

# Impingement Survival Review

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ASA analysis & communication

# Project Goals

- 1. Identify/summarize imp. survival studies
- 2. Facilitate access to reports/information
- 3. Identify factors influencing survival
- 4. Discuss use in BTA assessments

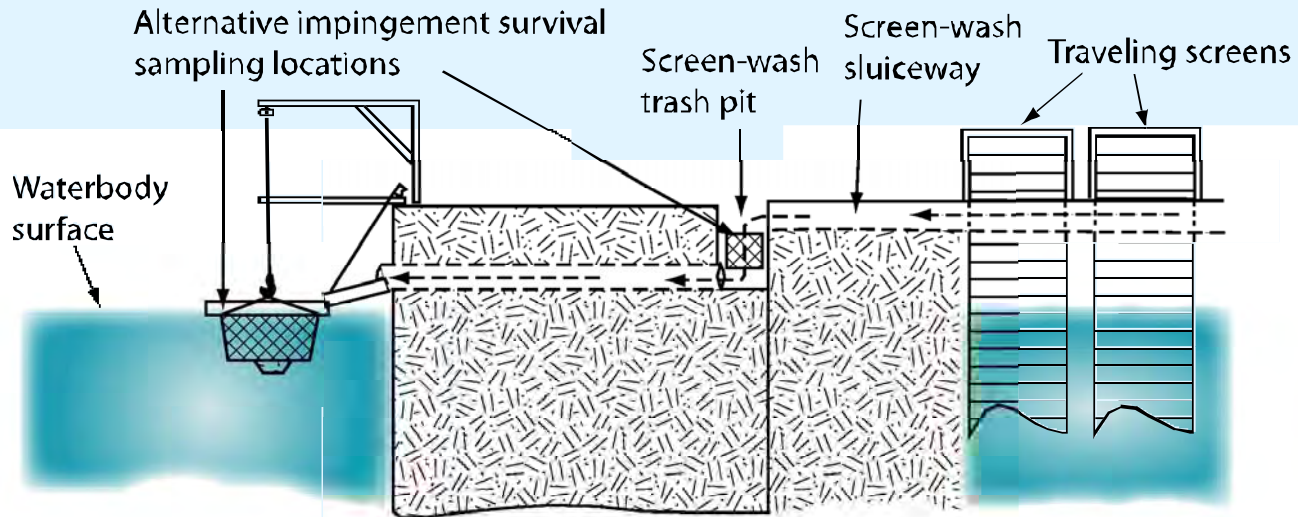
# 1. Summaries of the Studies

- 67 source documents identified/reviewed
- Summary of general methodology
- Summary of coverage
  - years, species, waterbodies, screen designs
- Summaries of impingement survival rates

# General Methodology

- Collection from screenwash water system
- Sampling during peak or seasonal
- Initial enumeration - live, “stunned”, dead
- Latent mortality over 24-108 hrs
- Controls – some studies & species
- Survival rate = proportion remaining alive

