

The Use of Biological Data to Achieve Compliance with the Final 316(b) Rule

“...the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact...”

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IMPINGEMENT AND ENTRAINMENT

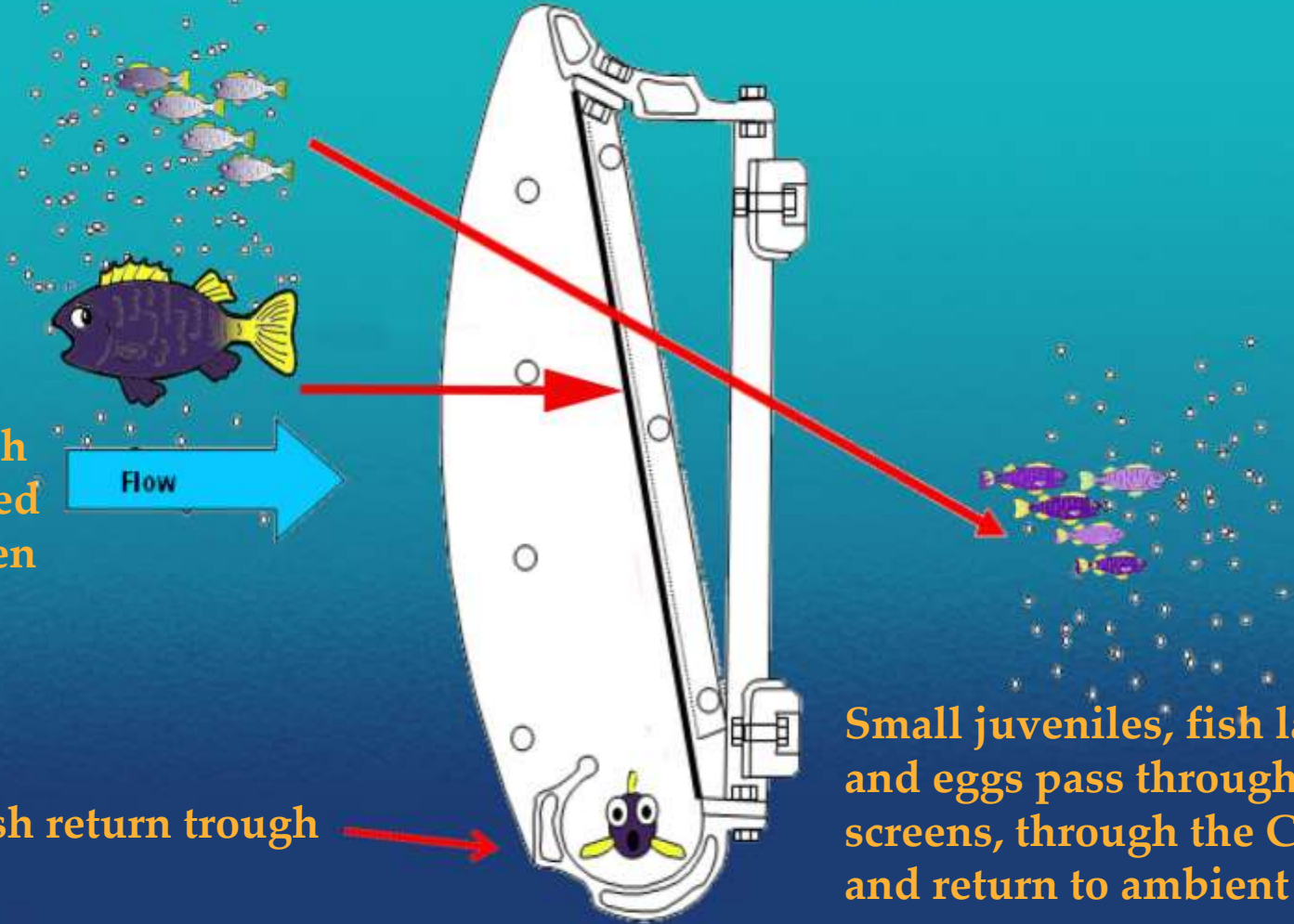
IMPINGEMENT

ENTRAINMENT

Adult and juvenile fish are impinged on the screen

Flow

Fish in fish return trough



Small juveniles, fish larvae and eggs pass through screens, through the CWS and return to ambient water.

