

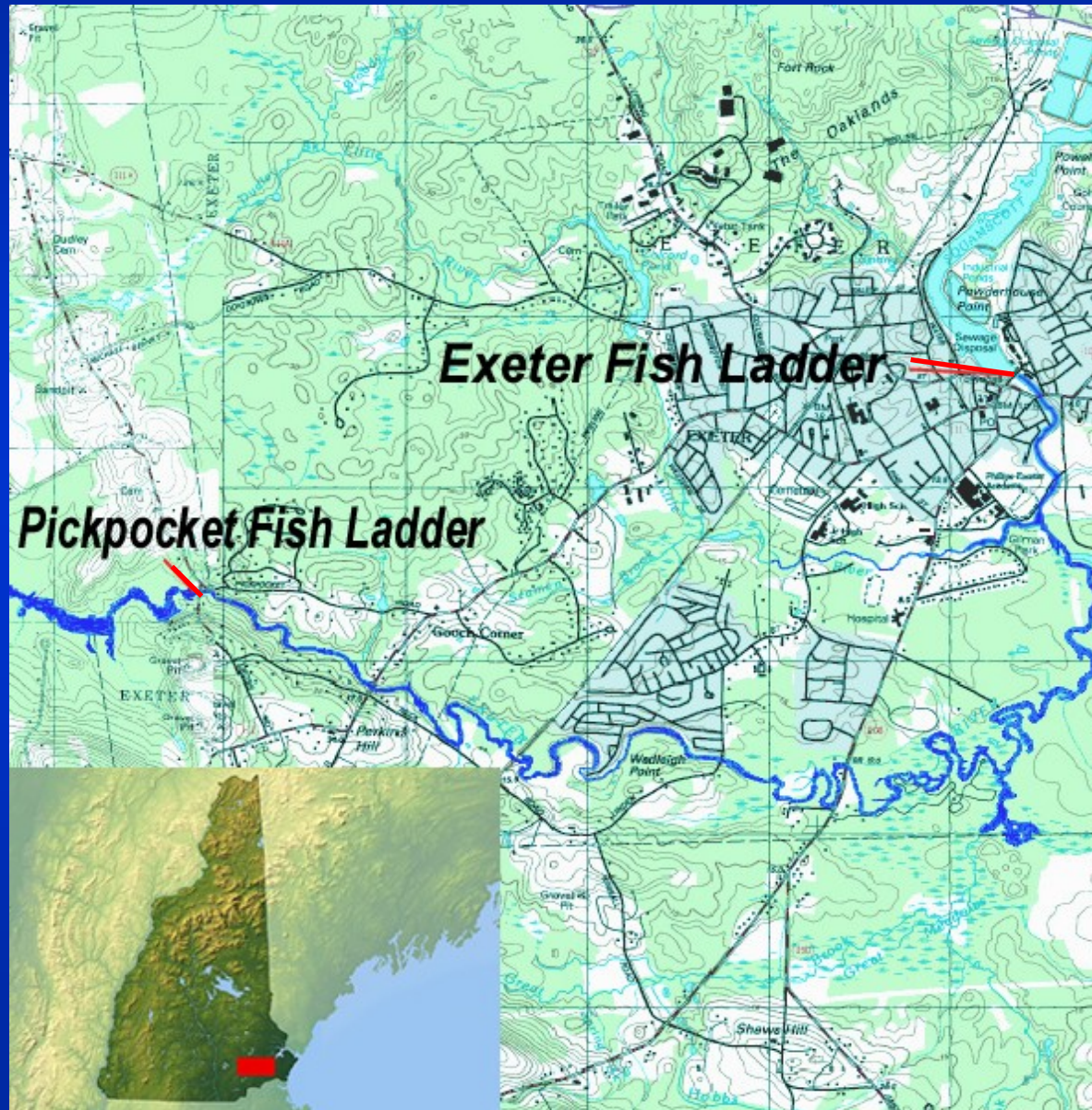
Anadromous Fish In Coastal New Hampshire: Habitat, history, and population trends

Cheri Patterson

NH Fish & Game Department



Exeter River Fish Ladders and Habitat



Fish Passage

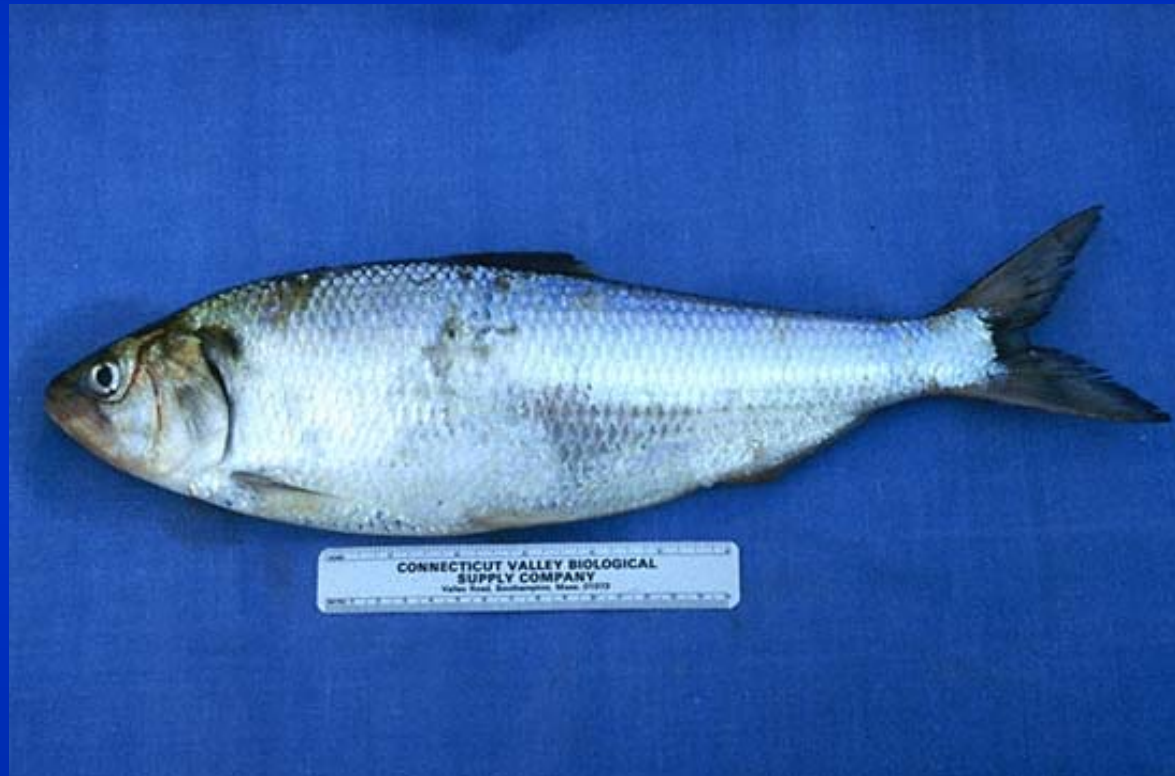
- Species Utilizing Great Dam Fish Ladder on Exeter River and Migration Timing
- Current operation of Great Dam Fish Ladder
- Population status
- Downstream Fish Emigration Timing and Pathway