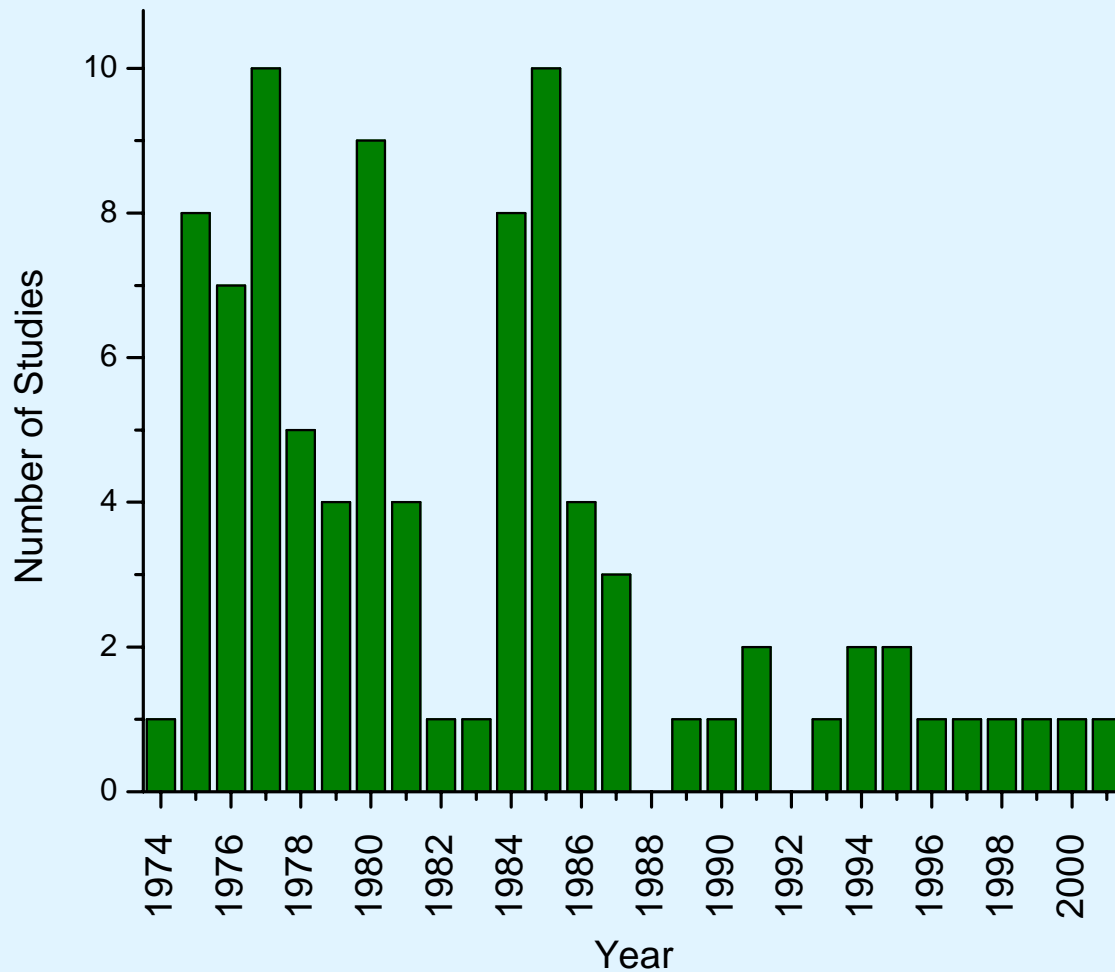
# Survival Sampling Locations



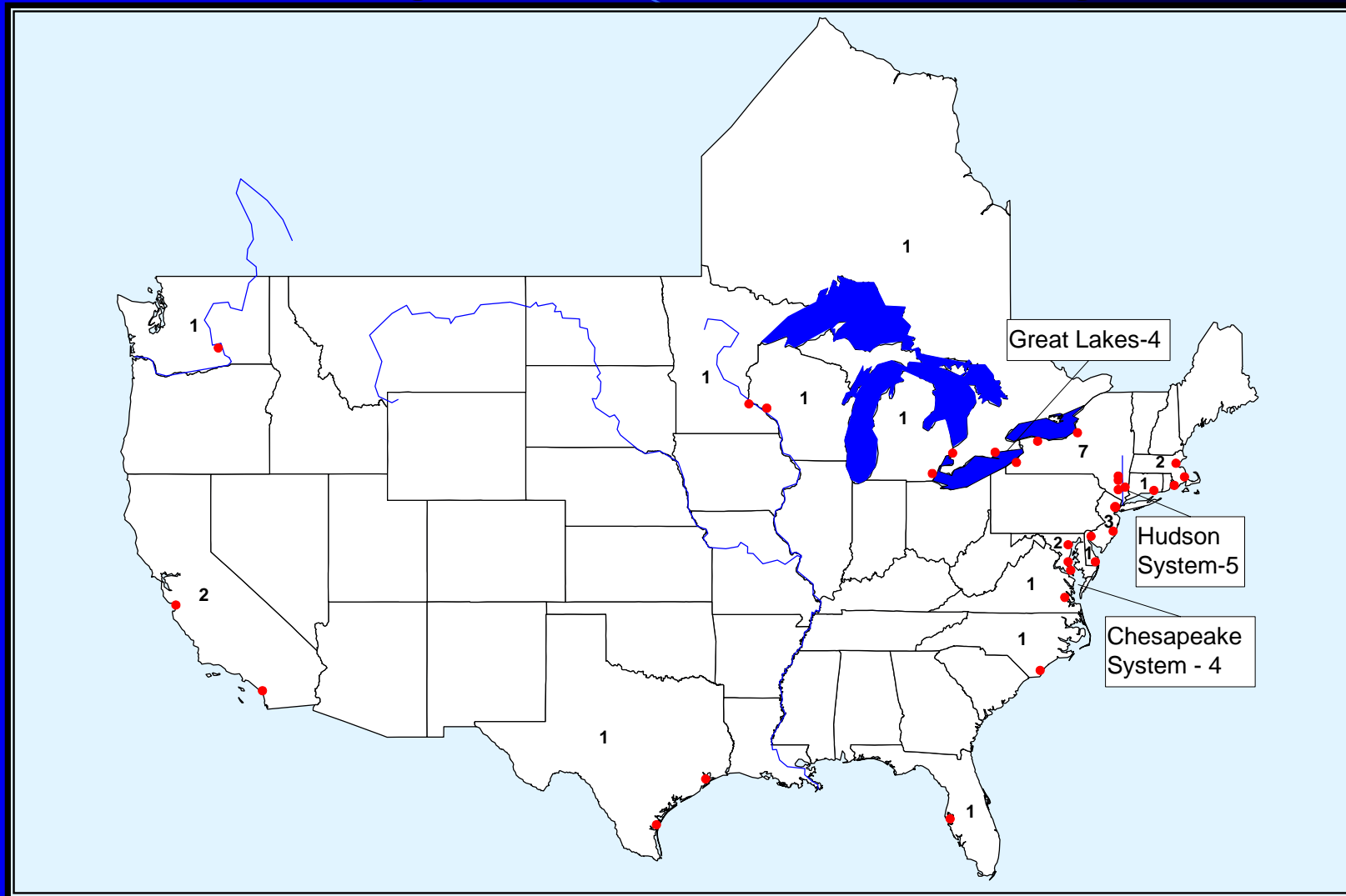
# Survival Rate Measures

- Initial Survival =  $P_i = A_i / N_T = L_i + St_i$
- Latent Effects Survival =  $P_l = A_{l(t)} / N_l$
- Extended Survival =  $P_e = P_i \times P_l$

# Chronology of Studies



# Geographic Coverage



# Waterbody Coverage

| Water Body Type            | No. of Facilities | No. of Waterbodies |
|----------------------------|-------------------|--------------------|
| Freshwater stream or river | 4                 | 3                  |
| Great lake                 | 5                 | 2                  |
| Tidal river or estuary     | 16                | 13                 |
| Ocean                      | 4                 | 4                  |

# Screen Designs Studied

| Traveling Screen Type | No. of Facilities |
|-----------------------|-------------------|
| Single-Flow           | 23                |
| Dual-Flow             | 5                 |
| Angled                | 4                 |

