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**Abundance of Juvenile American Shad  
In the Vernon Pool During 2002**

**Prepared for  
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## ABSTRACT

A third year of sampling was conducted to estimate an index of abundance of juvenile American shad and other fish taxa found in Vernon Pool of the Connecticut River (between Vernon and Brattleboro, VT) during July through October 2002. The program began during 2000 and was continued during 2001 and 2002 using the same sampling design, gear and deployment techniques. A 30.5 m (100 ft.) beach seine was deployed to sample the shore zone (water less than 3 m [10 ft.] deep) during the day, and a 1.8 m x 1.2 m (6 ft. x 4 ft.) midwater trawl was used to sample pelagic waters (greater than 3 m [10 ft.] deep) at night. Twenty randomly selected beaches were sampled with the seine and twelve randomly selected midwater trawl tows were taken during each of eight surveys scheduled on alternating weeks in 2002. The catch of fish in each sample was identified to species, enumerated, and measured. The beach seine survey caught an annual total of 3,852 fish in Vernon Pool during 2002, and the catch was comprised of 17 fish taxa. Bluegill (1,512 fish) and yellow perch (560 fish) were the most abundant fish species caught by seines, collectively comprising 54% of the total seine catch in 2002. Juvenile American shad ranked sixth in abundance (249 fish) among the 17 fish species caught by seines during 2002. The weekly mean catch per unit of effort for juvenile American shad caught by seines was zero during the first six surveys. Juvenile American shad catch per seine haul was 6.30 fish/haul among all sampling regions of Vernon Pool during the seventh week of the 2002 survey (30 September – 4 October 2002), and was 6.15 fish/haul during the last week (14-18 October 2002). However, all of the juvenile American shad caught by seines in 2002 were from the Vernon Region in lower Vernon Pool. The mean length of American shad caught in the beach seine increased by 4 mm as the fish grew from 112 mm during the seventh week of the survey to 116 mm during the last (eighth) week of the 2002 survey. No American shad were caught by the midwater trawl among the total of 11 fish representing three fish taxa observed in the pelagic waters of Vernon Pool during 2002. Smallmouth bass (6 fish) and spottail shiner (4 fish) were the most abundant fish species caught, contributing 91% (10 fish) of the total midwater trawl catch. One largemouth bass was the only other fish species caught by the midwater trawl effort in 2002. When the weekly mean catch/seine haul of American shad was weighted by the area of beach habitat in each region and summed across regions, the resulting combined standing crop index of juvenile American shad abundance in Vernon Pool averaged 10,528 fish among all eight surveys conducted in 2002. This 2002 index was highly variable among weeks and regions, with a standard error of  $\pm 7,712$  fish, and a range from a low of 0 fish to a high of 42,620 juvenile American shad. The juvenile American shad standing crop index of 10,528 fish for Vernon Pool in 2002 was in the middle between the low 2002 index of 2,433 fish and the high 2000 index of 31,244 fish.

## INTRODUCTION

One of the stated objectives by the Shad Studies Subcommittee of the Connecticut River Atlantic Salmon Commission in "A Management Plan for American Shad in the Connecticut River Basin" (prepared February 1992) is that population monitoring is required to support the achievement of the management goal of sustaining 1.5 to 2 million shad in the Connecticut River system. Vermont Yankee has participated in the long-term population monitoring in previous years (e.g., Vermont Yankee Analytical Bulletin Nos. 40, 42, and 71), and in 1997 agreed to evaluate beach seining and electrofishing at locations that could be used to develop a juvenile shad index of relative abundance (Normandeau 1998, Bulletin No. 71). Sampling via electrofishing and beach seine continued in 1998 and 1999 (Normandeau 1999, Bulletin No. 73; Normandeau 2000, Bulletin No. 75).

The juvenile shad program first conducted during 2000 was significantly modified and expanded from the 1999 and previous programs (Normandeau 2001, Bulletin No. 76). Based on three consecutive years of effort with little success (1997, 1998, and 1999), electrofishing for young-of-the-year (YOY or juvenile) shad was judged ineffective and was not conducted above the Vernon Dam in 2000. Furthermore, beach seine sampling in the West River near Brattleboro, VT (Retreat Meadows) was not conducted in 2000 because efforts in 1998 and 1999 failed to capture any YOY shad (Normandeau 2000, Bulletin No. 75). Cost savings from these changes and from terminating monthly fish sampling with trap nets in the Connecticut River to provide protection for Bald Eagles nesting in our sampling area allowed for an expansion of fishing effort for YOY shad in the 2000 study. The sampling design conducted during July through October 2000 replaced approximately 7 beach seine samples and electrofishing samples collected twice per month with a standard design of 20 beach seine samples and 12 midwater trawl samples collected twice per month.

The sampling design first implemented in 2000 and continued in 2001 obtained sufficient data to calculate a juvenile shad index of relative abundance in Vernon Pool for both years (Normandeau 2001 and 2002, Bulletin No. 76 and No. 78). The abundance index was defined in terms of the mean catch per unit of effort (CPUE) and standing crop of juvenile shad (Marcy 1976; Crecco et al. 1981) collected in bimonthly samples at a set of sampling stations during a consistent time period (July through October). Marcy's (1976) estimation for juvenile shad year class strength in the lower Connecticut River (Essex, CT [rkm 11.3] to Northampton, MA [rkm 138]) was based on bag seine CPUE and trawl CPUE at 12 sampling stations.

The goal of the 2002 program was to continue the same juvenile shad sampling program conducted during 2000 and 2001. Use of the same sampling design and sampling procedures consistently across years will develop a time series of relative abundance indices to measure inter-annual variations in year class strength of juvenile American shad in Vernon Pool.

## **MATERIALS AND METHODS**

### **Study Area**

The proposed study area referred to as "Vernon Pool" was defined as the mainstem Connecticut River extending from the Vernon Hydroelectric Dam in Vernon, VT upstream to the confluence of the West River in Brattleboro, VT (Figure 1). The study area included the "Cersosimo Lake" backwater area of the Connecticut River but not the Retreat Meadows area of the West River or other West River habitat. Vernon Pool was partitioned into the following four regions or strata based on a habitat survey of the shoreline and bathymetry conducted during the 2000 survey (Normandeau 2001, Bulletin No. 76): Vernon, Cersosimo, Brattleboro, and Cersosimo Lake (Figure 2). Surface area (beaches) or volume (water column) of each stratum was calculated for use to "weight" the abundance index of YOY shad (Table 1). By using these weighting factors, a "combined standing crop" index based on the proportion of the habitat sampled by each gear, the total amount of that habitat in the study area, and the catch of YOY shad in each habitat and week could be calculated for each week.

A total of 131 beaches were identified as candidate sampling sites in Vernon Pool during the 2000 survey (Normandeau 2001, Bulletin No. 76). However, 10 of these original 131 beaches were found to be inaccessible for sampling in 2002 due to obstructions. Therefore, 121 beaches were considered potential sampling sites in 2002, with 39 beaches in the Vernon Region, 25 beaches in the Cersosimo

Region, 52 beaches in the Brattleboro Region, and 5 beaches in the Cersosimo Lake backwater (Figure 2, Table 2).

A total of 45 midwater trawl tows were identified as potential sampling sites in Vernon Pool during the 2002 survey, with 20 transects in the Vernon Region, 13 transects in the Cersosimo Region, and 12 transects in the Brattleboro Region (Figure 2, Table 3). No midwater trawl transects were identified in Cersosimo Lake. The same 45 midwater trawl transects were used during the 2000 and 2001 surveys (Normandeau 2001, Bulletin No. 76; Normandeau 2002, Bulletin No. 78).

### **Sampling Design**

Beach seine sampling and midwater trawling in the Vernon Pool study area were conducted during July through October 2002 to determine the abundance and catch per unit of effort of YOY American shad and other fish species. We conducted one survey with each gear during the same week, and sampling continued every other week beginning Monday, 8 July 2002 through Friday, 18 October 2002, for a total of eight surveys. The actual number and allocation of 20 seine hauls and 12 midwater trawl tows for each survey was determined based on a proportional allocation scheme (in direct proportion to the amount of habitat in each stratum, Cochran, 1977). Each beach or trawl tow was randomly selected for sampling in each survey (without replacement) from among all available sampling locations in each stratum. For example, in the Brattleboro Region of the Connecticut River, we identified 52 beaches that were potentially available for beach seine sampling based on the shoreline, slope, substrate and absence of large obstructions, and then randomly selected three of these beaches for sampling in each survey. Two alternate sites were also randomly selected for sampling with each gear in each week and region in case it was not possible to sample the primary site due to obstructions or extensive weed beds. Complete inventories of the station names and GPS coordinates of all beaches and trawl tow transects that were available for sampling during 2002 are presented in this bulletin as Table 2 (beaches) and Table 3 (trawls).

### **Beach Seine Survey**

The beach seining conducted in Vernon Pool since 1997 established the effectiveness of this gear for capturing YOY American shad, and the same sampling design conducted during 2000 and 2001 was repeated during 2002. For each beach seine survey, 20 beaches were randomly selected from all 121 available beaches and sampled during the day (one hour after sunrise to one hour before sunset) with a 100 ft x 8 ft x 3/8 in. delta mesh beach seine (30.5 m long) using standardized deployment practices. Habitat weighting resulted in the random selection and sampling of 3 beaches in the Brattleboro Region, 3 beaches in the Cersosimo Region, 12 beaches in the Vernon Region, and 2 beaches in the Cersosimo Lake Region of Vernon Pool during each survey (Table 1).

The entire catch of fish in each beach seine sample was identified to species, enumerated, and measured to the nearest mm total length (TL). All American shad caught were identified, enumerated, measured to the nearest mm TL, and weighed to the nearest gram. Unusually large catches of American shad or other fish species were randomly subsampled so that at least 50 individuals of each species in the sample were measured for length and weight, and the remaining portion of the sample was counted.

### **Midwater Trawl Survey**

Midwater trawling was conducted during 2002 to sample the YOY shad population inhabiting the pelagic water in Vernon Pool that was not sampled by beach seining. The midwater trawl, deployment, and sample allocations during 2002 were the same as used in 2000 and 2001. Midwater trawling was accomplished by randomly selecting 10 surface coordinates and sampling at each location at night (one hour after sunset to one hour before sunrise) with a fixed-frame midwater trawl. Habitat weighting resulted in the random selection and sampling of 3 midwater trawl tows in the Brattleboro Region, 3 tows in the Cersosimo Region, and 6 tows in the Vernon Region (Table 1). Midwater trawl tows were not taken in the Cersosimo Lake Region of Vernon Pool because this region was too small and shallow to deploy this gear there. The midwater trawl specifications were as follows: 1.8 m x 1.2 m fixed frame net (6 ft wide by 4 ft high), 4.6 m long (15 ft), with 7.9 mm (5/16 in) bar mesh netting throughout and a 6.35 mm (1/4 in) bar mesh cod end liner. The gear was towed behind the boat from a bridle, with a flowmeter (General Oceanics Model 2030) fixed in the center of the frame to measure sample volume. When towed at the surface, a float was mounted at each upper corner of the frame (9-kg or 20 lb. buoyancy), each lower corner was rigged with a 5-kg cable depressor, and the net was towed 61 m (200 ft) behind the boat. Each tow was for 10 minutes of duration, against the current, at a speed (through water) of  $1.3 \text{ m/sec} \pm 0.1 \text{ m/sec}$  ( $4.4 \text{ fps} \pm 0.2 \text{ fps}$ ). The mean sample volume per tow during 2002 was  $1303 \text{ m}^3$  ( $\pm 12.8 \text{ m}^3 \text{ SE}$ ). The maximum and minimum tow volumes were  $1803 \text{ m}^3$  and  $1027 \text{ m}^3$ , respectively. Only surface tows were taken in Vernon Pool because we found that there was insufficient water at depths below 3 m (10 ft) to fish the trawl at night while avoiding "hanging down" on the bottom along a tow path that was between one-quarter and one-half of a mile long.

The entire catch of fish in each midwater trawl sample was identified to species, enumerated, and measured to the nearest mm total length (TL). All American shad caught were identified, enumerated, measured to the nearest mm TL, and weighed to the nearest gram. Unusually large catches of American shad or other fish species were randomly sampled so that at least 50 individuals of each species in the sample were measured for length and weight, and the remaining fish were counted.

### **Analytical Methods**

#### **Catch-Per-Unit-Effort and Density Estimates**

Estimates of population densities were made for American shad and other species caught in the beach seine and midwater trawl surveys. For these two surveys the number of fish (by species) in individual samples was first converted to density (number/ $\text{m}^2$  for fish caught in the beach seine or number/1000  $\text{m}^3$  of water sampled for the midwater trawl) using the equations shown below. Similarly, the mean density and the standard error of the mean were then calculated for each stratum, region, and sampling week using the equations shown below. To obtain a mean density and standard error for each region during each sampling week, the stratum densities were weighted by the proportion of the regional river area (seines) or volume (trawls) found in the stratum.

Catches from the beach seines were reported as number caught per seine haul (catch-per-unit-effort [CPUE]) by life stage and species. The average CPUE for seines in a region and its standard error were calculated using Equations 1 and 2:

$$C_{rw} = \frac{1}{n_{rw}} \sum_{i=1}^{n_{rw}} C_{i_{rw}} \quad (1)$$

$C_{rw}$  = Average CPUE in region r during week w.

$C_{i_{rw}}$  = CPUE for sample in region r during week w.

$n_{rw}$  = Number of samples taken in region r during week w.

$$SE(C_{rw}) = \frac{\sum_{i=1}^{n_{rw}} (C_{i_{rw}} - C_{rw})^2}{n_{rw}(n_{rw} - 1)} \quad (2)$$

where

$SE(C_{rw})$  = Standard error of average CPUE in region r during week w.