Anadromous Fish in the Exeter River – River Herring (Alewife and Blueback)



- Upstream migration occurs from April through June
- Downstream migration occurs from July through October

Anadromous Fish in the Exeter River – American Shad



- Upstream migration occurs from May through July
- Downstream migration occurs from July through October

Anadromous Fish in the Exeter River – Sea Lamprey



- Upstream migration occurs from April through July
- Downstream migration occurs from April through December

Anadromous Fish in the Exeter River – Rainbow Smelt



- Migrate to estuaries or tributaries from December through March
- Spawn at head of tide areas from March through April
- Do not utilize the fish ladders – weak swimmers

Catadromous Fish in the Exeter River – American Eel



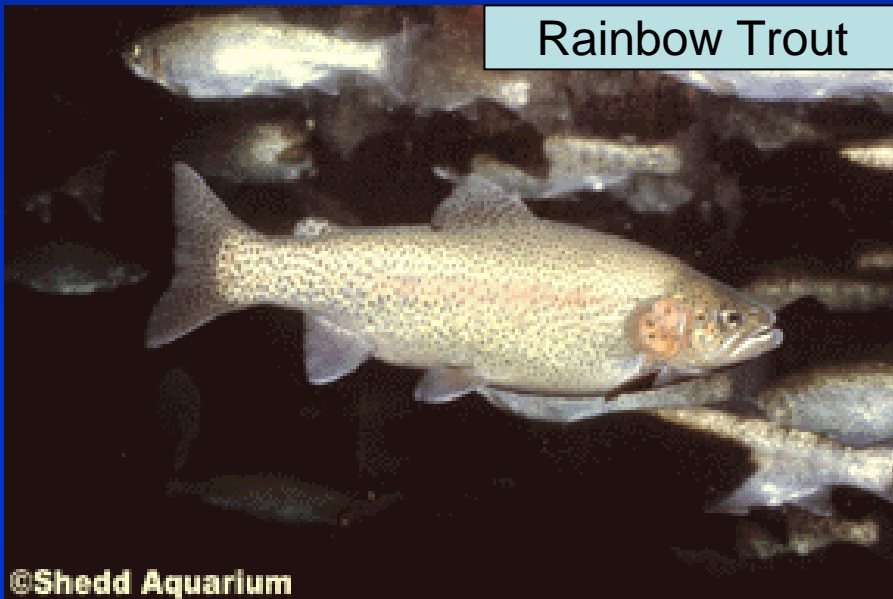
- Upstream migration occurs from March through August



Downstream migration of adults occurs from August through November (or even during winter months)

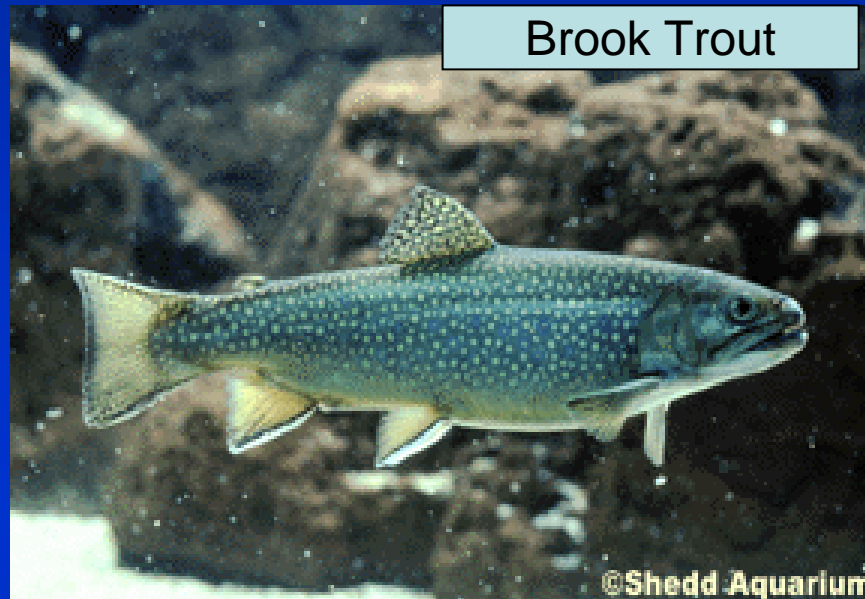
Other Fish Utilizing the Fish Ladder

Rainbow Trout



©Shedd Aquarium

Brook Trout



©Shedd Aquarium

Brown Trout



Ladder Operation and Dam Management



Great Dam Water Use, Fish Ladder Operation and Fish Migrations

- Flow and migration/emigration
 - Upstream
- Water levels in the ladder
- Water conditions and downstream migration (emigration)
 - Water level over the dam
 - Dissolved Oxygen

Great Dam Water Use, Ladder Operation and Fish Migrations

- Flow and migration/emigration
 - Upstream
 - Water levels in the ladder
 - Water conditions and downstream migration (emigration)
 - Water level over the dam
 - Dissolved Oxygen

Lower Dam Exeter River



- Optimal flow conditions



- High flow conditions and flood gate operating

Exeter Fishway Entrance



- Ladder opening produces the strongest current – flood gate closed.

- Water over the dam produces a strong current conflicting with the ladder opening – flood gate open.

