Informative Item:

Effects of Submerged Aquatic Vegetation on Biota

ORSANCO Special Biological Study

Report to TEC Committee

February 7, 2017

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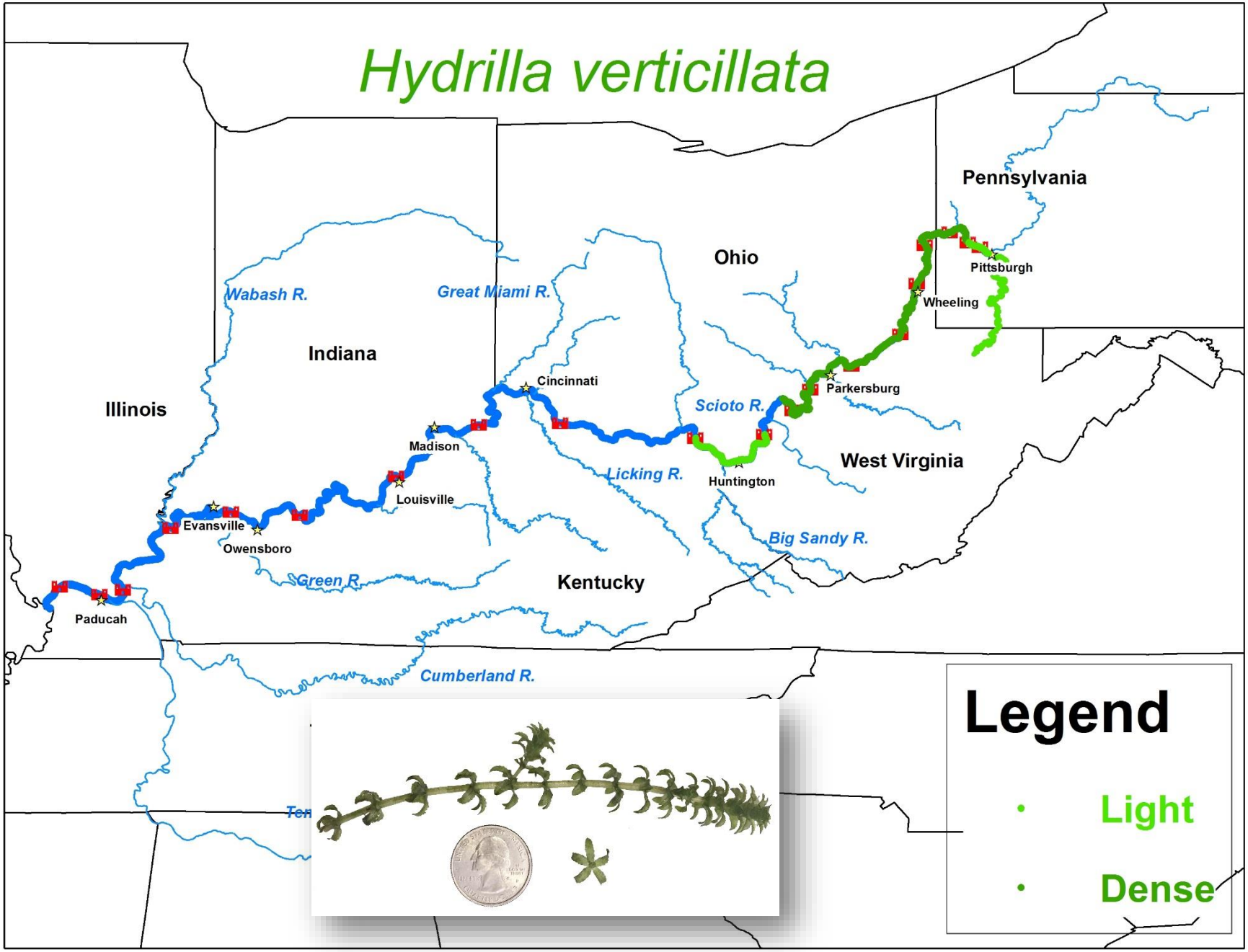
Background

- Introduced submerged aquatic plant, Hydrilla, has spread dramatically across the upper 1/3 of the Ohio River in the last 10 years

- Appears to be causing shifts in biotic communities encountered during routine surveys
  - Impacts fish and macroinvertebrate indices

- Designed study for 2016 to quantify effects on fish

Hydrilla verticillata



2016 Study Design

- Targeted Willow Island to overlap with routine surveys
  - Heavily infested

- Phase 1
  - Quantify SAV species composition and density at all probabilistic sites

- Phase 2
  - Electrofish 500m zones (N=12) under peak SAV growth
    - 4 Heavily infested
    - 4 Medium
    - 4 Little to no SAV

SAV Characterization

- Developed methods based on modifications of EMAP-GRE and others
  - Double-sided rake
    - Attached to 12’ pole
- Lower to bottom at 66 points throughout 500m zone
- Twist rake pole and pull up
- Quantify amount of each species present in each grab
- Record biomass of each species from each 500m zone

Fullness Rating	Coverage	Description
0		No plants present.
1		Only few plants. There are not enough plants to entirely cover the length of the rake head in a single layer.
2		There are enough plants to cover the length of the rake head in a single layer, but not enough to fully cover the tines.
3		The rake is completely covered and tines are not visible.

Figure 3. Illustration of rake fullness ratings modified from Hauxwell et al 2010.