$C_{rw}$  = Average regional CPUE calculated in Equation 1.

Catches from the midwater trawl tows were reported as number caught per 1000 m<sup>3</sup> (density) by species (Equation 3).

$$D_{i_{krw}} = \frac{C_{i_{krw}}}{V_{i_{krw}}} * 1000 \quad (3)$$

where

$D_{i_{krw}}$  = Density (for a life stage and species)/1000 m<sup>3</sup> for sample i in stratum k in region r during week w.

$C_{i_{krw}}$  = Number of fish caught in sample i in stratum k in region r during week w.

$V_{i_{krw}}$  = Volume sampled (m<sup>3</sup>) by sample i in stratum k in region r during week w.

The average density of fish in a region (Equation 4) and its standard error (Equation 5) were calculated as:

$$D_{krw} = \frac{1}{n_{krw}} \sum_{i=1}^{n_{krw}} D_{i_{krw}} \quad (4)$$

where

$D_{krw}$  = Average density in stratum k in region r during week w.

$D_{i_{krw}}$  = Sample density calculated in Equation 3.

$n_{krw}$  = Number of samples taken in stratum k in region r during week w.

$$SE(D_{krw}) = \sqrt{\frac{\sum_{i=1}^{n_{krw}} (D_{ikrw} - D_{krw})^2}{(n_{krw})(n_{krw} - 1)}} \quad (5)$$

where

$SE(D_{krw})$  = Standard error of the average density in stratum k in region r during week w.

$D_{ikrw}$  = Sample density calculated in Equation 3.

$D_{krw}$  = Average stratum density calculated in Equation 4.

The stratum densities (Equation 6) and standard errors (Equation 7) were weighted by the proportion of the regional river area (seines) or volume (trawls) found in the stratum to determine an average regional density:

$$D_{rw} = \sum_{k=1}^{n_{rw}} (D_{krw})(P_k) \quad (6)$$

where

$D_{krw}$  = Average density in region r during week w.

$P_k^*$  = Proportion of the regional river area or volume found in stratum k (Table 1).

$n_{rw}$  = Number of strata sampled in region r during week w.

$$SE(D_{rw}) = \sqrt{\sum_{k=1}^{n_{krw}} [SE(D_{krw})^2 (P_k)^2]} \quad (7)$$

where

$SE(D_{rw})$  = Standard error of average density in region r during week w.

$SE(D_{krw})$  = Standard error of average stratum density calculated in Equation 6.

### Standing Crop Estimates

An index of standing crop (the number of fish in an area at a particular time) was estimated for American shad for each week. Standing crop indices and the associated standard errors were calculated for each stratum in a region by taking the product of the average stratum density (or the standard error) and the volume of water contained in that stratum (Equations 6 and 7, Table 1). The regional standing crop index was then estimated as the sum of the stratum index values (Equations 8 and 9). Similarly, an estimate of the standing crop index for the entire Vernon Pool for each week was calculated by summing the standing crops for the four (4) seine river regions or three (3) trawl

\* When a stratum is missing,  $P_k$  for the sampled stratum is equal to the sum of the  $P_k$  for the sampled stratum and the  $P_k$  for the unsampled stratum.

river regions (Equations 10 and 11). This value is considered an index rather than an absolute standing crop value because no adjustment was applied for collection efficiency.

$$SC_{krw} = (V_{kr})(D_{krw}) \quad (8)$$

where

$SC_{krw}$  = Standing crop index for stratum k in region r during week w.

$V_{kr}$  = River volume contained by stratum k in region r.

$D_{krw}$  = Average stratum density calculated in Equation 4.

$$SE(SC_{krw}) = (V_{kr})[SE(D_{krw})] \quad (9)$$

where

$SE(SC_{krw})$  = Standard error of the standing crop index for stratum k in region r during week w.

$SE(D_{krw})$  = Standard error of average stratum density calculated in Equation 5.

$$SC_{rw}^{**} = \sum_{k=1}^r SC_{krw} \quad (10)$$

where

$SC_{rw}$  = Standing crop index for region r during week w.

$SC_{krw}$  = Stratum standing crop index calculated in Equation 8.

$$SE(SC_{rw})^{**} = \sqrt{\sum_{k=1}^r [SE(SC_{krw})]^2} \quad (11)$$

where

$SE(SC_{rw})$  = Standard error of standing crop index for region r during week w.

$SE(SC_{krw})$  = Standard error of stratum standing crop index calculated in Equation 9.

$$SC_w = \sum_{r=1}^r SC_{rw} \quad (12)$$

where

$SC(SC_w)$  = Standing crop index for week w.

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\*\* Volume of unsampled pelagic zone of Cersosimo Lake strata was added to the volume of the adjacent Cersosimo Region.

$SC(SC_{rw})$  = Regional standing crop index calculated in Equations 10 or 14.

$$SE(SC_w) = \sqrt{\sum_{r=1}^r [SE(SC_{rw})]^2} \quad (13)$$

where

$SE(SC_w)$  = Standard error of standing crop index for week w.

$SE(SC_{rw})$  = Standard error of regional standing crop index calculated in Equations 11 or 15.

An index of regional standing crop (and standard error) for the beach seines was obtained by multiplying CPUE and the surface area of the shore zone and dividing by the empirically derived estimate of the area sampled by the 100 ft (30.5-m) beach seine (Equations 14 and 15). The weekly index of standing crop for the shore zone was calculated as the sum of the 4 regional standing crops (Equations 12 and 13).

$$SC_{rw} = (C_{rw}A_r)/A \quad (14)$$

$SC_{rw}$  = Standing crop index for the shore zone in region r during week w.

$C_{rw}$  = Average regional CPUE calculated in Equation 9.

$A_r$  = Surface area (m<sup>2</sup>) of the shore zone in region r.

A = Surface area (m<sup>2</sup>) sampled by the beach seine (450 m<sup>2</sup>) (TI 1981).

$$SE(SC_{rw}) = \frac{[SE(C_{rw})](A_r)}{A} \quad (15)$$

where

$SE(SC_{rw})$  = Standard error of standing crop index for the shore zone in region r during week w.

$SE(C_{rw})$  = Standard error of average regional CPUE calculated in Equation 10.

## RESULTS

### Sampling Effort

A total of 20 beach seine samples and 12 midwater trawl samples were collected in Vernon Pool of the Connecticut River during each of the eight biweekly surveys, resulting in the collection of 160 beach seine samples and 96 midwater trawl samples in the July through October 2002 period.

### Catch and Species Composition

#### Beach Seine Survey

The beach seine survey caught an annual total of 3852 fish in Vernon Pool, and the catch was comprised of 17 fish taxa (Table 4). At least one fish was caught in each region and week that the beach seine was fished in Vernon Pool. Bluegill (1512 fish) was the most abundant fish species caught by seines during 2002. Yellow perch (560 fish) ranked second in abundance, black crappie

(350 fish) ranked third in abundance, golden shiner (309 fish) was fourth, largemouth bass (288 fish) was fifth, pumpkinseed (160 fish) was seventh, and spottail shiner (148 fish) was eighth in abundance in the 2002 beach seine survey (Table 4). These seven species collectively contributed 90% of the total catch by beach seine. Fewer than 100 individuals of each of the remaining 13 fish taxa were caught, and these 13 taxa collectively contributed only 10% of the total beach seine catch during 2001.

Juvenile American shad ranked sixth in abundance among the fish species caught by seines (Table 4). A total of 249 juvenile American shad were caught by beach seine during last two of the eight surveys; shad were caught during the weeks of 30 September – 4 October (126 fish) and 14-18 October 2002 (123 fish, Table 4). American shad were only caught in the Vernon Region of the Connecticut River during 2002 (Table 4). The juvenile shad catch in the Vernon Region during the week of 30 September – 4 October was from three seine hauls taken on 30 September 2002 at Beach Numbers 91 (2 fish), 94 (97 fish), and 106 (27 fish). The juvenile shad catch in the Vernon Region during the week of 14-18 October was from three seine hauls taken on 14 October 2002 at Beach Numbers 104 (74 fish), 105 (1 fish), and 112 (48 fish).

The weekly length-frequency distribution for juvenile American shad demonstrated growth during the last two surveys of the 2002 program (Figure 3). The mean length of the 126 American shad caught during the week of 30 September – 4 October 2002 was 112 mm, with a range in length from 86 mm to 129 mm. The mean length of American shad was 116 mm during the week of 14-18 October (123 fish measured), with a range in length from 96 mm to 136 mm.

The beach seine catch of all fish species combined increased during each successive survey, reached a peak during the seventh survey week of 30 September – 4 October, and declined during the last eighth) survey (Table 4). The observed temporal pattern of increase was influenced most by corresponding changes in bluegill abundance in the Vernon Region (Table 4). The Vernon Region also contributed the most fish to the total catch (2496 fish or 65%), but this was not surprising since this region also had most of the seine sampling effort. Yellow perch abundance in the seine catch was relatively uniform during surveys 2 – 8, ranging from 48 fish to 80 fish per week, and exhibited a seasonal peak of 119 fish during the first survey (Table 4).

### **Midwater Trawl Survey**

The midwater trawl survey caught an annual total of 11 fish representing three fish taxa in the pelagic waters of Vernon Pool during the 2002 survey (Table 5). The midwater trawl failed to catch any juvenile American shad. Smallmouth bass (6 fish) and spottail shiner (4 fish) were the most abundant fish species caught by the midwater trawl. Only one largemouth bass was caught by the midwater trawl during July – October 2002. The midwater trawl catch was distributed among all three Connecticut River Regions sampled during the 2002 program (Table 5).

### **Catch Per Unit Effort (CPUE) and Density (No./1000 m<sup>3</sup>)**

#### **Beach Seine Survey**

The weekly mean CPUE for all fish taxa combined in the beach seine survey was between a low of 17.30 fish/haul among all sampling regions of Vernon Pool during the week of 19-23 August 2002 and a high of 32.00 fish/haul during the week of 30 September – 4 October 2002 (Table 6). Bluegill (12.50 fish/haul), American shad (6.30 fish/haul), and yellow perch (14.70 fish/haul) were the fish

species contributing most to the seasonal peak in CPUE during the week of 30 September – 4 October 2002 (Table 6). The highest regional mean CPUE of 52.33 fish/haul was observed in the Cersosimo Region of Vernon Pool during the week of 30 September – 4 October 2002 (Table 6). Cersosimo Lake also exhibited a high CPUE of 49.50 fish/haul during the week of 5-9 August and a CPUE of 52.00 fish/haul during the week of 30 September – 4 October 2002 (Table 6). Spottail shiner, yellow perch, pumpkinseed and bluegill contributing most to this Cersosimo Region peak in CPUE (Table 6). Black crappie, yellow perch, and bluegill contributing most to the Cersosimo Lake regional peaks in CPUE (Table 6).

The weekly mean CPUE for American shad in the beach seine survey was generally low throughout the 2002 survey, and was 0.00 fish/haul among all sampling regions of Vernon Pool during the first six surveys (July, August and most of September) of 2002 (Table 6). Comparable weekly mean CPUE's of 6.30 fish/haul and 6.15 fish/haul were observed during the weeks of 30 September – 4 October 2002 and 14-18 October 2002 across all regions (Table 6). Similar high CPUE's of 10.50 fish/haul during the week of 30 September – 4 October and 10.25 fish/haul during the week of 14-18 October 2002 were observed in the Vernon Region, the only region in which juvenile American shad were caught (Table 6). Sampling variability was also high, with the standard error of the mean CPUE nearly equal to the mean CPUE in each week and region (Table 6). The high variability is most likely a result of schooling behavior in juvenile American shad, which makes the probability of catching fish at any one beach low, but when they are present the CPUE will be high. For example, the juvenile American shad catch of 10.50 fish per seine haul in the Vernon Region during the week of 30 September - 4 October 2002 was primarily from one seine haul in which 97 out of the total of 126 shad were caught. Similarly, the weekly mean CPUE for American shad of 10.25 fish/haul observed in the Vernon Region during the week of 14-18 October 2002 (Table 6) was primarily the catch of 74 fish from one seine haul (60% of the total catch).

#### **Midwater Trawl Density (No./1000 m<sup>3</sup>)**

The weekly mean density for all fish taxa combined in midwater trawl survey ranged from a low of 0.00 fish/1,000 m<sup>3</sup> among all sampling regions of Vernon Pool during the weeks of 2-6 September, 17-21 September, and 30 September – 4 October 2002 to a high of 0.39 fish/1,000 m<sup>3</sup> during the week of 22-26 July 2002 (Table 7). No American shad were caught during the midwater trawl survey in 2002. Smallmouth bass and spottail shiner both exhibited the highest density in the midwater trawl. Smallmouth bass contributed all of the fish to the observed density of 0.39 fish/1,000 m<sup>3</sup> during the week of 22-26 July 2002 (Table 7). Spottail shiner were caught in a mean density of 0.21 fish/1,000 m<sup>3</sup> during the week of 19-23 August 2002 and in a mean density of 0.06 fish/1,000 m<sup>3</sup> during the week of 14-18 October 2002 (Table 7).

#### **Juvenile American Shad Standing Crop Index**

The Vernon Region was the only region in Vernon Pool contributing juvenile American shad to the weekly combined standing crop index in 2002, and this contribution came from the last two surveys (Table 8). When the average was taken among all eight weeks in the 2002 survey, the standing crop index was 10,528 juvenile American shad with a standard error of  $\pm 7,712$  fish. The beach seine survey contributed all of the fish to the index in 2002, because no American shad were caught in the midwater trawl survey.

