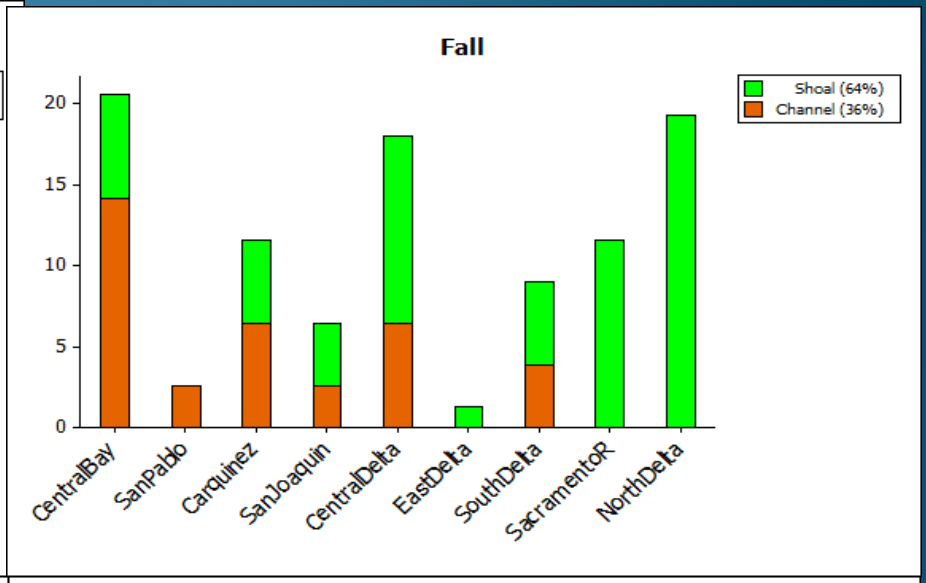


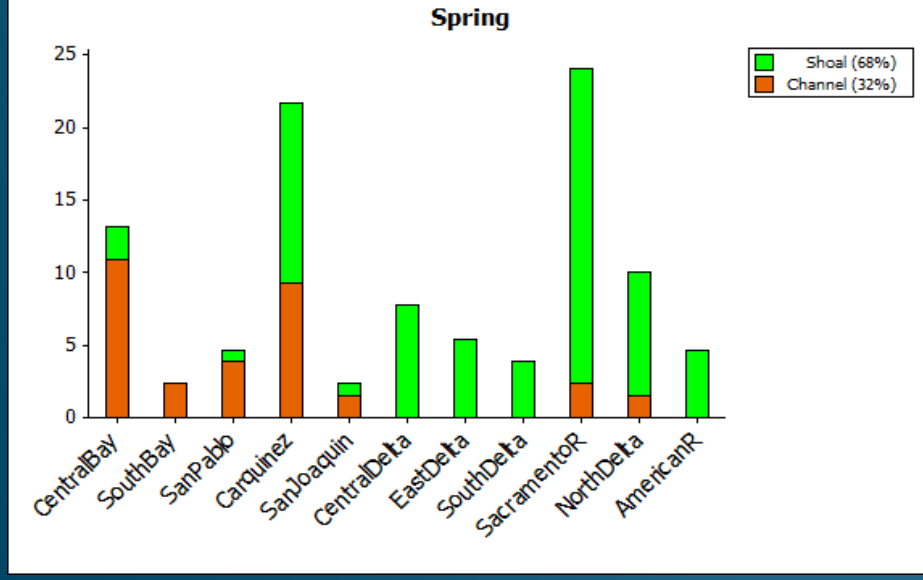

Salinity
< 0.4
Limnetic
4.9-0.5
Oligohaline
17.9-5.0
Mesohaline
29.9-18.0
Polyhaline
32.0-30.0
Euhaline
Fish Abundance
Small 2-15
Large 16-35
Summer
Fall
Spring
Winter
N
0 10 20 40
Kilometers