Great Dam Water Use, Ladder Operation and Fish Migrations

- Flow and migration
 - Upstream
 - Sampling of Populations
- **Water levels in the ladder**
- Water conditions and downstream migration (emigration)
 - Water level over the dam
 - Dissolved Oxygen

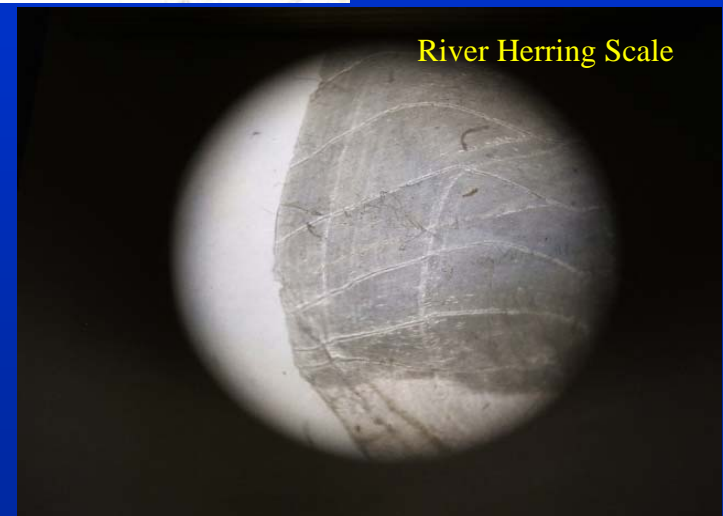
Exeter Fishway Trap – Exit of Fishway



The water level within the fishway trap is adjusted to be as close to river level as possible allowing two feet depth to flow down through the ladder.

Fish Ladder Monitoring

- The fish ladder is monitored daily
- Fork length, sex, are recorded and scales are collected from all river herring and shad present
- Other species present are counted and all are passed out of the ladder trap into freshwater
- Scales are mounted between microscope slides and read to determine the ages of river herring and shad



Great Dam Water Use, Ladder Operation and Fish Migrations

- Flow and migration/emigration
 - Upstream
- Water levels in the ladder
- **Water conditions and downstream migration (emigration)**
 - Water level over the dam
 - Dissolved Oxygen



