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PRECISION AND VARIABILITY OF SCALE PATTERN DATA FROM TWO STOCKS OF SOUTHEASTERN ALASKAN COHO SALMON

by

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ABSTRACT

The objectives of this project were to 1) provide age determinations and scale measurement data for a study to determine the effects of logging on juvenile coho salmon in two southeastern Alaskan streams, 2) compare the precision of age determinations by several different readers, and 3) examine sample and reader variability in scale measurements. The results of objectives 2 and 3 were used to evaluate the consistency of age determinations and scale measurements, the quality of the scale samples, and the adequacy of the data for further analyses of the effect of environment on age and growth.

The scales from a total of 3,785 coho salmon collected from Deer Track Creek and Kake Bake Creek, Kupreanof Island in 1983-1985 were aged and measured by three experienced scale readers. Precisions of age determinations, calculated by an index of average percent error, were 9.3%, 2.0%, and 16.7% for Kake Bake samples and 10.0%, 6.0%, and 10.0% for Deer Track samples for reader nos. 1, 2, and 3, respectively, and are thought to be adequate. Average percent agreement among the three readers was good (84% for Kake Bake and 92% for Deer Track). Changes in age determinations never varied more than $\pm$ 1 year, were not uniformly negative or positive, and should not result in any large consistent biases in subsequent age composition or survival estimates. Accuracy of the age determinations could not be evaluated, but potential sources of error include false annuli, late emergence, regenerated scales, body area of scale collection, dirty, obscured, or eroded scales, and tagged or marked fish. Age verification studies to determine the reliability of freshwater age determinations from scale patterns were recommended. No statistically significant ($\alpha = 0.05$) sample effects (3 scales per fish) for either stock in any of the scale characters tested were found. There were statistically significant ($\alpha = 0.05$) reader effects for some scale characters, but the magnitudes of these differences were not considered large enough to warrant concern over the consistency of the data or adequacy of the data for further analyses.

Precision and Variability of Scale Pattern Data from Two Stocks of Southeastern Alaskan Coho Salmon

INTRODUCTION

Freshwater age and growth characteristics of coho salmon (Oncorhynchus kisutch) near the center of their range (southeastern Alaska) are variable (Crone and Bond 1976). Natural variability in age and growth is related to both genetic and environmental factors, and alterations in habitat such as those resulting from logging are also known to affect growth rates of juvenile coho salmon (Scrivener and Andersen 1984). Because differences in fish growth are reflected in the structural features of scales, scale pattern analysis is a likely technique for examining the effects of changes in habitat components (e.g., temperature, primary productivity, turbidity, etc.) on age and growth of juvenile coho salmon. However, scale characteristics of coho salmon are known to vary with sampling location on the body (Scarnecchia 1979), and interpretation of coho salmon scale features among readers can be variable and inaccurate (Peck 1970; Kato 1977, 1984; Machidori 1981; Myers et al. 1981).

The objectives of this project were to: 1) provide age determinations and scale measurement data for a study to determine the effects of logging on juvenile coho salmon in two southeastern Alaskan streams, 2) compare the precision of age determinations by several different readers, and 3) examine sample and reader variability in scale measurements. The results from objectives 2 and 3 will be used to evaluate the consistency of age determinations and scale measurements, the quality of the scale samples, and the adequacy of the data for further analyses of the effects of changes in habitat on age and growth.

METHODS

Age Determination and Scale Measurement

Scale samples collected from approximately 4,000 juvenile coho salmon and 100 coho adults from two streams in southeastern Alaska (Kake Bake Creek and Deer Track Creek, Kupreanof Island) were provided by the National Marine Fisheries Service (NMFS), Auke Bay Laboratory. The sample for each fish consisted of a smear of scales inside of a folded strip of clear acetate. Each sample was contained in a separate coin envelope, and biological and sample information for the fish was recorded on the outside of the envelope.

The scale samples were measured on the Fisheries Research Institute's (FRI) microcomputer-based digitizing system. Because of the large number of samples and the short period of time (2 months) in which the work had to be completed, the samples were aged and measured by three experienced readers.

Each acetate strip was magnified at 210X, and the freshwater age was determined by visual examination of scale features. Biological and sample (header) information was read from the scale sample envelope and coded onto a CRT form. The header information included the following variables:

stream,
treatment,
strata,
lower reach,
upper reach,
month,
day,
year,
scale number,
brand,
fin clip,
species,
life history stage,
length,
weight,
FRI age determination, and
FRI reader code.

Codes for stream, treatment, strata, fin clips, brands, species, and life history stage were provided by NMFS and are listed in Appendix Table 1.

One scale per fish was selected for measurement and aligned on a standard measurement axis (Fig. 1). Because the acetate strips often contained as many as 50 or more scales per fish, readers were instructed to select the 'best' scale that they could find, i.e., a large, nonregenerated scale with the greatest number of circuli. The diameter of the focus (from outer edge to outer edge) and the width of each successive space and circulus through the last circulus on the scale was digitized. Each incremental measurement was assigned one of the following 'key' codes to identify the scale character or life history stage as interpreted by the reader:

1 = diameter of focus,
2 = first year of growth,
3 = first annulus,
4 = second year of growth,
5 = second annulus,
6 = third year of growth,
7 = third annulus,
8 = fourth year of growth, and
9 = fourth annulus.

An 'annulus' was defined as the last space and the last circulus in each year of growth and consisted of only two measurements, i.e., the width of the space preceding the last circulus and the width of the last

circulus in each year of growth. For scales collected during the winter (after January 1) and spring, if there was no visible annulus at or near the edge of the scale but the reader interpreted the last zone on the scale as a full year of growth, then the last space and the last circulus at the edge of the scale were digitized as the annulus, and one false increment, identified with the code for the next year of growth, was entered as the last 'measurement' on the scale. For scales collected during the summer, fall, or winter (prior to January 1), structures at or near the edge of the scale that had the appearance of annuli were assumed to be 'false annuli' or 'false checks,' and the increments were identified with the code for the appropriate year of growth. If there were no usable scales for a particular fish, then a single record with all of the header information was coded. The FRI age determination was coded 'R' if all the scales in a sample were grossly regenerated or otherwise unusable and 'X' if the reader thought that there might be a usable scale if the samples were cleaned and remounted.

After each scale was measured, the data were written to a computer disk file. The format of these multiple-record-per-fish (raw) data files is listed in Appendix Table 2.

A FORTRAN program was written to reformat the incremental measurements into the following variables:

1) length of focus,

2) total radius of the scale from the center of the focus to the outer edge of the last circulus,

3) scale radius of the i^{th} year from the outer edge of the $i-1^{th}$ annulus to outer edge of the i^{th} annulus,

4) total number of circuli excluding edge of focus and all annuli,

5) number of circuli in i^{th} year excluding edge of focus and the annulus,

6) total circuli width for i^{th} year excluding the annulus,

7) total circuli spacing for i^{th} year excluding the annulus, and

8) width of i^{th} year annulus.

The format of these single-record-per-fish (reformatted) data files is listed in Appendix Table 3.

Both the raw and reformatted scale data and header information were written to magnetic tape in a format (specified by NMFS) that is readable by the Burroughs 7800 computer. The magnetic tape, hard copies of the data files, and the source code of the FORTRAN program used to reformat the raw data were provided to NMFS. All scale samples were returned to NMFS after the measurements were completed.

Precision of Age Determinations

A random subsample of 50 fish each from the 1983 Kake Bake Creek and Deer Track Creek samples were aged on two separate occasions by each scale reader (see Appendix Figs. A1-A50 and B1-B50). The scales were aged once near the beginning (October) and once near the end (November) of the data collection period so that there was about a 1-month interval between the first and last times that the scales were aged.

The precision (reproducibility) of the age determinations was compared by the method of Beamish and Fournier (1981). The average percentage error for the j^{th} fish is:

$$\left[1/R \sum_{i=1}^{R} \frac{|X_{ij}-X_j|}{X_j} \right] 100$$

and the index of average percent error is:

$$\left[1/N \sum_{j=1}^{N} \left[1/R \sum_{i=1}^{R} \frac{|X_{ij}-X_j|}{X_j} \right] \right] 100$$

where X_{ij} is the i^{th} age determination of the j^{th} fish, X_j is the average age calculated for the j^{th} fish, R is the number of times each is aged, and N is the number of fish aged. The reader with the smallest index is the most precise.

Sample Variability in Scale Measurements

The same subsamples of 50 fish each from the 1983 Kake Bake Creek and Deer Track Creek samples used to determine reader precision of age determinations were used to examine the variability in scale measurements of several scales collected from the same fish (see Appendix Figs. A1-A50 and B1-B50). One reader measured all of the samples to reduce the effect of reader variability. Three scales were selected from each fish and digitized along the same measurement axis. The reader attempted to select the three 'best' scales that could be found for each fish by the same criteria described above, i.e., the largest non-regenerated scales with the greatest number of circuli.

