Appendix A

Quality Control Report for the 2000 Hudson River Ichthyoplankton Laboratory Program and 2000 Fall Juvenile Survey

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ENVIRONMENTAL CONSULTANTS

Quality Control Report for the 2000 Hudson River Ichthyoplankton Laboratory Program and 2000 Fall Juvenile Survey

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QUALITY CONTROL REPORT FOR THE 2000 HUDSON RIVER ICHTHYOPLANKTON LABORATORY PROGRAM AND 2000 FALL JUVENILE SURVEY

1.0 INTRODUCTION

This quality control report for the laboratory tasks of the 2000 Hudson River Ichthyoplankton Survey and the 2000 Fall Juvenile Survey was prepared for Entergy Nuclear Operations, Inc. by Normandeau Associates Inc. (NAI).

To comply with Entergy's requirements for valid and reliable data on the Hudson River Ichthyoplankton Laboratory Program and the Fall Juvenile Survey, NAI implemented a Quality Assurance Plan that provides a 10% Average Outgoing Quality Limit (AOQL) for all measurement parameters collected. The Quality Assurance Plan consists of two systems: a quality control (QC) system and a quality assurance (QA) system. The QC system is managed by the program manager and conducted by operational personnel. The system monitors and documents the reliability and validity (accuracy, precision, completeness) of daily operations. The specific features of the QC system are determined by the Quality Assurance Department to insure that all procedures conform to Entergy's data requirements. The QA system is managed by NAI's Quality Assurance Director and utilizes project independent personnel familiar with the work or activities under evaluation to conduct performance and systems audits. These audits are designed to provide objective evidence that the quality control program and technical requirements, methods, and procedures as outlined in the program Standard Operating Procedures are being implemented. The outcomes of the QA system activities are

- verification of the effectiveness of the QC system,
- assignment of corrective actions to resolve nonconforming procedures or data deficiencies,
- communication of audit results to project and staff managers for follow-up, and
- objective validation or improvement of project operations.

This report provides a compilation of QC system data verifying the results of the 2000 Hudson River Ichthyoplankton Laboratory Program and 2000 Fall Juvenile Survey activities. Determinations of the fraction inspected, percent nonconforming, and average outgoing quality are presented for both programs. In addition, for the 2000 Hudson River Ichthyoplankton Laboratory Program the results include percent measurement error, a summary of the number of each taxon-life stage found during sorting QC, and cumulative error rates for each taxon-life stage.

2.0 METHODS

2.1 LABORATORY QUALITY CONTROL PROCEDURES

2.1.1 Ichthyoplankton Survey

For sorting and identification of samples from the 2000 Hudson River Ichthyoplankton Laboratory Program, NAI used a continuous sampling plan designed to provide a 10% Average Outgoing Quality Limit (U.S. Department of Defense 1981). A flow diagram of how the sampling plan was applied is presented in Figure 1. A summary of the sampling plan, tolerances and QC sample definitions used for each measurement parameter is presented in Table 1. Quality control inspection was applied on a laboratory-wide basis for the sorting task and to each individual processor for the identification task. Quality control samples were selected in a random manner utilizing random number tables. As determined from the sampling plan outlined in Table 1, a given number of quality control samples were reprocessed by QC inspectors with expertise in the task being inspected. In cases where a sample was subdivided and counted, counts for all subdivisions were combined before calculating percent error for that sample. If the difference between the quality control value and the original value exceeded acceptable tolerances (Table 1), a third measurement could be obtained to verify one of the measurements. If a sample was found to have exceeded acceptable tolerances, all subsequent samples processed by the same technician were subjected to 100% quality control until an appropriate number of consecutive samples (i) were found within tolerance as determined by the continuous sampling plan (Table 1 and Figure 1). The standard operating procedures manual (NAI 1998) documents specific QA/QC methods utilized for this program (there were no changes between the 1998 and 2000 programs, so the manual was not changed for 2000).

TABLE 1. TASK SPECIFIC APPLICATIONS OF CONTINUOUS SAMPLING PLANS FOR THE 2000 HUDSON RIVER ICHTHYOPLANKTON LABORATORY PROGRAM.

LABORATORY TASK	CSP-1 AOQL-10% i	f	SAMPLE TOLERANCE	QC SAMPLE DEFINITION
Sorting	8	1/7	± 2 if ≤20 organisms ± 10% if >20 organisms	one sample
Identification	8	1/7	± 2 if ≤20 ± 10% if >20 for every taxon in the sample (in identifying, assigning a life stage, or counting any species, errors are cumulative by life stage within each taxon)	one sample

In some cases one of the taxonomists (either the original identifier or the QC inspector) was able to determine the taxon or life stage of damaged specimens when the other taxonomist recorded them as