Willow Island - Preliminary Results

- Identified 6 SAV taxa

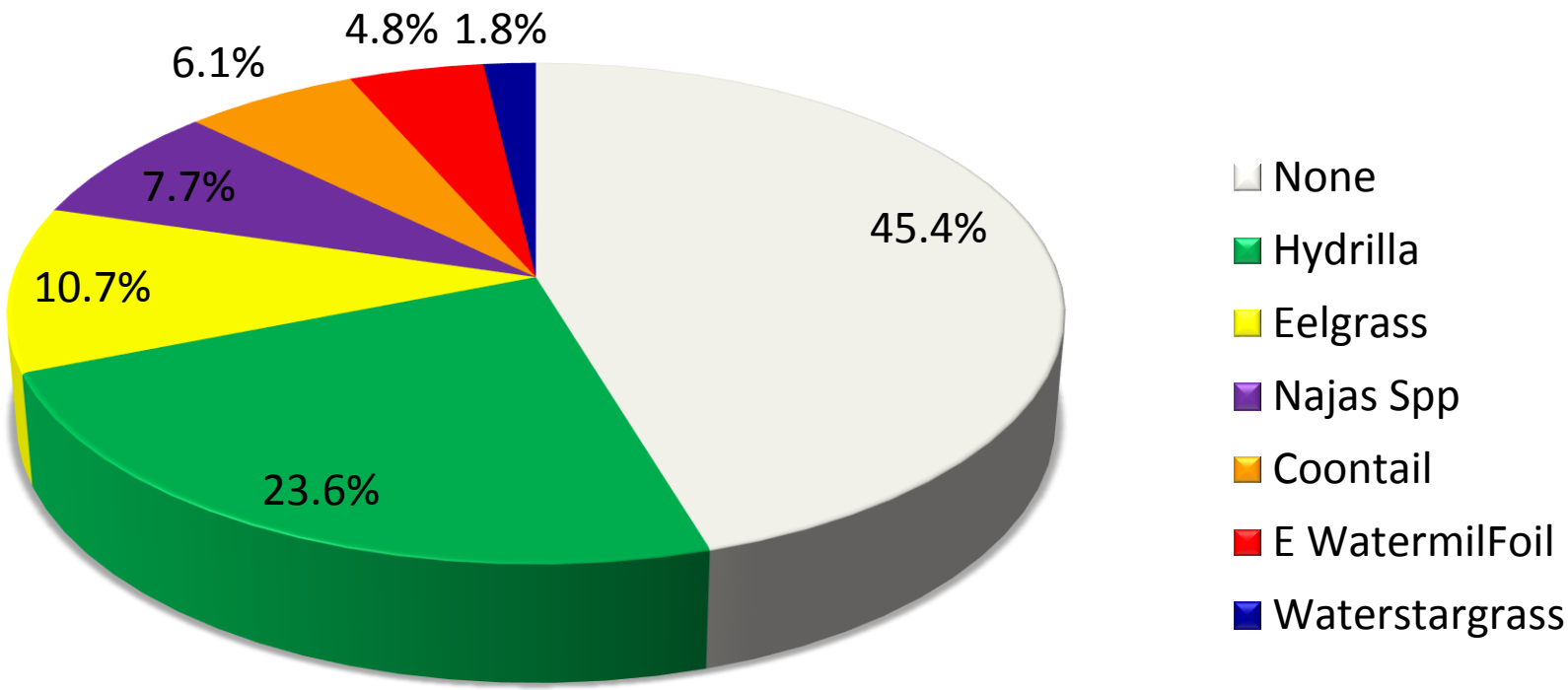
Hydrilla

Eurasian Watermilfoil

Native Species

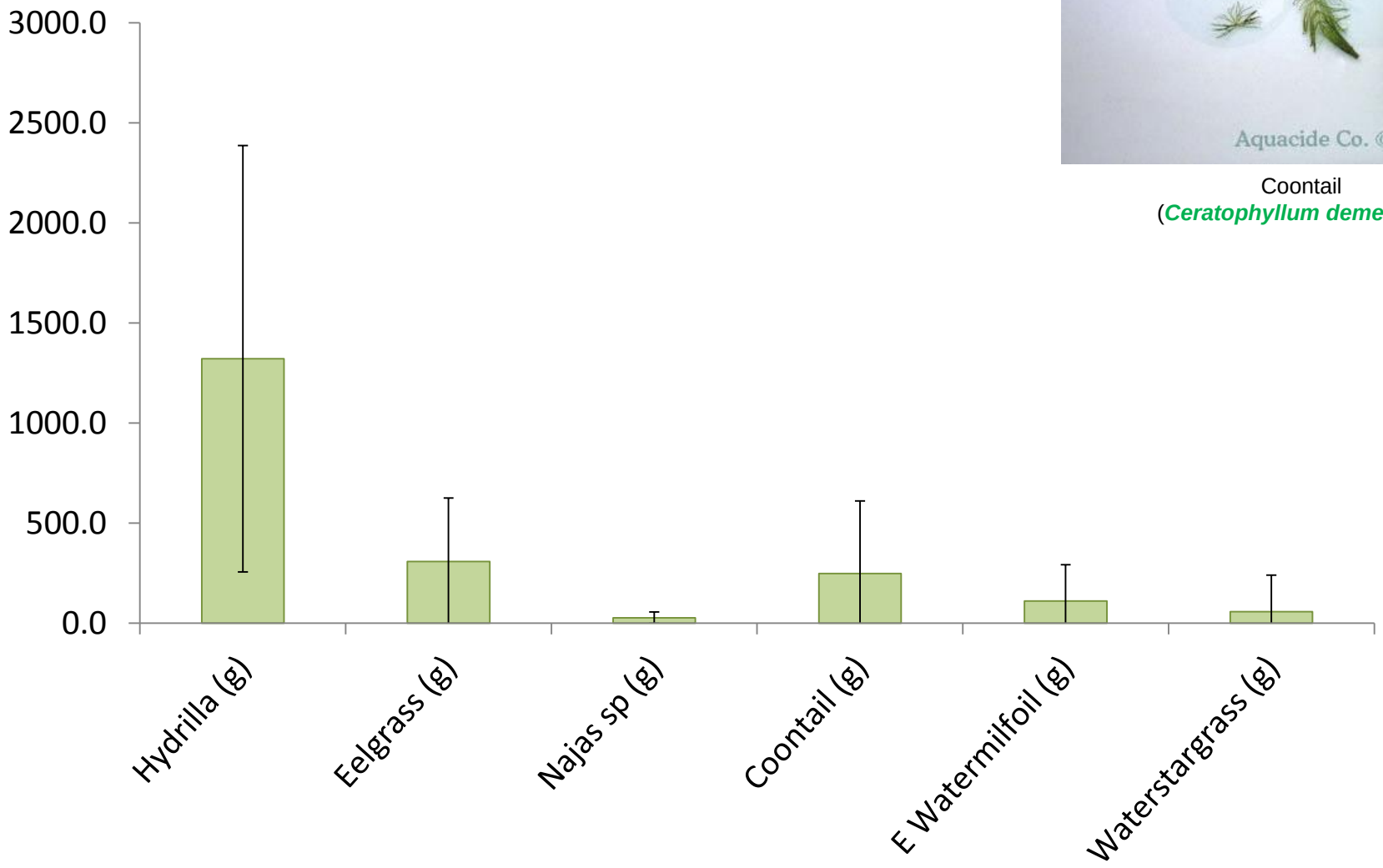
- Eelgrass
- Coontail
- Water Star-grass
- Water nymph spp (Naiads)