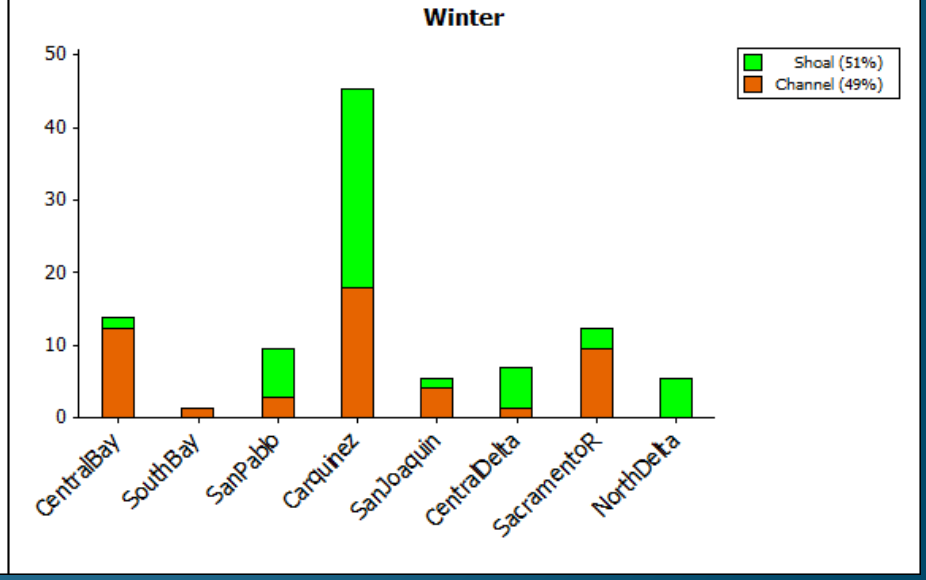

Temperature
< 10 Cold
10 -15 Cool
15 - 20 Temperate
20 - 25 Warm
Fish Abundance
Small 2-15
Large 16-35
Summer
Fall
Spring
Winter
A
A
N
0 10 20 40
Kilometers