The null hypothesis that there is no variability in scale measurements among samples was tested with a single factor (3 samples per fish) analysis of variance (ANOVA; Zar 1984) for each of the following characters:

NMEAS = total number of measurements (increments) digitized
LFOCUS = diameter of the focus (from outer edge to outer edge)
TOTRAD = total radius of scale (from center of focus to outer edge of last circulus)

SRAD1 = scale radius of 1st year (from center of focus to outer edge of 1st annulus)
TOTCIRC = total number of circuli (excluding edge of focus and all annuli)
NCIRC1 = Number of circuli in the 1st year (excluding the edge of focus and the annulus)
WIDTH1 = Total circuli width for the 1st year (excluding the focus and annulus)
SPACE1 = Total circuli spacing for the 1st year (excluding the annulus)

Reader Variability in Scale Measurements

The same subsamples of 50 fish each from the 1983 Kake Bake Creek and Deer Track Creek samples used to determine reader precision of age determinations and sample variability in scale measurements were used to examine reader variability in scale measurements (see Appendix Figs. A1-A50 and B1-B50). One scale from each fish was measured by each reader on at least two separate occasions. We attempted to measure the same scale (identified by a mark on the acetate) for each fish to eliminate sample variability. However, the selected scale for two fish in the Deer Creek sample (Appendix Figs. B5 and B25) were dislodged after the first reading and another scale was selected by each reader for the last reading. The first measurements were made at the beginning (October) of the data collection period and the last measurements were made near the end (November) of the data collection period so that there was about a 1-month interval between measurements.

Both among and within reader variability in scale measurements were examined. The null hypothesis that there is no variability in scale measurements among readers was tested with two single factor (3 readers) ANOVAs, one for the first set of measurements and one for the last set of measurements. If a significant ($\alpha = 0.05$) reader effect was found, then a Tukey multiple comparisons test was used to determine which readers were significantly different (Zar 1984). The null hypothesis that the difference between the first and last measurements made by each reader was equal to zero was tested with a two-tailed paired sample t-test ($\alpha = 0.05$; Zar 1984). The same eight scale characters described above for the analysis of sample variability were also used for these analyses.

RESULTS AND DISCUSSION

Age Determination and Scale Measurement

The number of coho salmon scales aged and measured is presented by stream, date, sample description, and freshwater age class in Table 1. The scales from a total of 3,785 fish were aged. Approximately 93% (3,512 scales) of the total were measured, 3% (120 fish) were samples in which all of the scales were grossly regenerated, and 4% (153 fish) were samples that might be measurable if the scales were cleaned and remounted.

The three FRI readers identified four freshwater age classes in the samples (0., 1., 2., and 3.). There were no scales that were assigned more than three freshwater annuli (Table 1). Age 0. was the dominant age class assigned to the August and November 1983 samples from Deer Track Creek, and age 1. was the most frequent age class in both the non-smolt and smolt trap samples from Deer Track Creek in the spring of 1984. In contrast, age 1. was the dominant age class assigned to the August and November, 1983 samples from Kake Bake Creek, and age 2. was the most frequent age class in the 1984 Kake Bake Creek smolt trap samples. However, age 1. was the overwhelmingly predominant freshwater age class in both the non-smolt and smolt trap samples collected from Kake Bake Creek in the spring of 1985. The adult samples from Kake Bake Creek in 1983-1985 contained similar proportions of age 1. (24%) and age 2. (28%) fish.

Precision of Age Determinations

The freshwater ages and average percent error in ageing for the first and second readings of 50 fish each from the 1983 Kake Bake Creek and Deer Track Creek samples by three FRI readers are presented in Tables 2-7. The reader should note that Beamish and Fournier's (1981) method is not independent of age. For example, the average percent error in changing an age from 0 to 1 (or vice versa) is greater (100%) than changing an age from 1 to 2 (33%). Therefore, the index of average percent error reflects the greater difficulty in ageing samples or stocks with older fish or more freshwater age classes.

The indices of average percent error for readers 1, 2, and 3 calculated for the Kake Bake Creek samples were 9.3%, 2.0%, and 16.7%, respectively. Reader 2 changed the age of only one fish, reader 1 changed the ages of six fish, and reader 3 changed the ages of eleven fish (Tables 2-4). All of these changes involved a difference in age of $\pm$ 1 year. FRI readers disagreed on the ages of eight fish (16% of the sample) in both the first and second readings of the Kake Bake Creek sample. Therefore, the average percent agreement between readers was 84%. Seventy-four percent of the fish in the Kake Bake Creek sample were assigned the same age in all six readings.

The indices of average percent error for readers 1, 2, and 3 calculated for the Deer Track Creek samples were 10.0%, 6.0%, and 10.0%, respectively. Reader 2 changed the ages of three fish and readers 1 and 3 changed the ages of five fish (Tables 5-7). Similar to the Kake Bake Creek results, all of these changes involved a difference in age of $\pm$ 1 year. Readers disagreed on the ages of six fish (12.0% of the sample) in the first reading and two fish (4.0% of the sample) in the second reading. Therefore the average percent agreement between readers was 92%. Eight-four percent of the fish in the Deer Track Creek sample were assigned the same age in all six readings.

Although precision varied with reader, stock, and time, the precision of the FRI age determinations is thought to be adequate. Ricker (1975) considered 80-90% agreement between two individuals as good. In addition, because changes in age determinations between the first and

second readings were not uniformly negative or positive (Tables 2-7,) they should not cause any large consistent bias in age composition or survival estimates.

The true ages of the fish in the Kake Bake Creek and Deer Track Creek samples were not known, and, therefore, the accuracy of the FRI age determinations cannot be evaluated. However, we would like to note the following potential sources of error in the FRI age determinations:

1) False Annuli

A major roadblock to obtaining accurate freshwater ages from the scale patterns of Kake Bake Creek and Deer Track Creek coho may be the presence of what was interpreted by FRI readers as a false check or false annulus at or near the edge of the scale on many of the fish in the August samples (e.g., Appendix Figs. A5, A6, A22, B10, and B15). Whether this type of check can be distinguished from a true annulus in samples collected at a later date is not known. Kato (1977) observed similar false annuli that formed on the scales of Washington coho in June and July. To further confound the problem, a false annulus on a younger, more rapidly growing coho may occur in the same position on the scale as a true annulus on an older, more slowly growing coho. Based upon unpublished studies of marked fish by R. Nobel, Royal (1972) noted that Washington coho that spend 2 years rearing in freshwater prior to ocean emigration exhibit little increase in total size over that of 1-year smolts, and that to distinguish the two age classes from their scales (perhaps because of the presence of false annuli) is impossible.

2) Late Emergence

Late emerging or slow growing coho may not form a scale in the first year of growth. Fish in the samples with this type of life history would be under-aged by one year.

3) Regenerated Scales

Although not quantified, the ratio of regenerated to non-regenerated scales in scrape samples taken from individual fish was often high. Scale loss may cause checks to form on non-regenerated scales, and these checks may be erroneously identified as annuli. Furthermore, the identification of slightly regenerated scales missing only a few circuli is very difficult. If the annulus occurs very close to the scale focus, then slightly regenerated scales may be under-aged by 1 year.

4) Body Area of Scale Collection

The body area of scale collection was not indicated on the sample envelopes. However, the wide range of shapes and sizes of scales in many of the samples and the large number of scales per fish indicate that the sample was taken from a large area of the body. In general, the farther the scale is from the lateral line the fewer the circuli.

If the annulus occurs very close to the scale focus as in late emerging fish, then scales collected well above the lateral line may be underaged by one year.

5) Dirty, Obscured, or Eroded Scales

Many of the scale samples were very dirty and the scales were often stacked one on top of another so that their individual features were obscured. Often the 'best' scales in the samples, i.e., the largest scales with the greatest number of circuli, were not usable. In addition, the circuli on the scales of the adult samples were often eroded so that identification of detailed features was difficult. The use of dirty, obscured, or eroded samples may result in both inaccurate and imprecise age determinations and scale measurements.

6) Tagged and Marked Fish

The Kake Bake Creek and Deer Track Creek samples contained many tagged and marked fish. The processes of capturing, anesthetizing, scaling, weighing, measuring, tagging or marking, and releasing can affect both scale structure and growth rate and may result in errors in age determination.

Because of these and other potential sources of error, we recommend that age verification studies be conducted on Kake Bake Creek and Deer Track Creek stocks to determine the reliability of freshwater age determinations from scale patterns.

Sample Variability in Scale Measurements

Results of the ANOVAs (three scale samples per fish) are presented in Table 8. There were no significant ($\alpha = .05$) sample effects for either stock in any of the scale characters tested. Therefore, sample variability in scale measurements for the type of 'best' scales selected by FRI readers in this study does not appear to be a problem and little would be gained by measuring more than 1 scale per fish. However, if a completely random sample, e.g. one that included grossly regenerated scales, had been selected, then significant sample effects would have been likely.

Reader Variability in Scale Measurements

Results of the ANOVAs (three readers) for the first set of measurements are presented in Table 9. There were significant ($\alpha = .05$) reader effects in only three tests (Deer Track - WIDTH1, Kake Bake - WIDTH1 and SPACE1). The results of the Tukey multiple comparisons tests showed that measurements of WIDTH1 by reader 1 were significantly different ($\alpha = .05$) than measurements of WIDTH1 by readers 2 and 3 for both stocks, and measurements of SPACE1 by readers 1 and 2 were significantly different for the Kake Bake sample.