Relative Occurrence

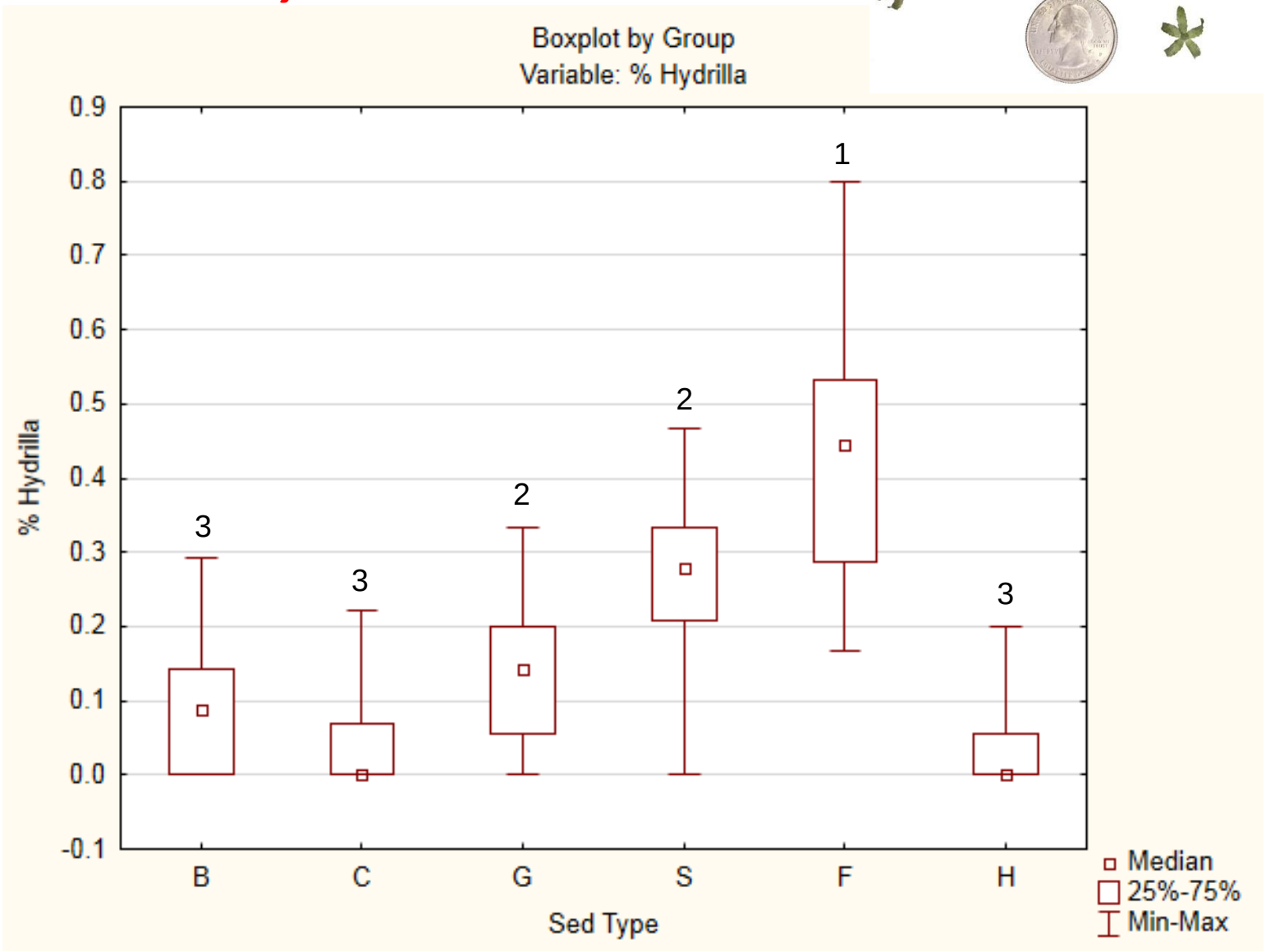


Average Biomass

Coontail
(***Ceratophyllum demersum***)