Seasonal Shoal vs. Channel Use



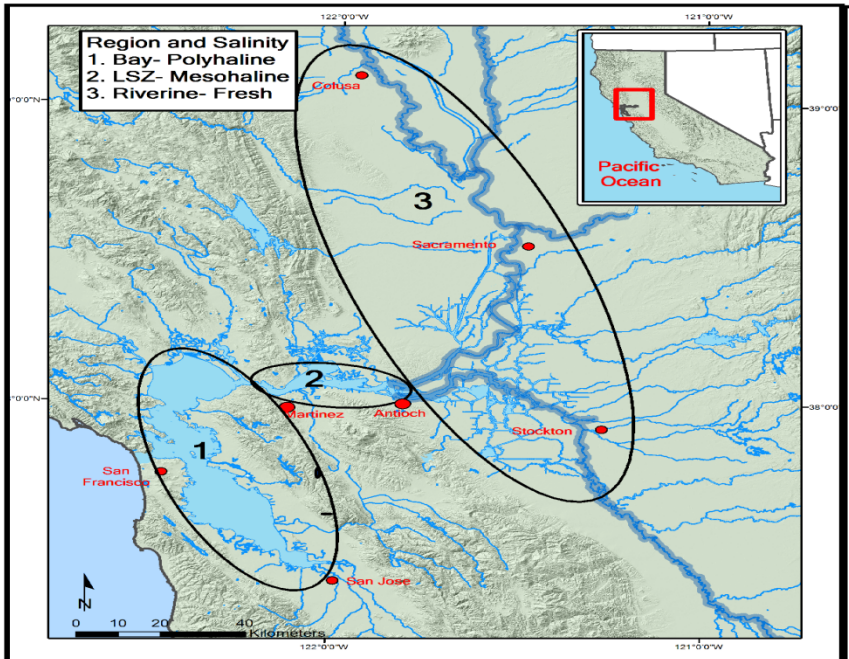


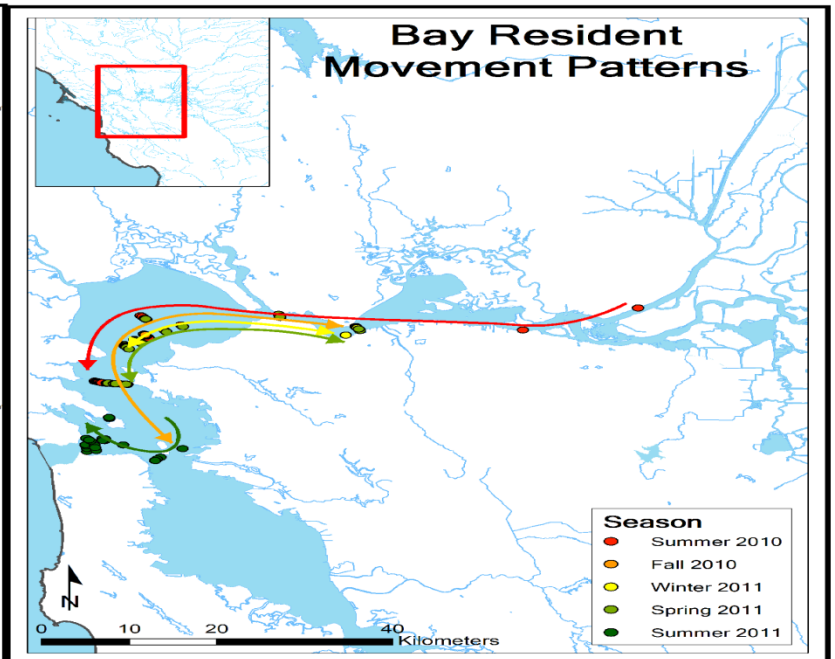


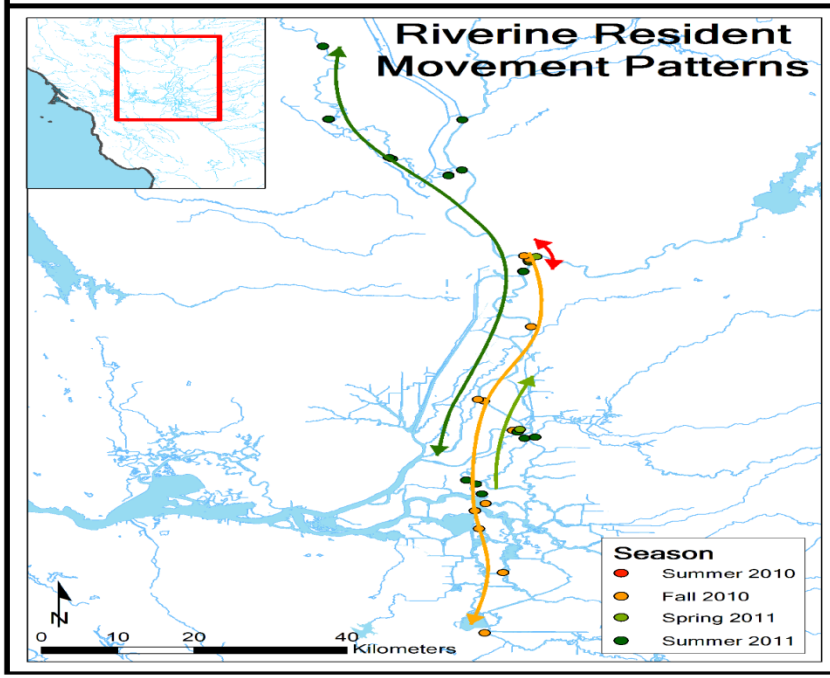


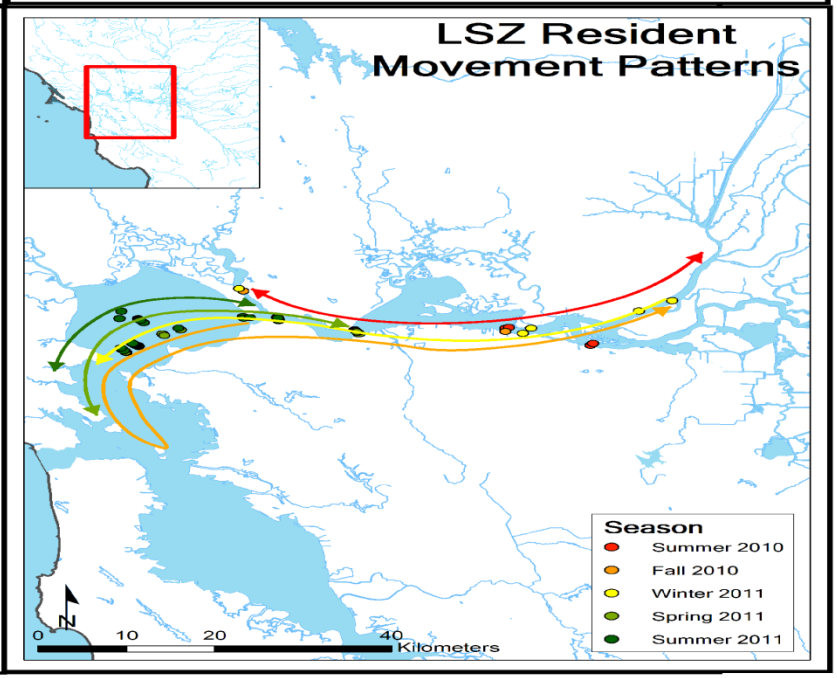
Movement and Residence

- Movement=relocation
- Residence=movement within salinity region
- Esri Tracker Analyst & Time Slider Extensions
- Mapped Visualization ArcMap 10
- Visualization in Camtasia

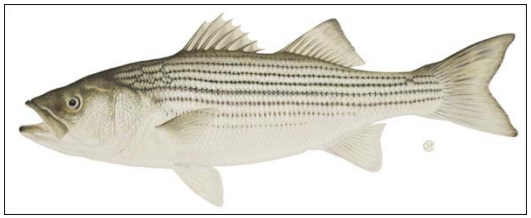

Region and Salinity
1. Bay- Polyhaline
2. LSZ- Mesohaline
3. Riverine- Fresh
Colusa
Sacramento
Martinez
Antioch
Stockton
San Francisco
San Jose
Pacific Ocean
1
2
3
0 10 20 40
Kilometers


Bay Resident
Movement Patterns
Season
Summer 2010
Fall 2010
Winter 2011
Spring 2011
Summer 2011
0 10 20 40
Kilometers