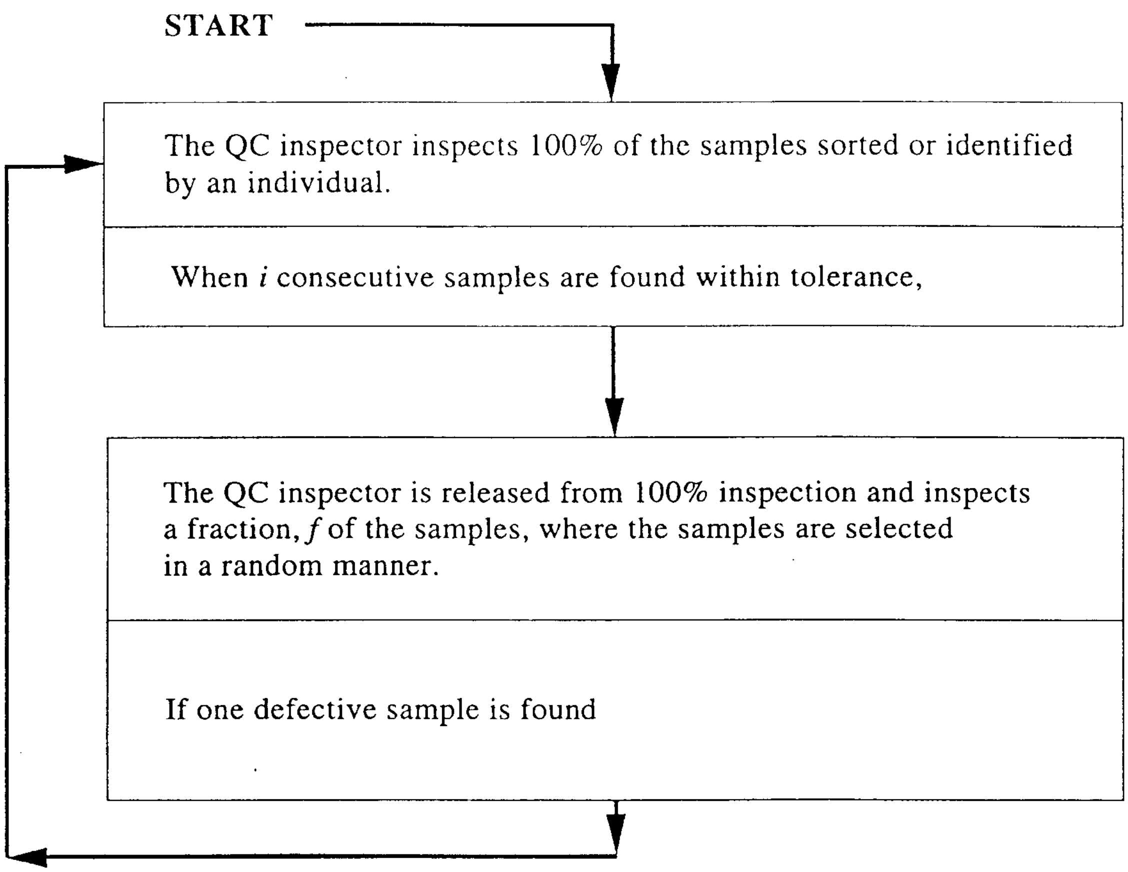

Figure 1. Quality control inspection plan for ichthyoplankton sorting and identification tasks.

unknown life stage, unidentified taxon, or a higher level taxon (genus or family). If a more general taxon or life stage used by one taxonomist *included* the more specific category used by the other taxonomist, and that was the only reason for a count discrepancy, then that sample was not considered as failing the QC inspection. For example, damaged specimens recorded as *Morone* sp. by the original identifier and as striped bass by the QC inspector were considered to be in agreement because the category *Morone* sp. includes striped bass. In contrast, an original determination of unidentified gobiid would not be acceptable if the QC determination was striped bass, because striped bass is not included in the family Gobiidae.

2.1.2 Fall Juvenile Survey

The Fall Juvenile Survey consisted of two types of collections, referred to as the Fall Shoals Survey (which used Tucker trawls) and the Beach Seine Survey. For laboratory identification and length measurements of young-of-the-year fishes in the 2000 Fall Juvenile Survey, NAI used a continuous sampling plan designed to provide a 10% Average Outgoing Quality Limit (U.S. Department of Defense, 1981). A flow diagram of how the plan was applied is presented in Figure 2. A summary of the sampling plan, tolerances, and QC sample definitions used for each task is shown in Table 2. QC samples were selected as specified by the appropriate plan in Table 2, using random numbers, and reprocessed by QC inspectors. If the difference between original and QC values exceeded the acceptable tolerance, a third value was obtained as a resolution. The QC methods documented in the 1999 Standard Operating Procedures (NAI 2000) are the same methods used for the 2000 program (there were no changes between the 1999 and 2000 programs, so the manual was not revised for 2000). Young-of-the-year fishes were identified in the laboratory for the first two Fall Shoals "river runs" (sampling weeks) and the first three Beach Seine Survey river runs. Young-of-the-year fishes were identified in the field starting with Fall Shoals river run 3 and Beach Seine Survey river run 4. The same quality control procedures applied to both field and laboratory identifications. All length measurements of young-of-the-year fishes occurred in the laboratory.

TABLE 2. TASK SPECIFIC APPLICATIONS OF CONTINUOUS SAMPLING PLANS FOR THE 2000 FALL JUVENILE SURVEY .

TASK	QC PLAN	AOQL	i	f	x	TOLERANCE	QC SAMPLE DEFINITION
Identification	CSP-V	7%	21	1/15	7	±10% of total count or ±2 individuals when <25 fish	One taxon
Length	CSP-V	7%	30	1/50	10	±1 mm when <34 mm TL ±3% when >34 mm TL	One fish

2.2 REPORTING PROCEDURES

The 2000 Hudson River Ichthyoplankton Laboratory Program Sort and Identification Quality Control Logs were keyed, verified, and error-checked to produce SAS data sets. From these data, fraction inspected, percent nonconforming, and percent measurement error (precision) were determined for each river run and for the entire study. For the 2000 Fall Juvenile Survey, QC data were used to determine fraction inspected and percent nonconforming for the entire study (combining all river runs processed in the laboratory for both the Fall Shoals Survey and the Beach Seine Survey).