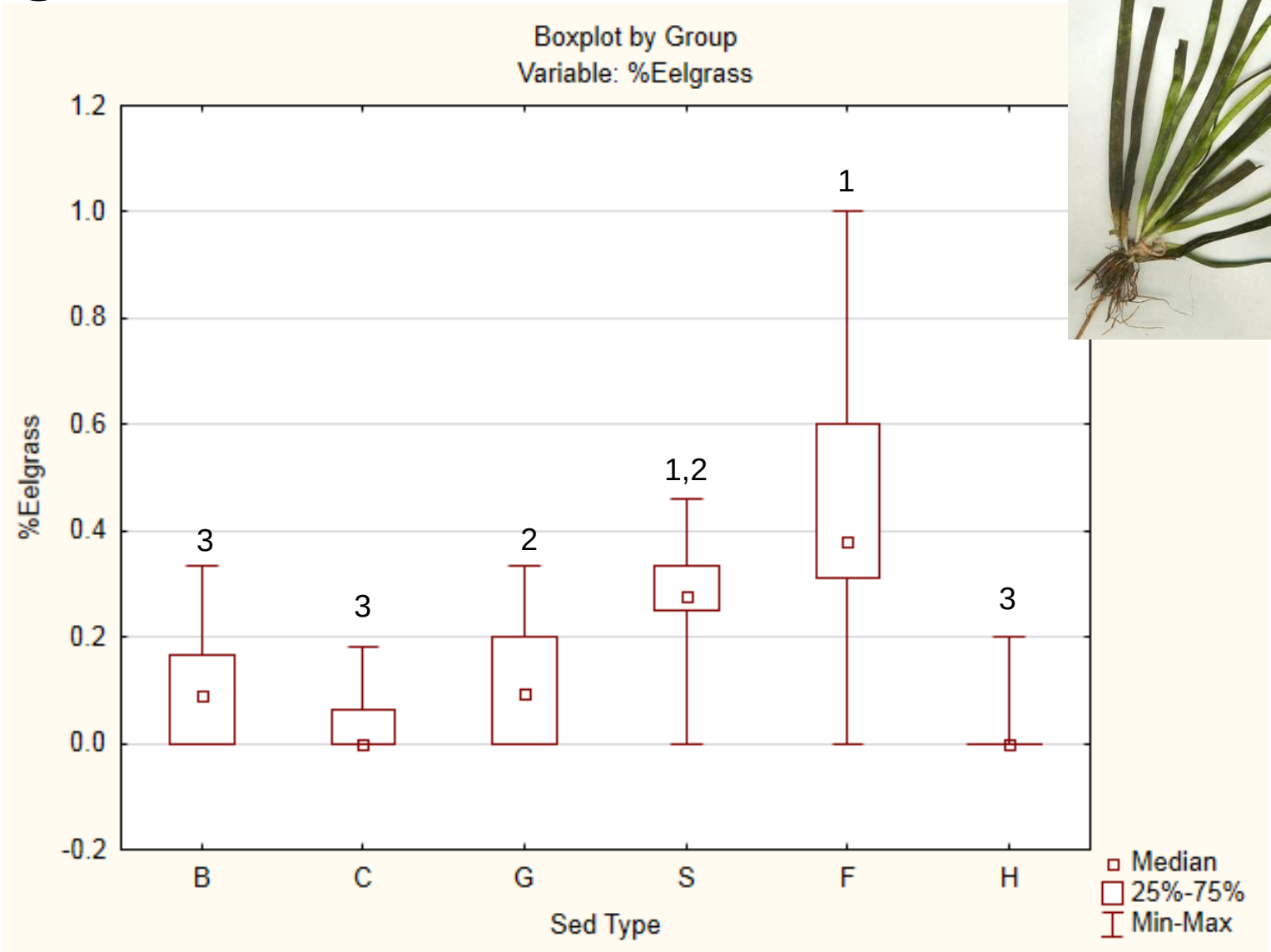


Hydrilla - *Hydrilla verticillata*



Kruskal-Wallis, p<0.0001

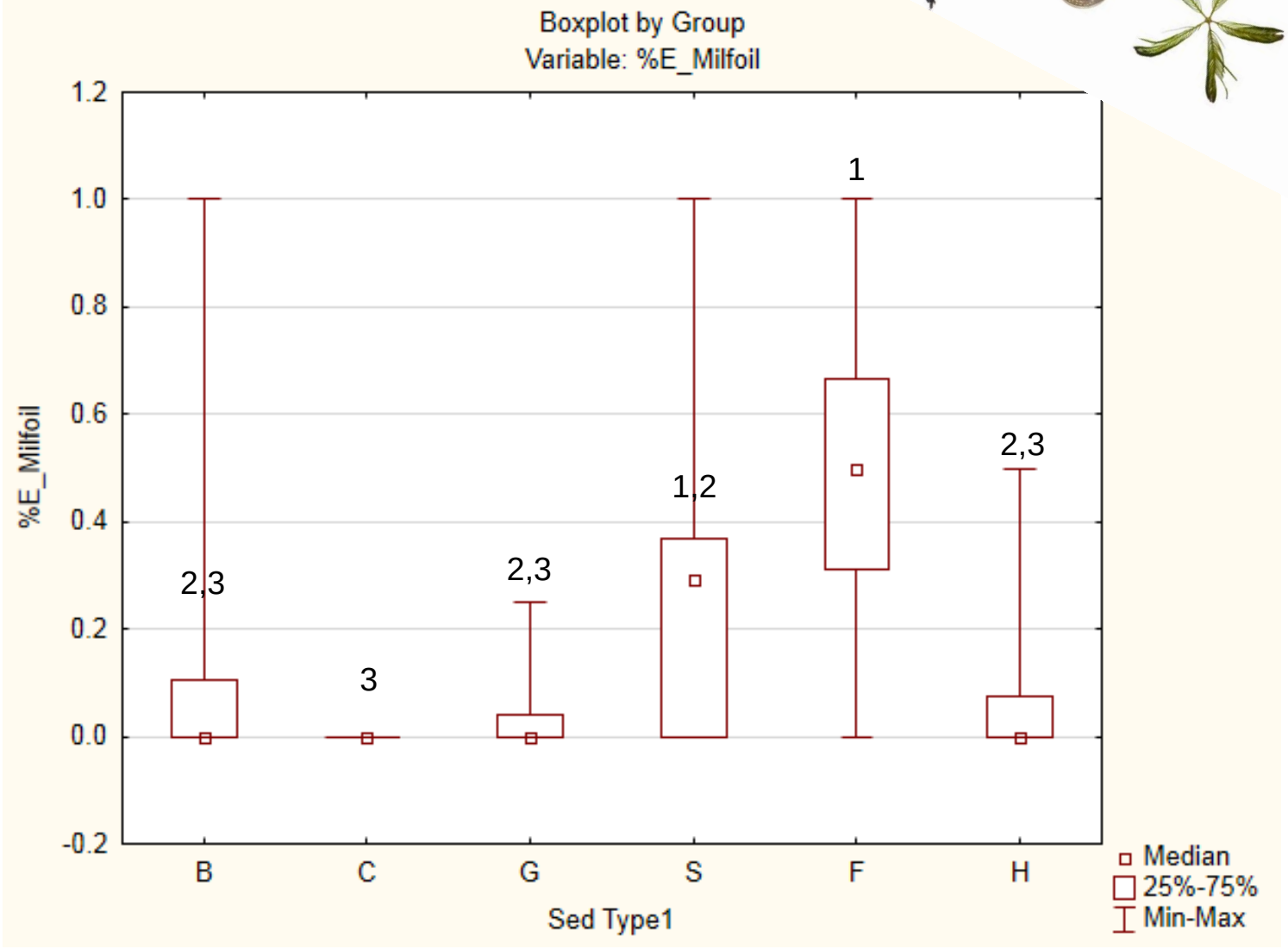
Eelgrass – *Vallisneria americana*



Kruskal-Wallis, p<0.0001

Eurasian Watermilfoil

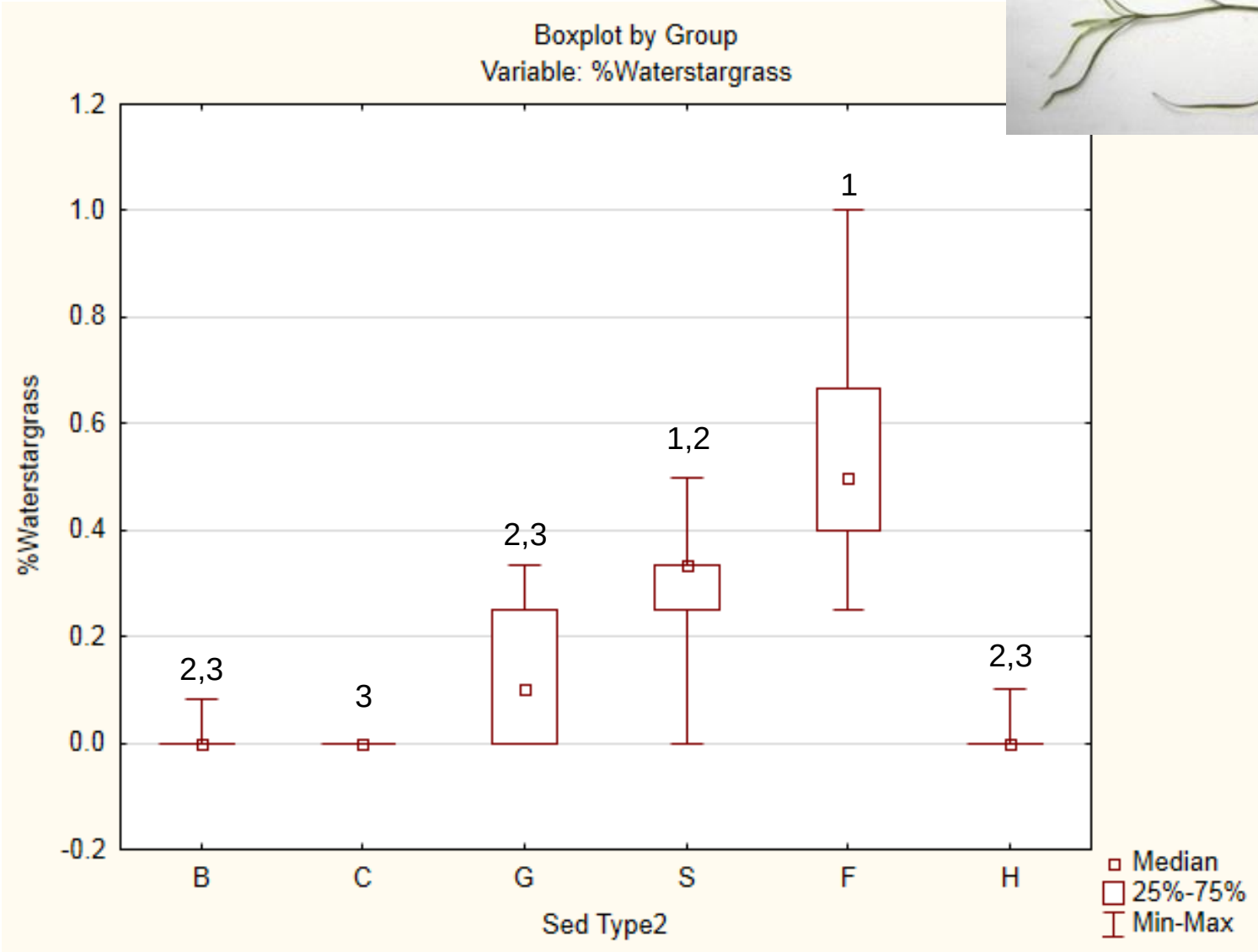
Myriophyllum spicatum