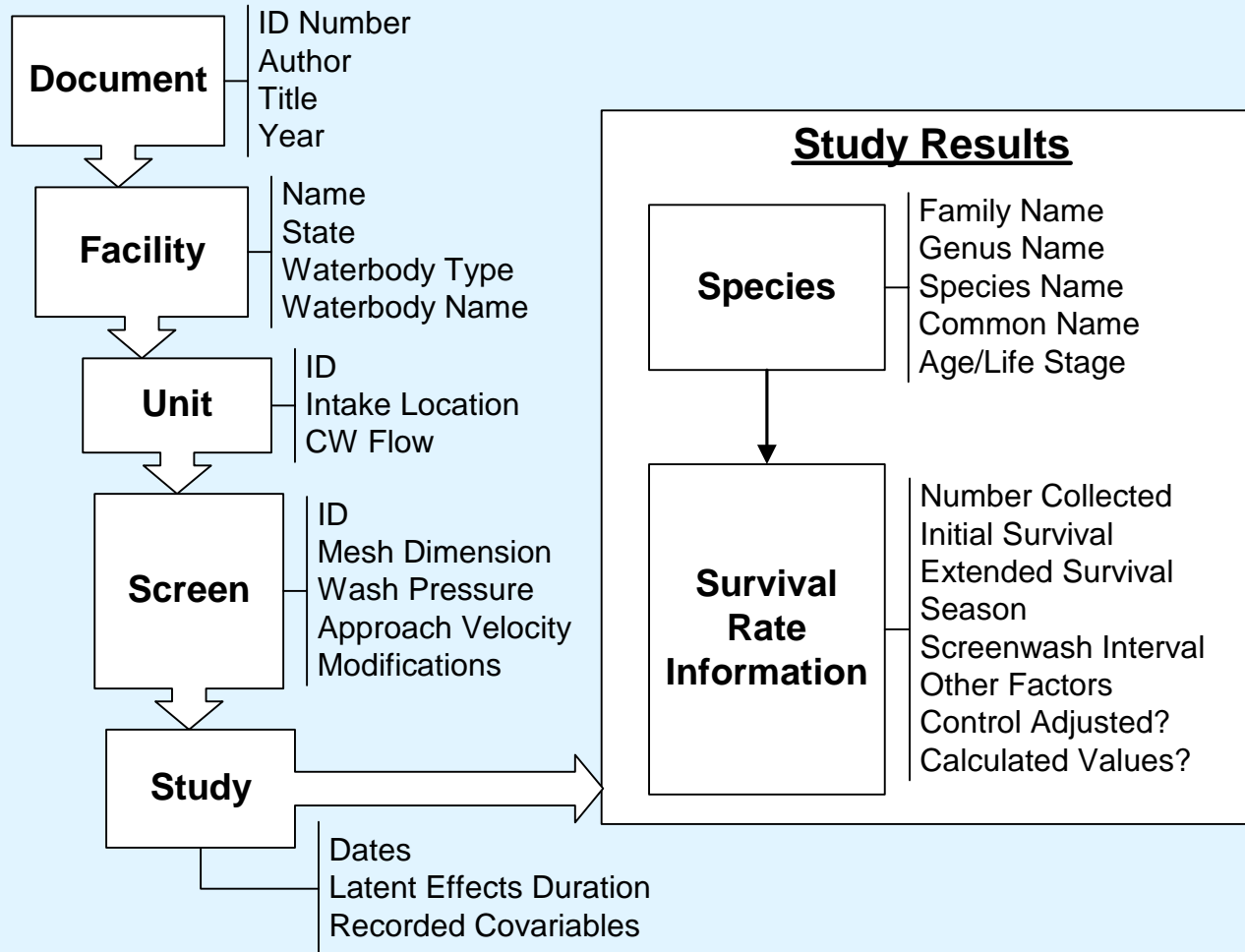
# Taxonomic Coverage

| Water Body Type            | Total No. of Taxa |
|----------------------------|-------------------|
| Freshwater stream or river | 55                |
| Great lake                 | 39                |
| Tidal river or estuary     | 184               |
| Ocean                      | 85                |

## 2. Facilitate Information Access

- Report tables
  - Descriptive information referenced to sources
  - Impingement survival rate estimates
- Database of key information
- Images of available documents on CD