## DISCUSSION

The beach seine survey continues to be a highly effective program for sampling juvenile American shad and other fish taxa in Vernon Pool. Random allocation of the sampling effort among four geographic regions made the beach seine survey conducted during 2000, 2001 and 2002 more robust and representative of the entire Vernon Pool compared with previous surveys. The random design was not subjected to variability associated with changes in fish distribution compared with a fixed location design such as sampling only in Cersosimo Lake. All three annual surveys demonstrated that significant numbers of juvenile American shad are found in the Vernon Pool section of the Connecticut River (Table 9). The Vernon Region has consistently contributed most of the fish to the standing crop index among all three survey years (Table 9) compared to the other regions identified in Vernon Pool, and has a substantial amount of beach habitat that may represent a nursery area for juvenile American shad. Zero catches in all regions during the first six surveys (July, August and most of September) of 2002 may reflect later development and sampling that occurred prior to recruitment of juvenile American shad to the sampling gear. In 2000, the highest weekly standing crop index for juvenile American shad was observed during the week of 7-11 August (Normandeau 2001, Bulletin no. 76), while during 2001, the peak standing crop index was observed nearly two months later during the week 1-5 October 2001 (Normandeau 2001, Bulletin no. 78). The occurrence of the peak standing crop index during the last two weeks of the 2002 survey is consistent with the timing seen in 2001.

The midwater trawl survey failed to capture American shad in Vernon Pool during the 2000, 2001 and 2002 programs. This gear was fished at night to minimize gear avoidance by juvenile fish, and the standard deployment has been used effectively to sample juvenile fish in the pelagic zone of other river systems. The pelagic zone of Vernon Pool represents 63% of the available fish habitat (volume), and in the Brattleboro and Cersosimo Regions, the pelagic zone is between two and five times the size of the beach zone. Each fish caught in the pelagic zone contributes two to five times to the standing crop index compared to a fish caught in the beach zone. Therefore, it was useful to sample with the midwater trawl in the pelagic zone so that the combined standing index for Vernon Pool is represented by random sampling effort allocated among the entire available fish habitat.

Marcy (1976) considered year class strength of American shad in the Connecticut River to be dependent primarily on the following three factors: number of adults potentially available to spawn, water temperature, and discharge. A multiple linear regression model developed by Marcy (1976) revealed a highly significant relationship ( $p < 0.05$ ) between year class strength (CPUE) and the combination of available spawning adults, water temperature, and discharge. Marcy stated that this model can explain 86% of the variability in year class strength and could therefore be used to predict the production of juvenile shad in a particular year with a relatively high degree of success. However, with only three years (2000, 2001 and 2002) of standing crop indices, it is premature to develop a model to predict year class strength of juvenile American shad in Vernon Pool.

Examining the observed relationship between the number of adult American shad in Vernon Pool and the juvenile shad standing crop index for 2000, 2001, and 2002 (Table 10) suggests that the index may be better correlated with the number of adult females than the total number of adults. The total number of adult shad in Vernon Pool was similar between 2000 (1,807 fish) and 2001 (1,737 fish), but was about one-half of the previous two years in 2003 (956 fish), while the juvenile shad index for 2003 (10,528 juvenile fish) was intermediate between 2000 (31,244 juvenile fish) and 2001 (2,433 fish). The estimated total number of adult female (roe) shad in Vernon Pool was also intermediate in

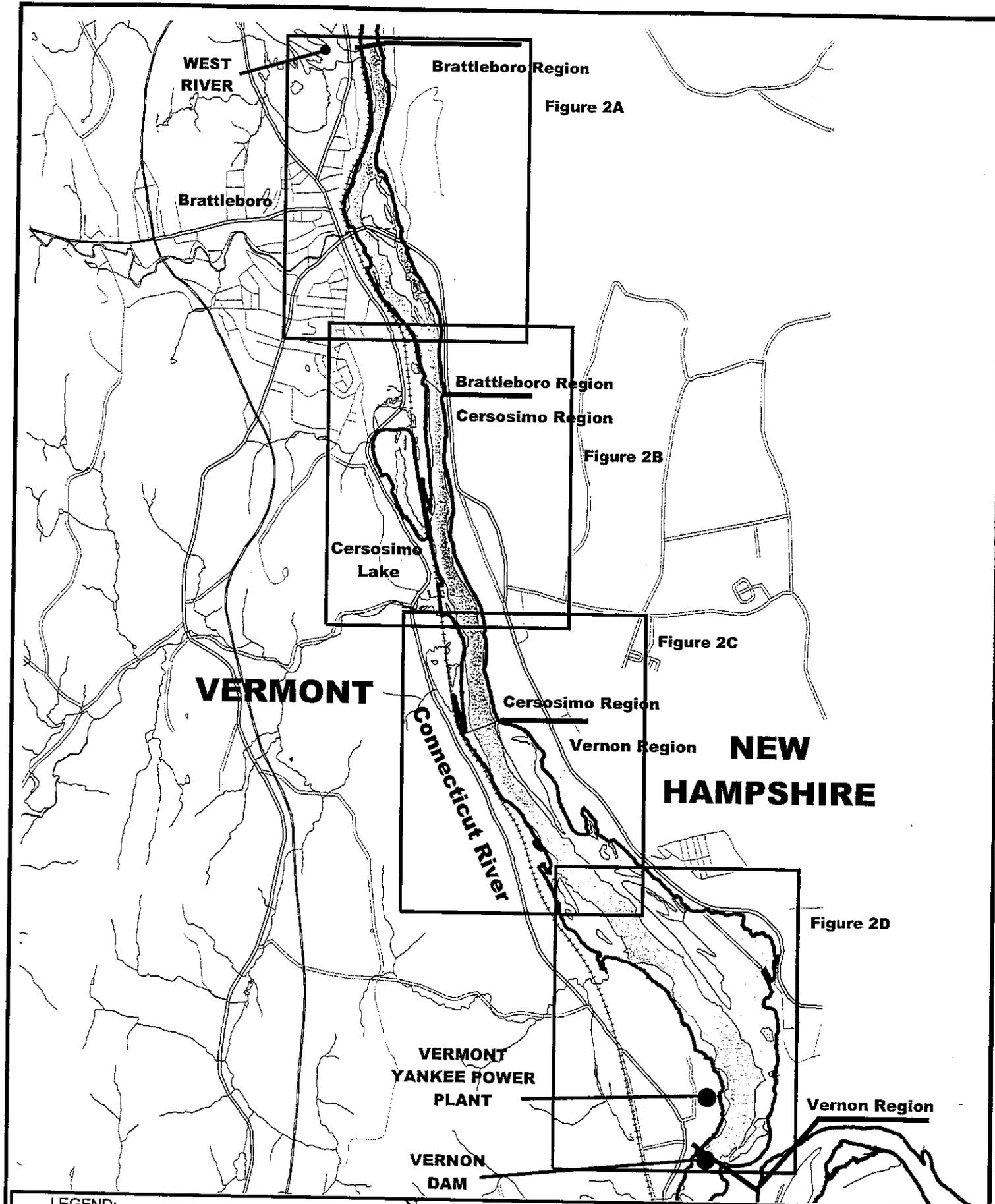
**FIGURES AND TABLES  
FOR THE 2002 JUVENILE  
AMERICAN SHAD BULLETIN NO. 79**

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- Figure 2. Juvenile American Shad Study in the Connecticut River, Vernon to Brattleboro, VT.
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- Table 4. Weekly and Regional Number of Fish Taxa Caught by Beach Seine in Vernon Pool of the Connecticut River, July – October 2002.
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WEST RIVER

Brattleboro Region

Figure 2A

Brattleboro

Brattleboro Region

Cersosimo Region

Figure 2B

Cersosimo Lake

Figure 2C

VERMONT

Cersosimo Region

Vernon Region

NEW HAMPSHIRE

Connecticut River

Figure 2D

VERMONT  
YANKEE POWER  
PLANT

Vernon Region

VERNON  
DAM

- LEGEND:
- Major Roads
  - Minor Roads
  - Railroads
  - Depth 10ft and Greater
  - Depth 10ft. or Less

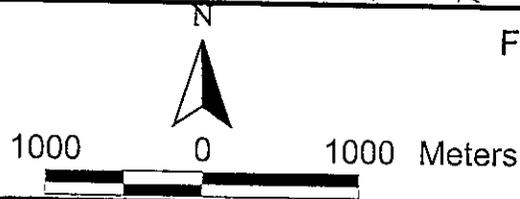
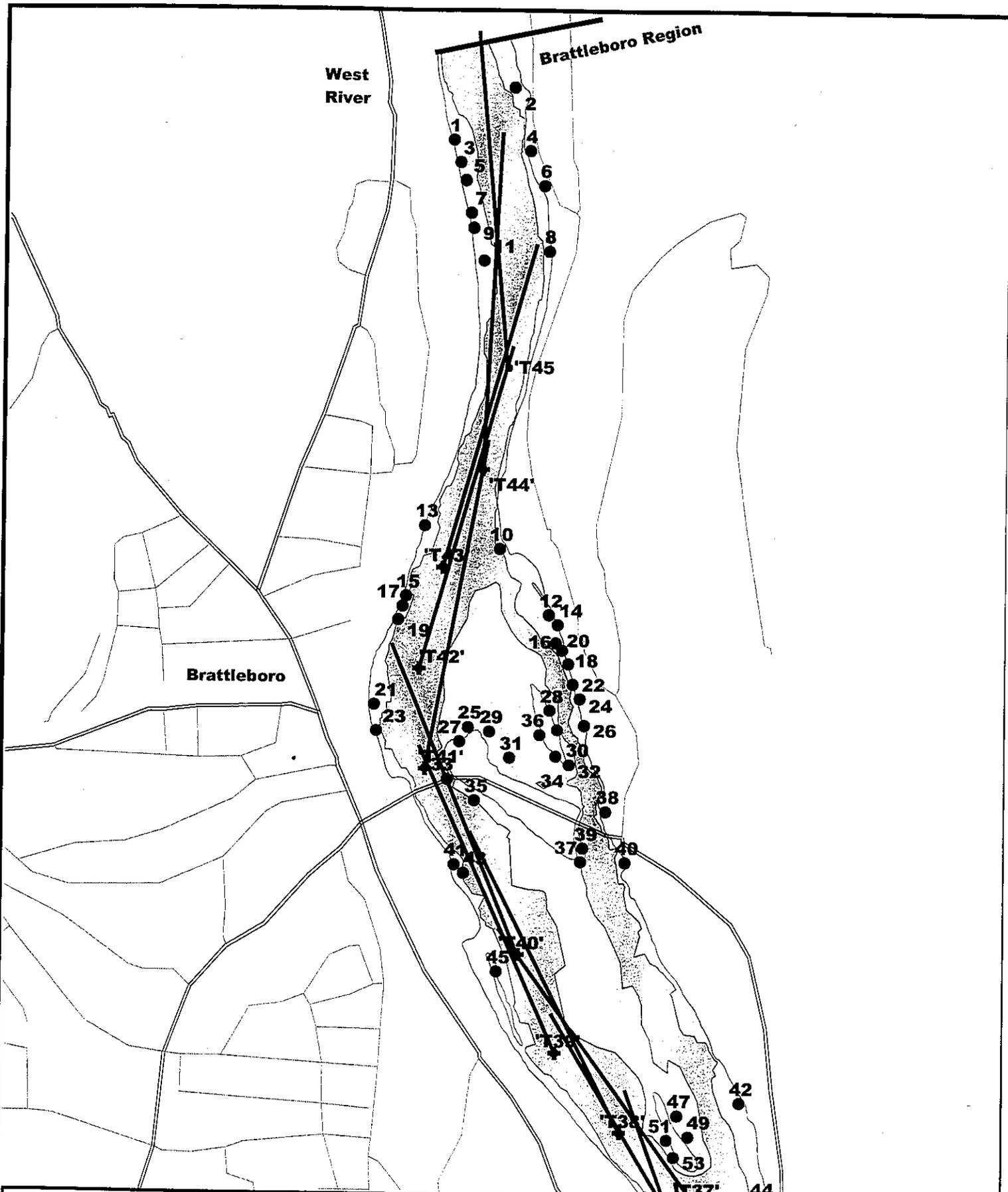


Figure 1: Vernon Pool Study Area of the Connecticut River, Vernon to Brattleboro, VT