Kruskal-Wallis, p<0.0001

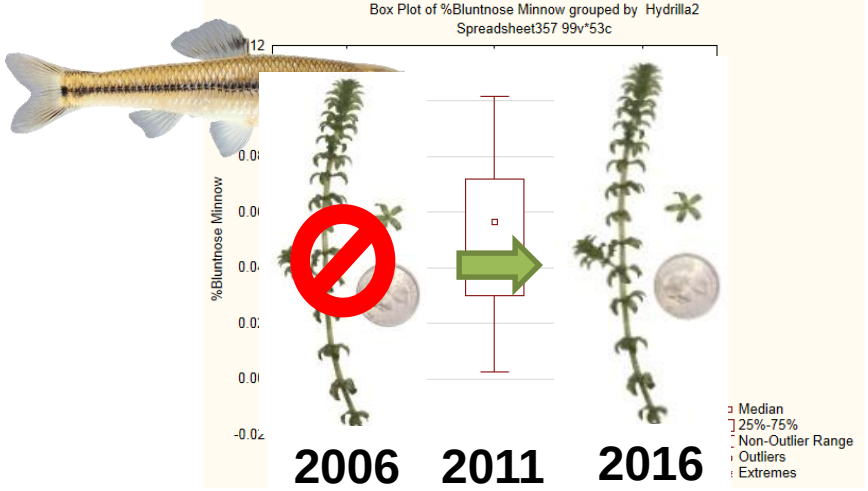
Waterstargrass

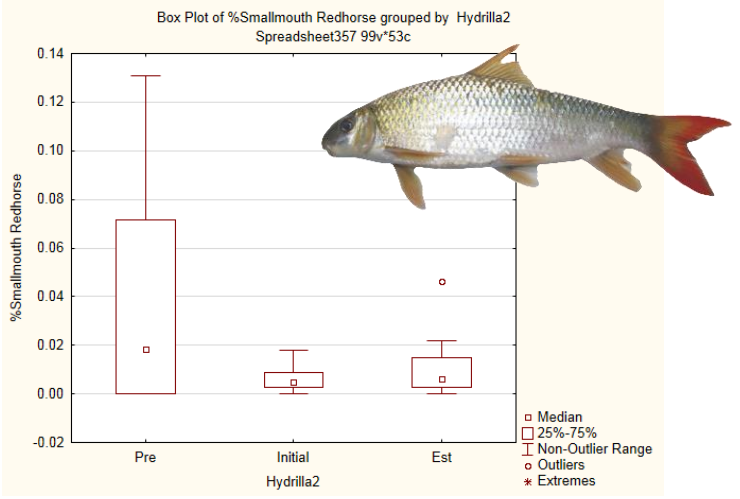
Heteranthera dubia

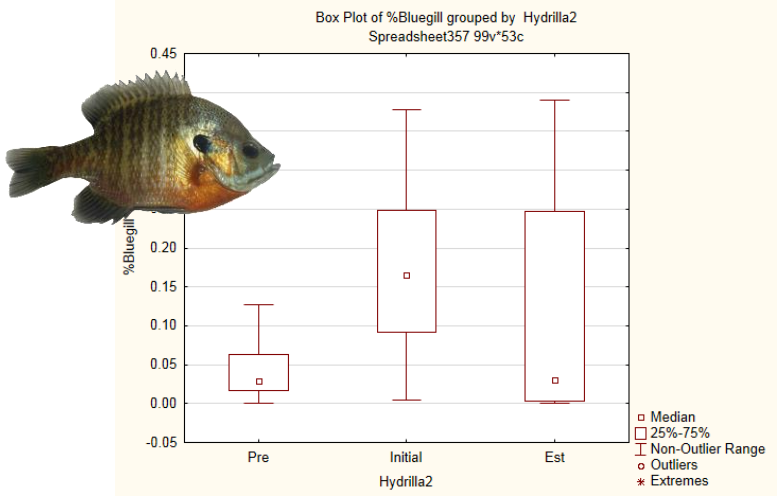


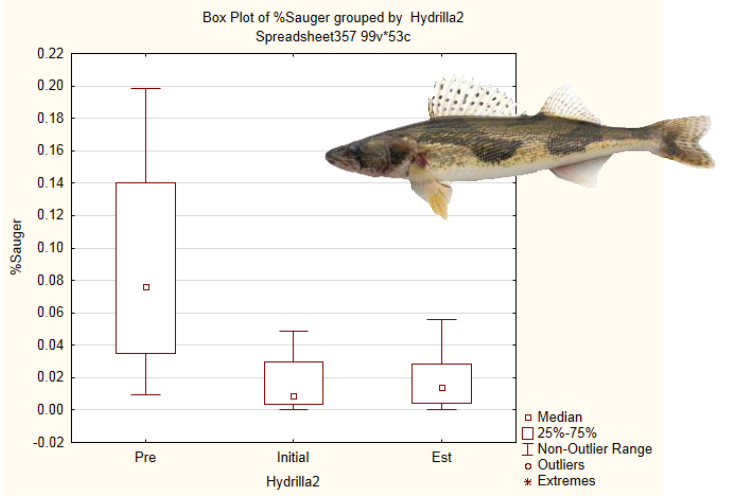
Kruskal-Wallis, p<0.0001

Species Shifts (Pre Hydrilla – Initial – Est.)