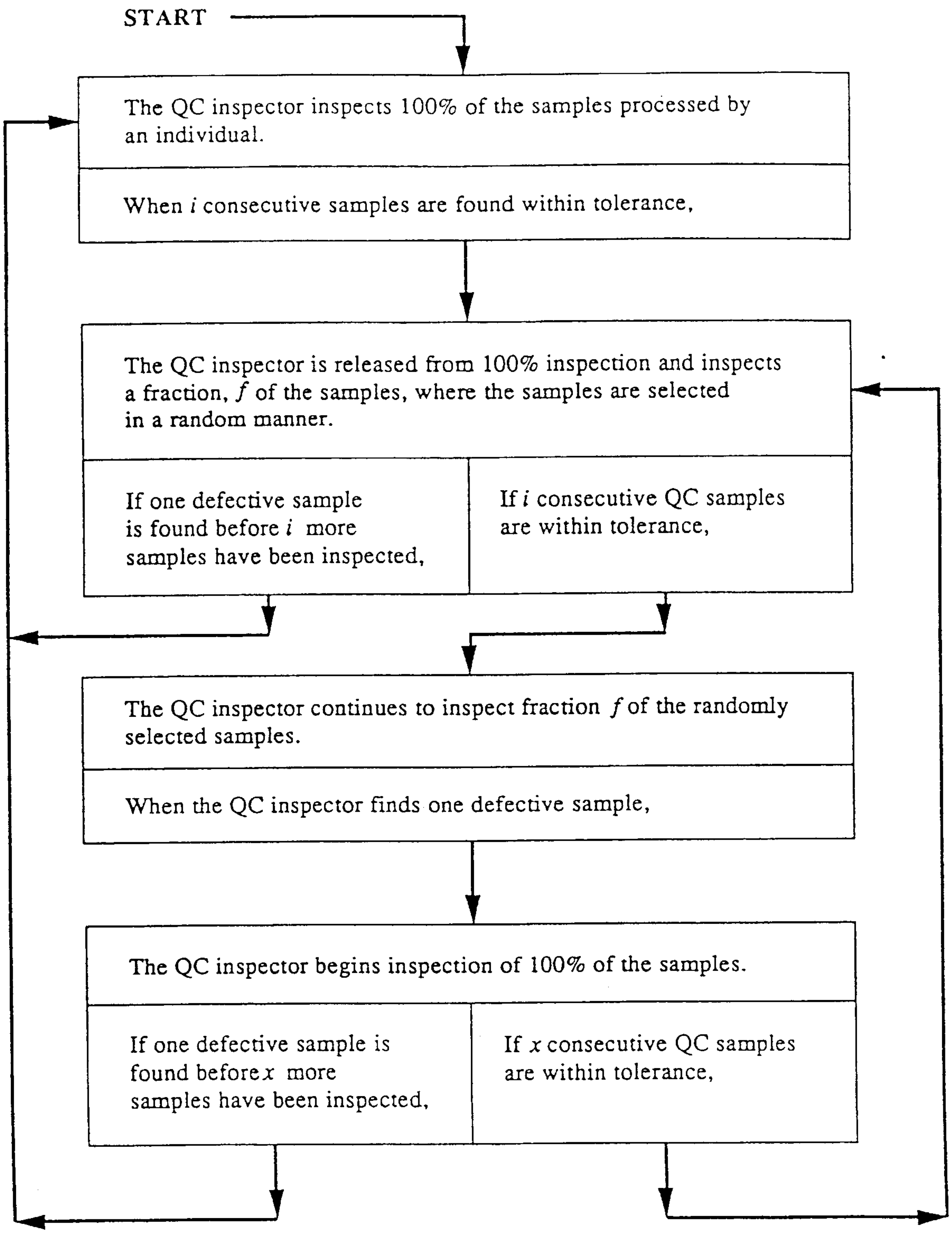

Figure 2. Quality control inspection plan for identification and length measurement of young-of-the-year fishes.

2.2.1 Fraction Inspected

Fraction Inspected

$$= \frac{\text{Number of Samples Inspected}}{\text{Total Number of Samples}} \times 100 \qquad \text{(Equation 1)}$$

River Run: Fraction inspected for a river run (Equation 1) was one hundred times the number of samples inspected divided by the total number of samples analyzed for that river run. For ichthyoplankton tasks, the number of samples inspected excludes "training QC samples," which do not represent the independent performance of the technician. For the ichthyoplankton identification task, the total number of samples identified excludes empty ("no catch") samples, which did not require processing by an identifier.

Entire Study: Fraction inspected for the entire study was one hundred times the number of samples inspected divided by the total number of samples analyzed during the study.

2.2.2 Percent Nonconforming

Percent Nonconforming

$$= \frac{\text{Number of Nonconforming Samples Inspected}}{\text{Number of Samples Inspected}} \times 100 \qquad \text{(Equation 2)}$$

River Run: Percent nonconforming for a river run (Equation 2) was one hundred times the number of nonconforming quality control samples found for that river run divided by the total number of quality control samples inspected for that river run.

Entire Study: Percent nonconforming for the entire study was one hundred times the total number of nonconforming quality control samples for the study divided by the total number of quality control samples inspected for the study. The results of this analysis was a determination of the actual incoming quality level of each measurement parameter. (Note that because samples checked by QC found to be defective were rectified during QC, the average outgoing quality of the final data set was better than that indicated by the percent nonconforming.)

2.2.3 Percent Measurement Error

Sorting Task

Sorting Percent Measurement Error

$$= \frac{\text{Quality Control Value}}{(\text{Original Value} + \text{Quality Control Value})} \times 100 \qquad \text{(Equation 3)}$$

Sample: Percent measurement error for a sorted sample (Equation 3) was one hundred times the quality control value divided by the sum of the original value and the quality control value. If the total count (original value plus quality control value) was less than or equal to 20, and the quality control value (i.e., the number of organisms missed by the sorter and found during sort QC inspection) was one or two, the percent measurement error for the sorted sample was defined as zero.