The results of these tests clearly indicated that reader 1 was making larger measurements of circulus width and smaller measurements of circulus space than the other two readers. After this initial test, readers 2 and 3 demonstrated their measurement techniques to Reader 1, and Reader 1 attempted to duplicate their methods while remeasuring the Kake Bake Creek samples. Sample means and results of a single factor (three readers) ANOVA with readers 2's and 3's first set of measurements and reader 1's second set of measurements are presented in Table 10. There were no significant (α = .05) reader effects for any of the scale characters.

The results of the ANOVAs (three readers) for the last set of measurements are presented in Table 11. There was a significant (α = .05) reader effect in only one test (Deer Track - WIDTH1). The results of a Tukey multiple comparisons test showed that reader 2's measurements of WIDTH1 were significantly different (α = .05) than readers 1's and 3's measurements. The sample means of this character show that measurements of WIDTH1 by reader 2 are somewhat larger ($\approx$.1 in) than measurements of WIDTH1 by readers 1 and 3 (Table 11).

The results of paired sample t-tests of the first and last measurements of the Deer Track Creek and Kake Bake Creek samples by readers 1, 2, and 3 are presented in Tables 12 and 13, respectively. Not surprisingly, since reader 1's measurement techniques differed between the first and last set of measurements, there were a number of significant differences for reader 1 for both stocks (Tables 12 and 13). However, paired sample t-tests of the second and last measurements of the Kake Bake Creek samples by reader 1 showed no significant (α = .05) differences for any of the scale characters (Table 14). There were no significant differences for any of the scale characters between the first and last measurements of the Kake Bake Creek samples by readers 2 and 3 (Table 13), but there were significant differences in several scale characters for readers 2 and 3 in the Deer Track Creek measurements.

For all of these tests, significant mean differences in circulus counts ranged in value from $\pm$ .56 to 1.4 circuli and significant mean differences in measurements ranged in value from $\pm$ .035 to .233 in (Table 12 and 13). Differences of these magnitudes could certainly be attributable to factors such as slight differences in measurement axes, but, in our opinion, are not great enough to warrant concern over consistency of the data or adequacy of the data for further analyses. However, in future analyses care should be taken not to attribute difference of these magnitudes to ecological or other factors.

SUMMARY AND CONCLUSIONS

1. The scales from a total of 3,785 coho salmon collected from two streams in southeastern Alaska (Kake Bake Creek and Deer Track Creek, Kupreanof Island) in 1983-1985 were aged by three experienced FRI readers. Of these, 93% (3,512 scales) were measured, 3% (120 fish) were samples in which all of the scales were grossly

regenerated, and 4% (153 fish) were samples that might be measurable if the scales were cleaned and remounted (Table 1).

2. The three FRI readers identified four freshwater age classes in the samples (0., 1., 2., and 3.). There were no scales that were assigned more than three freshwater annuli (Table 1).

3. Age 0. was the dominant age class assigned to the August and November, 1983 samples from Deer Creek and age 1. was the most frequent age class in samples of this stock from the following spring. Age 1. was the dominant age class in the August and November, 1983 samples from Kake Bake Creek, and age 2. was the most frequent age class in samples of this stock from the following spring. Age 1. was the overwhelmingly predominant age class in samples collected from Kake Bake Creek in the spring of 1985. Pooled adult samples from Kake Bake Creek in 1983-85 contained similar proportions of age 1. (24%) and age 2. (28%) fish.

4. Indices of average percent error in ageing for FRI readers 1, 2, and 3 calculated for a sub-sample of 50 fish from the 1983 Kake Bake Creek (Tables 2-4) samples were 9.3%, 2.0%, and 16.7%, respectively. The average percent agreement between readers for this sample was 84%.

5. Indices of average percent error in ageing for FRI readers 1, 2, and 3 calculated for a sub-sample of 50 fish from the 1983 Deer Track Creek samples (Table 5-7) were 10.0%, 6.0% and 10.0%, respectively. The average percent agreement between readers for this sample was 92%.

6. Precisions in ageing by FRI readers are thought to be adequate and reader agreement is good. Changes in age determinations between the first and last readings never varied more than $\pm$ 1 year and were not uniformly negative or positive. Therefore, these changes should not result in any large consistent bias in age composition or survival estimates.

7. The accuracy of FRI age determinations could not be evaluated, as the true ages of fish in the samples were not known. Potential sources of error in the FRI age determinations are false annuli, late emergence, regenerated scales, body area of scale collection, dirty, obscured, or eroded scales, and tagged and marked fish. Because of these and other potential sources of error, we recommend that age verification studies be conducted on these stocks to determine the reliability of freshwater age determinations from scale patterns.

8. The results of ANOVAs (three scales per fish) showed that there were no significant sample effects for either stock in any of the scale characters tested (Table 8). Therefore, sample variability in scale measurements for the types of scales selected by FRI readers in this study does not appear to be a problem.

9. The results of ANOVAs (3 readers) and paired sample t-tests of two different readings of the same scales by each reader showed some statistically significant differences ($\alpha = 0.05$) for some readers and scale characters. For all of these tests, significant mean differences in circulus counts ranged in value from $\pm$ .56 to 1.4 circuli and significant mean differences in measurements ranged in value from $\pm$ .035 to .233 in (Table 12 and 13). In our opinion, differences of these magnitudes are not great enough to warrant concern over consistency or adequacy of the data for further analyses. However, in future analyses care should be taken not to attribute differences of these magnitudes to ecological or other factors.

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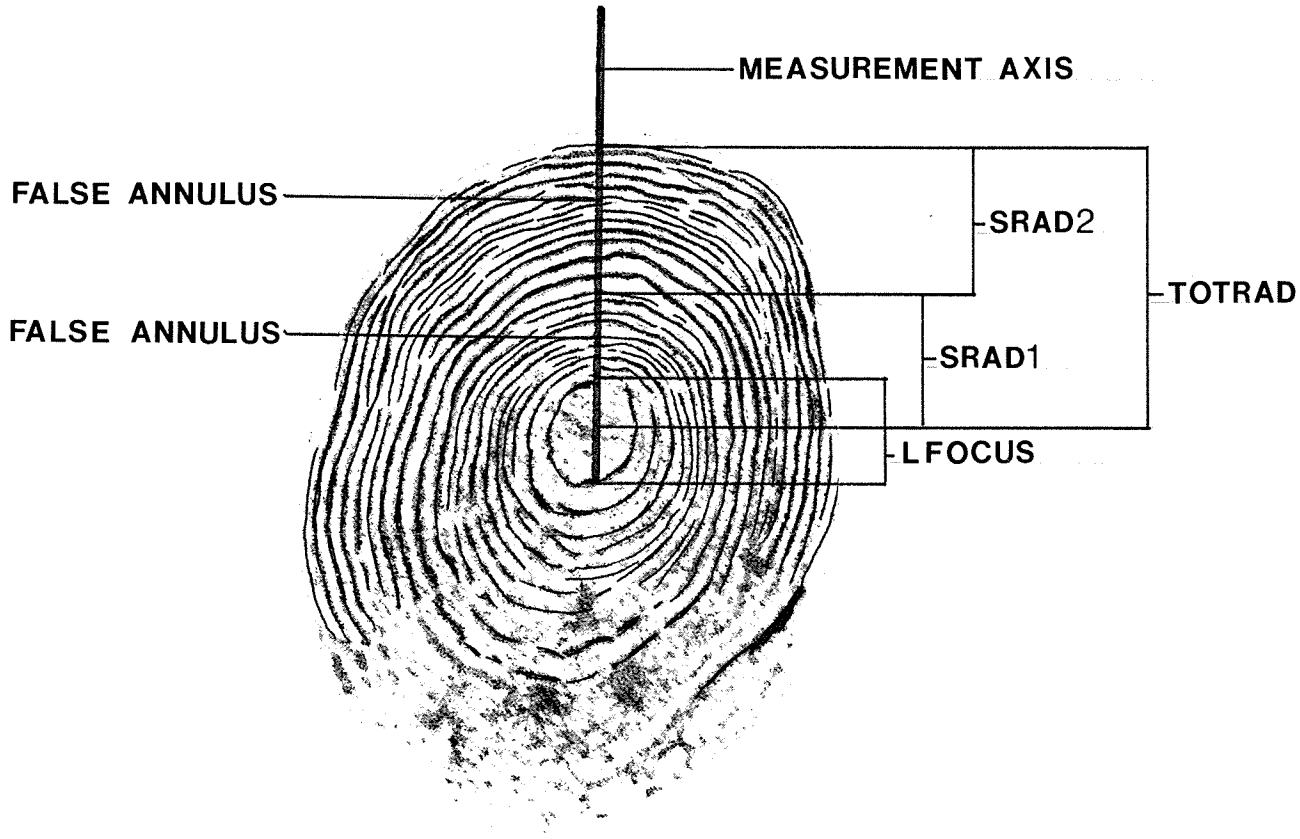


Fig. 1. The measurement axis and other features on the scale of a juvenile coho salmon (107 mm, 13.6 g) from Deer Track Creek on 9 November 1983. The true age of the fish is not known, but the scale was aged as a 1. (one freshwater annulus) by three Fisheries Research Institute (FRI) readers. Two checks that were identified by FRI readers as false annuli are also indicated. The picture was made on a Minolta micro-fiche copier with a 90X lens. LFOCUS = length of focus (from outer edge to outer edge), TOTRAD = total radius of the scale from center of focus to outer edge of last circulus, SRAD1 = scale radius of 1st year from center of focus to outer edge of 1st annulus, SRAD2 = scale radius of 2nd year from outer edge of the 1st annulus to outer edge of the last circulus.