Jan. 11, 2001

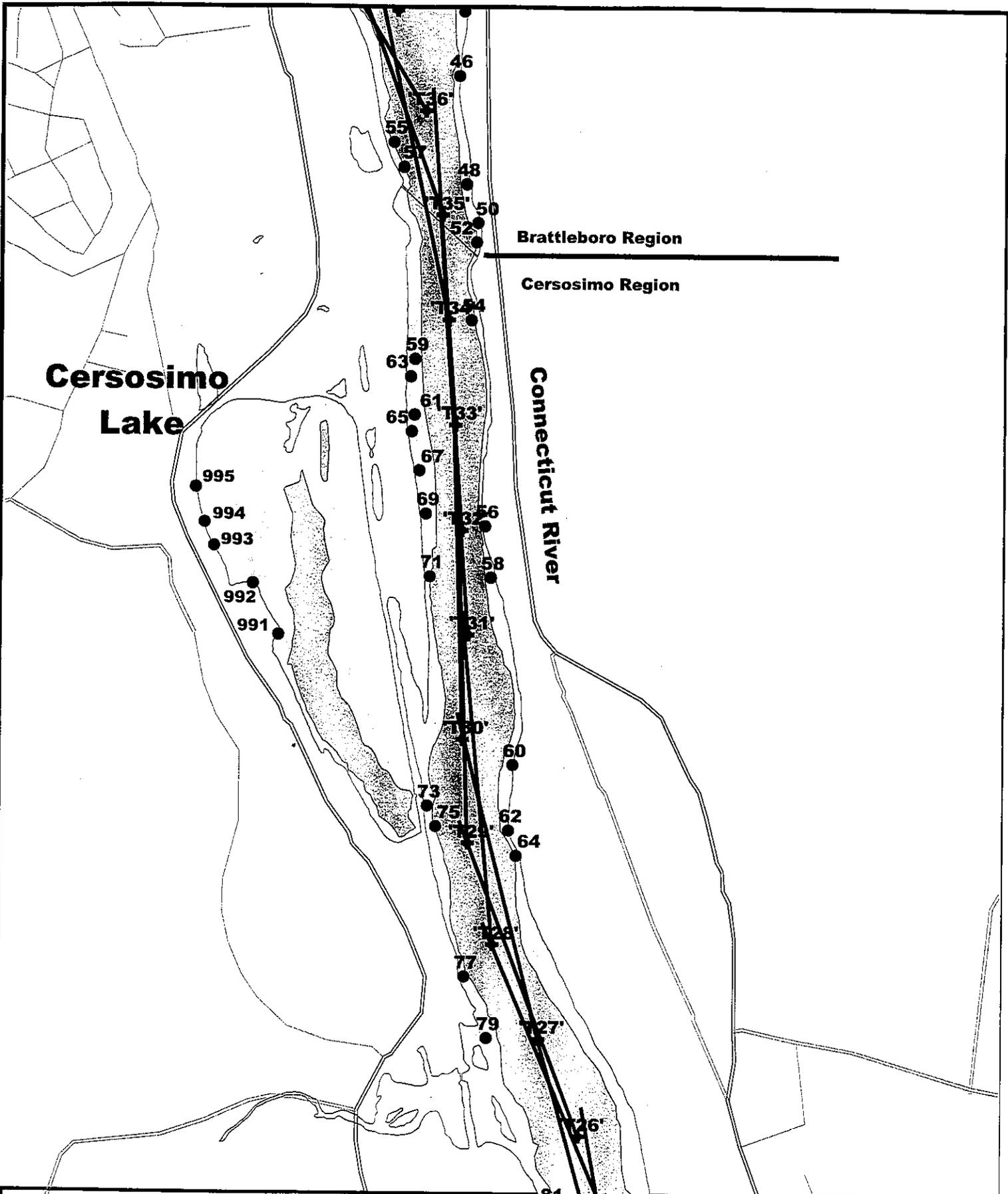


**LEGEND:**

- Beaches
- Major Roads
- Minor Roads
- Towlines
- Railroads
- Depth 10ft. and Greater
- Depth 10ft. or Less

N  
0  
300      300 Meters

Figure 2A: Juvenile American Shad Study, Connecticut River  
Vernon to Brattleboro, VT  
May 3, 2002



LEGEND:

- Beaches
- Major Roads
- Minor Roads
- Towlines
- Railroads
- Depth 10ft and Greater
- Depth 10ft. or Less

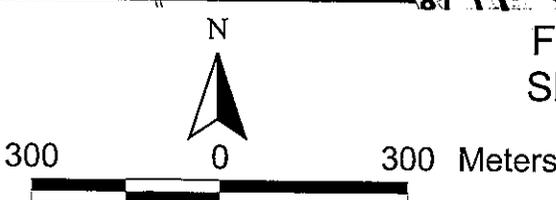
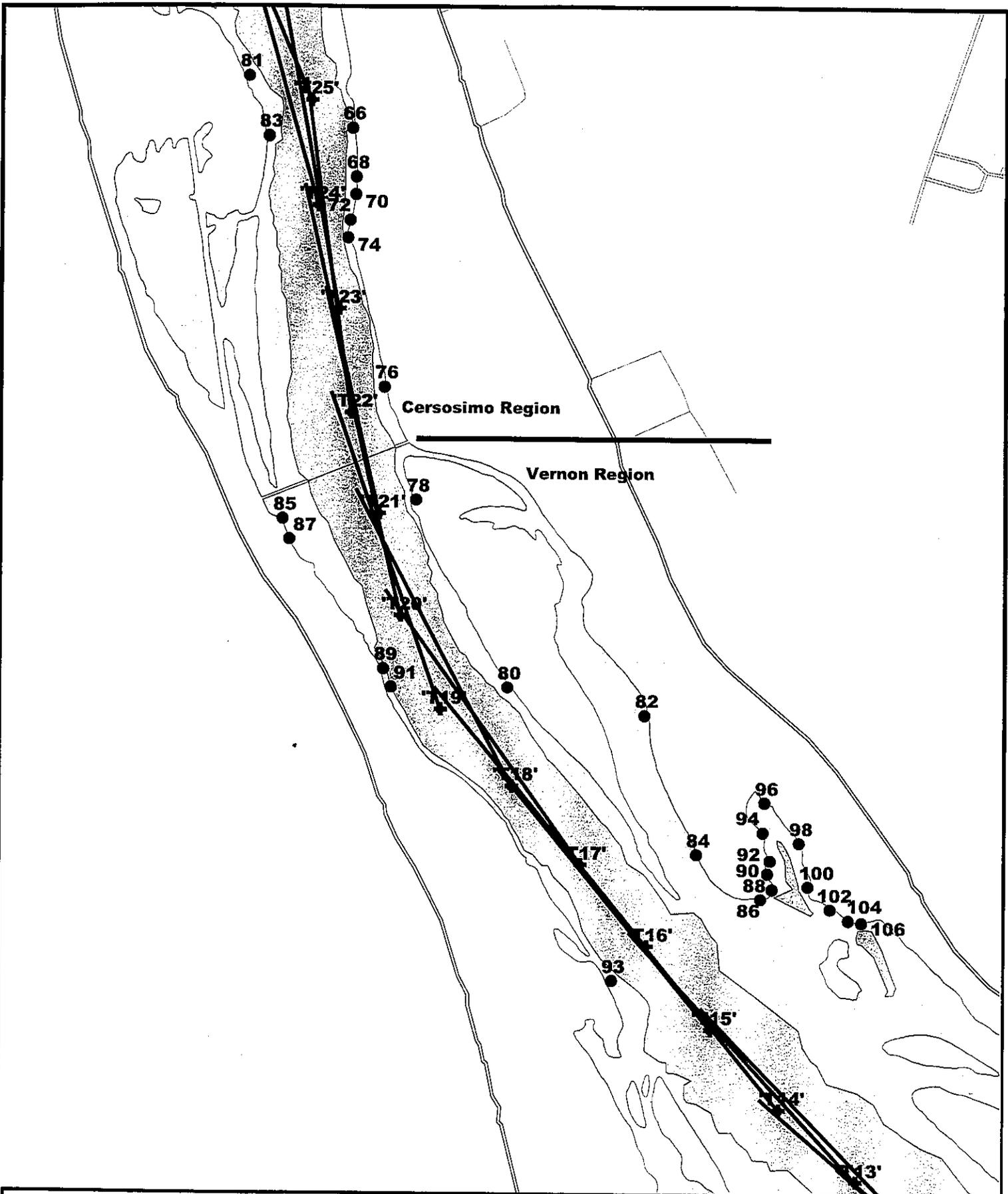


Figure 2B: Juvenile American Shad Study, Connecticut River  
 Vernon to Brattleboro, VT

May 3, 2002



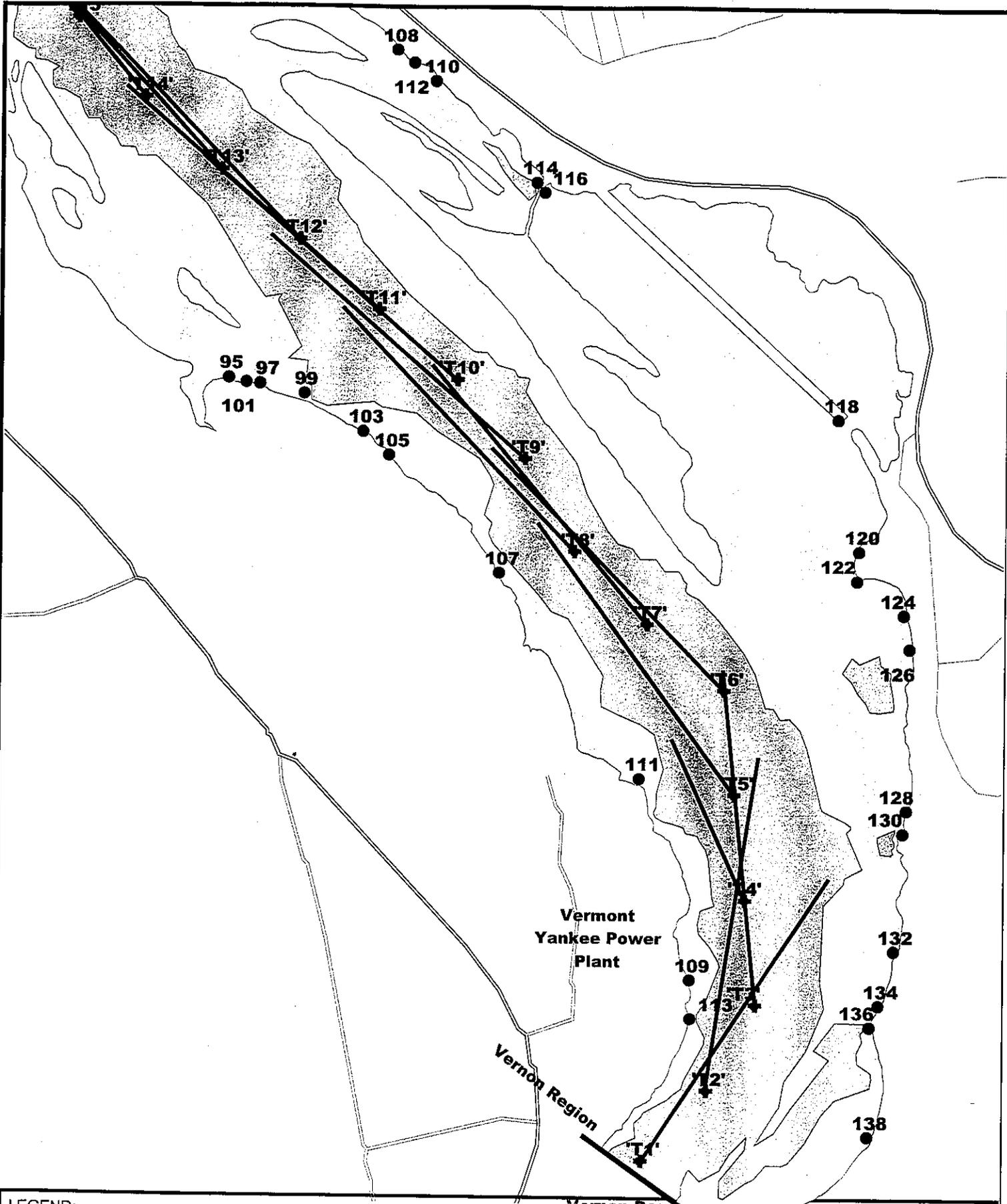
**LEGEND:**

- Beaches
- Major Roads
- Minor Roads
- Towlines
- Railroads
- Depth 10ft and Greater
- Depth 10ft. or Less

N

300 0 300 Meters

**Figure 2C: Juvenile American Shad Study, Connecticut River**  
**Vernon to Brattleboro, VT**  
 May 3, 2002



**LEGEND:**

- Beaches
- Major Roads
- Minor Roads
- Towlines
- Railroads
- Depth 10ft and Greater
- Depth 10ft. or Less

N

300      0      300 Meters

Figure 2D: Juvenile American Shad Study, Connecticut River  
 Vernon to Brattleboro, VT

May 3, 2002

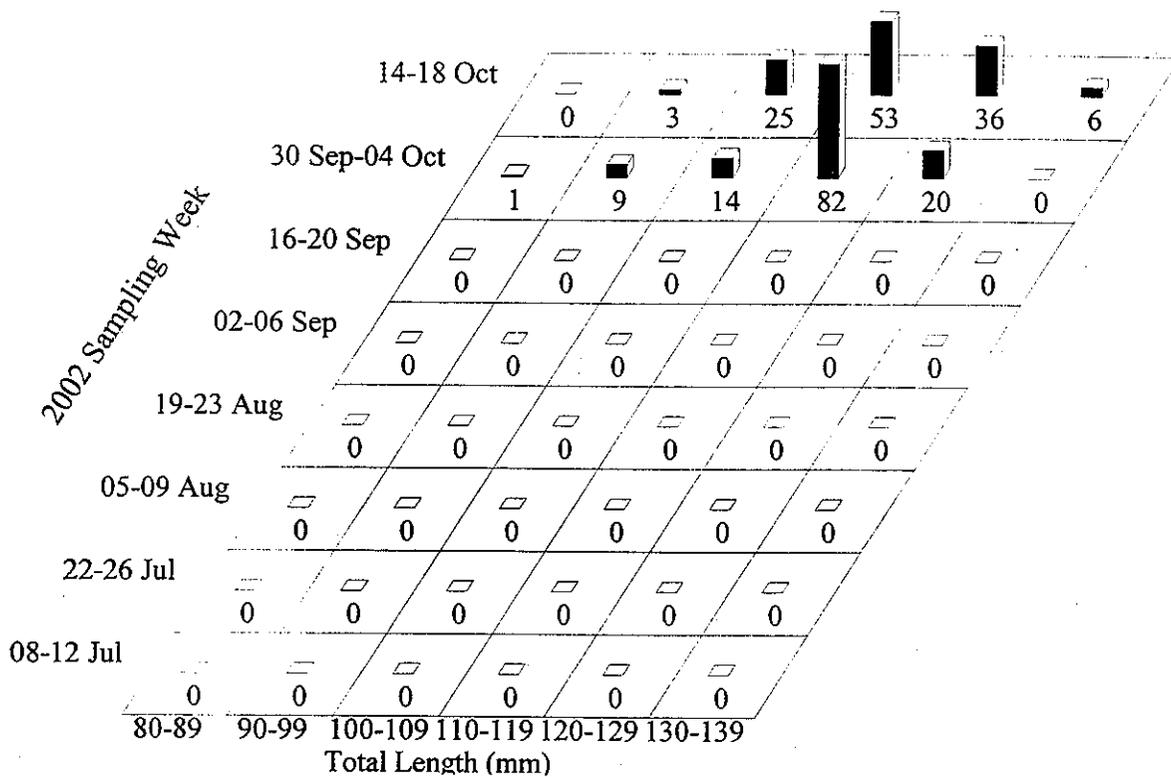


Figure 3. Weekly Length-Frequency of Juvenile American Shad Caught by Seine in Vernon Pool of the Connecticut River, July – October 2002.