River Run: Mean percent measurement error for sorted samples for a river run was the sum of the percent measurement errors for each sample inspected during the river run divided by the total number of samples inspected for the river run.

Entire Study: Mean percent measurement error for sorted samples for the entire study was the sum of the percent measurement errors for each sample inspected during the study divided by the total number of samples inspected for the study. (Note that this method of averaging gives equal weight to each sample, regardless of the number of organisms present).

Identification Task

Life Stage Percent Measurement Error

$$= \frac{\text{(Original Value} - \text{Quality Control Value)}}{\text{Quality Control Value}} \text{ x} 100 \qquad \text{(Equation 4)}$$

Life Stage: Percent measurement error for a life stage (Equation 4) was one hundred times the difference between the original value and the quality control value divided by the quality control value. For life stages where the quality control value was 20 or less, if the original and quality control values differed by less than or equal to two organisms the percent measurement error was defined as zero. For life stages where the quality control value was 20 or less and the original and quality control values differed by more than two organisms, the percent measurement error was calculated utilizing Equation 4. If the quality control value was zero, the percent measurement error was calculated by multiplying the difference between the original and quality control values by 100. This results in percent measurement error values which are at times extremely large (e.g. possibly several hundred percent for a life stage of a taxon in a sample) and not truly indicative of the actual proportion of specimens misidentified, mis-staged, or miscounted in a sample. If the original count for a life stage was acceptably close to a resolution value but not to the quality control value, the percent measurement error was calculated as described above except that the resolution value was substituted for the quality control value.

Taxon: Percent measurement error for an identified taxon was the sum of the absolute values of percent measurement error for each life stage within the taxon. Refer to Figure 3 for an example of taxon percent measurement error calculations.

River Run: Mean percent measurement error for the identification task for a river run was the sum of the percent measurement errors for all taxa inspected during the river run divided by the total number of taxa inspected for the river run. This statistic was computed by averaging taxa rather than samples because even though complete samples were inspected and reworked for identification quality control, the pass/fail criterion was whether any taxon in the sample individually exceeded the 10% tolerance.

Entire Study: Mean percent measurement error for identified taxa for the entire study was the sum of the percent measurement errors for all taxa inspected during the study divided by the total number of taxa inspected for the study.

		EGGS	POST YOLK-SAC LARVAE	YOUNG-OF-THE-YEAR	TOTAL
Taxon 1					
	Original Value	103	176	25	
	Quality Control Value	100	194	26	
	% Measurement Error Life Stage	3.0	-9.3	-3.8	16.1
Taxon 2					
	Original Value		2		
	Quality Control Value		1		
	% Measurement Error Life Stage		0		0
Taxon 3					
	Original Value		8		
	Quality Control Value		2		
	% Measurement Error Life Stage		300		300

Figure 3. Example of percent measurement error calculations for individual taxa during the identification task.

2.2.4 Average Outgoing Quality

At the completion of these studies, the Average Outgoing Quality (AOQ) was calculated for each measurement parameter inspected. Continuous sampling plans were used for all tasks. Continuous sampling plans are devised for processes involving a continuous or nearly continuous flow of products or other entities. For these types of processes, it is extremely difficult to organize units into discrete groups commonly referred to as lots. As a result, inspection must be performed on individual units drawn from a continuous flow of products and a decision made concerning the quality of units produced based on the inspection results. Rectification is performed on any nonconforming unit found during inspection, followed by 100% screening of a number of subsequent units depending on the sampling plan. Average Outgoing Quality for each laboratory task was calculated as a function of the percent nonconforming and the fraction of total units inspected (Stephens 1979). This calculation applies to continuous sampling plans when nonconforming units found are rectified:

$$AOQ = \frac{p'(1-f)q^{i}}{f + (1-f)q^{i}} \times 100 \qquad \text{(Equation 5)}$$

where

p' = Percent nonconforming as a decimal fraction
f = Fraction of units inspected. This is a parameter of the sampling plan.
q = 1-p' = Percent conforming as a decimal fraction
i = Clearing interval. This is a parameter of the sampling plan.

Example:

p' = 0.0689
f = 1/7 = 0.1429

$q = 1\text{-}0.0689 = 0.9311$
$i = 8$

$$AOQ = \frac{0.0689(1-0.1429)(0.9311)^8}{0.1429+(1-0.1429)(0.9311)^8} \times 100 = 5.32\%$$

The above equation for calculating AOQ was formulated specifically for CSP-1 sampling plans such as those used for the ichthyoplankton sorting and identification (Table 1). The same equation was used to calculate AOQ for young-of-the-year identifications and measurements, which used CSP-V plans (Table 2). When Equation 5 is used for CSP-V plans, the calculated AOQ is conservatively high, because the equation does not take into account the times when the number of consecutive reinspections following a failure is x (which is smaller than i).

2.2.5 Cumulative Error Rates

Due to the non-independence of identification errors across taxa and life stages, and to the cumulation of errors within taxa, a relatively high fraction of samples may fail QC inspection even though only a small fraction of organisms are incorrectly identified or counted. In order to present the error frequencies more realistically for particular taxa-life stages, two additional statistics were calculated for each taxon-life stage for the identification/counting process.

Absolute Error Rate =

$$\sum_{i=1}^{n} | I_i - Q_i | / \sum_{i=1}^{n} Q_i \qquad \text{Equation 6}$$

Net Error Rate =

$$\sum_{i=1}^{n} (I_i - Q_i) / \sum_{i=1}^{n} Q_i \qquad \text{Equation 7}$$

where

I_i = initial count for taxon-life stage in sample i
Q_i = QC count for taxon-life stage in sample i (or the resolution count, if I_i was acceptably close to it but not to the QC count)
n = number of samples in the entire study

If the sum of Q_i for the entire study was zero for the taxon-life stage, then the sum of Q_i was set equal to one for the purpose of calculating absolute and net error rate.