Table 1. The number of coho scales aged and measured by stream, date, sample description, and freshwater age class. X = sample might be usable if the scales were cleaned and remounted; R = all scales in the sample were grossly regenerated or otherwise unusable; 0 = no freshwater annuli; 1 = one freshwater annulus; 2 = two freshwater annuli; 3 = three freshwater annuli; 4 = four freshwater annuli.

Stream	Date	Sample description		Freshwater age							Total
				X	R	0	1	2	3	4	
Deer Track	Aug. & Nov., 1983	Non-smolt	No.	7	3	254	22	2	0	0	288
			%	2.43	1.04	88.19	7.64	0.69	0.00	0.00	100.0
"	1984	Smolt trap	No.	22	11	0	322	60	1	0	416
			%	5.29	2.64	0.00	77.40	14.42	0.24	0.00	100.0
"	Feb.,May,Jun., 1984	Non-smolt	No.	0	2	0	47	7	2	0	58
			%	0.00	3.45	0.00	81.03	12.07	3.45	0.00	100.0
Kake Bake	Aug. & Nov., 1983	Non-smolt	No.	9	8	110	192	10	1	0	330
			%	2.73	2.42	33.33	58.18	3.03	0.30	0.00	100.0
"	1984	Smolt-trap	No.	38	34	1	317	372	10	0	772
			%	4.92	4.40	0.13	41.06	48.19	1.30	0.00	100.0
"	Feb., Jun., Oct. & Nov., 1984	Non-smolt	No.	5	9	280	175	15	1	0	485
			%	1.03	1.86	57.73	36.08	3.09	0.21	0.00	100.0
"	1985	Smolt-trap	No.	10	18	0	475	135	4	0	642
			%	1.56	2.80	0.00	73.99	21.03	0.62	0.00	100.0
"	Mar. & Jun., 1985	Non-smolt	No.	6	7	0	525	81	1	0	620
			%	0.97	1.13	0.00	84.68	13.06	0.16	0.00	100.0
"	1983-1985	Adult	No.	56	28	0	42	48	0	0	174
			%	32.18	16.09	0.00	24.14	27.59	0.00	0.00	100.0
Total			No.	153	120	645	2117	730	20	0	3785
			%	4.04	3.17	17.04	55.93	19.29	0.53	0.00	100.0

Table 2. Freshwater ages and average percent error (Beamish and Fournier, 1981) for first (AGE 1) and second (AGE 2) readings of 50 fish from Kake Bake Creek in 1983 by reader 1. Pictures of the scales are shown in Appendix Figs. A1-A50.

FISH NUMBER	AGE 1	AGE 2	AVERAGE ERROR (%)
1	2.	2.	.00
2	0.	0.	.00
3	1.	1.	.00
4	1.	1.	.00
5	0.	0.	.00
6	0.	0.	.00
7	0.	0.	.00
8	0.	0.	.00
9	0.	0.	.00
10	0.	0.	.00
11	1.	1.	.00
12	1.	1.	.00
13	1.	1.	.00
14	0.	0.	.00
15	1.	1.	.00
16	1.	1.	.00
17	2.	2.	.00
18	1.	1.	.00
19	1.	1.	.00
20	1.	1.	.00
21	0.	0.	.00
22	1.	1.	.00
23	0.	1.	100.00
24	1.	1.	.00
25	1.	1.	.00
26	1.	2.	33.33
27	1.	1.	.00
28	0.	0.	00
29	0.	0.	.00
30	1.	1.	.00
31	2.	1.	33.33
32	1.	0.	100.00
33	1.	1.	.00
34	0.	0.	.00
35	1.	1.	.00
36	1.	1.	.00
37	0.	0.	.00
38	1.	1.	.00
39	0.	1.	100.00
40	0.	0.	.00
41	1.	0.	100.00
42	1.	1.	.00
43	1.	1.	.00
44	0.	0.	.00
45	1.	1.	.00
46	0.	0.	.00
47	1.	1.	.00
48	1.	1.	.00
49	2.	2	.00
50	0.	0.	.00

Table 3. Freshwater ages and average percent error (Beamish and Fournier, 1981) for first (AGE 1) and second (AGE 2) readings of 50 fish from Kake Bake Creek in 1983 by reader 2. Pictures of the scales are shown in Appendix Figs. A1-A50.

FISH NUMBER	AGE 1	AGE 2	AVERAGE ERROR (%)
1	2.	2.	.00
2	0.	0.	.00
3	1.	1.	.00
4	1.	1.	.00
5	0.	0.	.00
6	0.	0.	.00
7	0.	0.	.00
8	0.	0.	.00
9	0.	0.	.00
10	0.	0.	.00
11	1.	1.	.00
12	1.	1.	.00
13	1.	1.	.00
14	0.	0.	.00
15	1.	1.	.00
16	1.	1.	.00
17	2.	2.	.00
18	0.	1.	100.00
19	1.	1.	.00
20	1.	1.	.00
21	0.	0.	.00
22	1.	1.	.00
23	0.	0.	.00
24	1.	1.	.00
25	1.	1.	.00
26	1.	1.	.00
27	1.	1.	.00
28	0.	0.	.00
29	0.	0.	.00
30	1.	1.	.00
31	1.	1.	.00
32	1.	1.	.00
33	1.	1.	.00
34	0.	0.	.00
35	1.	1.	.00
36	1.	1.	.00
37	0.	0.	.00
38	1.	1.	.00
39	1.	1.	.00
40	0.	0.	.00
41	1.	1.	.00
42	1.	1.	.00
43	1.	1.	.00
44	0.	0.	.00
45	1.	1.	.00
46	0.	0.	.00
47	0.	0.	.00
48	1.	1.	.00
49	2.	2.	.00
50	0.	0.	.00

Table 4. Freshwater ages and average percent error (Beamish and Fournier, 1981) for first (AGE 1) and second (AGE 2) readings of 50 fish from Kake Bake Creek in 1983 by reader 3. Pictures of the scales are shown in Appendix Figs. A1-A50.

FISH NUMBER	AGE 1	AGE 2	AVERAGE ERROR (%)
1	1.	1.	.00
2	0.	0.	.00
3	1.	1.	.00
4	1.	1.	.00
5	0.	0.	.00
6	0.	0.	.00
7	0.	0.	.00
8	0.	0.	.00
9	0.	0.	.00
10	0.	0.	.00
11	1.	1.	.00
12	1.	1.	.00
13	1.	1.	.00
14	0.	0.	.00
15	1.	1.	.00
16	1.	1.	.00
17	1.	2.	33.33
18	1.	1.	.00
19	1.	1.	.00
20	1.	1.	.00
21	0.	0.	.00
22	1.	1.	.00
23	0.	1.	100.00
24	1.	1.	.00
25	1.	1.	.00
26	1.	2.	33.33
27	1.	1.	.00
28	0.	0.	.00
29	0.	0.	.00
30	1.	2.	33.33
31	1.	2.	33.33
32	1.	0.	100.00
33	1.	1.	.00
34	1.	0.	100.00
35	1.	1.	.00
36	1.	1.	.00
37	1.	0.	100.00
38	1.	1.	.00
39	0.	1.	100.00
40	0.	0.	.00
41	1.	0.	100.00
42	1.	1.	.00
43	1.	1.	.00
44	0.	0.	.00
45	1.	1.	.00
46	0.	0.	.00
47	1.	0.	100.00
48	1.	1.	.00
49	2.	2.	.00
50	0.	0.	.00

Table 5. Freshwater ages and average percent error (Beamish and Fournier, 1981) for first (AGE 1) and second (AGE 2) readings of 50 fish from Deer Track Creek in 1983 by reader 1. Pictures of the scales are shown in Appendix Figs. B1-B50.