**Table 1. Area (Square Meters) and Volume (Cubic Meters) of Sampling Regions, and Weighting Factors Used to Calculate the Standing Crop Index for Juvenile American Shad in Vernon Pool of the Connecticut River, July - October 2002.**

Region	Total Water Surface Area (m <sup>2</sup> )	Beach (Shore) Zone Surface Area (m <sup>2</sup> )	Pelagic Zone Surface Area (m <sup>2</sup> )	Number of Seine Sample Units (450 m <sup>2</sup> )	Beach Area Weighting Factor	Allocation Number of Seine Samples
Brattleboro	912,828	372,683	540,145	828	0.1392	3
Cersosimo	795,667	259,316	536,351	576	0.0969	3
Vernon	3,127,489	1,826,417	1,301,072	4,059	0.6821	12
Cersosimo Lake	292,504	219,084	73,420	487	0.0818	2
<b>All Regions</b>	<b>5,128,488</b>	<b>2,677,500</b>	<b>2,450,988</b>	<b>5,950</b>	<b>1.0000</b>	<b>20</b>

Region	Total Volume (m <sup>3</sup> )	Volume of Water in Pelagic Bottom Water Zone (m <sup>3</sup> )	Volume of Water in Shore Zone (m <sup>3</sup> )	Volume of Water in Pelagic Surface Water Zone (m <sup>3</sup> )	Beach Weighting Factor	Pelagic Weighting Factor	Allocation Number of Trawl Samples
Brattleboro	3,576,577	1,359,081	572,140	1,645,356	0.0549	0.1578	3
Cersosimo	3,924,770	1,918,552	371,262	1,634,956	0.0356	0.1568	3
Vernon	8,461,697	2,593,130	1,897,588	3,970,979	0.1820	0.3809	6
Cersosimo Lake	569,283	11,181	333,539	224,563	0.0320	0.0000	0
<b>All Regions</b>	<b>16,532,327</b>	<b>5,881,944</b>	<b>3,174,529</b>	<b>7,475,854</b>	<b>0.3045</b>	<b>0.6955</b>	<b>12</b>

**Table 2. Station Names and Latitude/Longitude Coordinates for Beach Seine Samples in Vernon Pool of the Connecticut River, July - October 2002.**

River Region	Shore	Station (Beach Number)	Minutes of	
			Latitude N 42 Deg.	Longitude W 72 Deg.
Brattleboro	VT	1 <sup>1</sup>	51.9255	33.2941
Brattleboro	NH	2	51.9929	33.1879
Brattleboro	VT	3 <sup>1</sup>	51.8968	33.2822
Brattleboro	NH	4	51.9117	33.1598
Brattleboro	VT	5 <sup>1</sup>	51.8737	33.2727
Brattleboro	NH	6	51.8675	33.1341
Brattleboro	VT	7	51.8321	33.2630
Brattleboro	NH	8	51.7837	33.1249
Brattleboro	VT	9	51.8129	33.2584
Brattleboro	NH	10	51.4018	33.2066
Brattleboro	VT	11	51.7713	33.2397
Brattleboro	NH	12	51.3173	33.1191
Brattleboro	VT	13	51.4312	33.3382
Brattleboro	NH	14	51.3046	33.1035
Brattleboro	VT	15	51.3401	33.3706
Brattleboro	NH	16	51.2814	33.1059
Brattleboro	VT	17	51.3270	33.3766
Brattleboro	NH	18	51.2545	33.0841
Brattleboro	VT	19	51.3095	33.3840
Brattleboro	NH	20	51.2716	33.0954
Brattleboro	VT	21	51.1998	33.4244
Brattleboro	NH	22	51.2280	33.0760
Brattleboro	VT	23	51.1657	33.4202
Brattleboro	NH	24	51.2090	33.0628
Brattleboro	VT	25	51.1714	33.2593
Brattleboro	NH	26	51.1749	33.0550
Brattleboro	VT	27	51.1526	33.2741
Brattleboro	NH	28	51.1937	33.1158
Brattleboro	VT	29	51.1660	33.2216
Brattleboro	NH	30	51.1685	33.1021
Brattleboro	VT	31	51.1323	33.1857
Brattleboro	NH	32	51.1236	33.0806
Brattleboro	VT	33	51.1040	33.2952
Brattleboro	NH	34	51.1346	33.1047
Brattleboro	VT	35	51.0769	33.2470
Brattleboro	NH	36	51.1623	33.1327
Brattleboro	VT	37	50.9990	33.0589
Brattleboro	NH	38	51.0640	33.0155
Brattleboro	VT	39	51.0167	33.0551
Brattleboro	NH	40	50.9986	32.9806
Brattleboro	VT	41	50.9942	33.2817
Brattleboro	NH	42	50.6922	32.7754
Brattleboro	VT	43	50.9832	33.2651
Brattleboro	NH	44	50.5639	32.7361
Brattleboro	VT	45	50.8573	33.2048
Brattleboro	NH	46	50.4804	32.7448

Table 2. (Continued)

River Region	Shore	Station (Beach Number)	Minutes of	
			Latitude N 42 Deg.	Longitude W 72 Deg.
Brattleboro	VT	47	50.6755	32.8840
Brattleboro	NH	48	50.3419	32.7304
Brattleboro	VT	49	50.6485	32.8648
Brattleboro	NH	50	50.2923	32.7100
Brattleboro	VT	51	50.6439	32.9017
Brattleboro	NH	52	50.2676	32.7126
Brattleboro	VT	53	50.6221	32.8894
Brattleboro	VT	55	50.3951	32.8583
Brattleboro	VT	57	50.3634	32.8403
Cersosimo	NH	54	50.1685	32.7202
Cersosimo	NH	56	49.9046	32.6941
Cersosimo	NH	58	49.8384	32.6834
Cersosimo	VT	59	50.1186	32.8186
Cersosimo	NH	60	49.5969	32.6430
Cersosimo	VT	61	50.0469	32.8196
Cersosimo	NH	62	49.5126	32.6496
Cersosimo	VT	63	50.0960	32.8262
Cersosimo	NH	64	49.4802	32.6362
Cersosimo	VT	65	50.0257	32.8243
Cersosimo	NH	66	48.9618	32.3895
Cersosimo	VT	67	49.9757	32.8106
Cersosimo	NH	68	48.8995	32.3828
Cersosimo	VT	69	49.9204	32.7984
Cersosimo	NH	70	48.8769	32.3835
Cersosimo	VT	71	49.8398	32.7912
Cersosimo	NH	72	48.8442	32.3932
Cersosimo	VT	73	49.5438	32.7932
Cersosimo	NH	74	48.8215	32.3967
Cersosimo	VT	75	49.5173	32.7778
Cersosimo	NH	76	48.6312	32.3305
Cersosimo	VT	77	49.3245	32.7262
Cersosimo	VT	79	49.2461	32.6862
Cersosimo	VT	81	49.0282	32.5713
Cersosimo	VT	83	48.9513	32.5365
Vernon	NH	78	48.4866	32.2750
Vernon	NH	80	48.2457	32.1131
Vernon	NH	82 <sup>1</sup>	48.2104	31.8710
Vernon	NH	84 <sup>1</sup>	48.0319	31.7799
Vernon	VT	85	48.4618	32.5088
Vernon	NH	86	47.9749	31.6672
Vernon	VT	87	48.4355	32.4971
Vernon	NH	88	47.9872	31.6469
Vernon	VT	89	48.2695	32.3307
Vernon	NH	90	48.0080	31.6550
Vernon	VT	91	48.2456	32.3175
Vernon	NH	92	48.0240	31.6508
Vernon	VT	93	47.8682	31.9313

Table 2. (Continued)

River Region	Shore	Station (Beach Number)	Minutes of	
			Latitude N 42 Deg.	Longitude W 72 Deg.
Vernon	NH	94	48.0606	31.6635
Vernon	VT	95	47.3485	31.4840
Vernon	NH	96	48.0987	31.6603
Vernon	VT	97	47.3411	31.4301
Vernon	NH	98	48.0471	31.5997
Vernon	VT	99	47.3290	31.3525
Vernon	NH	100	47.9911	31.5845
Vernon	VT	101	47.3428	31.4538
Vernon	NH	102	47.9621	31.5452
Vernon	VT	103	47.2810	31.2483
Vernon	NH	104	47.9455	31.4903
Vernon	VT	105	47.2511	31.2035
Vernon	NH	106	47.9482	31.5137
Vernon	VT	107	47.1011	31.0094
Vernon	NH	108	47.7681	31.1934
Vernon	VT	109	46.8380	30.7601
Vernon	NH	110	47.7284	31.1257
Vernon	VT	111	46.5809	30.6698
Vernon	NH	112	47.7520	31.1641
Vernon	VT	113	46.5315	30.6682
Vernon	NH	114	47.5999	30.9487
Vernon	NH	116	47.5869	30.9346
Vernon	NH	118	47.3001	30.4170
Vernon	NH	120 <sup>1</sup>	47.1317	30.3791
Vernon	NH	122 <sup>1</sup>	47.0937	30.3818
Vernon	NH	124 <sup>1</sup>	47.0502	30.2996
Vernon	NH	126	47.0071	30.2895
Vernon	NH	128	46.7989	30.2935
Vernon	NH	130	46.7695	30.2993
Vernon	NH	132	46.6186	30.3132
Vernon	NH	134	46.5492	30.3401
Vernon	NH	136 <sup>1</sup>	46.5217	30.3546
Vernon	NH	138 <sup>1</sup>	46.3821	30.3575
Cersosimo Lake	VT	991	49.7639	33.0567
Cersosimo Lake	VT	992	49.8296	33.1013
Cersosimo Lake	VT	993	49.8778	33.1700
Cersosimo Lake	VT	994	49.9080	33.1873
Cersosimo Lake	VT	995	49.9531	33.2030

<sup>1</sup> Not sampled in 2002 due to shallow depth or heavy debris.

**Table 3. Station Names, Latitude/Longitude Coordinates, and Tow Directions for Midwater Traw Tows in Vernon Pool of the Connecticut River, July-October 2002.**

Region	Station	Minutes of		Tow Direction
		Latitude N 42 deg.	Longitude W 72 deg.	
Brattleboro	T45'	51.6353	33.1946	'N05'
Brattleboro	T44'	51.5040	33.2375	'N357'
Brattleboro	T43'	51.3778	33.3065	'N354'
Brattleboro	T42'	51.2472	33.3464	'N354'
Brattleboro	T41'	51.1176	33.3344	'N350'
Brattleboro	T40'	50.8798	33.1682	'N23'
Brattleboro	T39'	50.7544	33.1007	'N24'
Brattleboro	T38'	50.6533	32.9855	'N26'
Brattleboro	T37'	50.5655	32.8532	'N36'
Brattleboro	T36'	50.4359	32.8027	'N32'
Brattleboro	T35'	50.3027	32.7722	'N20'
Brattleboro	T34'	50.1691	32.7596	'N12'
Cersosimo	T33'	50.0345	32.7473	'N04'
Cersosimo	T32'	49.8997	32.7348	'N04'
Cersosimo	T31'	49.7651	32.7233	'N04'
Cersosimo	T30'	49.6301	32.7318	'N01'
Cersosimo	T29'	49.4963	32.7216	'N02'
Cersosimo	T28'	49.3663	32.6770	'N05'
Cersosimo	T27'	49.2458	32.5951	'N14'
Cersosimo	T26'	49.1221	32.5243	'N21'
Cersosimo	T25'	48.9980	32.4614	'N24'
Cersosimo	T24'	48.8635	32.4495	'N16'
Cersosimo	T23'	48.7315	32.4112	'N10'
Cersosimo	T22'	48.5986	32.3901	'N08'
Cersosimo	T21'	48.4697	32.3400	'N13'
Vernon	T20'	48.3384	32.3018	'N13'
Vernon	T19'	48.2177	32.2309	'N19'
Vernon	T18'	48.1191	32.1056	'N28'
Vernon	T17'	48.0184	31.9837	'N36'
Vernon	T16'	47.9142	31.8670	'N39'
Vernon	T15'	47.8080	31.7538	'N39'
Vernon	T14'	47.7060	31.6338	'N39'
Vernon	T13'	47.6147	31.4989	'N43'
Vernon	T12'	47.5263	31.3622	'N44'
Vernon	T11'	47.4371	31.2223	'N49'
Vernon	T10'	47.3485	31.0844	'N49'
Vernon	T9'	47.2484	30.9655	'N49'
Vernon	T8'	47.1297	30.8777	'N44'
Vernon	T7'	47.0372	30.7493	'N40'
Vernon	T6'	46.9524	30.6134	'N44'
Vernon	T5'	46.8182	30.5944	'N36'
Vernon	T4'	46.6833	30.5742	'N25'
Vernon	T3'	46.5495	30.5544	'N06'
Vernon	T2'	46.4404	30.6389	'N352'
Vernon	T1'	46.3505	30.7530	'N327'

Table 4. Weekly and Regional Number of Fish Taxa Caught by Beach Seine in Vernon Pool of the Connecticut River, July – October 2002.