The absolute error rate is the approximate fraction of the taxon-life stage that was originally identified or counted incorrectly. This is an estimate of the fraction of erroneous countable items in the uninspected samples.

Net error rate is the approximate relative error in the total counts for the taxon-life stage. For this index, positive (original count too high) and negative (original count too low) errors cancel each other so that the index reflects the relative net bias to the taxon-life stage abundance.

3.0 RESULTS

3.1 ICHTHYOPLANKTON LABORATORY PROGRAM

The Average Outgoing Quality (AOQ) of the 2000 Hudson River Ichthyoplankton Laboratory Program was 4.07% for the sorting task and 0.81% for the identification task. These AOQ levels represent the actual or achieved quality for measurement parameters and were well within the 10% AOQL requirement of the study. The Average Fraction Inspected (AFI) was 24.15% for sorting and 15.25% for identification (Table 3).

TABLE 3. FRACTION INSPECTED, PERCENT NONCONFORMING, MEAN PERCENT MEASUREMENT ERROR, AND AVERAGE OUTGOING QUALITY OF TASKS PERFORMED BY NAI FOR THE 2000 HUDSON RIVER ICHTHYOPLANKTON LABORATORY PROGRAM .

TASK	FRACTION INSPECTED (%)	PERCENT NONCON-FORMING (%)	MEAN PERCENT MEASUREMENT ERROR (%)	AOQ (%)
Sorting	24.15	5.10	2.91	4.07
Identification	15.25	0.96	1.01	0.81

The AFI for the sorting task as calculated here is conservatively low, because samples used as "training QCs" were not entered into the formal QC inspection plan. Each training QC sample was reprocessed by the Sorting Supervisor during the training process, so these do not represent the independent performance of the sorter. Only after a new sorter demonstrated proficiency in the training program were subsequent samples processed by that sorter entered into the laboratory-wide QC plan.

Sorting and identification tasks were also evaluated on a sampling week basis representing river runs (sampling weeks) 1 through 23. Sorted samples were inspected at a rate of 13.49% to 36.51% for individual river runs (Table 4). Nonconformance for the sorting task among the inspected samples ranged from 0% to 17.50% among the river runs and was 5.10% overall (Table 5). Sorting measurement error was between 0% and 8.28% and averaged 2.91% for the study (Table 6). For the task of sample identification, 9.62% to 22.13% of samples were inspected from individual river runs (Table 7). Percent nonconforming for the identification task ranged from 0% to 21.43% for each of river runs 1-23 and averaged 0.96 (Table 8). Measurement error ranged from 0% to 3.95% and overall measurement error was 1.01% for the identification task of this study (Table 9).

Measurement error results are skewed towards high values as a result of the method of computation at the life stage level. In addition, measurement errors are summed over life stages within each taxon, which then amplifies the already skewed life stage values. These data are not indicative of actual measurement error and should only be compared to other measurement error results that are calculated using exactly the same methods. In all cases of failed QC samples, the data were corrected and the QC sample inspection frequency was maintained at 100% for that individual until acceptable results were demonstrated as determined by the QC sampling plan.

Additional organisms found during the sort QC were identified independently to determine the frequency of species and life stages missed during the initial sort. Six taxa accounted for 92% of the additional organisms found during sort QC: white perch, striped bass, clupeids, *Morone* sp., bay anchovy, and winter flounder (Table 10). The additional number found in the sort QC was less than 1% of the total found during sample processing.

For the six taxa most commonly encountered during sort QC the total number of each life stage found in the sort QC was low compared to the total number sorted except for bay anchovy of undetermined life stage (Table 11). For most taxa-life stages the percentage missed by the original sorter was well under 2%. The high proportion of unknown life stage bay anchovy missed by sorters reflected the low number (4 of 13 were missed) and the poor condition of the specimens.

The life stage most commonly missed by sorters for white perch, winter flounder, *Morone* sp., and clupeids was post yolk-sac larvae (Table 11). The most commonly missed life stage was eggs for bay anchovy and striped bass. Generally the life stage most frequently missed by sorters was the most abundant one, except that the larger of the post yolk-sac larvae and the young-of-the-year fish were very rarely overlooked by the sorters.

Absolute error rates of the identification process for individual life stages of commonly encountered taxa ranged from 0 to 2, but most taxa-life stages had rates less than 0.05. Generally, only those taxa-life stages with low total counts had absolute error rates above 0.05 (Table 12).

Net error rates were substantially lower than the absolute error rates in most cases, demonstrating that errors often tended to cancel each other out. This was noticeable for many of the more abundant taxa-life stages, such as post yolk-sac larvae of striped bass, white perch, clupeids, and bay anchovy; yolk-sac larvae of striped bass and white perch; eggs of bay anchovy and striped bass; and young-of-the-year of bay anchovy.

3.2 FALL JUVENILE SURVEY

Results of the laboratory quality control program for the 2000 Fall Juvenile Survey (consisting of the Beach Seine Survey and the Fall Shoals Survey) were summarized by the same methods as the QC results for the 2000 Hudson River Ichthyoplankton Laboratory Program (Section 2.1.2) and are presented in Table 13.

A total of 1,399 and 1,367 young-of-the-year fish identification records were made in the laboratory for the Fall Shoals and Beach Seine surveys respectively and 6,818 and 4,037 young-of-the-year fish length measurement records were made for the Fall Shoals and Beach Seine surveys respectively.