Upper Dam Exeter River - Two optimal conditions for downstream migration

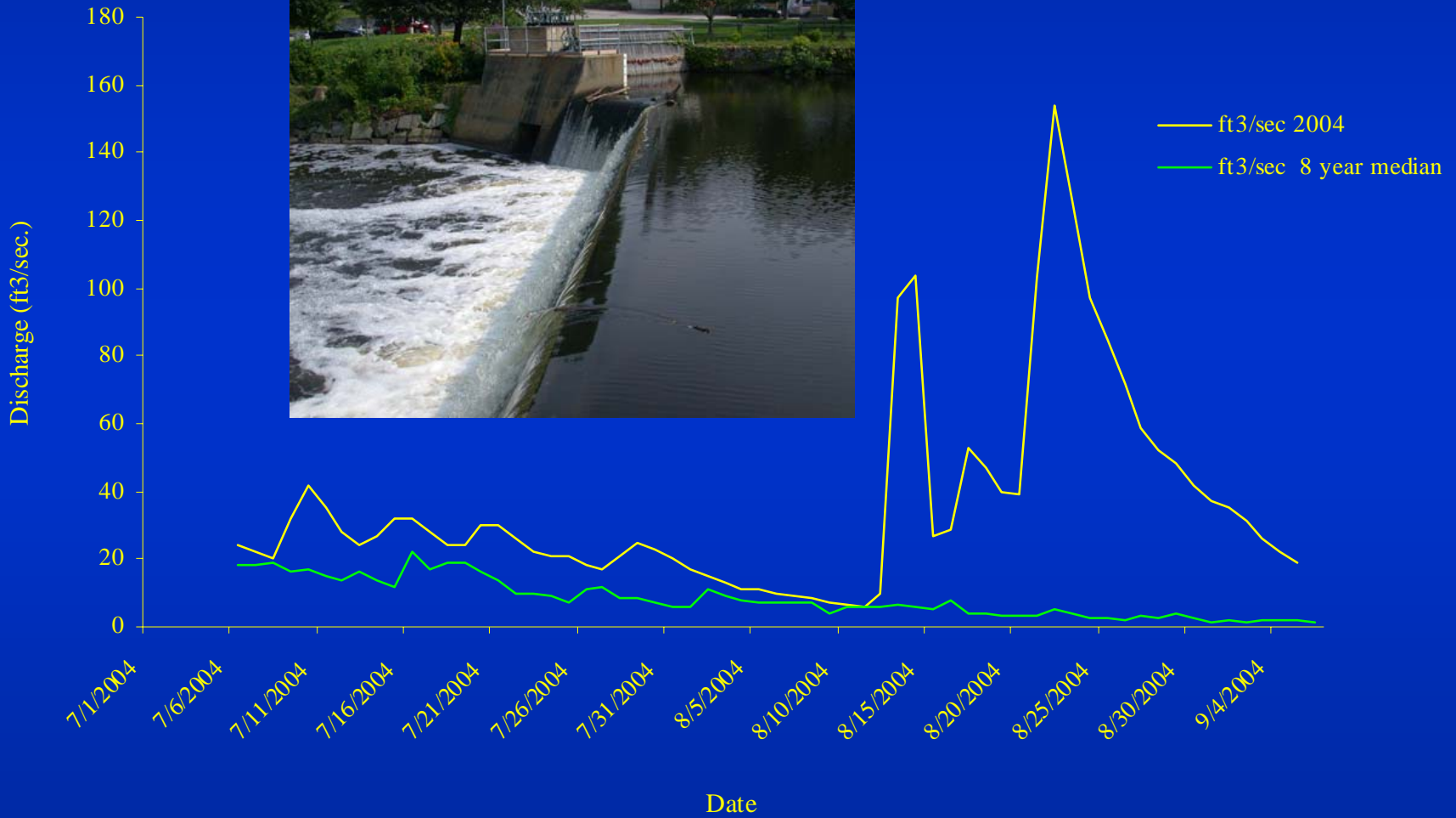


- Normal Spring Flow Conditions-Flood Gates Closed



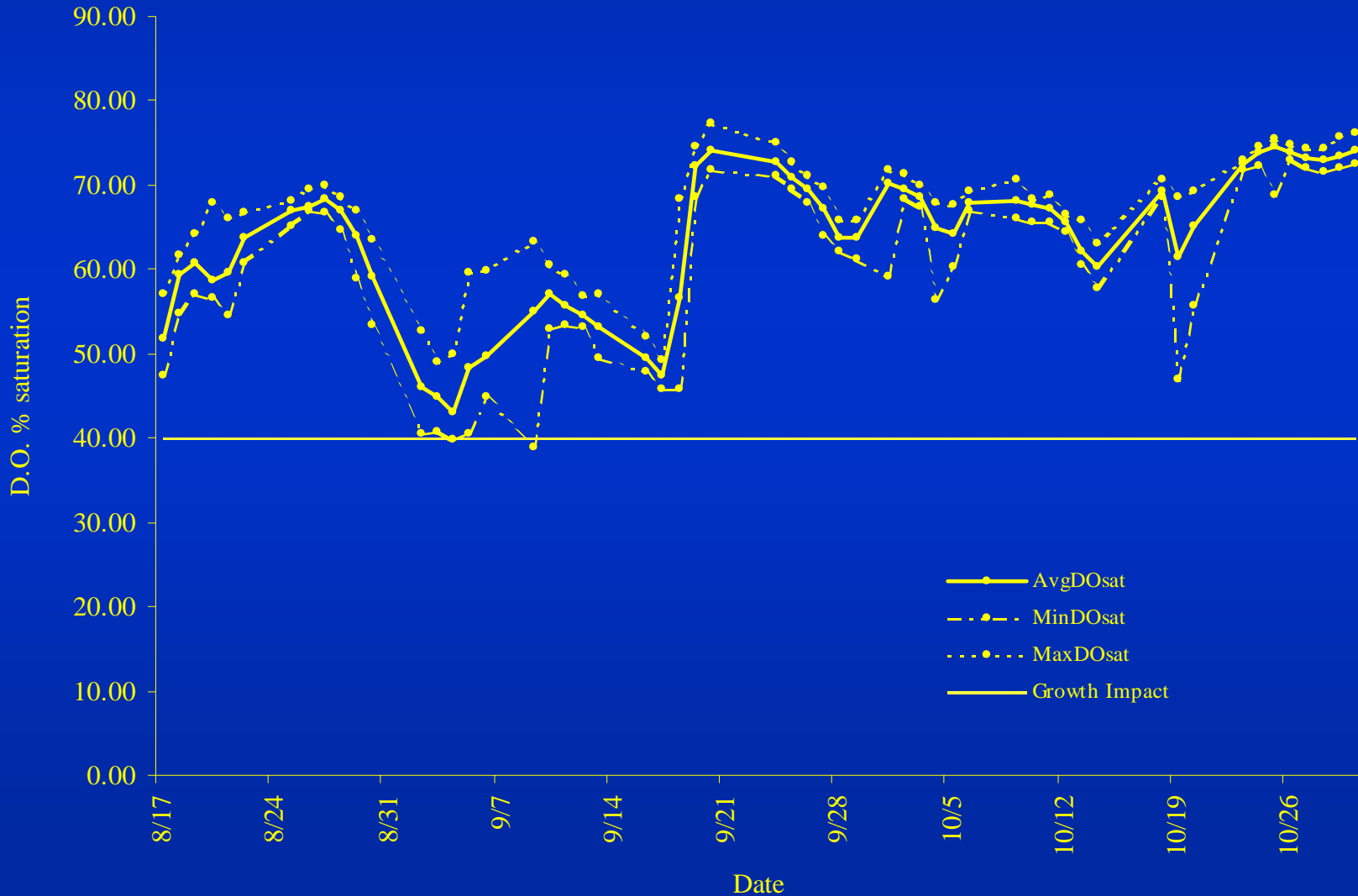
- High Flow Conditions – Flood Gate Open