Taxon	Region	Hauls Per Week	NUMBER OF FISH OF CAUGHT IN 2002								
			SAMPLING WEEK								
			08-12 Jul	22-26 Jul	05-09 Aug	19-23 Aug	02-06 Sep	16-20 Sep	30 Sep-04 Oct	14-18 Oct	All Weeks
American shad	Brattleboro	3	0	0	0	0	0	0	0	0	0
	Cersosimo	3	0	0	0	0	0	0	0	0	0
	Vernon	6	0	0	0	0	0	0	126	123	249
	Cersosimo Lake	2	0	0	0	0	0	0	0	0	0
	All Regions	12	0	0	0	0	0	0	126	123	249
Bluegill	Brattleboro	3	0	0	11	3	8	11	2	2	37
	Cersosimo	3	23	37	17	50	28	18	16	2	191
	Vernon	6	127	113	94	98	161	201	218	89	1101
	Cersosimo Lake	2	18	2	9	13	37	70	14	20	183
	All Regions	12	168	152	131	164	234	300	250	113	1512
Yellow perch	Brattleboro	3	0	0	3	10	0	4	17	8	42
	Cersosimo	3	23	3	5	11	1	8	29	20	100
	Vernon	6	57	48	26	22	21	45	32	19	270
	Cersosimo Lake	2	39	18	27	11	31	19	2	1	148
	All Regions	12	119	69	61	54	53	76	80	48	560
Black crappie	Brattleboro	3	0	0	2	4	0	0	0	0	6
	Cersosimo	3	4	5	3	9	4	4	1	0	30
	Vernon	6	2	14	46	6	30	24	15	4	141
	Cersosimo Lake	2	0	51	56	0	0	3	9	54	173
	All Regions	12	6	70	107	19	34	31	25	58	350
Golden shiner	Brattleboro	3	0	0	0	0	0	0	1	0	1
	Cersosimo	3	9	0	0	1	0	16	1	0	27
	Vernon	6	1	5	97	29	31	20	0	88	271
	Cersosimo Lake	2	0	0	0	0	10	0	0	0	10
	All Regions	12	10	5	97	30	41	36	2	88	309
Largemouth bass	Brattleboro	3	0	2	0	10	0	0	0	1	13
	Cersosimo	3	5	4	2	11	5	10	19	3	59
	Vernon	6	6	22	36	24	44	35	10	10	187
	Cersosimo Lake	2	4	4	2	0	6	9	2	2	29
	All Regions	12	15	32	40	45	55	54	31	16	288

(continued)

Table 4 (Continued)

Taxon	Region	Hauls Per Week	NUMBER OF FISH OF CAUGHT IN 2002 SAMPLING WEEK								
			30								
			08-12 Jul	22-26 Jul	05-09 Aug	19-23 Aug	02-06 Sep	16-20 Sep	Sep-04 Oct	14-18 Oct	All Weeks
Pumpkinseed	Brattleboro	3	0	0	2	0	0	1	0	0	3
	Cersosimo	3	0	5	13	3	2	8	22	0	53
	Vernon	6	17	28	9	11	5	22	4	4	100
	Cersosimo Lake	2	1	0	0	0	0	3	0	0	4
	<b>All Regions</b>	<b>12</b>	<b>18</b>	<b>33</b>	<b>24</b>	<b>14</b>	<b>7</b>	<b>34</b>	<b>26</b>	<b>4</b>	<b>160</b>
Spottail shiner	Brattleboro	3	7	0	0	2	1	0	9	6	25
	Cersosimo	3	15	0	0	0	0	7	51	0	73
	Vernon	6	0	0	13	3	13	12	0	9	50
	Cersosimo Lake	2	0	0	0	0	0	0	0	0	0
	<b>All Regions</b>	<b>12</b>	<b>22</b>	<b>0</b>	<b>13</b>	<b>5</b>	<b>14</b>	<b>19</b>	<b>60</b>	<b>15</b>	<b>148</b>
Smallmouth bass	Brattleboro	3	0	1	1	0	2	5	3	0	12
	Cersosimo	3	0	0	3	1	6	7	5	0	22
	Vernon	6	1	3	9	11	32	15	2	0	73
	Cersosimo Lake	2	3	2	0	1	2	0	1	1	10
	<b>All Regions</b>	<b>12</b>	<b>4</b>	<b>6</b>	<b>13</b>	<b>13</b>	<b>42</b>	<b>27</b>	<b>11</b>	<b>1</b>	<b>117</b>
White perch	Brattleboro	3	0	0	0	0	0	0	0	0	0
	Cersosimo	3	0	0	0	0	0	0	7	0	7
	Vernon	6	0	0	0	0	0	0	0	0	0
	Cersosimo Lake	2	0	0	3	0	47	0	1	0	51
	<b>All Regions</b>	<b>12</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>47</b>	<b>0</b>	<b>8</b>	<b>0</b>	<b>58</b>
Chain pickerel	Brattleboro	3	0	0	0	1	1	0	0	0	2
	Cersosimo	3	0	0	0	0	0	1	3	1	5
	Vernon	6	3	4	3	1	5	5	7	9	37
	Cersosimo Lake	2	0	0	0	0	0	0	0	0	0
	<b>All Regions</b>	<b>12</b>	<b>3</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>6</b>	<b>6</b>	<b>10</b>	<b>10</b>	<b>44</b>
Rock bass	Brattleboro	3	0	0	0	0	5	1	1	4	11
	Cersosimo	3	3	2	1	0	1	3	3	0	13
	Vernon	6	2	4	3	0	2	1	2	1	15
	Cersosimo Lake	2	0	0	1	0	0	0	1	0	2
	<b>All Regions</b>	<b>12</b>	<b>5</b>	<b>6</b>	<b>5</b>	<b>0</b>	<b>8</b>	<b>5</b>	<b>7</b>	<b>5</b>	<b>41</b>

(continued)

Table 4 (Continued)

Taxon	Region	Hauls Per Week	NUMBER OF FISH OF CAUGHT IN 2002 SAMPLING WEEK								
			30								
			08-12 Jul	22-26 Jul	05-09 Aug	19-23 Aug	02-06 Sep	16-20 Sep	Sep-04 Oct	14-18 Oct	All Weeks
Banded Killifish	Brattleboro	3	0	0	0	0	0	0	3	0	3
	Cersosimo	3	0	0	0	0	0	1	0	0	1
	Vernon	6	0	0	0	0	0	0	0	0	0
	Cersosimo Lake	2	0	0	0	0	0	0	0	2	2
	All Regions	12	0	0	0	0	0	1	3	2	6
Tessellated darter	Brattleboro	3	0	0	0	0	0	0	0	0	0
	Cersosimo	3	0	0	0	0	1	0	0	0	1
	Vernon	6	0	0	0	0	0	0	0	0	0
	Cersosimo Lake	2	0	1	1	0	0	0	0	0	2
	All Regions	12	0	1	1	0	1	0	0	0	3
Walleye	Brattleboro	3	0	0	0	0	0	0	0	0	0
	Cersosimo	3	0	0	0	0	0	0	0	0	0
	Vernon	6	0	1	0	0	0	1	0	0	2
	Cersosimo Lake	2	0	0	0	0	1	0	0	0	1
	All Regions	12	0	1	0	0	1	1	0	0	3
Fallfish	Brattleboro	3	0	0	0	0	0	0	0	0	0
	Cersosimo	3	0	0	0	0	0	0	0	0	0
	Vernon	6	0	0	0	0	0	0	0	0	0
	Cersosimo Lake	2	0	0	0	0	2	0	0	0	2
	All Regions	12	0	0	0	0	2	0	0	0	2
Brown bullhead	Brattleboro	3	0	0	0	0	0	0	1	0	1
	Cersosimo	3	0	0	0	0	0	0	0	0	0
	Vernon	6	0	0	0	0	0	0	0	0	0
	Cersosimo Lake	2	1	0	0	0	0	0	0	0	1
	All Regions	12	1	0	0	0	0	0	1	0	2
All Taxa Combined	Brattleboro	3	7	3	19	30	17	22	37	21	156
	Cersosimo	3	82	56	44	86	48	83	157	26	582
	Vernon	6	216	242	336	205	344	381	416	356	2496
	Cersosimo Lake	2	66	78	99	25	136	104	30	80	618
	All Regions	12	371	379	498	346	545	590	640	483	3852

**Table 5. Weekly and Regional Number of Fish Taxa Caught by Midwater Trawl in Vernon Pool of the Connecticut River, July – October 2002.**

Taxon and Region	Tows Per Week	NUMBER OF FISH OF CAUGHT IN SAMPLING WEEK								
		08-12 Jul	22-26 Jul	05-09 Aug	19-23 Aug	02-06 Sep	17-21 Sep	30 Sep-04 Oct	14-18 Oct	All Weeks
<b>Smallmouth bass</b>										
Brattleboro	3	0	4	0	0	0	0	0	0	4
Cersosimo	3	0	1	0	0	0	0	0	0	1
Vernon	6	0	1	0	0	0	0	0	0	1
<b>All Regions</b>	<b>12</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>6</b>
<b>Spottail shiner</b>										
Brattleboro	3	0	0	0	1	0	0	0	0	1
Cersosimo	3	0	0	0	2	0	0	0	0	2
Vernon	6	0	0	0	0	0	0	0	1	1
<b>All Regions</b>	<b>12</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>4</b>
<b>Largemouth bass</b>										
Brattleboro	3	0	0	0	0	0	0	0	0	0
Cersosimo	3	0	0	0	0	0	0	0	0	0
Vernon	6	1	0	0	0	0	0	0	0	1
<b>All Regions</b>	<b>12</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>
<b>All Taxa Combined</b>										
Brattleboro	3	0	4	0	1	0	0	0	0	5
Cersosimo	3	0	1	0	2	0	0	0	0	3
Vernon	6	1	1	0	0	0	0	0	1	3
<b>All Regions</b>	<b>12</b>	<b>1</b>	<b>6</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>11</b>

**Table 6. Weekly and Regional Mean Catch per Unit of Effort (CPUE) of Fish Taxa by Beach Seine in Vernon Pool of the Connecticut River, July – October 2002.**

2002 Week and Taxon		VERNON POOL REGION				
All Taxa		Brattleboro	Cersosimo	Vernon	Cersosimo Lake	All Regions
08-12 Jul	CPUE	2.33	27.33	18	33	18.55
	SE	2.33	12.67	7.50	7	5.12
	NO.HAULS	3	3	12	2	20
22-26 Jul	CPUE	1	18.67	20.17	39	18.95
	SE	0.58	2.19	4.77	38	4.50
	NO.HAULS	3	3	12	2	20
05-09 Aug	CPUE	6.33	14.67	28	49.50	24.90
	SE	4.48	5.81	6.97	26.50	5.33
	NO.HAULS	3	3	12	2	20
19-23 Aug	CPUE	10	28.67	17.08	12.50	17.30
	SE	3	13.91	5.48	11.50	3.99
	NO.HAULS	3	3	12	2	20
02-06 Sep	CPUE	5.67	16	28.67	68	27.25
	SE	2.96	14.50	6.36	29	5.95
	NO.HAULS	3	3	12	2	20
17-21 Sep	CPUE	7.33	27.67	31.75	52	29.50
	SE	3.28	14.88	7.25	20	5.55
	NO.HAULS	3	3	12	2	20
30 Sep-04 Oct	CPUE	12.33	52.33	34.67	15	32
	SE	8.25	32.46	8.99	15	7.42
	NO.HAULS	3	3	12	2	20
14-18 Oct	CPUE	7	8.67	29.67	40	24.15
	SE	2.08	7.17	6.93	37	5.59
	NO.HAULS	3	3	12	2	20

(Continued)

Table 6 (Continued).

2002 Week and Taxon		VERNON POOL REGION				
American shad		Brattleboro	Cersosimo	Vernon	Cersosimo Lake	All Regions
08-12 Jul	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
22-26 Jul	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
05-09 Aug	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
19-23 Aug	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
02-06 Sep	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
17-21 Sep	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
30 Sep-04 Oct	CPUE	0	0	10.50	0	6.30
	SE	0	0	8.17	0	4.96
	NO.HAULS	3	3	12	2	20
14-18 Oct	CPUE	0	0	10.25	0	6.15
	SE	0	0	7.03	0	4.30
	NO.HAULS	3	3	12	2	20

(Continued)

Table 6 (Continued).