MEANS OF COMPLIANCE WITH THE IMPINGEMENT MORTALITY (IM) STANDARD

1. Closed cycle recirculating cooling water system.
2. 0.5 fps design through screen intake velocity.
3. 0.5 fps actual through screen intake velocity.
4. Existing offshore intake velocity cap.
5. Modified traveling screens.
6. Systems of technologies as BTA for IM.
7. Meet the IM standard of 24% mortality.
8. *De minimis* rate of impingement.

FLOW OF DATA TO REACH COMPLIANCE

Biology

- Impingement Mortality and Entrainment Estimates

Engineering

- Technology Selection and Optimization

Resource
Economics

- Cost Benefit Analyses

NEW RULE REQUIRES THE COLLECTION OF PHYSICAL AND BIOLOGICAL DATA

- (r)(2) – Source Water Physical Data.
 - Characterize the source water’s hydrological and geomorphological features.
- (r)(4) – Source Water Baseline Biological Characterization Data.
 - Characterize the biological community near the intake.
 - List of species and lifestages.
 - Periods of reproduction, recruitment, and abundance.
 - Threatened and endangered species.

YOU SHOULD NOT HAVE TO DO THIS

Rely on existing data.



THREATENED AND ENDANGERED SPECIES

Don't forget marine mammals(MMPA)!

- Gains new emphasis in the rule.
 - However the ESA and MMPA were always applicable.
- You must identify potential T&E species and habitat.
 - Habitat is very inclusive, can include food items.
 - Define the species and habitat affected by your operations.
- Engage your appropriate regulators early.
 - You may have to apply for a limited take permit.
- This issue does not improve through delay.



ENTRAINMENT MONITORING

(r)(9) Applies to AIF >125 MGD but can be lower

- Two components: Field and Laboratory.
- Field:
 - Must describe the annual, seasonal, and diel variation in entrainment.
 - Annual: Two year study
 - Seasonal: All months when ichthyoplankton may be present
 - Diel: Day and night sampling
- Balance between monitoring design and efficiency