FISH NUMBER	AGE 1	AGE 2	AVERAGE ERROR (%)
1	0.	0.	.00
2	0.	0.	.00
3	1.	1.	.00
4	0.	0.	.00
5	0.	0.	.00
6	0.	0.	.00
7	0.	0.	.00
8	0.	0.	.00
9	0.	0.	.00
10	0.	0.	.00
11	0.	0.	.00
12	0.	0.	.00
13	0.	0.	.00
14	0.	0.	.00
15	0.	0.	.00
16	0.	0.	.00
17	0.	0.	.00
18	0.	0.	.00
19	0.	0.	.00
20	1.	0.	100.00
21	0.	0.	.00
22	0.	0.	.00
23	0.	0.	.00
24	0.	0.	.00
25	0.	0.	.00
26	1.	0.	100.00
27	1.	1.	.00
28	0.	0.	.00
29	1.	1.	.00
30	1.	1.	.00
31	1.	0.	100.00
32	0.	0.	.00
33	0.	0.	.00
34	1.	0.	100.00
35	1.	0.	100.00
36	0.	0.	.00
37	0.	0.	.00
38	0.	0.	.00
39	0.	0.	.00
40	1.	1.	.00
41	0.	0.	.00
42	0.	0.	.00
43	0.	0.	.00
44	1.	1.	.00
45	0.	0.	.00
46	0.	0.	.00
47	0.	0.	.00
48	1.	1.	.00
49	0.	0.	.00
50	0.	0.	.00

Table 6. Freshwater ages and average percent error (Beamish and Fournier, 1981) for first (AGE 1) and second (AGE 2) readings of 50 fish from Deer Track Creek in 1983 by reader 2. Pictures of the scales are shown in Appendix Figs. B1-B50.

FISH NUMBER	AGE 1	AGE 2	AVERAGE ERROR (%)
1	0.	0.	.00
2	0.	0.	.00
3	1.	1.	.00
4	0.	0.	.00
5	0.	0.	.00
6	0.	0.	.00
7	0.	0.	.00
8	0.	0.	.00
9	0.	0.	.00
10	0.	0.	.00
11	0.	0.	.00
12	0.	0.	.00
13	0.	0.	.00
14	0.	0.	.00
15	0.	0.	.00
16	0.	0.	.00
17	0.	0.	.00
18	0.	0.	.00
19	0.	0.	.00
20	0.	0.	.00
21	0.	0.	.00
22	0.	0.	.00
23	0.	0.	.00
24	0.	0.	.00
25	0.	0.	.00
26	0.	0.	.00
27	1.	1.	.00
28	0.	0.	.00
29	1.	1.	.00
30	1.	1.	.00
31	1.	1.	.00
32	0.	0.	.00
33	0.	0.	.00
34	0.	0.	.00
35	1.	0.	100.00
36	0.	0.	.00
37	0.	0.	.00
38	1.	0.	100.00
39	0.	0.	.00
40	1.	1.	.00
41	0.	0.	.00
42	0.	0.	.00
43	1.	0.	100.00
44	1.	1.	.00
45	0.	0.	.00
46	0.	0.	.00
47	0.	0.	.00
48	1.	1.	.00
49	0.	0.	.00
50	0.	0.	.00

Table 7. Freshwater ages and average percent error (Beamish and Fournier, 1981) for first (AGE 1) and second (AGE 2) readings of 50 fish from Deer Track Creek in 1983 by reader 3. Pictures of the scales are shown in Appendix Figs. B1-B50.

FISH NUMBER	AGE 1	AGE 2	AVERAGE ERROR (%)
1	0.	0.	.00
2	0.	0.	.00
3	1.	1.	.00
4	0.	0.	.00
5	0.	0.	.00
6	0.	0.	.00
7	0.	0.	.00
8	0.	0.	.00
9	0.	0.	.00
10	0.	0.	.00
11	0.	0.	.00
12	0.	0.	.00
13	0.	0.	.00
14	0.	0.	.00
15	0.	0.	.00
16	0.	0.	.00
17	0.	0.	.00
18	0.	0.	.00
19	0.	0.	.00
20	1.	1.	.00
21	0.	0.	.00
22	0.	0.	.00
23	0.	0.	.00
24	0.	0.	.00
25	0.	0.	.00
26	0.	0.	.00
27	1.	1.	.00
28	0.	0.	.00
29	1.	1.	.00
30	1.	1.	.00
31	1.	0.	100.00
32	0.	0.	.00
33	1.	0.	100.00
34	1.	0.	100.00
35	1.	0.	100.00
36	0.	0.	.00
37	0.	0.	.00
38	0.	0.	.00
39	0.	0.	.00
40	1.	1.	.00
41	0.	0.	.00
42	0.	0.	.00
43	1.	0.	100.00
44	1.	1.	.00
45	0.	0.	.00
46	0.	0.	.00
47	0.	0.	.00
48	1.	1.	.00
49	0.	0.	.00
50	0.	0.	.00

Table 8. Sample means and results of single factor (three scale samples per fish) analysis of variance of eight scale characters and two stocks. All sample sizes are equal to 50 fish. Scale characters are defined in Appendix Table 3. Measurements are inches x 10^3 for scales magnified at 210X.

Scale character	Mean			F-Probability
	Scale 1	Scale 2	Scale 3	
Deer Track				
NMEAS	24.32	23.44	23.52	.8228
LFOCUS	1596.08	1600.28	1569.32	.8038
TOTRAD	2763.82	2729.16	2652.08	.6665
SRAD1	2409.32	2351.20	2330.00	.7818
TOTCIRC	11.42	10.98	11.02	.7954
NCIRC1	9.22	8.64	8.90	.5621
WIDTH1	621.40	582.14	586.02	.6215
SPACE1	960.66	939.18	927.76	.8832
Kake Bake				
NMEAS	31.60	31.60	31.24	.9852
LFOCUS	1508.66	1511.48	1533.34	.8736
TOTRAD	3175.90	3178.88	3111.86	.9415
SRAD1	2059.68	2048.40	2037.30	.9903
TOTCIRC	14.60	14.60	14.42	.9832
NCIRC1	7.80	7.78	7.90	.9834
WIDTH1	628.26	598.72	604.54	.9336
SPACE1	606.20	623.02	597.06	.9353

Table 9. Sample means and results of single factor (three readers) analysis of variance of eight scale characters for the first measurements of the Deer Creek and Kake Bake Creek samples. All sample sizes are equal to 50 fish. Scale characters are defined in Appendix Table 3. Measurements are inches x 10^3 for scales magnified at 210X.

Scale character	Mean			F-Probability
	Reader 1	Reader 2	Reader 3	
Deer Track				
NMEAS	24.32	23.24	23.92	.7648
LFOCUS	1596.08	1563.62	1545.80	.6000
TOTRAD	2763.82	2709.66	2719.74	.9009
SRAD1	2409.32	2358.08	2319.24	.7684
TOTCIRC	11.42	10.09	11.20	.7492
NCIRC1	9.22	8.82	8.74	.6521
WIDTH1	621.40	498.68	463.40	.0002
SPACE1	960.66	1051.42	1051.90	.4216
Kake Bake				
NMEAS	31.60	29.48	30.48	.6486
LFOCUS	1508.66	1474.66	1457.98	.5777
TOTRAD	3175.90	3118.32	3148.34	.9657
SRAD1	2059.68	2070.72	2018.64	.9402
TOTCIRC	14.60	13.58	14.06	.6333
NCIRC1	7.80	7.68	7.28	.7090
WIDTH1	628.26	432.84	441.42	.0044
SPACE1	606.20	824.88	773.98	.0327

Table 10. Sample means and results of single factor (three readers) analysis of variance of eight scale characters for the first measurements of the Kake Bake samples by readers 2 and 3 and the second measurements of the Kake Bake samples by reader 1. All sample sizes are equal to 50 fish. Scale characters are defined in Appendix Table 3. Measurements are inches x 10^3 for scales magnified at 210X.

Scale character	Mean			F-Probability
	Reader 1	Reader 2	Reader 3	
NMEAS	30.20	29.48	30.48	.9010
LFOCUS	1497.74	1474.66	1457.98	.6941
TOTRAD	3153.28	3118.32	3148.34	.9853
SRAD1	2036.94	2070.72	2018.64	.9352
TOTCIRC	13.88	13.58	14.06	.9001
NCIRC1	7.40	7.68	7.28	.8012
WIDTH1	415.12	432.84	441.42	.8519
SPACE1	791.72	824.88	773.98	.8498

Table 11. Sample means and results of single factor (three readers) analysis of variance of eight scale characters for the last measurements of the Deer Creek and Kake Bake Creek samples. All sample sizes are equal to 50 fish. Scale characters are defined in Appendix Table 3. Measurements are inches x 10^3 for scales magnified at 210X.

Scale character	Mean			F-Probability
	Reader 1	Reader 2	Reader 3	
Deer Track				
NMEAS	23.76	23.08	24.00	.8048
LFOCUS	1546.12	1578.68	1553.18	.7850
TOTRAD	2707.42	2717.14	2735.10	.9744
SRAD1	2456.86	2434.80	2445.34	.9850
TOTCIRC	11.24	10.88	11.34	.7730
NCIRC1	9.68	9.24	9.58	.7111
WIDTH1	520.18	627.14	511.72	.0068
SPACE1	1148.44	999.74	1138.78	.1303
Kake Bake				
NMEAS	30.20	29.80	30.84	.9003
LFOCUS	1480.34	1501.16	1479.36	.8797
TOTRAD	3140.82	3150.58	3137.94	.9982
SRAD1	2082.22	2071.70	2055.96	.9795
TOTCIRC	13.90	13.72	14.22	.8915
NCIRC1	7.84	7.60	7.80	.9066
WIDTH1	424.56	457.46	397.66	.3406
SPACE1	839.30	781.70	848.08	.6817

Table 12. Results of paired-sample t-tests of the first and last measurements of the Deer Track Creek test sample by three scale readers. All sample sizes are equal to 50 fish. Scale characters are defined in Appendix Table 3. Measurements are inches x 10^3 for scales magnified at 210X.