2002 Week and Taxon		VERNON POOL REGION				
Bluegill		Brattleboro	Cersosimo	Vernon	Cersosimo Lake	All Regions
08-12 Jul	CPUE	0	7.67	10.58	9	8.40
	SE	0	2.91	5.76	5	3.54
	NO.HAULS	3	3	12	2	20
22-26 Jul	CPUE	0	12.33	9.42	1	7.60
	SE	0	1.20	2.57	1	1.81
	NO.HAULS	3	3	12	2	20
05-09 Aug	CPUE	3.67	5.67	7.83	4.50	6.55
	SE	2.73	2.85	1.98	1.50	1.33
	NO.HAULS	3	3	12	2	20
19-23 Aug	CPUE	1	16.67	8.17	6.50	8.20
	SE	0	8.51	2.40	6.50	2.09
	NO.HAULS	3	3	12	2	20
02-06 Sep	CPUE	2.67	9.33	13.42	18.50	11.70
	SE	2.67	8.84	4.21	8.50	2.99
	NO.HAULS	3	3	12	2	20
17-21 Sep	CPUE	3.67	6	16.75	35	15
	SE	1.86	3.46	4.49	15	3.51
	NO.HAULS	3	3	12	2	20
30 Sep-04 Oct	CPUE	0.67	5.33	18.17	7	12.50
	SE	0.67	4.33	5.86	7	3.90
	NO.HAULS	3	3	12	2	20
14-18 Oct	CPUE	0.67	0.67	7.42	10	5.65
	SE	0.67	0.33	4.08	10	2.63
	NO.HAULS	3	3	12	2	20

(Continued)

Table 6 (Continued).

2002 Week and Taxon		VERNON POOL REGION				
Yellow perch		Brattleboro	Cersosimo	Vernon	Cersosimo Lake	All Regions
08-12 Jul	CPUE	0	7.67	4.75	19.50	5.95
	SE	0	2.91	1.29	8.50	1.55
	NO.HAULS	3	3	12	2	20
22-26 Jul	CPUE	0	1	4	9	3.45
	SE	0	0.58	1.51	9	1.24
	NO.HAULS	3	3	12	2	20
05-09 Aug	CPUE	1	1.67	2.17	13.50	3.05
	SE	0.58	0.33	0.60	5.50	0.97
	NO.HAULS	3	3	12	2	20
19-23 Aug	CPUE	3.33	3.67	1.83	5.50	2.70
	SE	3.33	2.33	0.86	5.50	0.87
	NO.HAULS	3	3	12	2	20
02-06 Sep	CPUE	0	0.33	1.75	15.50	2.65
	SE	0	0.33	0.52	6.50	1.15
	NO.HAULS	3	3	12	2	20
17-21 Sep	CPUE	1.33	2.67	3.75	9.50	3.80
	SE	0.88	1.76	1.15	0.50	0.87
	NO.HAULS	3	3	12	2	20
30 Sep-04 Oct	CPUE	5.67	9.67	2.67	1	4
	SE	3.84	4.63	0.84	1	1.10
	NO.HAULS	3	3	12	2	20
14-18 Oct	CPUE	2.67	6.67	1.58	0.50	2.40
	SE	2.19	6.17	0.45	0.50	0.97
	NO.HAULS	3	3	12	2	20

(Continued)

Table 6 (Continued).

2002 Week and Taxon		VERNON POOL REGION				
Black crappie		Brattleboro	Cersosimo	Vernon	Cersosimo Lake	All Regions
08-12 Jul	CPUE	0	1.33	0.17	0	0.30
	SE	0	1.33	0.17	0	0.22
	NO.HAULS	3	3	12	2	20
22-26 Jul	CPUE	0	1.67	1.17	25.50	3.50
	SE	0	1.67	0.51	25.50	2.53
	NO.HAULS	3	3	12	2	20
05-09 Aug	CPUE	0.67	1	3.83	28	5.35
	SE	0.67	0.58	1.64	23	2.61
	NO.HAULS	3	3	12	2	20
19-23 Aug	CPUE	1.33	3	0.50	0	0.95
	SE	0.88	3	0.34	0	0.49
	NO.HAULS	3	3	12	2	20
02-06 Sep	CPUE	0	1.33	2.50	0	1.70
	SE	0	1.33	1.01	0	0.67
	NO.HAULS	3	3	12	2	20
17-21 Sep	CPUE	0	1.33	2	1.50	1.55
	SE	0	1.33	0.66	1.50	0.47
	NO.HAULS	3	3	12	2	20
30 Sep-04 Oct	CPUE	0	0.33	1.25	4.50	1.25
	SE	0	0.33	0.65	4.50	0.58
	NO.HAULS	3	3	12	2	20
14-18 Oct	CPUE	0	0	0.33	27	2.90
	SE	0	0	0.19	27	2.69
	NO.HAULS	3	3	12	2	20

(Continued)

Table 6 (Continued).

2002 Week and Taxon		VERNON POOL REGION				
Largemouth bass		Brattleboro	Cersosimo	Vernon	Cersosimo Lake	All Regions
08-12 Jul	CPUE	0.00	1.67	0.50	2.00	0.75
	SE	0.00	1.20	0.23	2.00	0.29
	NO.HAULS	3	3	12	2	20
22-26 Jul	CPUE	0.67	1.33	1.83	2.00	1.60
	SE	0.67	0.88	0.72	1.00	0.46
	NO.HAULS	3	3	12	2	20
05-09 Aug	CPUE	0.00	0.67	3.00	1.00	2.00
	SE	0.00	0.33	1.38	0.00	0.86
	NO.HAULS	3	3	12	2	20
19-23 Aug	CPUE	3.33	3.67	2.00	0.00	2.25
	SE	2.40	2.33	1.07	0.00	0.79
	NO.HAULS	3	3	12	2	20
02-06 Sep	CPUE	0.00	1.67	3.67	3.00	2.75
	SE	0.00	1.67	0.99	2.00	0.71
	NO.HAULS	3	3	12	2	20
17-21 Sep	CPUE	0.00	3.33	2.92	4.50	2.70
	SE	0.00	2.03	0.95	1.50	0.68
	NO.HAULS	3	3	12	2	20
30 Sep-04 Oct	CPUE	0.00	6.33	0.83	1.00	1.55
	SE	0.00	6.33	0.32	1.00	0.94
	NO.HAULS	3	3	12	2	20
14-18 Oct	CPUE	0.33	1.00	0.83	1.00	0.80
	SE	0.33	0.58	0.41	0.00	0.26
	NO.HAULS	3	3	12	2	20

(Continued)

Table 6 (Continued).

2002 Week and Taxon		VERNON POOL REGION				
Golden shiner		Brattleboro	Cersosimo	Vernon	Cersosimo Lake	All Regions
08-12 Jul	CPUE	0	3	0.08	0	0.50
	SE	0	3	0.08	0	0.45
	NO.HAULS	3	3	12	2	20
22-26 Jul	CPUE	0	0	0.42	0	0.25
	SE	0	0	0.26	0	0.16
	NO.HAULS	3	3	12	2	20
05-09 Aug	CPUE	0	0	8.08	0	4.85
	SE	0	0	4.32	0	2.71
	NO.HAULS	3	3	12	2	20
19-23 Aug	CPUE	0	0.33	2.42	0	1.50
	SE	0	0.33	2.42	0	1.45
	NO.HAULS	3	3	12	2	20
02-06 Sep	CPUE	0	0	2.58	5	2.05
	SE	0	0	1.12	5	0.83
	NO.HAULS	3	3	12	2	20
17-21 Sep	CPUE	0	5.33	1.67	0	1.80
	SE	0	5.33	1.41	0	1.13
	NO.HAULS	3	3	12	2	20
30 Sep-04 Oct	CPUE	0.33	0.33	0	0	0.10
	SE	0.33	0.33	0	0	0.07
	NO.HAULS	3	3	12	2	20
14-18 Oct	CPUE	0	0	7.33	0	4.40
	SE	0	0	4.45	0	2.75
	NO.HAULS	3	3	12	2	20

(Continued)

Table 6 (Continued).

2002 Week and Taxon		VERNON POOL REGION				
Spottail shiner		Brattleboro	Cersosimo	Vernon	Cersosimo	
					Lake	All Regions
08-12 Jul	CPUE	2.33	5.00	0.00	0.00	1.10
	SE	2.33	5.00	0.00	0.00	0.81
	NO.HAULS	3	3	12	2	20
22-26 Jul	CPUE	0.00	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00	0.00
	NO.HAULS	3	3	12	2	20
05-09 Aug	CPUE	0.00	0.00	1.08	0.00	0.65
	SE	0.00	0.00	0.56	0.00	0.35
	NO.HAULS	3	3	12	2	20
19-23 Aug	CPUE	0.67	0.00	0.25	0.00	0.25
	SE	0.67	0.00	0.13	0.00	0.12
	NO.HAULS	3	3	12	2	20
02-06 Sep	CPUE	0.33	0.00	1.08	0.00	0.70
	SE	0.33	0.00	0.61	0.00	0.38
	NO.HAULS	3	3	12	2	20
17-21 Sep	CPUE	0.00	2.33	1.00	0.00	0.95
	SE	0.00	2.33	0.75	0.00	0.55
	NO.HAULS	3	3	12	2	20
30 Sep-04 Oct	CPUE	3.00	17.00	0.00	0.00	3.00
	SE	2.08	17.00	0.00	0.00	2.55
	NO.HAULS	3	3	12	2	20
14-18 Oct	CPUE	2.00	0.00	0.75	0.00	0.75
	SE	2.00	0.00	0.54	0.00	0.43
	NO.HAULS	3	3	12	2	20

(Continued)

Table 6 (Continued).

2002 Week and Taxon		VERNON POOL REGION				
Pumpkinseed		Brattleboro	Cersosimo	Vernon	Cersosimo Lake	All Regions
08-12 Jul	CPUE	0	0	1.42	0.50	0.90
	SE	0	0	0.63	0.50	0.40
	NO.HAULS	3	3	12	2	20
22-26 Jul	CPUE	0	1.67	2.33	0	1.65
	SE	0	0.33	0.77	0	0.51
	NO.HAULS	3	3	12	2	20
05-09 Aug	CPUE	0.67	4.33	0.75	0	1.20
	SE	0.67	3.38	0.33	0	0.56
	NO.HAULS	3	3	12	2	20
19-23 Aug	CPUE	0	1	0.92	0	0.70
	SE	0	0.58	0.47	0	0.30
	NO.HAULS	3	3	12	2	20
02-06 Sep	CPUE	0	0.67	0.42	0	0.35
	SE	0	0.67	0.19	0	0.15
	NO.HAULS	3	3	12	2	20
17-21 Sep	CPUE	0.33	2.67	1.83	1.50	1.70
	SE	0.33	1.33	0.81	1.50	0.54
	NO.HAULS	3	3	12	2	20
30 Sep-04 Oct	CPUE	0	7.33	0.33	0	1.30
	SE	0	4.84	0.19	0	0.85
	NO.HAULS	3	3	12	2	20
14-18 Oct	CPUE	0	0	0.33	0	0.20
	SE	0	0	0.26	0	0.16
	NO.HAULS	3	3	12	2	20

(Continued)

Table 6 (Continued).

2002 Week and Taxon		VERNON POOL REGION				
White perch		Brattleboro	Cersosimo	Vernon	Cersosimo Lake	All Regions
08-12 Jul	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
22-26 Jul	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
05-09 Aug	CPUE	0	0	0	1.50	0.15
	SE	0	0	0	0.50	0.11
	NO.HAULS	3	3	12	2	20
19-23 Aug	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
02-06 Sep	CPUE	0	0	0	23.50	2.35
	SE	0	0	0	23.50	2.35
	NO.HAULS	3	3	12	2	20
17-21 Sep	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
30 Sep-04 Oct	CPUE	0	2.33	0	0.50	0.40
	SE	0	1.20	0	0.50	0.24
	NO.HAULS	3	3	12	2	20
14-18 Oct	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20

(Continued)

Table 6 (Continued).

2002 Week and Taxon		VERNON POOL REGION				
Smallmouth bass		Brattleboro	Cersosimo	Vernon	Cersosimo Lake	All Regions
08-12 Jul	CPUE	0	0	0.08	1.50	0.20
	SE	0	0	0.08	1.50	0.16
	NO.HAULS	3	3	12	2	20
22-26 Jul	CPUE	0.33	0	0.25	1	0.30
	SE	0.33	0	0.18	1	0.15
	NO.HAULS	3	3	12	2	20
05-09 Aug	CPUE	0.33	1	0.75	0	0.65
	SE	0.33	0.58	0.35	0	0.23
	NO.HAULS	3	3	12	2	20
19-23 Aug	CPUE	0	0.33	0.92	0.50	0.65
	SE	0	0.33	0.57	0.50	0.35
	NO.HAULS	3	3	12	2	20
02-06 Sep	CPUE	0.67	2	2.67	1	2.10
	SE	0.33	1.53	1.24	1	0.78
	NO.HAULS	3	3	12	2	20
17-21 Sep	CPUE	1.67	2.33	1.25	0	1.35
	SE	0.67	2.33	0.55	0	0.47
	NO.HAULS	3	3	12	2	20
30 Sep-04 Oct	CPUE	1	1.67	0.17	0.50	0.55
	SE	0.58	1.67	0.11	0.50	0.27
	NO.HAULS	3	3	12	2	20
14-18 Oct	CPUE	0	0	0	0.50	0.05
	SE	0	0	0	0.50	0.05
	NO.HAULS	3	3	12	2	20

(Continued)

Table 6 (Continued).

2002 Week and Taxon		VERNON POOL REGION				
Rock bass		Brattleboro	Cersosimo	Vernon	Cersosimo Lake	All Regions
08-12 Jul	CPUE	0	1	0.17	0	0.25
	SE	0	1	0.11	0	0.16
	NO.HAULS	3	3	12	2	20
22-26 Jul	CPUE	0	0.67	0.33	0	0.30
	SE	0	0.33	0.26	0	0.16
	NO.HAULS	3	3	12	2	20
05-09 Aug	CPUE	0	0.33	0.25	0.50	0.25
	SE	0	0.33	0.13	0.50	0.10
	NO.HAULS	3	3	12	2	20
19-23 Aug	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
02-06 Sep	CPUE	1.67	0.33	0.17	0	0.40
	SE	1.67	0.33	0.11	0	0.26
	NO.HAULS	3	3	12	2	20
17-21 Sep	CPUE	0.33	1	0.08	0	0.25
	SE	0.33	0.58	0.08	0	0.12
	NO.HAULS	3	3	12	2	20
30 Sep-04 Oct	CPUE	0.33	1	0.17	0.50	0.35
	SE	0.33	0.58	0.17	0.50	0.15
	NO.HAULS	3	3	12	2	20
14-18 Oct	CPUE	1.33	0	0.08	0	0.25
	SE	0.88	0	0.08	0	0.16
	NO.HAULS	3	3	12	2	20

(Continued)

Table 6 (Continued).