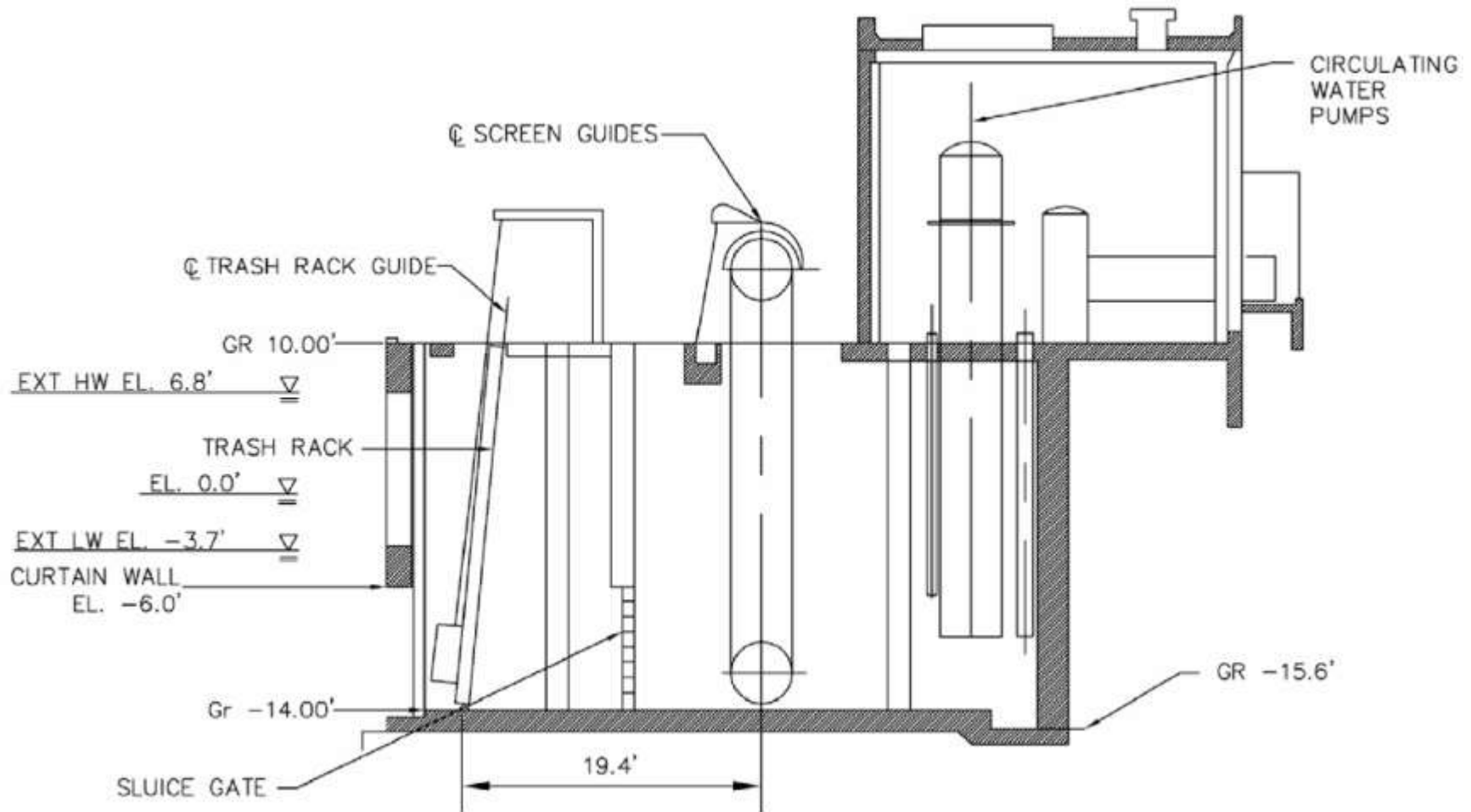
ENTRAINMENT FIELD SAMPLING

The details!