Exeter River Discharge

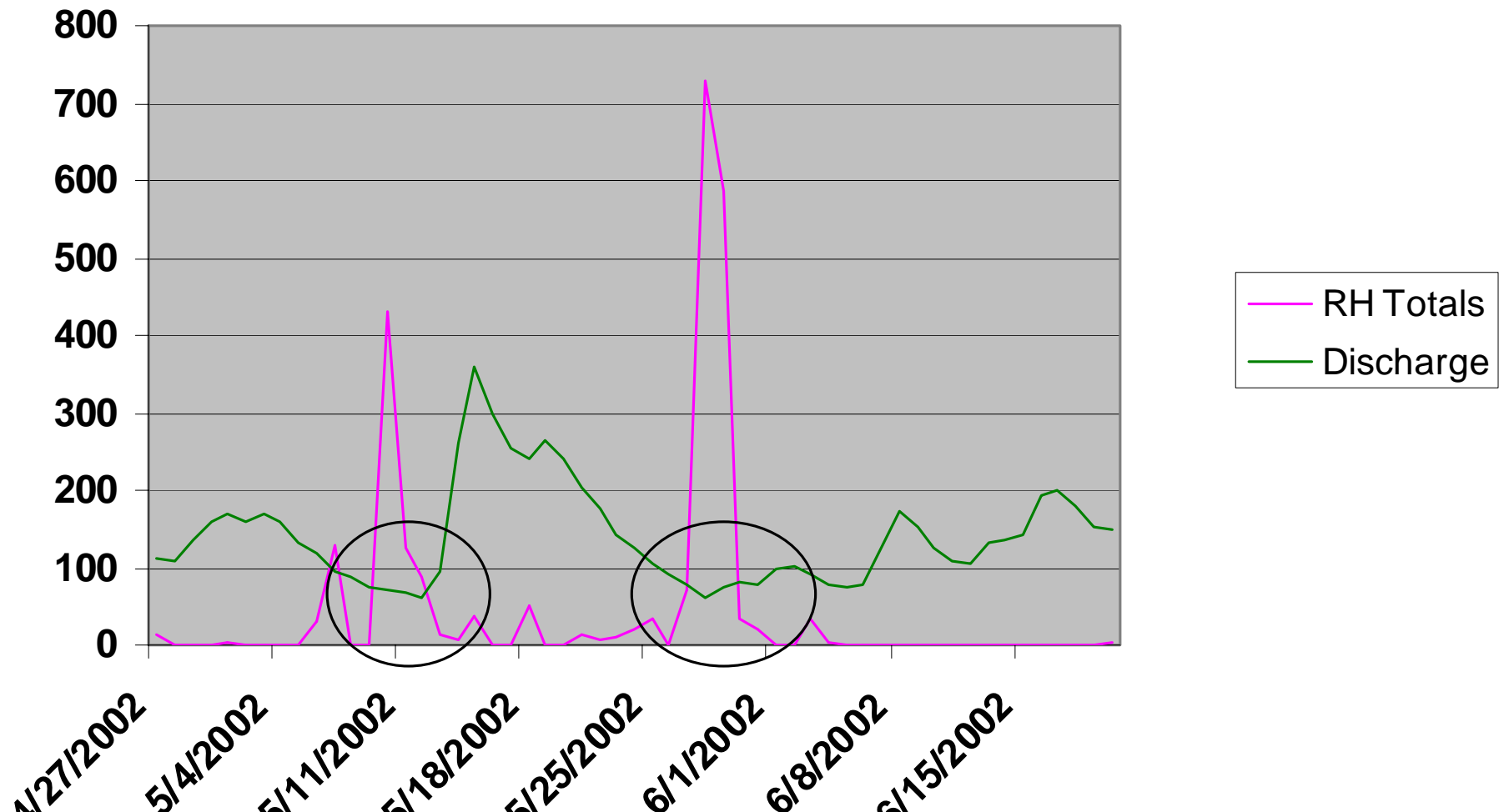


DO During Downstream Emigration

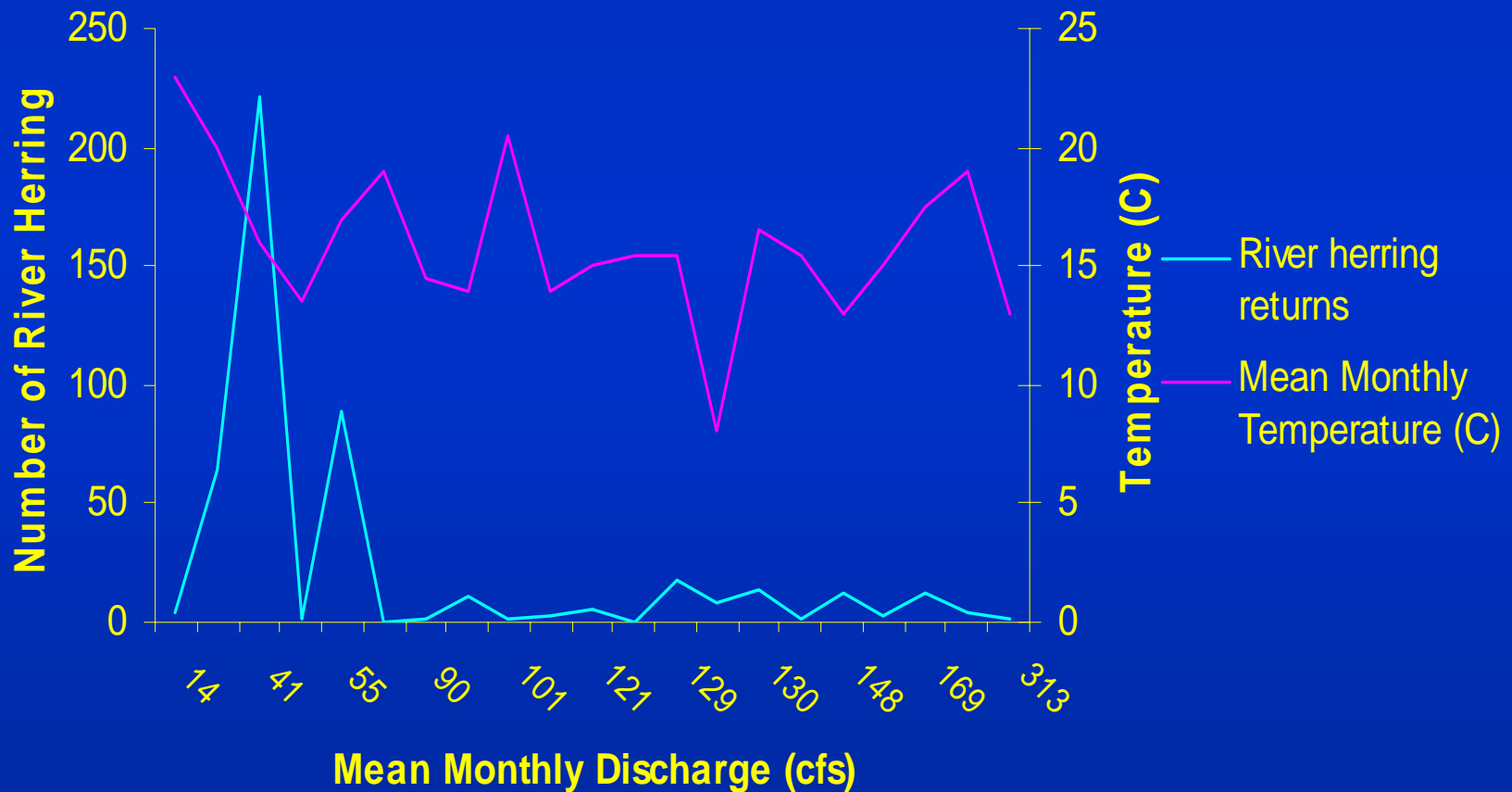
. Daily Mean, Max, and min Dissolved Oxygen Satuaration in the Exeter River NH 2004