2002 Week and Taxon		VERNON POOL REGION				
Chain pickerel		Brattleboro	Cersosimo	Vernon	Cersosimo Lake	All Regions
08-12 Jul	CPUE	0	0	0.25	0	0.15
	SE	0	0	0.13	0	0.08
	NO.HAULS	3	3	12	2	20
22-26 Jul	CPUE	0	0	0.33	0	0.20
	SE	0	0	0.19	0	0.12
	NO.HAULS	3	3	12	2	20
05-09 Aug	CPUE	0	0	0.25	0	0.15
	SE	0	0	0.18	0	0.11
	NO.HAULS	3	3	12	2	20
19-23 Aug	CPUE	0.33	0	0.08	0	0.10
	SE	0.33	0	0.08	0	0.07
	NO.HAULS	3	3	12	2	20
02-06 Sep	CPUE	0.33	0	0.42	0	0.30
	SE	0.33	0	0.19	0	0.13
	NO.HAULS	3	3	12	2	20
17-21 Sep	CPUE	0	0.33	0.42	0	0.30
	SE	0	0.33	0.26	0	0.16
	NO.HAULS	3	3	12	2	20
30 Sep-04 Oct	CPUE	0	1	0.58	0	0.50
	SE	0	1	0.29	0	0.22
	NO.HAULS	3	3	12	2	20
14-18 Oct	CPUE	0	0.33	0.75	0	0.50
	SE	0	0.33	0.28	0	0.18
	NO.HAULS	3	3	12	2	20

(Continued)

Table 6 (Continued).

2002 Week and Taxon		VERNON POOL REGION				
Banded killifish		Brattleboro	Cersosimo	Vernon	Cersosimo Lake	All Regions
08-12 Jul	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
22-26 Jul	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
05-09 Aug	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
19-23 Aug	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
02-06 Sep	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
17-21 Sep	CPUE	0	0.33	0	0	0.05
	SE	0	0.33	0	0	0.05
	NO.HAULS	3	3	12	2	20
30 Sep-04 Oct	CPUE	1	0	0	0	0.15
	SE	1	0	0	0	0.15
	NO.HAULS	3	3	12	2	20
14-18 Oct	CPUE	0	0	0	1	0.10
	SE	0	0	0	1	0.10
	NO.HAULS	3	3	12	2	20

(Continued)

Table 6 (Continued).

2002 Week and Taxon		VERNON POOL REGION				
Tessellated darter		Brattleboro	Cersosimo	Vernon	Cersosimo Lake	All Regions
08-12 Jul	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
22-26 Jul	CPUE	0	0	0	0.50	0.05
	SE	0	0	0	0.50	0.05
	NO.HAULS	3	3	12	2	20
05-09 Aug	CPUE	0	0	0	0.50	0.05
	SE	0	0	0	0.50	0.05
	NO.HAULS	3	3	12	2	20
19-23 Aug	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
02-06 Sep	CPUE	0	0.33	0	0	0.05
	SE	0	0.33	0	0	0.05
	NO.HAULS	3	3	12	2	20
17-21 Sep	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
30 Sep-04 Oct	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
14-18 Oct	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20

(Continued)

Table 6 (Continued).

2002 Week and Taxon		VERNON POOL REGION				
Fallfish		Brattleboro	Cersosimo	Vernon	Cersosimo Lake	All Regions
08-12 Jul	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
22-26 Jul	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
05-09 Aug	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
19-23 Aug	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
02-06 Sep	CPUE	0	0	0	1	0.10
	SE	0	0	0	1	0.10
	NO.HAULS	3	3	12	2	20
17-21 Sep	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
30 Sep-04 Oct	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
14-18 Oct	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20

(Continued)

Table 6 (Continued).

2002 Week and Taxon		VERNON POOL REGION				
Brown bullhead		Brattleboro	Cersosimo	Vernon	Cersosimo Lake	All Regions
08-12 Jul	CPUE	0	0	0	0.50	0.05
	SE	0	0	0	0.50	0.05
	NO.HAULS	3	3	12	2	20
22-26 Jul	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
05-09 Aug	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
19-23 Aug	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
02-06 Sep	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
17-21 Sep	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
30 Sep-04 Oct	CPUE	0.33	0	0	0	0.05
	SE	0.33	0	0	0	0.05
	NO.HAULS	3	3	12	2	20
14-18 Oct	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	30	30	120	20	20

(Continued)

Table 6 (Continued).

2002 Week and Taxon		VERNON POOL REGION				
Walleye		Brattleboro	Cersosimo	Vernon	Cersosimo Lake	All Regions
08-12 Jul	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
22-26 Jul	CPUE	0	0	0.08	0	0.05
	SE	0	0	0.08	0	0.05
	NO.HAULS	3	3	12	2	20
05-09 Aug	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
19-23 Aug	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
02-06 Sep	CPUE	0	0	0	0.50	0.05
	SE	0	0	0	0.50	0.05
	NO.HAULS	3	3	12	2	20
17-21 Sep	CPUE	0	0	0.08	0	0.05
	SE	0	0	0.08	0	0.05
	NO.HAULS	3	3	12	2	20
30 Sep-04 Oct	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20
14-18 Oct	CPUE	0	0	0	0	0
	SE	0	0	0	0	0
	NO.HAULS	3	3	12	2	20

Table 7. Weekly and Regional Mean Density (Number of Fish per 1000 m<sup>3</sup>) of Fish Taxa Caught by Midwater Trawl in Vernon Pool of the Connecticut River, July – October 2002.

2002 Week and Taxon		VERNON POOL REGION			
All Taxa		Brattleboro	Cersosimo	Vernon	All Regions
08-12 Jul	CPUE	0.00	0.00	0.11	0.05
	SE	0.00	0.00	0.11	0.05
	NO.TOWS	3.00	3.00	6.00	12.00
22-26 Jul	CPUE	1.12	0.24	0.11	0.39
	SE	0.74	0.24	0.11	0.21
	NO.TOWS	3.00	3.00	6.00	12.00
05-09 Aug	CPUE	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00
	NO.TOWS	3.00	3.00	6.00	12.00
19-23 Aug	CPUE	0.28	0.57	0.00	0.21
	SE	0.28	0.57	0.00	0.15
	NO.TOWS	3.00	3.00	6.00	12.00
02-06 Sep	CPUE	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00
	NO.TOWS	3.00	3.00	6.00	12.00
17-21 Sep	CPUE	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00
	NO.TOWS	3.00	3.00	6.00	12.00
30 Sep-04 Oct	CPUE	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00
	NO.TOWS	3.00	3.00	6.00	12.00
14-18 Oct	CPUE	0.00	0.00	0.12	0.06
	SE	0.00	0.00	0.12	0.06
	NO.TOWS	3.00	3.00	6.00	12.00

(Continued)

Table 7 (Continued).

2002 Week and Taxon		VERNON POOL REGION			
Smallmouth bass		Brattleboro	Cersosimo	Vernon	All Regions
08-12 Jul	CPUE	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00
	NO.TOWS	3.00	3.00	6.00	12.00
22-26 Jul	CPUE	1.12	0.24	0.11	0.39
	SE	0.74	0.24	0.11	0.21
	NO.TOWS	3.00	3.00	6.00	12.00
05-09 Aug	CPUE	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00
	NO.TOWS	3.00	3.00	6.00	12.00
19-23 Aug	CPUE	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00
	NO.TOWS	3.00	3.00	6.00	12.00
02-06 Sep	CPUE	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00
	NO.TOWS	3.00	3.00	6.00	12.00
17-21 Sep	CPUE	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00
	NO.TOWS	3.00	3.00	6.00	12.00
30 Sep-04 Oct	CPUE	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00
	NO.TOWS	3.00	3.00	6.00	12.00
14-18 Oct	CPUE	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00
	NO.TOWS	3.00	3.00	6.00	12.00

(Continued)

Table 7 (Continued).

2002 Week and Taxon		VERNON POOL REGION			
Spottail shiner		Brattleboro	Cersosimo	Vernon	All Regions
08-12 Jul	CPUE	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00
	NO.TOWS	3.00	3.00	6.00	12.00
22-26 Jul	CPUE	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00
	NO.TOWS	3.00	3.00	6.00	12.00
05-09 Aug	CPUE	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00
	NO.TOWS	3.00	3.00	6.00	12.00
19-23 Aug	CPUE	0.28	0.57	0.00	0.21
	SE	0.28	0.57	0.00	0.15
	NO.TOWS	3.00	3.00	6.00	12.00
02-06 Sep	CPUE	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00
	NO.TOWS	3.00	3.00	6.00	12.00
17-21 Sep	CPUE	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00
	NO.TOWS	3.00	3.00	6.00	12.00
30 Sep-04 Oct	CPUE	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00
	NO.TOWS	3.00	3.00	6.00	12.00
14-18 Oct	CPUE	0.00	0.00	0.12	0.06
	SE	0.00	0.00	0.12	0.06
	NO.TOWS	3.00	3.00	6.00	12.00

(Continued)

Table 7 (Continued).

2002 Week and Taxon		VERNON POOL REGION			
Largemouth bass		Brattleboro	Cersosimo	Vernon	All Regions
08-12 Jul	DENSITY	0.00	0.00	0.11	0.05
	SE	0.00	0.00	0.11	0.05
	NO.TOWS	3.00	3.00	6.00	12.00
22-26 Jul	DENSITY	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00
	NO.TOWS	3.00	3.00	6.00	12.00
05-09 Aug	DENSITY	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00
	NO.TOWS	3.00	3.00	6.00	12.00
19-23 Aug	DENSITY	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00
	NO.TOWS	3.00	3.00	6.00	12.00
02-06 Sep	DENSITY	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00
	NO.TOWS	3.00	3.00	6.00	12.00
17-21 Sep	DENSITY	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00
	NO.TOWS	3.00	3.00	6.00	12.00
30 Sep-04 Oct	DENSITY	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00
	NO.TOWS	3.00	3.00	6.00	12.00
14-18 Oct	DENSITY	0.00	0.00	0.00	0.00
	SE	0.00	0.00	0.00	0.00
	NO.TOWS	3.00	3.00	6.00	12.00

**Table 8. Standing Crop Index (and Standard Error, SE) for Juvenile American Shad in Vernon Pool Regions of the Connecticut River, July - October 2002.**

2002 Week	Brattleboro		Cersosimo		Vernon		Cersosimo Lake		All Regions	
	Index	SE	Index	SE	Index	SE	Index	SE	Index	SE
08-12 Jul	0	0	0	0	0	0	0	0	0	0
22-26 Jul	0	0	0	0	0	0	0	0	0	0
05-09 Aug	0	0	0	0	0	0	0	0	0	0
19-23 Aug	0	0	0	0	0	0	0	0	0	0
02 - 06 Sep	0	0	0	0	0	0	0	0	0	0
17- 21 Sep	0	0	0	0	0	0	0	0	0	0
30 Sep - 04 Oct	0	0	0	0	42620	33162	0	0	42620	33162
14-18 Oct	0	0	0	0	41605	28535	0	0	41605	28535
MEAN	0	0	0	0	10528	7712	0	0	10528	7712

NOTE: Standing Crop Index is the weekly mean estimated total number of juvenile American shad in each region.

**Table 9. Standing Crop Index of Juvenile American Shad Abundance in Vernon Pool Regions of the Connecticut River during July – October 2002.**

Year	Standing Crop Index in Region				
	Brattleboro	Cersosimo	Cersosimo Lake	Vernon	Combined
2000	1,069	108	944	29,123	31,244
2001	0	216	61	2,156	2,433
2002	0	0	0	10,528	10,528

**Table 10. Annual Juvenile American Shad Standing Crop Index and the Estimated Number of Adult Shad in Vernon Pool of the Connecticut River.**

Year	Juvenile Shad Index in Vernon Pool	Adult Shad Passed Upstream at Vernon Dam <sup>1</sup>			Adult Shad Trucked from Holyoke Lift and Stocked in Vernon Pool <sup>2</sup>			Combined Number of Adult Shad in Vernon Pool		
		Males	Females	Total	Males <sup>3</sup>	Females <sup>3</sup>	Total	Males	Females	Total
2000	31244	632	168	800	474	533	1007	1106	701	1807
2001	2433	1538	128	1666	31	40	71	1569	168	1737
2002	10528	281	75	356	273	327	600	554	402	956

<sup>1</sup> American shad upstream passage at Vernon Dam as reported in Normandeau 2002 (Bulletin No. 77). A ten-year average of 79% males (1990-2001, 2000 excluded) was used to estimate the sex composition of the run during 2000 and 2002 because sex composition was not determined in those years.

<sup>2</sup> American shad trucked as reported by Dr. Caleb Slater, Pers. Comm., 22 April 2002 and 14 April 2003.

<sup>3</sup> Number of male and female adult American shad estimated from the overall sex ratio reported for the Holyoke lift in each year, Dr. Caleb Slater, Pers. Comm., 22 April 2002 (47.1% males) and 14 April 2003 (45.5% males).