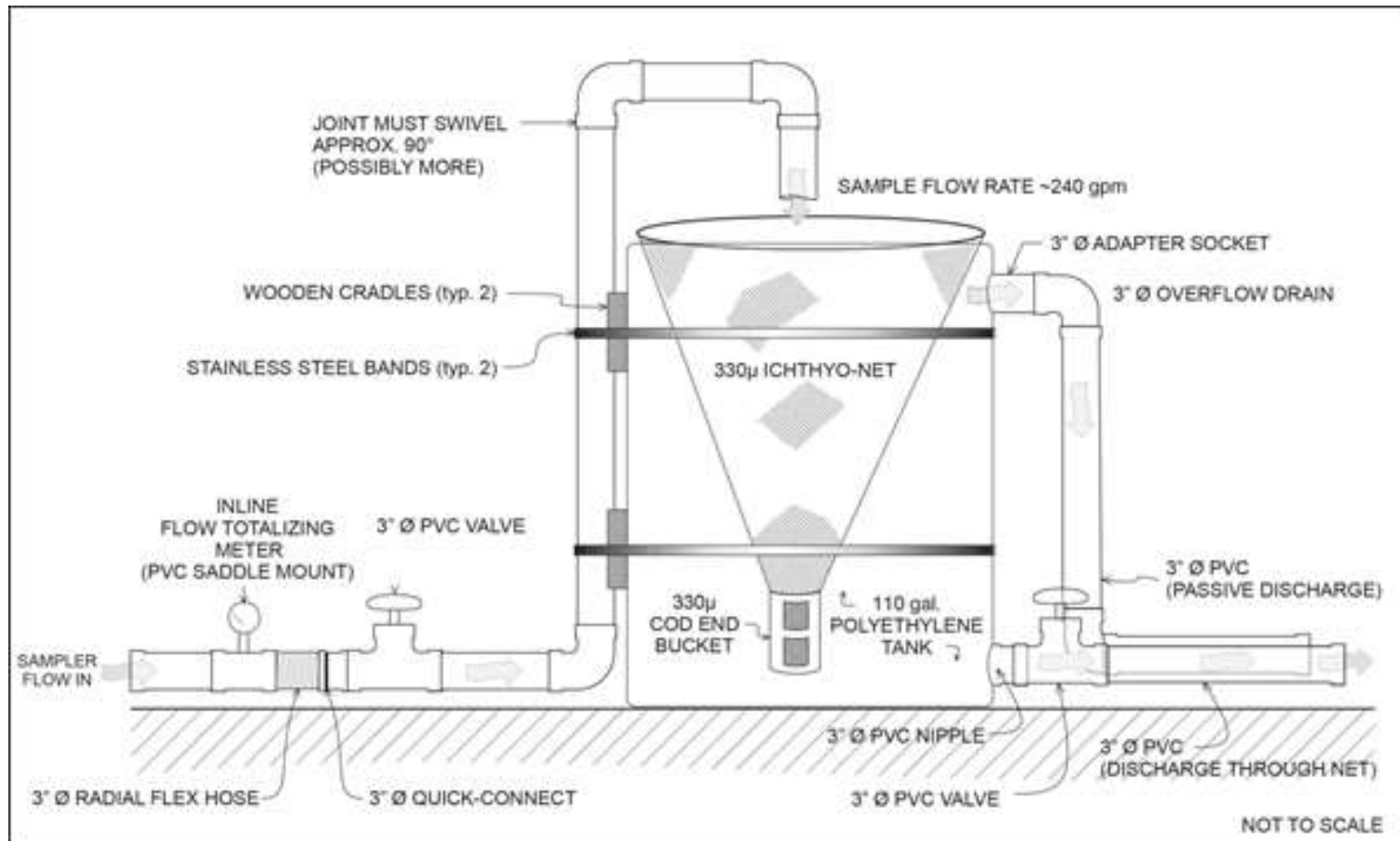
- Ideally sample beyond the “point of no return”.
- Locations: Intake or Discharge.
 - Intake, samples usually in better condition.
 - Discharge, completely integrated spatial sample.
- Methods: Nets or Pumps.
 - Nets can collect good condition high volume samples.
 - Not integrated over time.
 - Pumps can be easier to deploy.
 - Condition of samples can be a problem.
 - Dealing with electric hook up or gasoline.

TYPICAL CROSS SECTION OF AN INTAKE STRUCTURE

Consider the requirements of working at a nuclear station



TYPICAL ENTRAINMENT SAMPLING SET UP CUT?



LABORATORY ANALYSIS

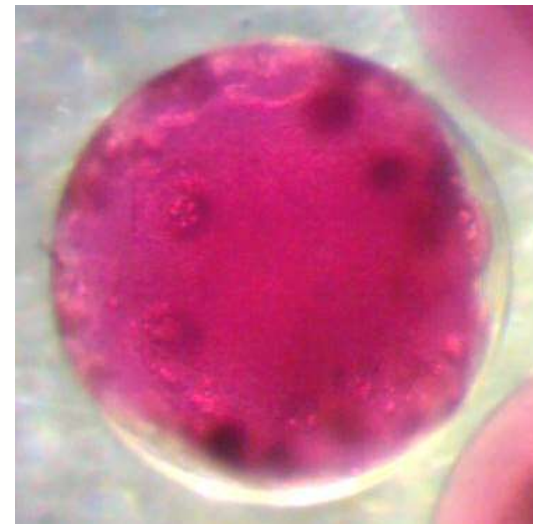
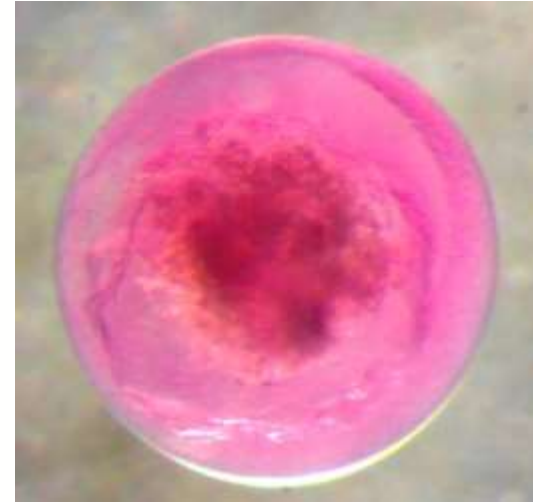
Can be overlooked but very important

- **Sorting:**
 - Removal of organisms from the sample.
- **Identification:**
 - Identification of organisms to the lowest practical taxon.
- **Quality Control:**
 - Control of the process by the operators.
 - Training and reinspection.
- **Quality Assurance:**
 - Verification by non-project personnel that the QC process is working.