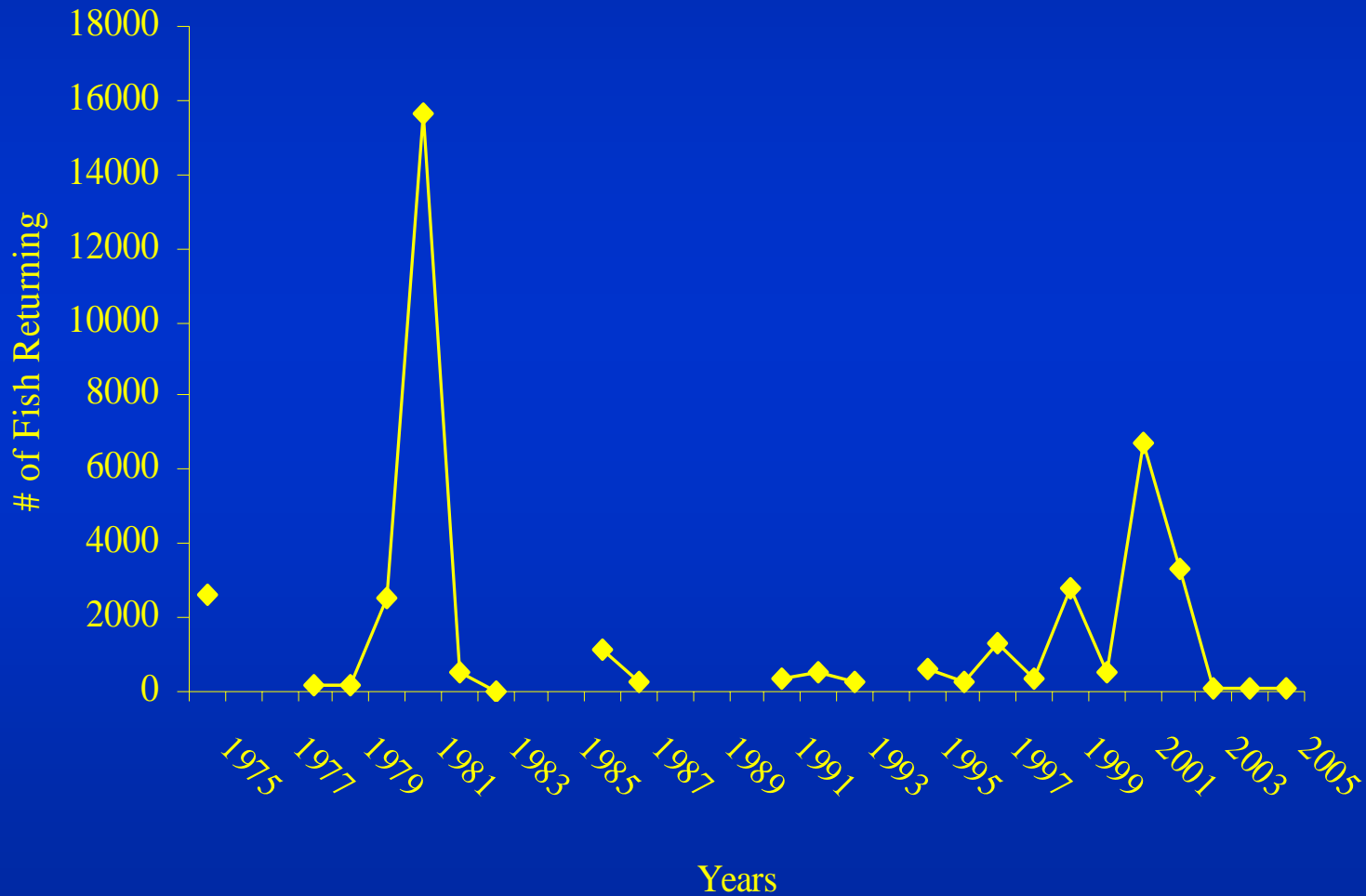
River Herring Returns and Discharge - 2002



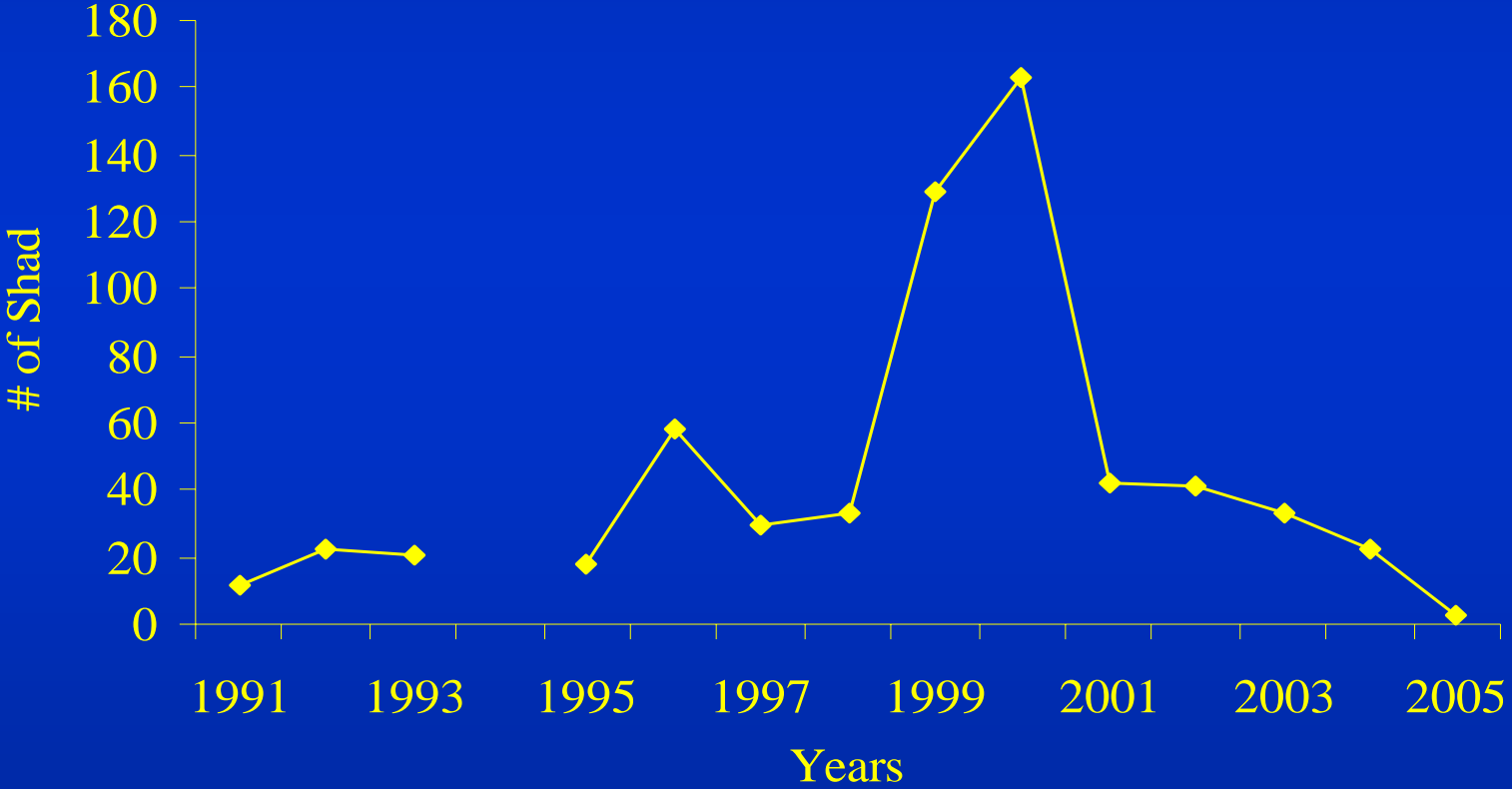
Monthly Mean River Herring Returns and Discharge From 1997-2005