TABLE 4. SAMPLE SORTING FRACTION INSPECTED RESULTS, 2000 HUDSON RIVER ICHTHYOPLANKTON LABORATORY PROGRAM.

	FRACTION INSPECTED SORTING QC		
SAMPLING WEEK (BEGINNING MONDAY)	TOTAL # OF SAMPLES INSPECTED	TOTAL # OF SAMPLES SORTED	FRACTION INSPECTED
06MAR00	11	73	15.07
20MAR00	15	72	20.83
27MAR00	12	74	16.22
03APR00	17	126	13.49
10APR00	25	126	19.84
17APR00	46	126	36.51
24APR00	22	135	16.30
01MAY00	24	135	17.78
08MAY00	33	135	24.44
15MAY00	33	125	26.40
22MAY00	27	126	21.43
29MAY00	39	125	31.20
05JUN00	37	123	30.08
12JUN00	39	123	31.71
19JUN00	40	123	32.52
26JUN00	35	123	28.46
10JUL00	28	81	34.57
24JUL00	16	80	20.00
07AUG00	11	81	13.58
21AUG00	19	81	23.46
04SEP00	11	80	13.75
18SEP00	23	81	28.40
02OCT00	25	81	30.86
STUDY	588	2435	24.15

TABLE 5. SAMPLE SORTING PERCENT NONCONFORMANCE RESULTS, 2000 HUDSON RIVER ICHTHYOPLANKTON LABORATORY PROGRAM.

	% NONCONFORMANCE SORTING QC			
SAMPLING WEEK (BEGINNING MONDAY)	# OF NONCON-FORMITIES	TOTAL # OF SAMPLES INSPECTED	% NON-CONFORMANCE (WEEK)	% NON-CONFORMANCE (STUDY)
06MAR00	1	11	9.09	9.09
20MAR00	1	15	6.67	7.69
27MAR00	0	12	0.00	5.26
03APR00	0	17	0.00	3.64
10APR00	0	25	0.00	2.50
17APR00	2	46	4.35	3.17
24APR00	0	22	0.00	2.70
01MAY00	0	24	0.00	2.33
08MAY00	2	33	6.06	2.93
15MAY00	3	33	9.09	3.78
22MAY00	0	27	0.00	3.40
29MAY00	3	39	7.69	3.95
05JUN00	5	37	13.51	4.99
12JUN00	1	39	2.56	4.74
19JUN00	7	40	17.50	5.95
26JUN00	4	35	11.43	6.37
10JUL00	1	28	3.57	6.21
24JUL00	0	16	0.00	6.01
07AUG00	0	11	0.00	5.88
21AUG00	0	19	0.00	5.67
04SEP00	0	11	0.00	5.56
18SEP00	0	23	0.00	5.33
02OCT00	0	25	0.00	5.10
STUDY	30	588		

TABLE 6. SAMPLE SORTING MEAN PERCENT MEASUREMENT ERROR RESULTS, 2000 HUDSON RIVER ICHTHYOPLANKTON LABORATORY PROGRAM.

	MEAN PERCENT MEASUREMENT ERROR SORTING QC	
SAMPLING WEEK (BEGINNING MONDAY)	TOTAL # OF SAMPLES INSPECTED	MEAN PERCENT MEASUREMENT ERROR
06MAR00	11	5.87
20MAR00	15	1.30
27MAR00	12	0.00
03APR00	17	0.00
10APR00	25	0.36
17APR00	46	1.57
24APR00	22	0.10
01MAY00	24	0.88
08MAY00	33	2.82
15MAY00	33	6.27
22MAY00	27	1.74
29MAY00	39	3.76
05JUN00	37	8.28
12JUN00	39	3.09
19JUN00	40	6.25
26JUN00	35	6.12
10JUL00	28	3.23
24JUL00	16	1.02
07AUG00	11	0.26
21AUG00	19	0.43
04SEP00	11	0.46
18SEP00	23	0.36
02OCT00	25	0.35
STUDY	588	2.91

TABLE 7. SAMPLE IDENTIFICATION FRACTION INSPECTED RESULTS, 2000 HUDSON RIVER ICHTHYOPLANKTON LABORATORY PROGRAM.

	FRACTION INSPECTED IDENTIFICATION QC		
SAMPLING WEEK (BEGINNING MONDAY)	TOTAL # OF SAMPLES INSPECTED	TOTAL # OF SAMPLES IDENTIFIED	FRACTION INSPECTED
06MAR00	8	57	14.04
20MAR00	7	48	14.58
27MAR00	4	38	10.53
03APR00	11	58	18.97
10APR00	7	46	15.22
17APR00	5	52	9.62
24APR00	10	73	13.70
01MAY00	16	109	14.68
08MAY00	18	131	13.74
15MAY00	20	125	16.00
22MAY00	16	126	12.70
29MAY00	27	125	21.60
05JUN00	16	123	13.01
12JUN00	16	123	13.01
19JUN00	27	122	22.13
26JUN00	16	122	13.11
10JUL00	14	81	17.28
24JUL00	17	80	21.25
07AUG00	10	81	12.35
21AUG00	11	80	13.75
04SEP00	12	80	15.00
18SEP00	12	81	14.81
02OCT00	11	79	13.92
STUDY	311	2040	15.25

TABLE 8. SAMPLE IDENTIFICATION PERCENT NONCONFORMANCE RESULTS, 2000 HUDSON RIVER ICHTHYOPLANKTON LABORATORY PROGRAM.