Scale character	Mean difference			Standard error			t-probability		
	Reader 1	Reader 2	Reader 3	Reader 1	Reader 2	Reader 3	Reader 1	Reader 2	Reader 3
NMEAS	.56	.16	-.08	.26	.18	.24	.04	.38	.74
LFOCUS	49.96	-15.06	-7.38	9.16	10.28	7.03	.00	.15	.30
TOTRAD	56.40	-7.48	-15.36	19.90	11.75	9.72	.01	.53	.12
SRAD1	-47.54	-76.72	-126.10	53.61	34.78	42.79	.38	.03	.01
TOTCIRC	.18	.02	-.14	.14	.08	.13	.19	.80	.27
NCIRC1	-.46	-.42	-.84	.35	.22	.31	.20	.06	.01
WIDTH1	101.22	-128.46	-48.32	23.06	18.17	17.06	.00	.00	.01
SPACE1	-187.78	51.68	-86.88	39.57	28.30	33.81	.00	.07	.01

Table 13. Results of paired-sample t-tests of the first and last measurements of the Kake Bake Creek test sample by three scale readers. All sample sizes are equal to 50 fish. Scale characters are defined in Appendix Table 3. Measurements are inches x 10^3 for scales magnified at 210X.

Scale character	Mean difference			Standard error			t-probability		
	Reader 1	Reader 2	Reader 3	Reader 1	Reader 2	Reader 3	Reader 1	Reader 2	Reader 3
NMEAS	1.40	-.32	-.36	.33	.41	.33	.00	.44	.28
LFOCUS	28.32	-26.50	-21.38	17.62	21.36	17.35	.15	.22	.22
TOTRAD	35.08	-32.26	10.40	13.13	17.97	14.67	.01	.08	.48
SRAD1	-22.54	-.98	-37.32	65.89	31.66	62.72	.73	.98	.55
TOTCIRC	.70	-.14	-.16	.17	.20	.16	.00	.50	.32
NCIRC1	.04	.08	-.52	.43	.25	.44	.93	.75	.24
WIDTH1	203.70	-24.62	43.76	46.56	15.64	28.22	.00	.12	.13
SPACE1	-233.10	-43.18	-74.10	35.90	23.63	43.68	.00	.07	.10

Table 14. Results of paired-sample t-tests of the second and last measurements of the Kake Bake Creek test sample by Reader 1. All sample sizes are equal to 50 fish. Scale characters are defined in Appendix Table 3. Measurements are inches x 10^3 for scales magnified at 210X.

Scale character	Mean difference	Standard error	t-probability
NMEAS	0.00	.26	1.00
LFOCUS	17.40	14.93	.25
TOTRAD	12.46	13.34	.35
SRAD1	-45.28	38.47	.25
TOTCIRC	-.02	.13	.87
NCIRC1	-.44	.29	.14
WIDTH1	-9.44	17.48	.59
SPACE1	-47.58	29.50	.11

APPENDIX TABLES

Appendix Table 1. NMFS codes for stream, treatment, strata, fin clips, brands, species, and life history stage.

a) Stream, treatment, and strata

Stream		Treatment		Strata	
Deer Track	1	Upper buffer	1	Steep	6
"	"	"	"	Flat	7
"	"	Fork Trib.	2	Below road	13
"	"	"	"	Above pond	15
"	"	Upper clearcut	3	Below road	8
"	"	"	"	Above road	9
"	"	Ponds	4	Beaver Pond	4
"	"	"	"	Meadow	5
"	"	"	"	Slough	10
"	"	"	"	Big Lake	12
"	"	"	"	Fork Trib. Pond	14
"	"	Lower buffer	5	Lower buffer	3
"	"	Old growth slough trib.	6	Old growth slough trib.	11
"	"	Lower clearcut	7	Lower clearcut	2
"	"	Beaver dam smolt trap	1	--	--
"	"	Slough trib. smolt trap	2	--	--
"	"	Fork trib. smolt trap	3	--	--
Kake Bake	2	Ponds	1	Pond 1 (lower)	1
"	"	"	"	Pond 2 (middle)	2
"	"	"	"	Pond 3 (upper)	3
"	"	Slough (pond outlet)	2	Slough (pond outlet)	4
"	"	Old growth mainstem	3	Lower old growth	7
"	"	"	"	Upper old growth	8
"	"	Old growth tribs.	4	Old growth trib.	9
"	"	"	"	Ecotone Trib.	10
"	"	"	"	Doris Trib.	12
"	"	Clearcut mainstem	5	Lower clearcut	13
"	"	"	"	Upper clearcut	14
"	"	Clearcut tribs.	6	Upper clearcut trib.	15
"	"	"	"	Lower clearcut trib.	16
"	"	Ecotone	7	Ecotone	6
"	"	Slough (wolf) smolt trap	4	--	--
"	"	Old growth mainstem	5	--	--
"	"	Doris Trib.	6	--	--
"	"	Old growth trib.	7	--	--
"	"	Ecotone Trib.	8	--	--

b) Deer Track fin clips

RVLC-Clearcut	1
LVLC-Ponds, slough, meadow	2
RVUC-Upper buffer	3
LVUC-Fork Trib.	4

Appendix Table 1. NMFS codes for stream, treatment, strata, fin clips, brands, species, and life history stage - cont'd.

b) Deer Track fin clips - cont'd

RMUC-Lower clearcut	7
LM-Lower clearcut	5
RM-Old growth slough trib.	6

c) Kake Bake fin clips

RVLC-Old growth mainstem	1
LVLC-Ponds	2
RVUC-Clearcut mainstem	3
LVUC-Ecotone	4
RMLC-Ecotone Trib.	5
LMUC-Oldgrowth Trib.	6
RMUC-Randy's Trib.	7
LMLC-Upper Clearcut Trib.	8

d) Kake Bake Brands

0 - Lower old growth mainstem	1
X - Lower clearcut mainstem	2
T - Upper old growth mainstem	3
⊥ - Old growth Trib.	4
- - Ecotone Trib.	6
C - Slough	7
⊃ - Ponds	8
V - Upper clearcut mainstem	9
∧ - Randy's Trib.	10

e) Species

Coho	1

f) Life history stage

Smolt	1
Presmolt	2
Parr	3
Fry	4
Adult	5

Appendix Table 2. The format of multiple record per fish (raw) scale data files for purchase order 43-ABNF-5-3218.

The data consists of multiple records per fish. The first record contains 40 columns of information on the scale (header), followed by the first 8 sets of measurements (key code [1 column] and incremental distance [4 columns] in thousandths of an inch) for an additional 40 columns, or a total of 80 columns. Second and subsequent records contain 16 sets of measurements each (80 columns per record). The total number of measurements per fish is coded in columns 38-40 of the first record. The key code for each measurement is used to identify the various life history zones as defined below.

Record no.	Column no.	Variable
1		Header Information:
	1	Stream
	2-3	Treatment
	4-5	Strata
	6-8	Lower reach
	9-11	Upper reach
	12-13	Month
	14-15	Day
	16-17	Year
	18	Blank
	19-22	Scale no.
	23-24	Brand
	25	Fin clip
	26	Species
	27	Life history stage
	28-29	Blanks
	30-32	Length
	33-35	Weight (decigrams)
	36	FRI freshwater age determination
	37	Reader code
	38-40	Total number of measurements (key code + incremental distance in inches x 10^3)
		Measurements:
	41	Key code (=1)
	42-45	Diameter of focus (from outer edge to outer edge)
	46	Key code
	47-50	1st space
	51	Key code
	52-55	1st circulus (width)
	56	Key code
	57-60	2nd space
	61	Key code
	62-65	2nd circulus (width)
	66	Key code
	67-70	3rd space

Appendix Table 2. The format of multiple record per fish (raw) scale data files for purchase order 43-ABNF-5-3218 - cont'd.

Record no.	Column no.	Variable
	71	Key code
	72-75	3rd circulus (width)
	76	Key code
	77-80	4th space
2	1	Key code
	2-5	4th circulus (width)
	.	.
	.	.
	.	.
	76	Key code
	77-80	12th space
3	1	Key code
	2-5	12th circulus (width)
	.	.
	.	.
	.	.
	76	Key code
	77-80	20th space (width)
etc.		

Key codes

1 = diameter of focus
2 = 1st year's growth
3 = 1st annulus
4 = 2nd year's growth
5 = 2nd annulus
6 = 3rd year's growth
7 = 3rd annulus
8 = 4th year's growth
9 = 4th annulus

Appendix Table 3. Format of single record per fish (reformatted) scale data files for purchase order 43-ABNF-5-3218.