IDENTIFICATION PROCESS

Must be able to discern subtle differences



QUALITY CONTROL AND QUALITY ASSURANCE

Shameless plug: Geoghegan 1996, Fisheries 21(8)

- QC applies to all tasks: field, lab, data processing.
 - SOP, training, and reinspection on a random basis.
- Field:
 - Audits of procedures by supervisors.
- Lab:
 - Reinspection of sorted and identified samples.
 - Reinspection of length measurements.
- Data Processing:
 - Double entry keypunching.
 - Random audit of final database.

FISH AND SHELLFISH

Wait, what's a *shellfish*?

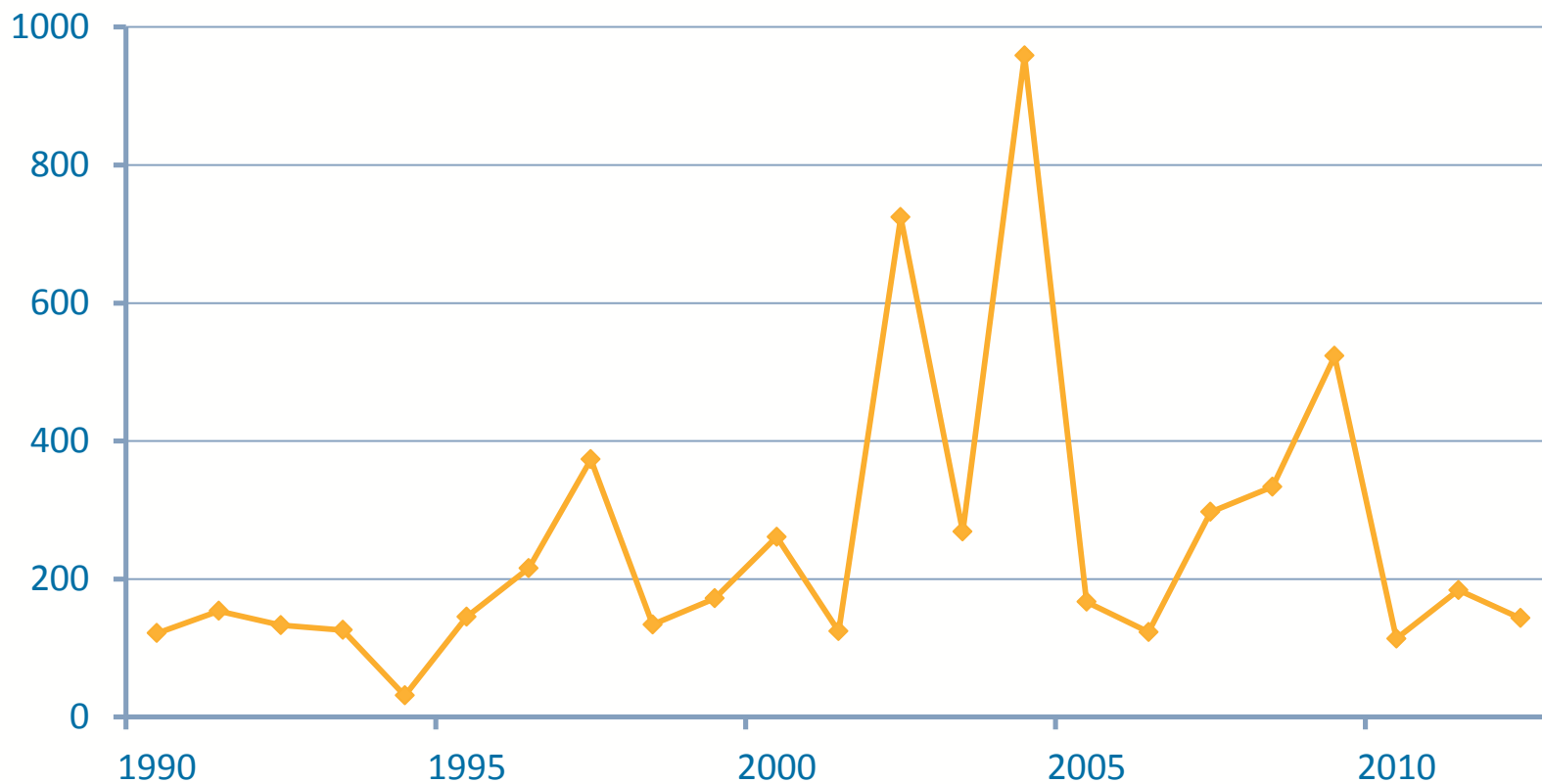
- Decapods: lobsters, crabs and shrimp.
- Mollusks: clams, oysters, mussels and even squid.
- Or copepods and amphipods?
- Different entrainment sampling programs for each.
 - Decapods will be captured in standard 0.500 or 0.300 mm mesh.
 - Mollusks require about 0.080 mm mesh net.
- Define shellfish early in the process.