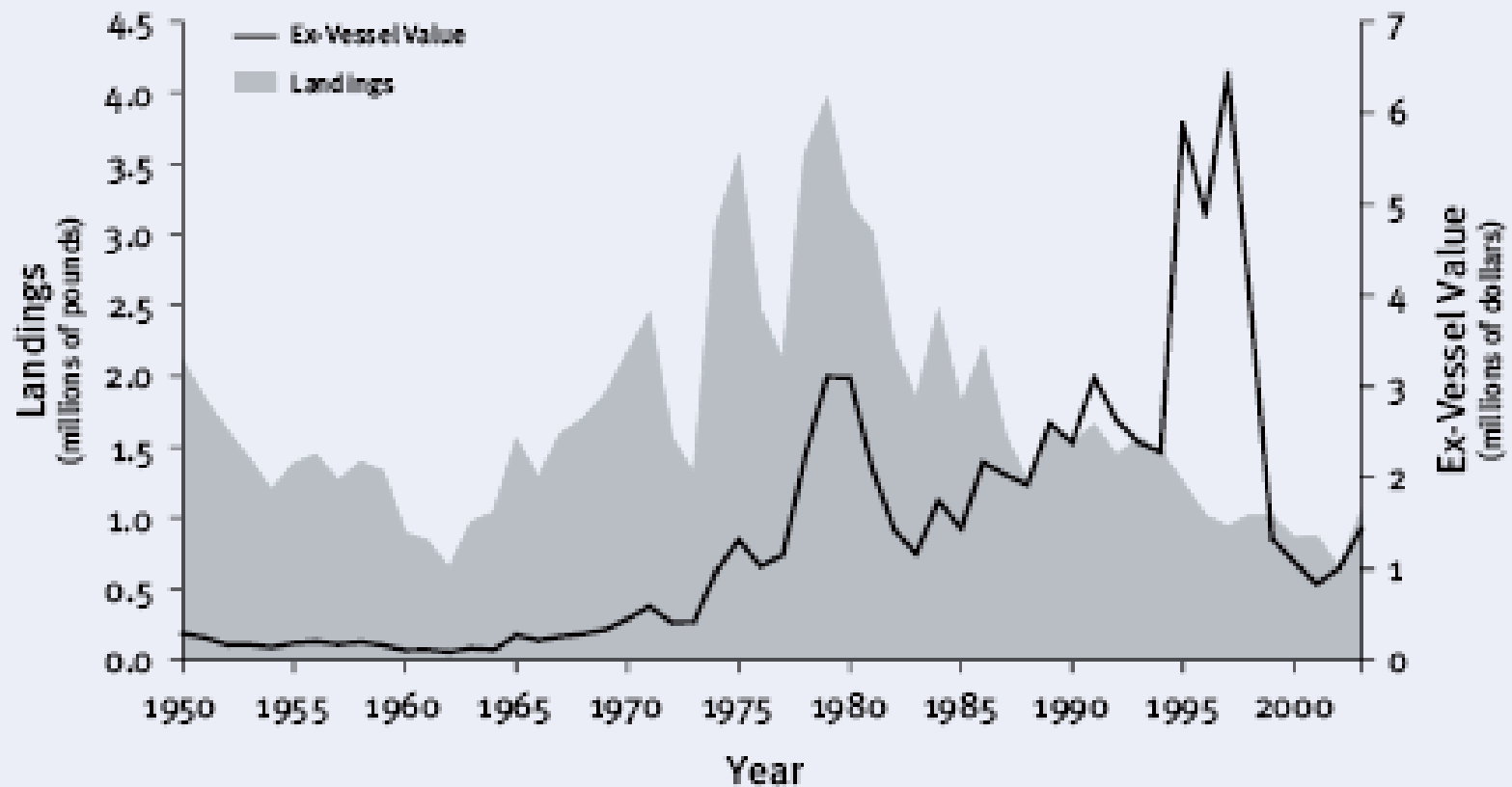
Exeter River - River Herring Returns



Exeter River American Shad Returns



American Eel Landings – 1950 - 2004



Source: Personal communication from the National Marine Fisheries Service, Fisheries Statistics and Economics Division. Estimated ex-vessel value is reported in nominal terms and has not been corrected for inflation.