Scale character	Description	Reformatted col. no.
LFOCUS	= Length of focus (from outer edge to outer edge)	41-44
TOTRAD	= Total radius of scale from center of focus to outer edge of last circulus	45-49
SRAD1	= Scale radius of 1st year from center of focus to outer edge of 1st annulus	50-53
SRAD2	= Scale radius of 2nd year from outer edge of the 1st annulus to outer edge of the 2nd annulus	54-57
SRAD3	= Scale radius of 3rd year from outer edge of the 2nd annulus to outer edge of the 3rd annulus	58-61
SRAD4	= Scale radius of 4th year from outer edge of the 3rd annulus to the outer edge of the 4th annulus	62-65
TOTCIRC	= total number of circuli excluding edge of focus and all annuli	66-68
NCIRC1	= Number of circuli in the 1st year excluding the edge of focus and the annulus	69-70
NCIRC2	= Number of circuli in the 2nd year excluding the annulus	71-72
NCIRC3	= Number of circuli in the 3rd year excluding the annulus	73-74
NCIRC4	= Number of circuli in the 4th year excluding the annulus	75-76
WIDTH1	= Total circuli width for 1st year excluding the focus and annulus	77-80
WIDTH2	= Total circuli width for 2nd year excluding the the annulus	81-84
WIDTH3	= Total circuli width for 3rd year excluding the the annulus	85-88
WIDTH4	= Total circuli width for 4th year excluding the the annulus	89-92
SPACE1	= Total circuli spacing for 1st year excluding the annulus	93-96
SPACE2	= Total circuli spacing for 2nd year excluding the annulus	97-100
SPACE3	= Total circuli spacing for 3rd year excluding the annulus	101-104
SPACE4	= Total circuli spacing for 4th year excluding the annulus	105-108
ANNU1	= Width of 1st annulus	109-111
ANNU2	= Width of 2nd annulus	112-114
ANNU3	= Width of 3rd annulus	115-117
ANNU4	= Width of 4th annulus	118-120

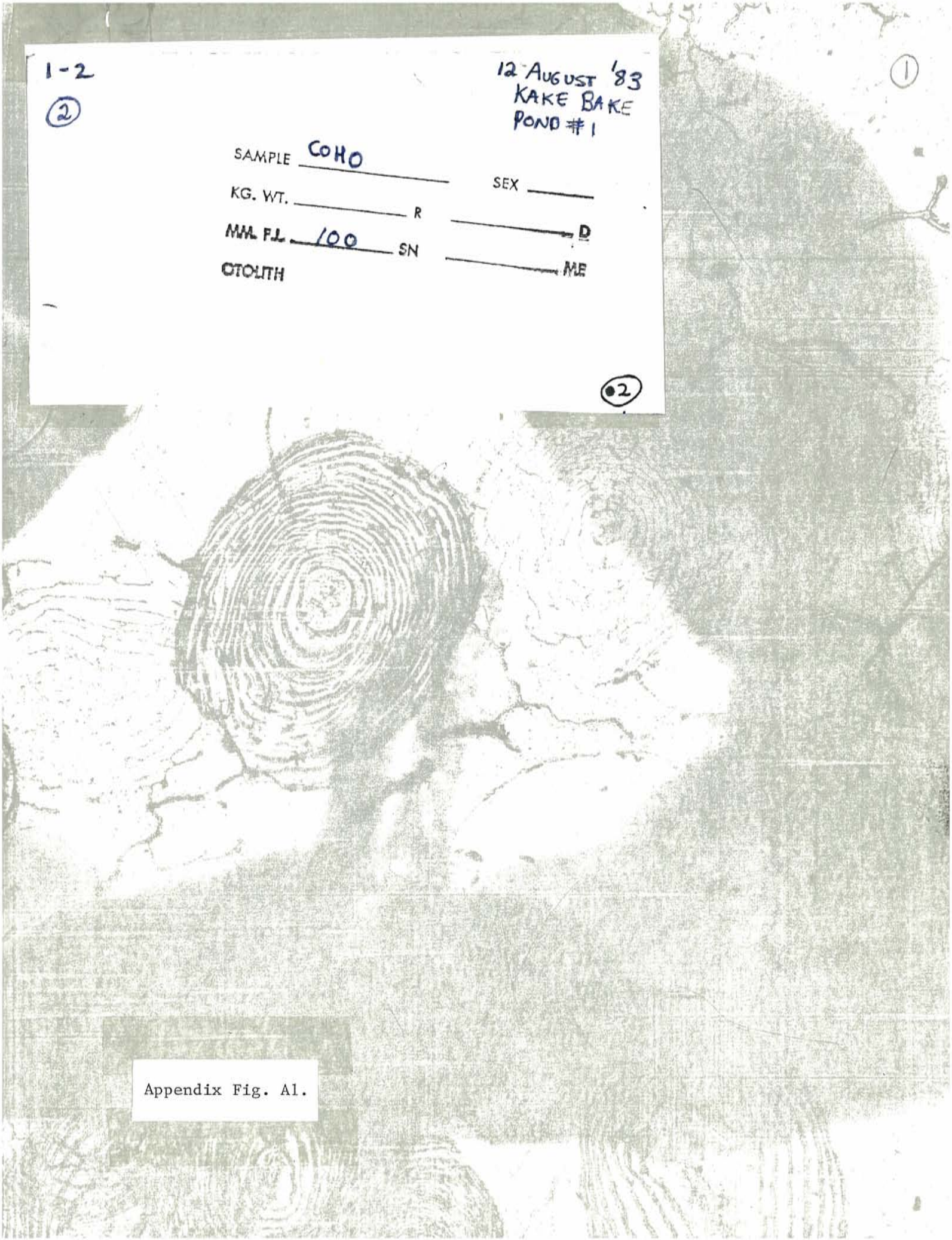
Columns 1-40 of the reformatted data file contain the same header information in the same format as the raw data file (see Appendix Table 2).

APPENDIX FIGURES A1-A50

Pictures of the August and November, 1983 Kake Bake Creek test samples. The scale pictures were made on a Minolta micro-fiche copier with a 90X lens. Sample and biological information duplicated from the coin envelopes containing the samples appears in the upper left-hand corner of the picture.

APPENDIX FIGURES B1-B50

Pictures of the August and November, 1983 Deer Track Creek test samples. The scale pictures were made on a Minolta micro-fiche copier with a 90X lens. Sample and biological information duplicated from the coin envelopes containing the samples appears in the upper left-hand corner of the picture.



Appendix Fig. A1.

I-11

(9)

12 AUGUST '83
KAKE BAKE
POND #1

(2)