	% NONCONFORMANCE IDENTIFICATION QC			
SAMPLING WEEK (BEGINNING MONDAY)	# OF NONCON-FORMITIES	TOTAL # OF SAMPLES INSPECTED	% NON-CONFORMANCE (WEEK)	% NON-CONFORMANCE (STUDY)
06MAR00	0	8	0.00	0.00
20MAR00	0	7	0.00	0.00
27MAR00	0	4	0.00	0.00
03APR00	0	11	0.00	0.00
10APR00	0	7	0.00	0.00
17APR00	0	5	0.00	0.00
24APR00	0	10	0.00	0.00
01MAY00	0	16	0.00	0.00
08MAY00	0	18	0.00	0.00
15MAY00	0	20	0.00	0.00
22MAY00	0	16	0.00	0.00
29MAY00	0	27	0.00	0.00
05JUN00	0	16	0.00	0.00
12JUN00	0	16	0.00	0.00
19JUN00	0	27	0.00	0.00
26JUN00	0	16	0.00	0.00
10JUL00	3	14	21.43	1.26
24JUL00	0	17	0.00	1.18
07AUG00	0	10	0.00	1.13
21AUG00	0	11	0.00	1.09
04SEP00	0	12	0.00	1.04
18SEP00	0	12	0.00	1.00
02OCT00	0	11	0.00	0.96
STUDY	3	311		

TABLE 9. SAMPLE IDENTIFICATION MEAN PERCENT MEASUREMENT ERROR RESULTS, 2000 HUDSON RIVER ICHTHYOPLANKTON LABORATORY PROGRAM.

MEAN PERCENT MEASUREMENT ERROR IDENTIFICATION QC

SAMPLING WEEK (BEGINNING MONDAY)	TOTAL # OF SAMPLES INSPECTED	MEAN PERCENT MEASUREMENT ERROR	NUMBER OF TAXA INSPECTED
06MAR00	8	0.30	14
20MAR00	7	0.58	13
27MAR00	4	0.00	5
03APR00	11	0.18	20
10APR00	7	0.08	19
17APR00	5	0.00	9
24APR00	10	0.00	17
01MAY00	16	0.00	33
08MAY00	18	0.61	74
15MAY00	20	1.20	88
22MAY00	16	1.19	82
29MAY00	27	1.10	165
05JUN00	16	1.28	79
12JUN00	16	0.97	90
19JUN00	27	0.65	148
26JUN00	16	1.01	89
10JUL00	14	3.95	101
24JUL00	17	0.24	85
07AUG00	10	0.36	36
21AUG00	11	1.18	36
04SEP00	12	0.31	38
18SEP00	12	0.28	44
02OCT00	11	0.36	43
STUDY	311	1.01	1328

TABLE 10. RANKING OF TAXA MISSED DURING INITIAL SORT AND FOUND DURING SORT QC.

TAXON	NUMBER OF ORGANISMS FOUND IN SORT QC	PERCENT
WHITE PERCH	1798	38.53
STRIPED BASS	871	18.67
HERRING FAMILY	773	16.57
MORONE SPECIES	450	9.64
BAY ANCHOVY	305	6.54
WINTER FLOUNDER	78	1.67
CARP AND MINNOW FAMILY	58	1.24
GIZZARD SHAD	54	1.16
UNIDENTIFIED	54	1.16
WEAKFISH	40	0.86
GOBY FAMILY	36	0.77
ATLANTIC MENHADEN	28	0.60
ATLANTIC TOMCOD	27	0.58
CUNNER	20	0.43
TESSELLATED DARTER	20	0.43
AMERICAN SHAD	19	0.41
HOGCHOKER	12	0.26
WINDOWPANE	7	0.15
ATLANTIC CROAKER	6	0.13
YELLOW PERCH	4	0.09
FOURBEARD ROCKLING	2	0.04
TAUTOG	2	0.04
SUNFISH FAMILY	1	0.02
WALLEYE	1	0.02
TOTAL	4666	100.00

TABLE 11. SUMMARY BY LIFE STAGE OF THE SIX HIGHEST RANKED TAXA MISSED DURING ORIGINAL SORT AND FOUND DURING SORT QC COMPARED TO TOTAL COUNT

TAXON	LIFE STAGE	NUMBER	PERCENT IN EACH STAGE	PERCENT OF TOTAL FOUND	TOTAL ORGANISMS FOUND[a]
BAY ANCHOVY	EGGS	259	84.92	1.09	23721
	YOLK-SAC LARVAE	0	0.00	0.00	13
	POST YOLK-SAC LARVAE	41	13.44	0.24	17075
	YOUNG-OF-THE-YEAR	1	0.33	0.01	12142
	UNIDENTIFIED	4	1.31	30.77	13
HERRING FAMILY	EGGS	87	11.25	0.89	9773
	YOLK-SAC LARVAE	28	3.62	0.79	3525
	POST YOLK-SAC LARVAE	658	85.12	1.45	45468
	YOUNG-OF-THE-YEAR	0	0.00	0.00	17
	UNIDENTIFIED	0	0.00	0.00	16
MORONE SPECIES	EGGS	0	0.00	0.00	1
	YOLK-SAC LARVAE	6	1.33	4.69	128
	POST YOLK-SAC LARVAE	321	71.33	1.42	22583
	UNIDENTIFIED	123	27.33	1.56	7873
STRIPED BASS	EGGS	314	36.05	1.22	25745
	YOLK-SAC LARVAE	261	29.97	0.47	55457
	POST YOLK-SAC LARVAE	296	33.98	0.18	163560
	YOUNG-OF-THE-YEAR	0	0.00	0.00	439
	UNIDENTIFIED	0	0.00	0.00	39
WHITE PERCH	EGGS	226	12.57	1.97	11459
	YOLK-SAC LARVAE	296	16.46	2.00	14817
	POST YOLK-SAC LARVAE	1274	70.86	2.17	58753
	YOUNG-OF-THE-YEAR	0	0.00	0.00	42
	UNIDENTIFIED	2	0.11	4.65	43
WINTER FLOUNDER	YOLK-SAC LARVAE	7	8.97	0.63	1119
	POST YOLK-SAC LARVAE	68	87.18	1.44	4716
	YOUNG-OF-THE-YEAR	0	0.00	0.00	62
	UNIDENTIFIED	3	3.85	1.95	154

[a] INCLUDES BOTH ORIGINAL COUNT AND ADDITIONAL ORGANISMS FOUND DURING SORT QC.