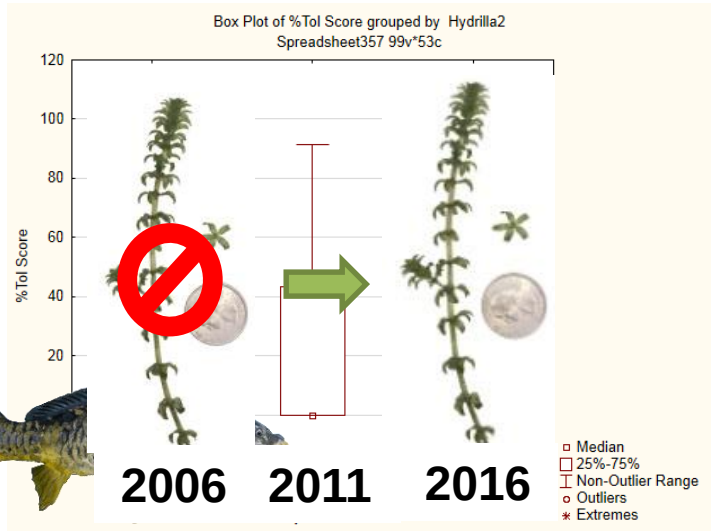


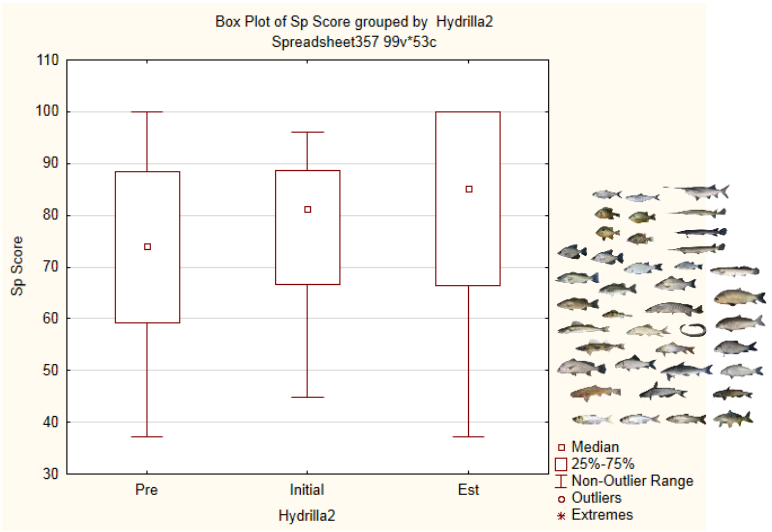


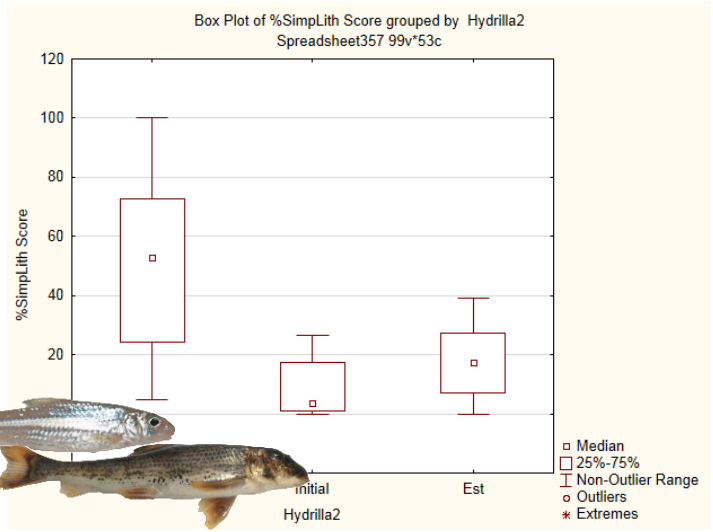


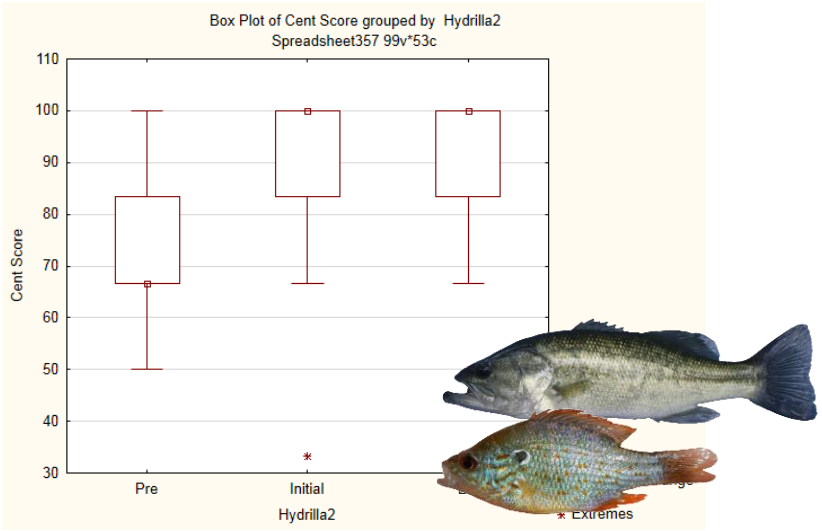


Metric Shifts (Pre Hydrilla – Initial – Established)