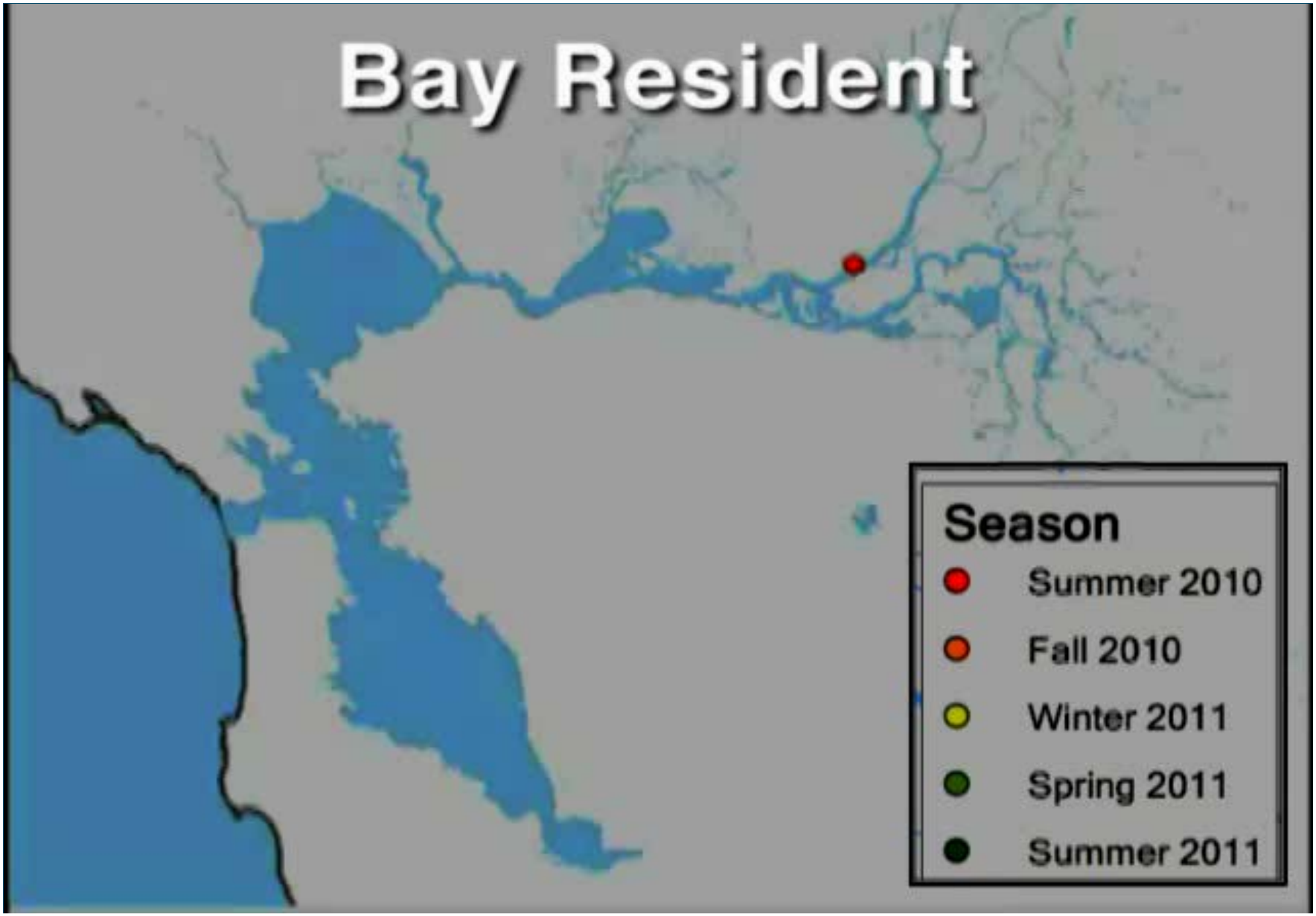

Riverine Resident
Movement Patterns
Season
Summer 2010
Fall 2010
Spring 2011
Summer 2011
0 10 20 40
Kilometers


LSZ Resident
Movement Patterns
Season
Summer 2010
Fall 2010
Winter 2011
Spring 2011
Summer 2011
0 10 20 40
Kilometers

Visual Analyses



- Visualization represent movement and residence patterns.
- Data appears in time sequence.
- No movement=No data
- Colors relate to season.