TABLE 12. CUMULATIVE NET AND ABSOLUTE ERROR RATES FOR COMMONLY ENCOUNTERED TAXA IN SAMPLES SELECTED FOR QC INSPECTION OF IDENTIFICATION AND COUNTING PROCESS.

TAXON	STAGE	TOTAL COUNT	NET ERROR RATE	ABSOLUTE ERROR RATE	N
AMERICAN SHAD	EGGS	209	0.00478	0.00478	17
	YOLK-SAC LARVAE	22	0.04545	0.13636	10
	POST YOLK SAC LARVAE	148	-0.01351	0.02703	34
	YOUNG OF THE YEAR	11	0.00000	0.00000	7
ATLANTIC CROAKER	POST YOLK SAC LARVAE	714	-0.00700	0.01261	12
	YOUNG OF THE YEAR	22	0.09091	0.09091	6
ATLANTIC MENHADEN	EGGS	388	0.01546	0.01546	5
	YOLK-SAC LARVAE	0	2.00000	2.00000	1
	POST YOLK SAC LARVAE	49	0.02041	0.02041	25
	YOUNG OF THE YEAR	153	0.00000	0.00000	39
ATLANTIC TOMCOD	UNIDENTIFIED	1	0.00000	0.00000	1
	YOLK-SAC LARVAE	3	0.00000	0.00000	1
	POST YOLK SAC LARVAE	223	0.00000	0.00897	17
	YOUNG OF THE YEAR	416	0.00000	0.00000	45
BAY ANCHOVY	UNIDENTIFIED	3	0.33333	0.33333	1
	EGGS	3634	0.01761	0.03082	24
	POST YOLK SAC LARVAE	2299	0.00870	0.02175	74
	YOUNG OF THE YEAR	1281	-0.00859	0.02576	58
GOBY FAMILY	UNIDENTIFIED	2	0.00000	0.00000	1
	POST YOLK SAC LARVAE	760	-0.00921	0.01184	50
	YOUNG OF THE YEAR	5	0.80000	0.80000	7
HERRING FAMILY	UNIDENTIFIED	4	0.00000	0.00000	1
	EGGS	314	0.01274	0.01274	18
	YOLK-SAC LARVAE	496	-0.03629	0.04032	54
	POST YOLK SAC LARVAE	7189	-0.00097	0.01711	163
	YOUNG OF THE YEAR	2	0.00000	0.00000	1
HOGCHOKER	EGGS	686	-0.01312	0.01895	9
	POST YOLK SAC LARVAE	6	0.00000	0.00000	3
	YOUNG OF THE YEAR	2	0.00000	0.00000	2
MORONE SPECIES	UNIDENTIFIED	961	0.02601	0.04475	41
	YOLK-SAC LARVAE	14	0.50000	0.50000	4
	POST YOLK SAC LARVAE	3069	0.03747	0.04529	68
STRIPED BASS	UNIDENTIFIED	11	0.18182	0.36364	4
	EGGS	6412	-0.00172	0.01357	59
	YOLK-SAC LARVAE	7669	-0.00456	0.02021	92
	POST YOLK SAC LARVAE	24885	-0.00072	0.02130	123
	YOUNG OF THE YEAR	45	0.02222	0.02222	9
TESSELLATED DARTER	UNIDENTIFIED	1	0.00000	0.00000	1
	YOLK-SAC LARVAE	115	0.00000	0.03478	32
	POST YOLK SAC LARVAE	98	-0.02041	0.04082	26

(CONTINUED)

TABLE 12. (Continued)

TAXON	STAGE	TOTAL COUNT	NET ERROR RATE	ABSOLUTE ERROR RATE	N
WEAKFISH	EGGS	685	0.01460	0.02628	13
	YOLK-SAC LARVAE	1	0.00000	0.00000	1
	POST YOLK SAC LARVAE	93	0.00000	0.02151	25
	YOUNG OF THE YEAR	72	0.00000	0.02778	19
WHITE PERCH	UNIDENTIFIED	6	0.00000	0.00000	1
	EGGS	383	0.01044	0.02611	33
	YOLK-SAC LARVAE	2026	-0.00099	0.02073	74
	POST YOLK SAC LARVAE	8409	-0.01546	0.02997	128
	YOUNG OF THE YEAR	3	0.33333	0.33333	3
WINTER FLOUNDER	UNIDENTIFIED	13	0.00000	0.30769	4
	YOLK-SAC LARVAE	52	0.03846	0.03846	6
	POST YOLK SAC LARVAE	512	-0.01758	0.02148	25
	YOUNG OF THE YEAR	6	-0.16667	0.16667	4

TABLE 13. FRACTION INSPECTED, PERCENT NONCONFORMING, AND AVERAGE OUTGOING QUALITY OF LABORATORY TASKS PERFORMED BY NAI FOR THE 2000 ALL JUVENILE SURVEY .

TASK	AVERAGE FRACTION INSPECTED(%)	PERCENT NONCON-FORMING(%)	AVERAGE OUTGOING QUALITY(%)
Identification	4.95	1.46	1.33
Measurement	3.22	1.43	1.39

4.0 LITERATURE CITED

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