Squamscott River Rainbow Smelt Uses

- Ice fishing during winter months
- Spawning habitat during spring months

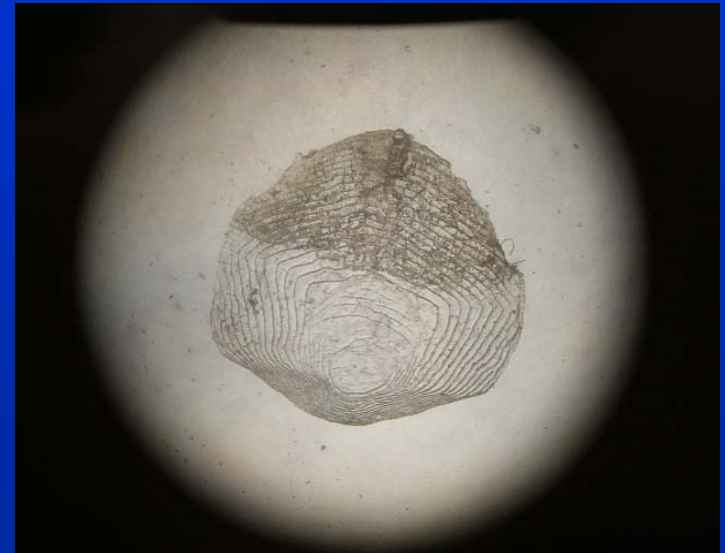


Ice Fishing for Smelt during the Winter Months



NHF&G Rainbow Smelt Creel Survey

- Anglers are interviewed on the ice about their fishing trip
- Samples taken of length, sex, scales, and weight are taken
- Scales are mounted between microscope slides and read to determine the age

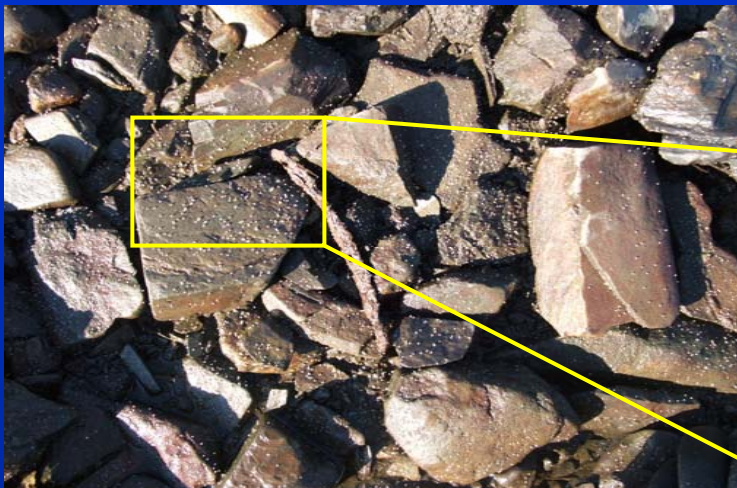


Squamscott River Rainbow Smelt Spawning Habitat

- Migrate to the tributary from December to March
- Spawn at the head of tide below the string bridge from March to April on gravel or rocky substrate



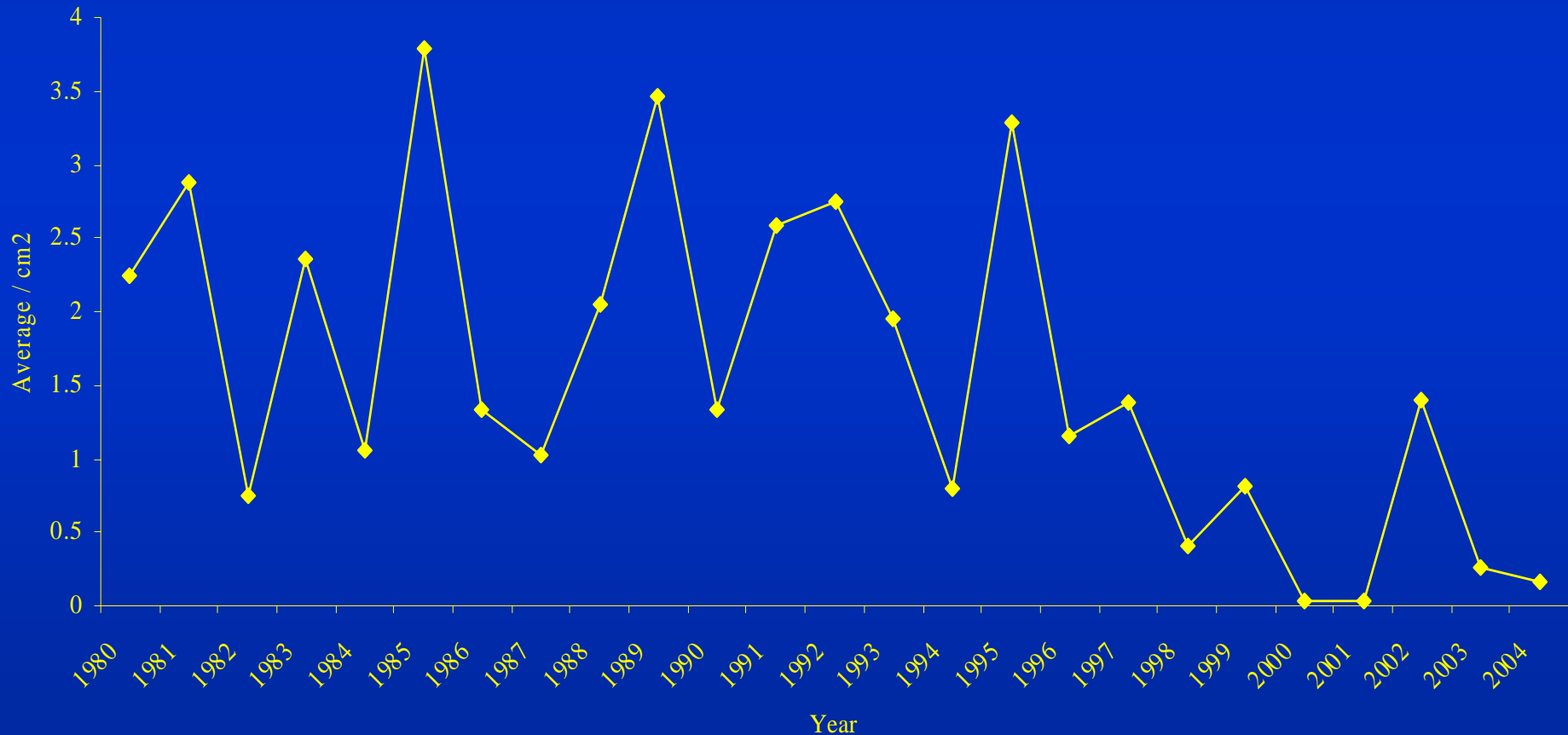
Spawning habitat



Rainbow smelt eggs deposited on
rocks



Squamscott River Rainbow Smelt Egg Deposition Index 1980-2004



Other Uses of the Exeter/Squamscott River



River herring being netted below
string bridge



Eel gig for catching eels

therionarms.com



JUN 4 2005