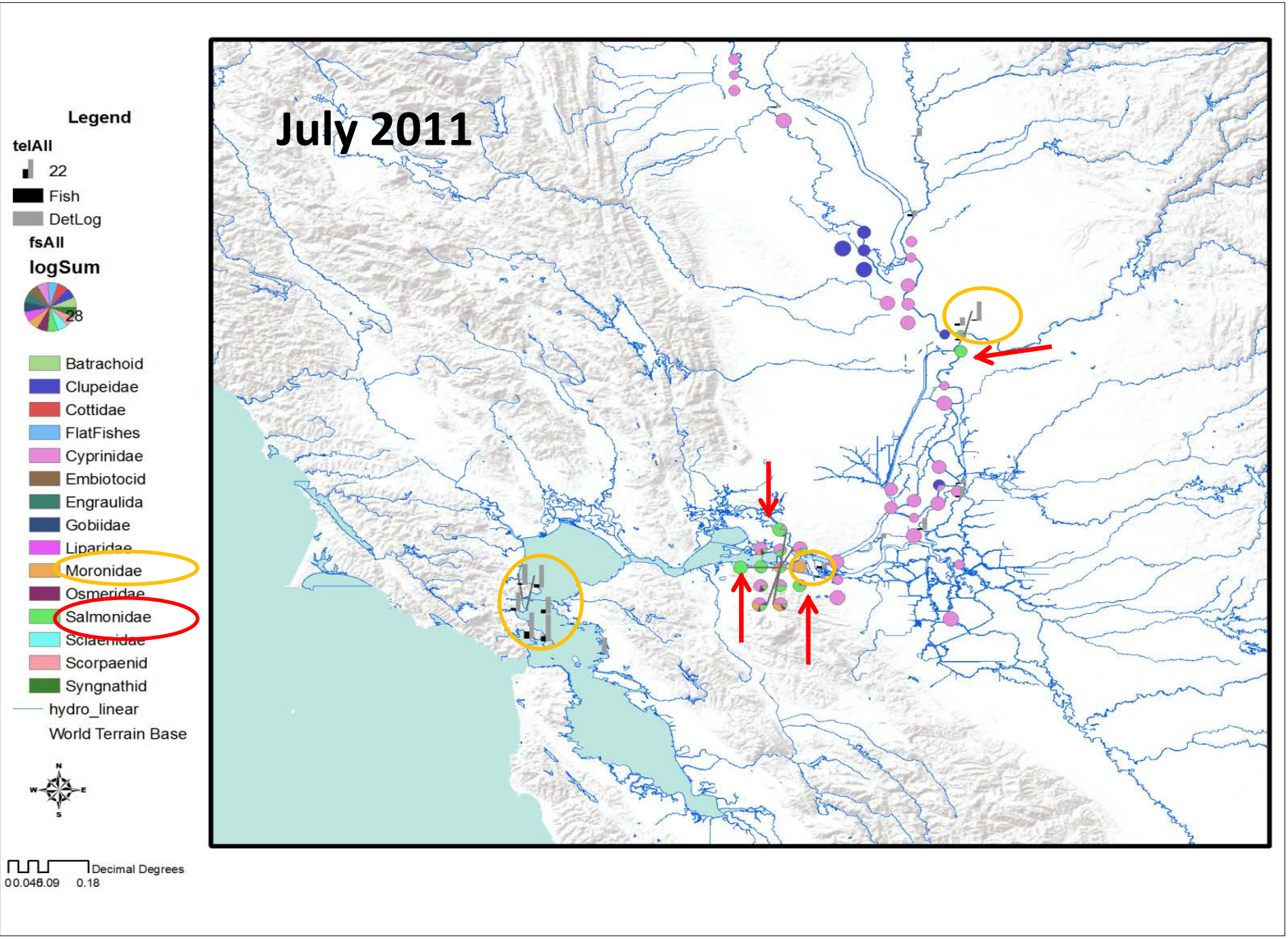

Bay Resident
Season
Summer 2010
Fall 2010
Winter 2011
Spring 2011
Summer 2011

Study Conclusions

1. Widely distributed until late fall/ early winter;
2. Shifts toward the ocean when temperatures decrease below 13C;
3. Seasonal abundance is highest in Limnetic and Polyhaline habitats;
4. Abundance is highest >20C and not observed in temps <10C;
5. Shoals over channels across all seasons;
6. Bay, LSZ, and Riverine residence patterns.

Suggested Next Steps

- Synthesize existing telemetry and trawl/seine data sets to determine seasonal and regional habitat overlap between predators and prey;
- Add piscivorous birds, river otters, seals, and sea lions seasonal distribution in analyses;
- Continue to incorporate deterrents and attractants to shield smolts from predation hot spots.


July 2011
Legend
telAll
22
Fish
DetLog
fsAll
logSum
28
Batrachoid
Clupeidae
Cottidae
FlatFishes
Cyprinidae
Embiotocid
Engraulida
Gobiidae
Liparidae
Moronidae
Osmeridae
Salmonidae
Sciaenidae
Scorpaenid
Syngnathid
hydro_linear
World Terrain Base
N
W
E
S
Decimal Degrees
0 0.045 0.09 0.18

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Thank you!