HELP THE DIRECTOR MAKE AN INFORMED DECISION

- Biology plays into:
 - Engineering evaluations
 - Economic evaluations
- Director must consider factors in §125.98(f)(2) to determine BTA:
 - (i) numbers and type of organisms entrained.
- Director may consider factors in §125.98(f)(3) to determine BTA:
 - (i) entrainment impacts on the waterbody.

LARVAL ENTRAINMENT (MILLIONS)

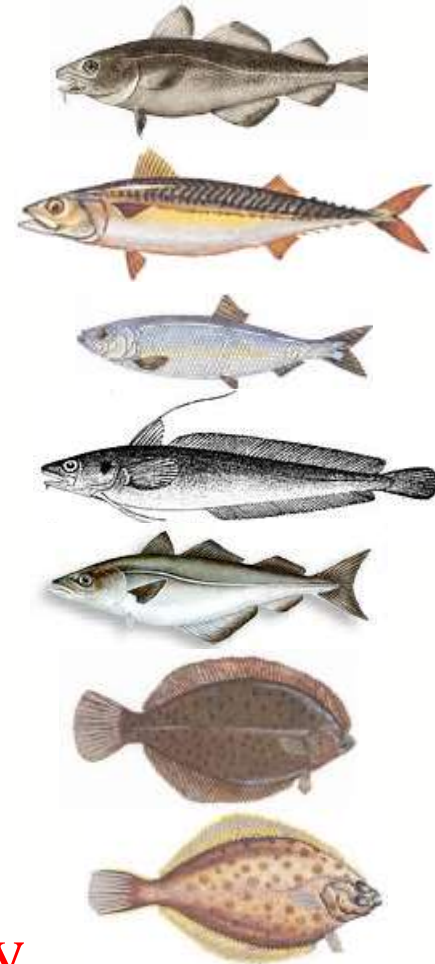
Cunner, Grubby, Rock Gunnel, *Liparis* spp., Fourbeard Rockling



ANNUAL ADULT EQUIVALENCY ESTIMATES

1998-2013 Average AE losses due to Entrainment (eggs and larvae)

- Atlantic Cod 421
- Atlantic Mackerel 216
- Atlantic Herring 957
- Hakes 289
- Pollock 24
- Winter Flounder 1,380
- Yellowtail Flounder 17



Entrainment impacts to the waterbody
are a factor the Director *may* consider.

COLLECTION OF SOUND BIOLOGICAL DATA

- Multi-million dollar decisions rest on the design and implementation of your biological programs.
- Technology selection is informed by biological data.
- Cost – Benefit analyses are dependent on biological data.

IT TAKES A TEAM TO ACHIEVE COMPLIANCE

- Statisticians
- Biologists
 - Field
 - Laboratory
 - Data Analysts
- Engineers
- Economists
- Utilities