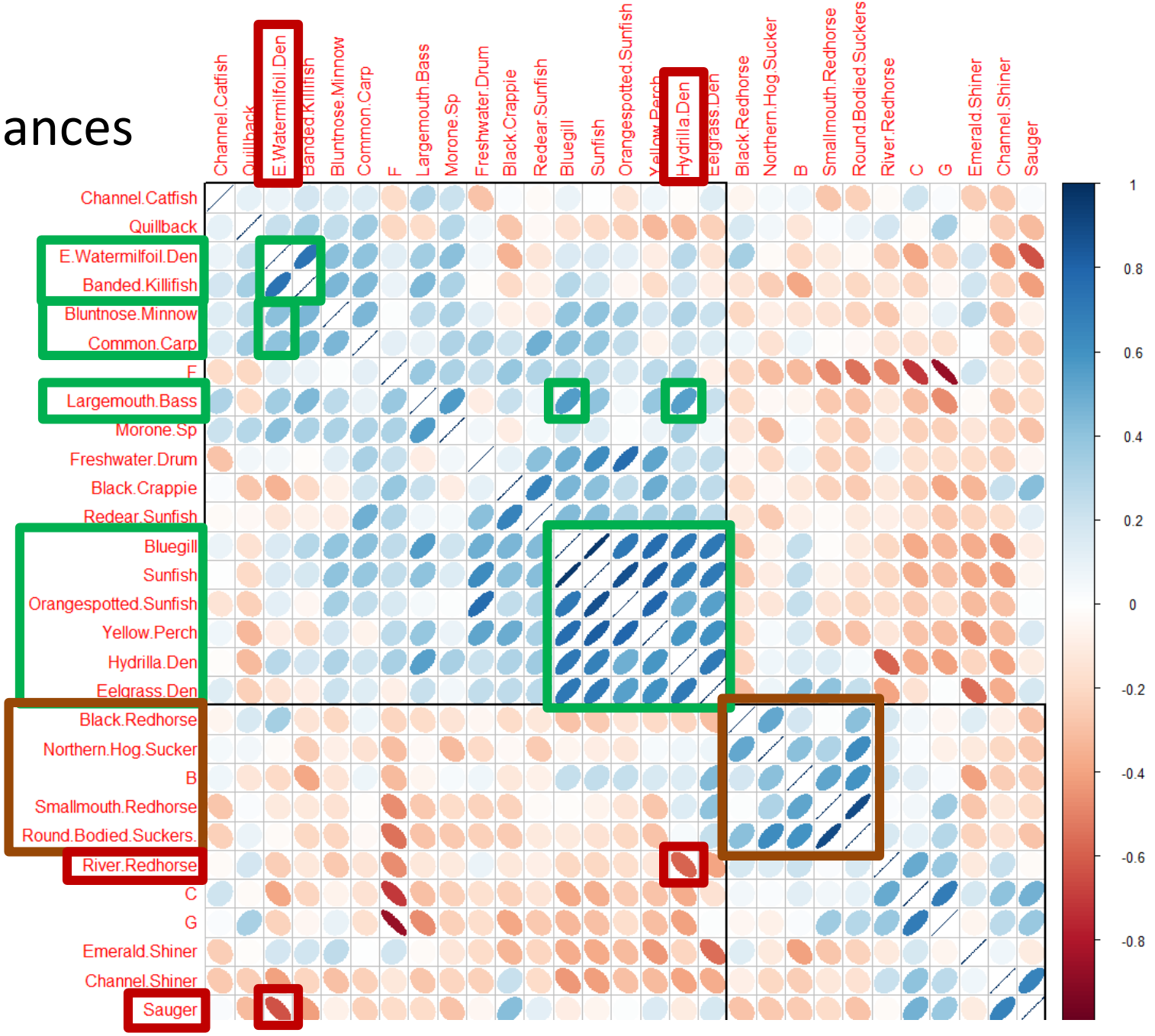




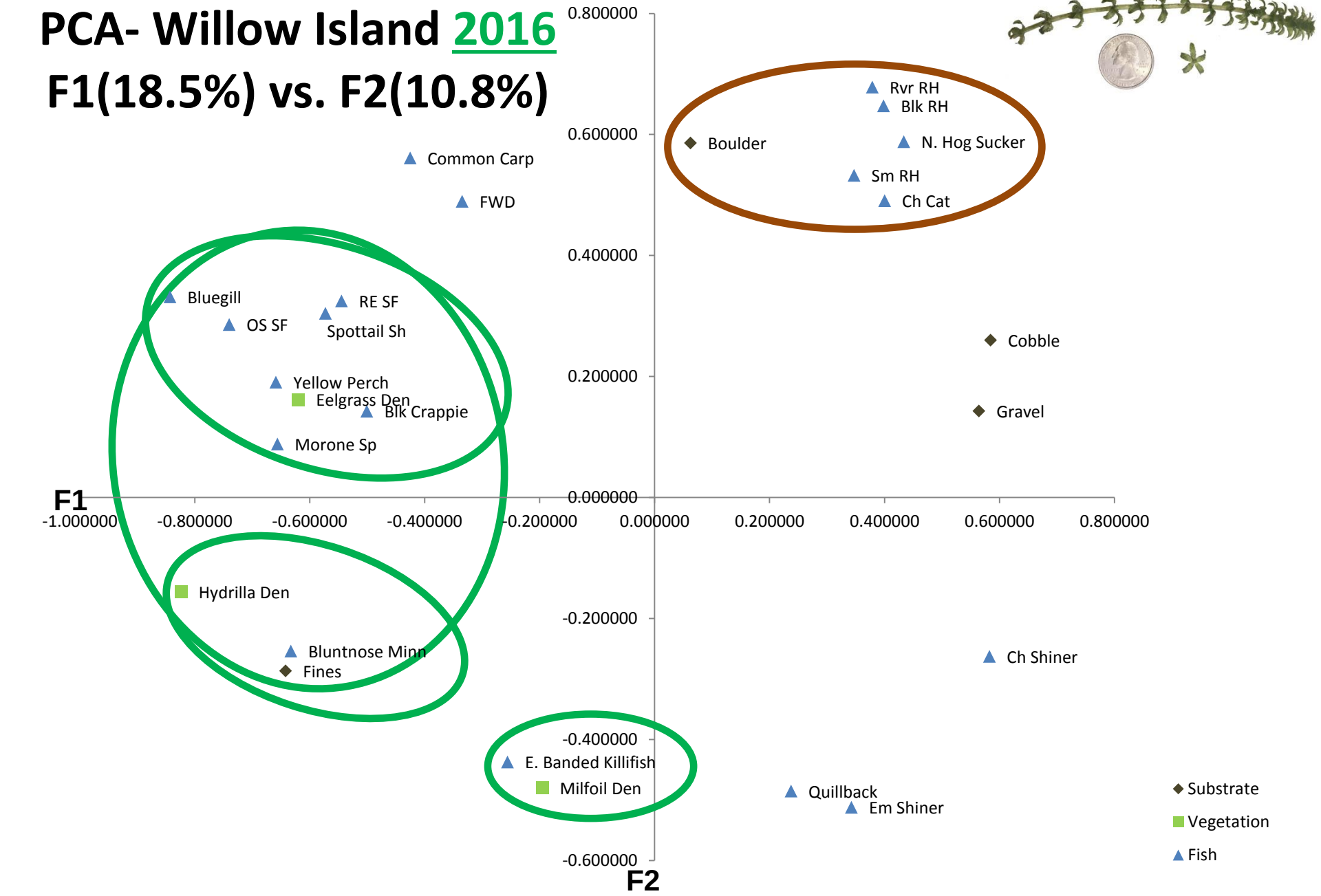




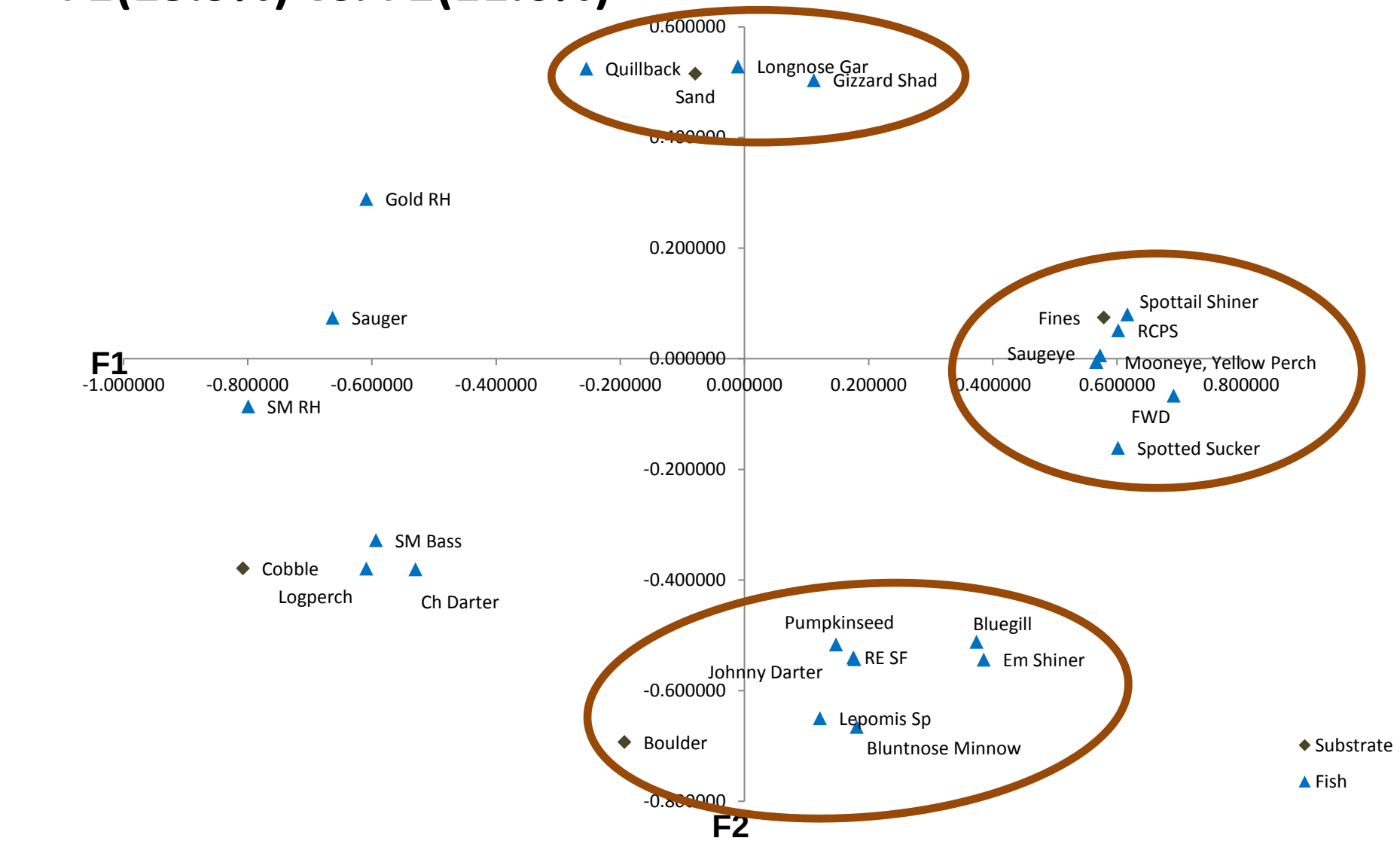
Fish Abundances



PCA- Willow Island 2016
F1(18.5%) vs. F2(10.8%)