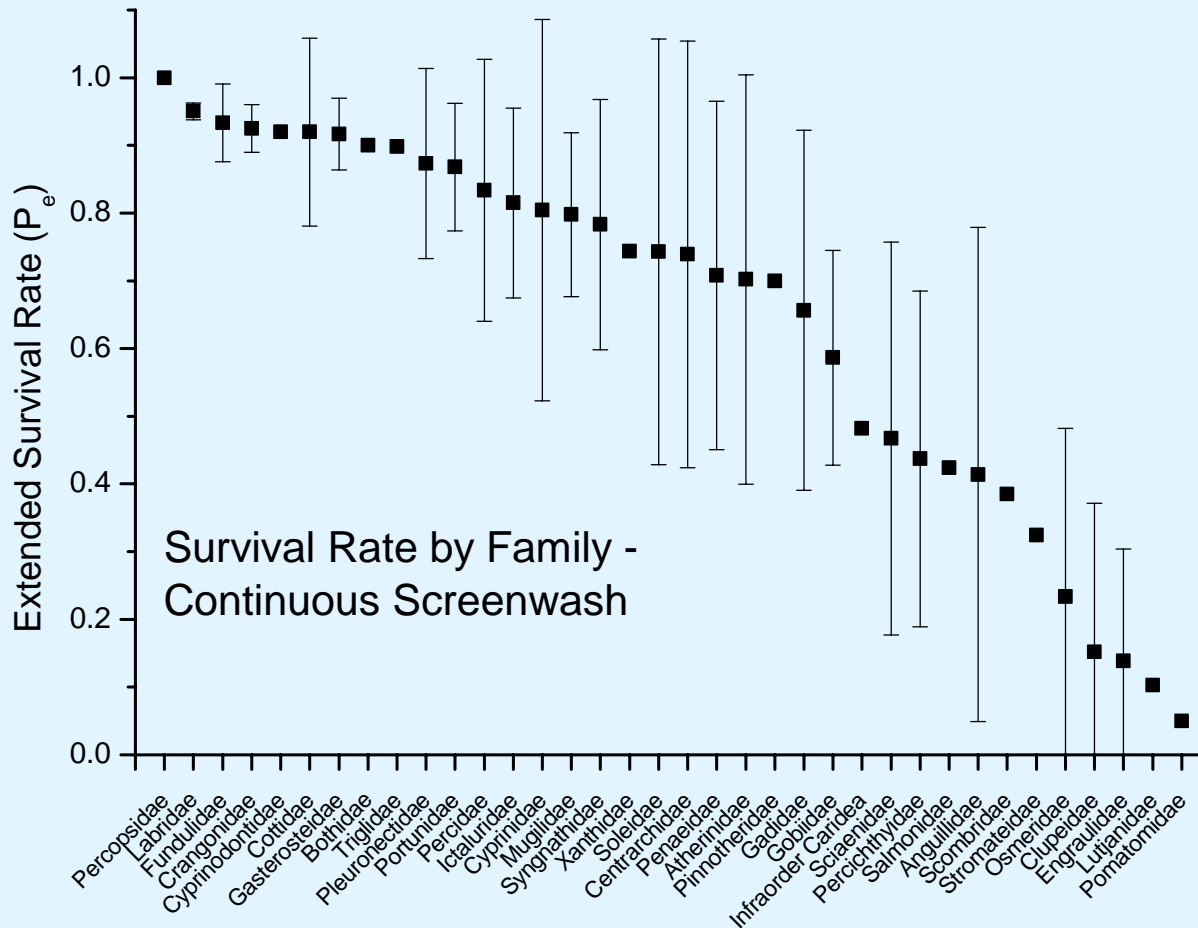
# Survival Study Database



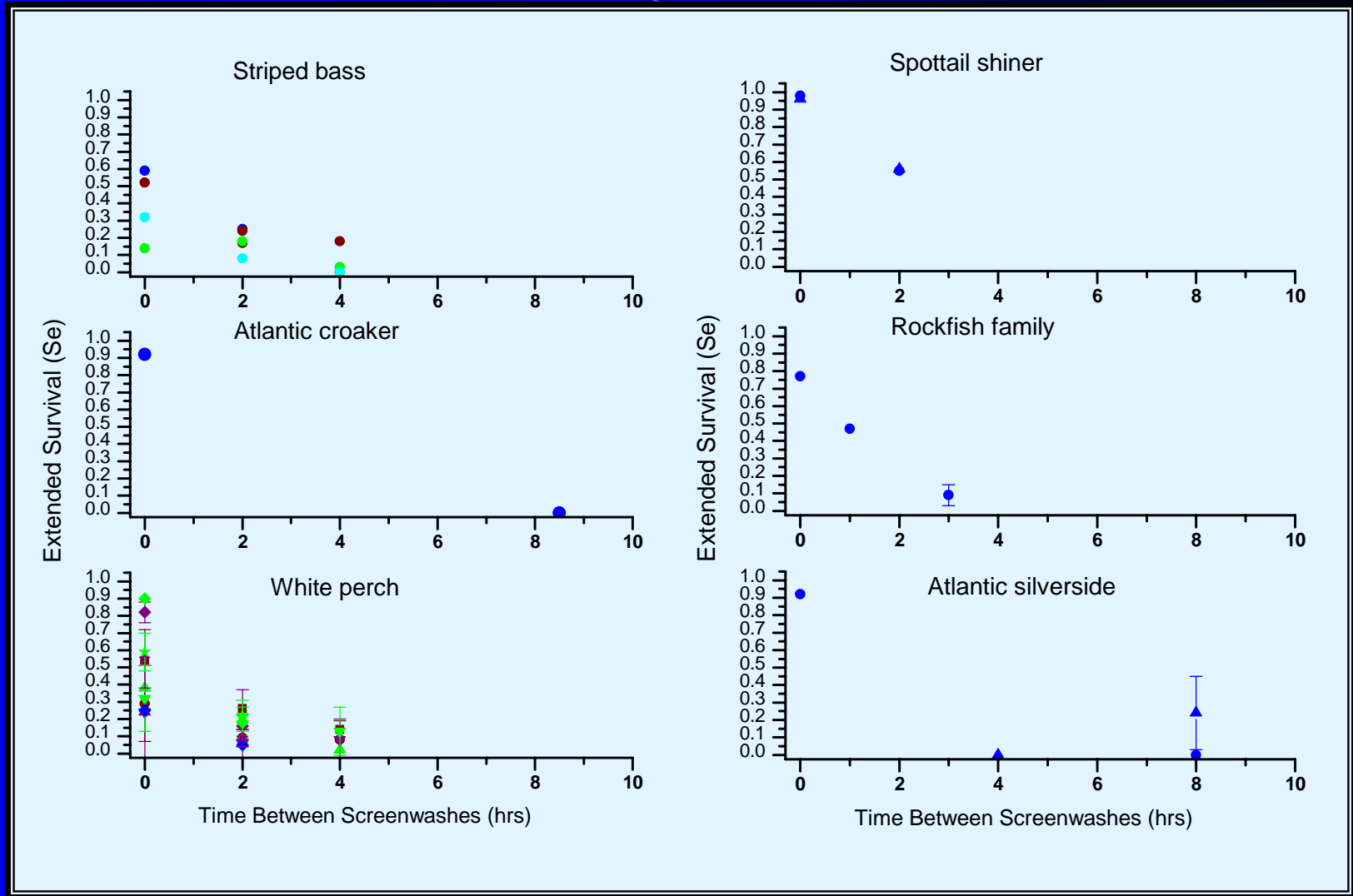
# 3. Factors Influencing Survival

- Factors affecting stresses
  - Screen wash frequency
  - Screen travel time
  - Modifications for fish handling
- Factors affecting sensitivity
  - Species type
  - Water temperature/season
  - Variable salinity in estuaries

# Factors - Species Sensitivity



# Factors – Screenwash Frequency



# Other Intake Factors

- Screen rotation speed & height
- Fish handling (Ristroph) modifications

# Waterbody Factors

- Loadings of debris and other organisms
- Ambient water temperature
- Salinity in estuaries

# 4. Uses of Prior Studies

- Defining data needs for site/intake conditions
- Selection of focal species
- Screening intake alternatives
- Benefit calculations

# Potential Mortality Rate Biases

- Overestimate mortality rate
  - No correction for collection/holding effects
  - No accounting for pre-impingement mortality
- Underestimate mortality rate
  - Low screenwash collection efficiency
  - Increased susceptibility to predation