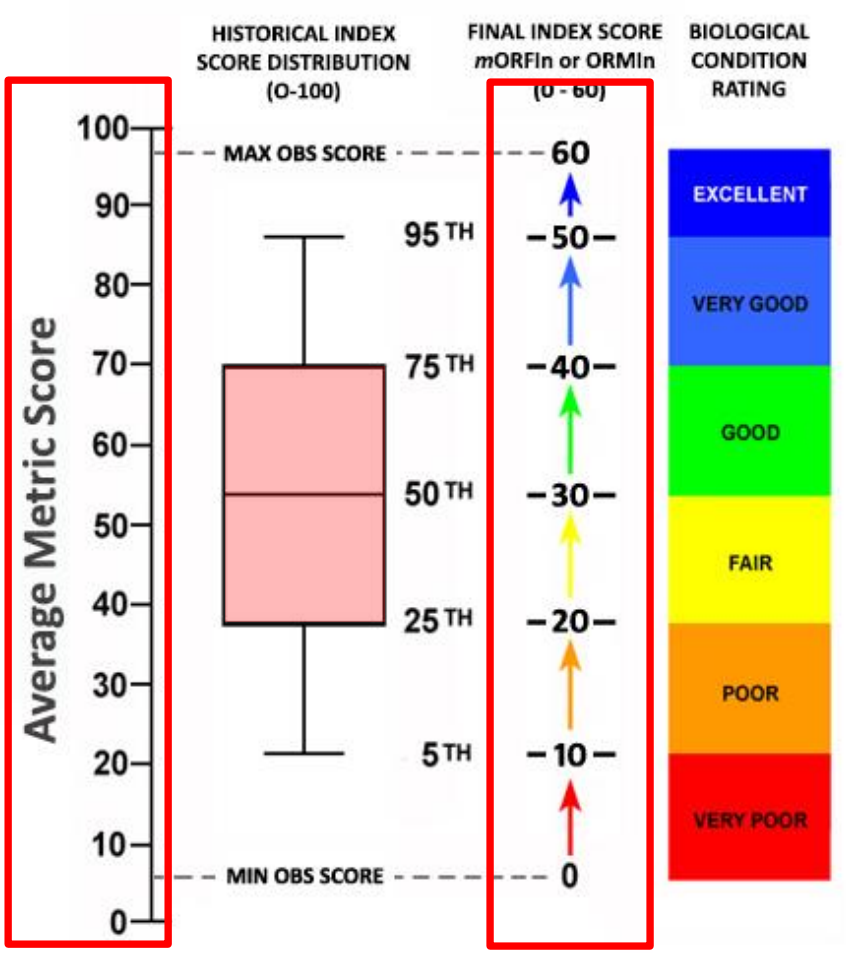


PCA- Willow Island 2006
F1(13.9%) vs. F2(11.0%)

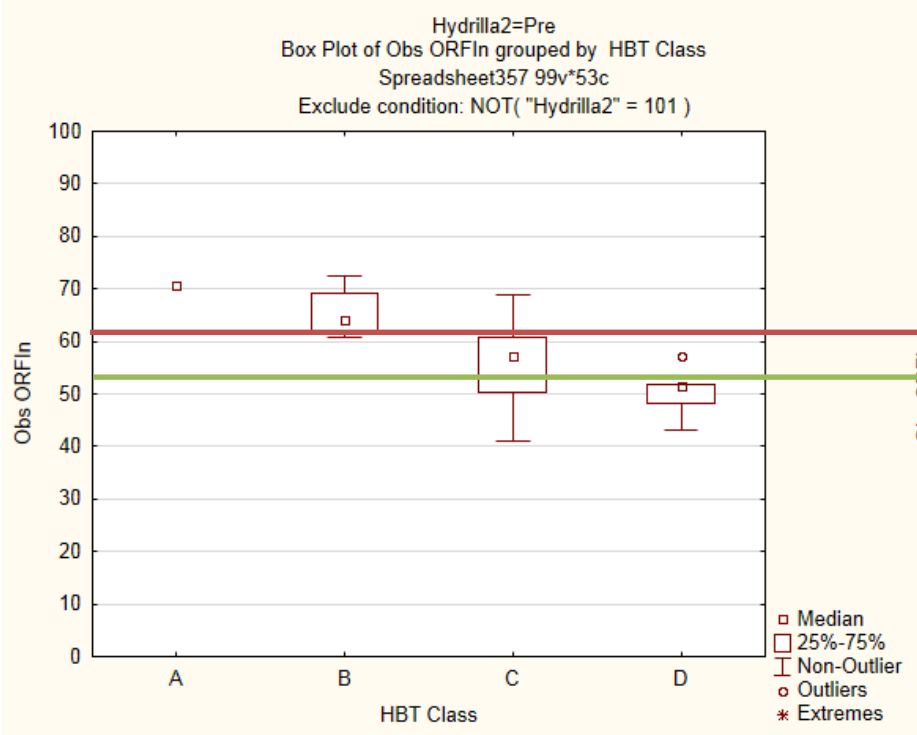


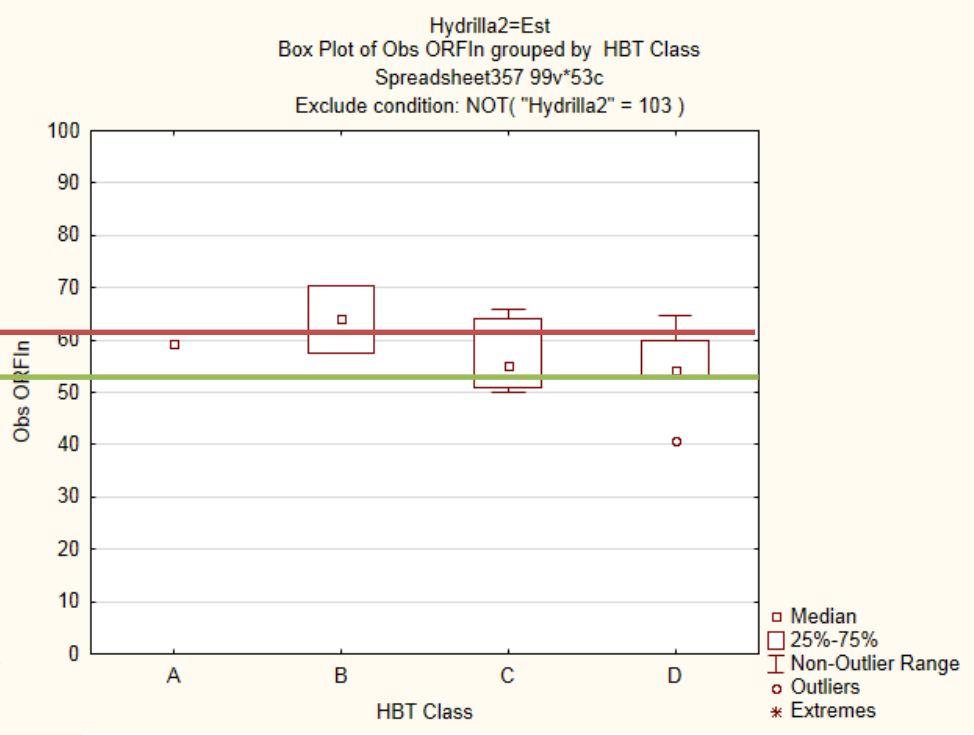
ORSANCO Index Refresher

- ORFIn (2003-2008)
  - Average score of 13 fish metrics (0-100)
- *m*ORFIn (2009-present)
  - Scaled value of ORFIn (0-60)
  - Based upon past performance of sites with similar habitat



ORFIn Shifts





Assessment Implications

- Do we adjust index expectations for an invasive exotic?
  - mORFIn metric scores may be inflated by *Hydrilla* presence in certain habitats, decreased in others
- Do we list pools based on non-native SAV densities
  - "Natural" river assemblage is shifted near SAV beds dominated by non-natives
- Do we wait for the pools to fail?
  - All questions for BWQSC, 305b, and TEC committees

USGS
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Map Source: U.S. Geological Survey, Nonindigenous Aquatic Species Database, Gainesville, FL. November 2015

Alaska

Virgin Islands

Guam

Hawaiian Islands

Puerto Rico

Hydrilla verticillata

Distribution by sub-basin (HUC 8)

States
- With records
- Without records

Established biotype
- Dioecious
- Monoecious
- Dioecious & Monoecious
- Unknown

Eradicated biotype
- Dioecious
- Monoecious

N

Kilometers
0 250 500

Moving Forward

- Continue to correlate fish species patterns with SAV density/diversity
- Correlate macroinvertebrates with SAV density/diversity
- Correlate DO patterns with SAV density/diversity
  - Account for in nutrient criteria development
- Continue SAV rake surveys at all future probabilistic sites
- Incorporate new data from routine surveys into analyses