SPECIES COHO SEX

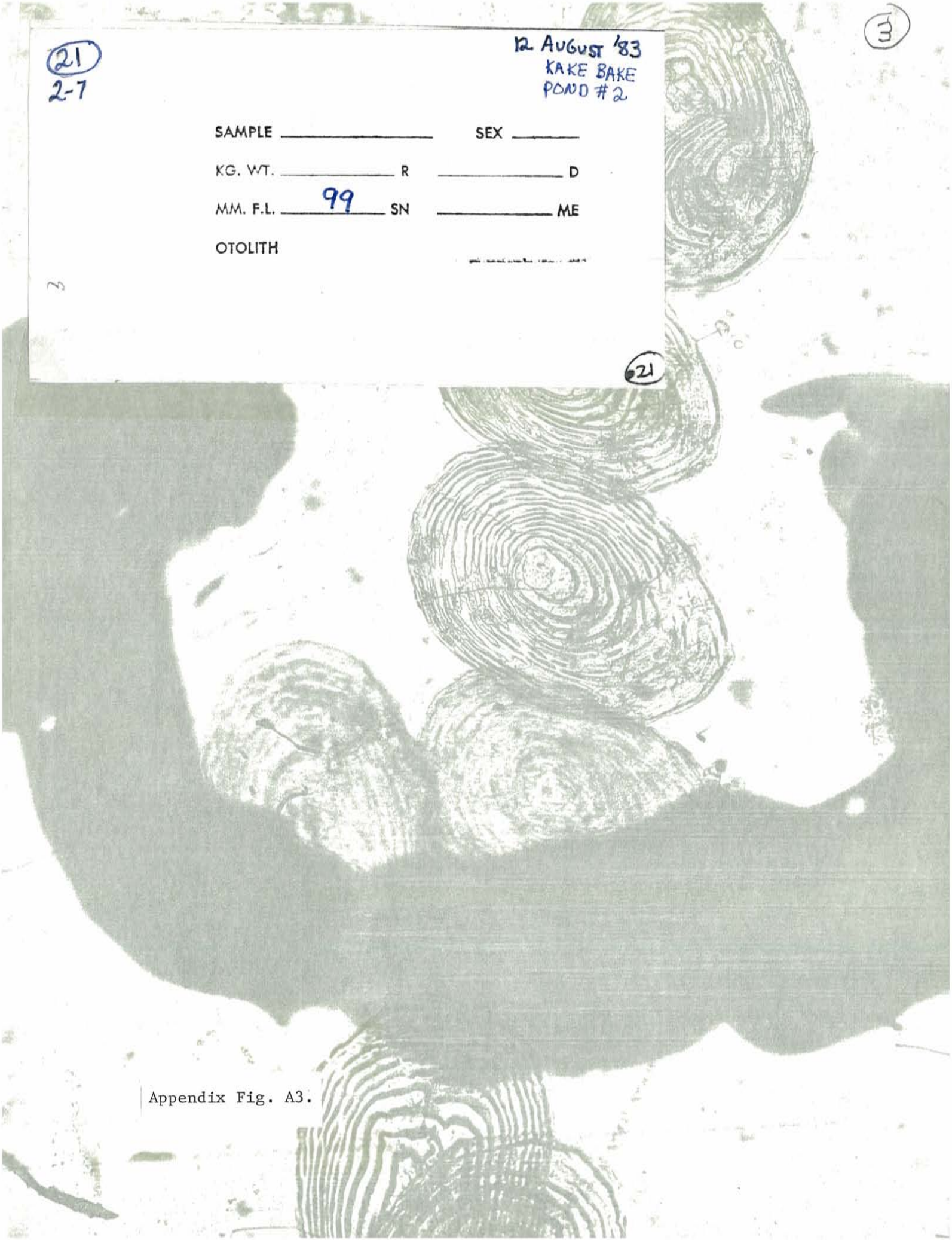
LOT R D

MID. F.L. 105 SN ME

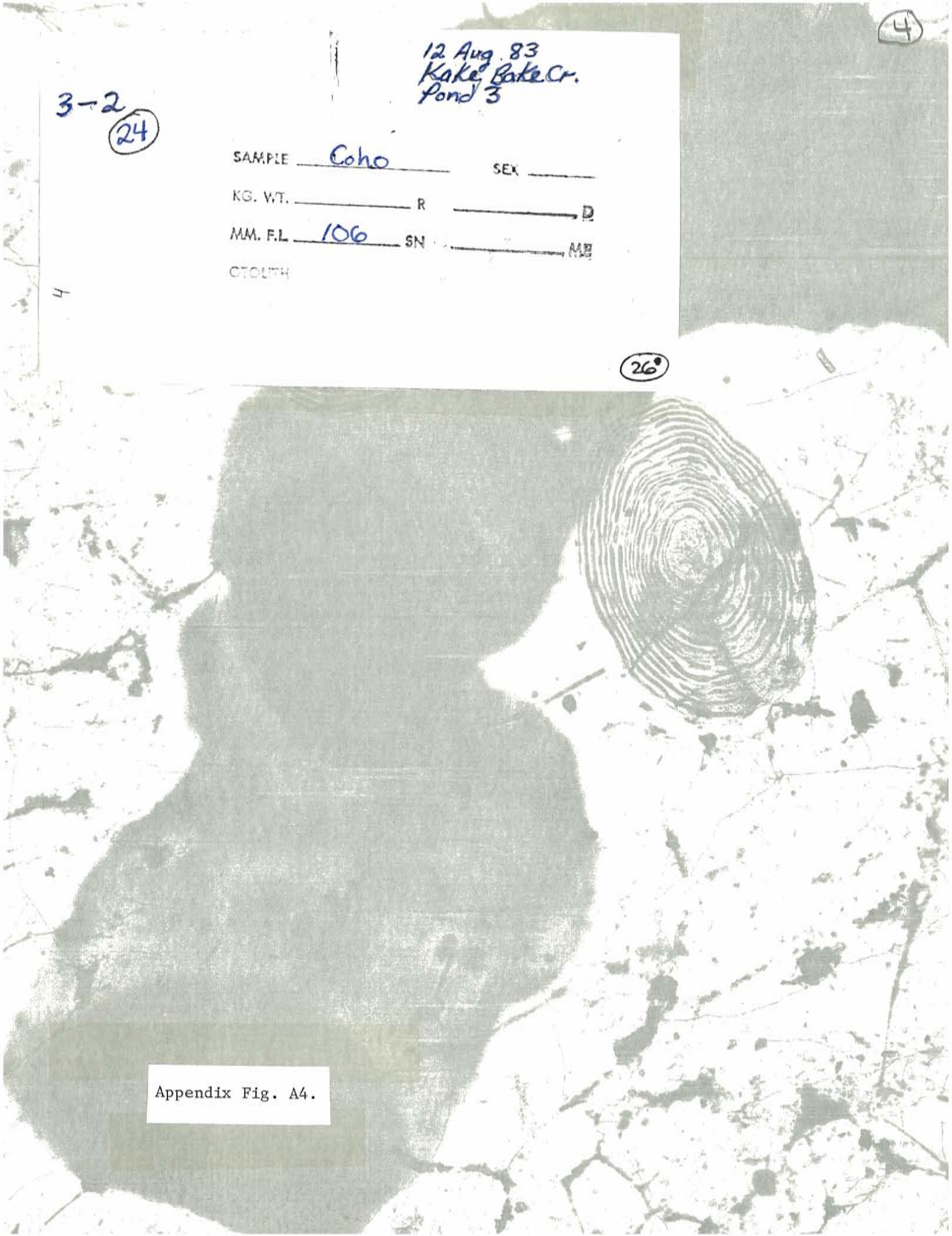
CTOLITH

(9)

Appendix Fig. A2.



Appendix Fig. A3.



Appendix Fig. A4.

Ecotone
Reach 3

Kahe Bahe 8/18/83

SAMPLE Coho #5 SEX

KG. WT. R D

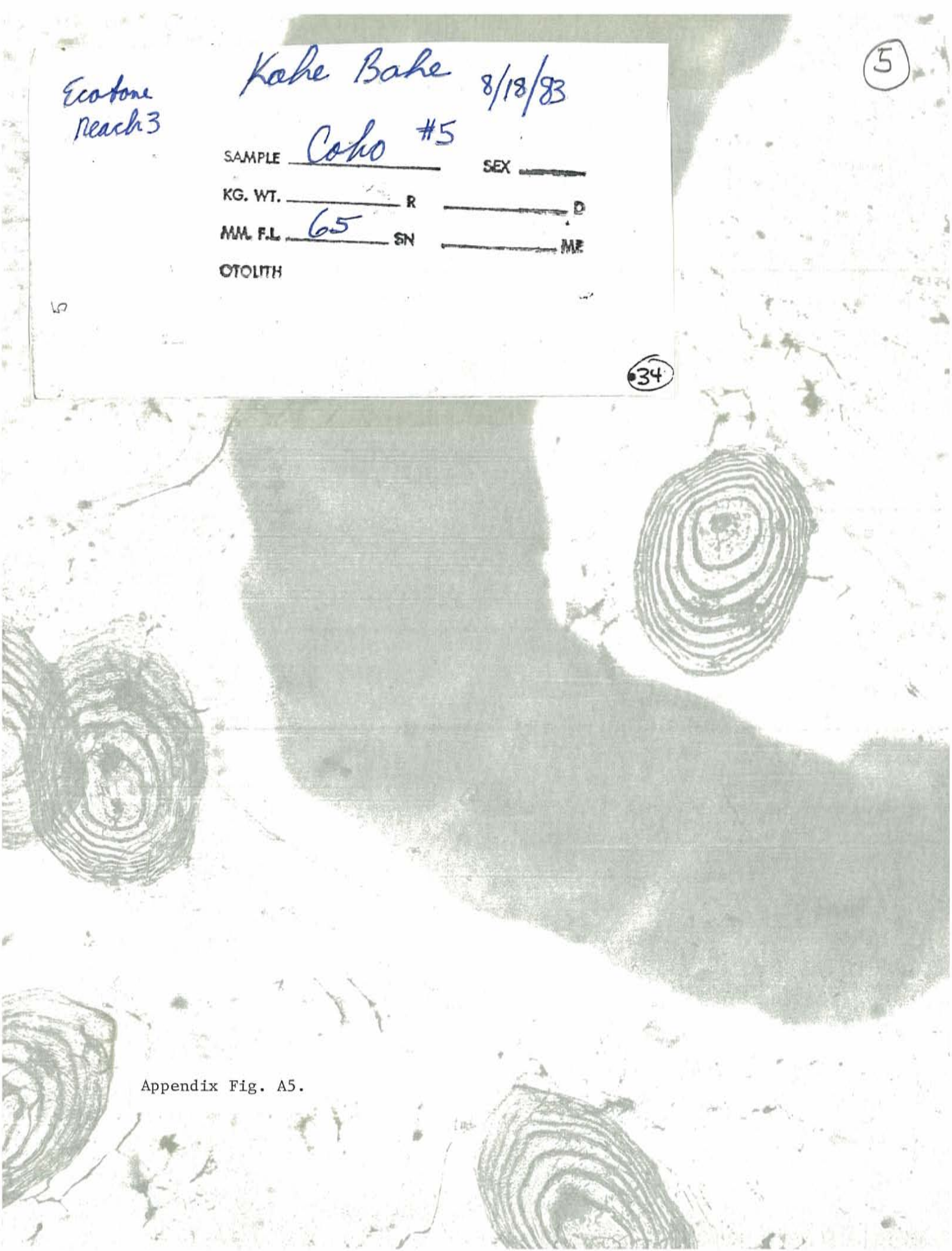
MM. F.L. 65 SN MF

OTOLITH

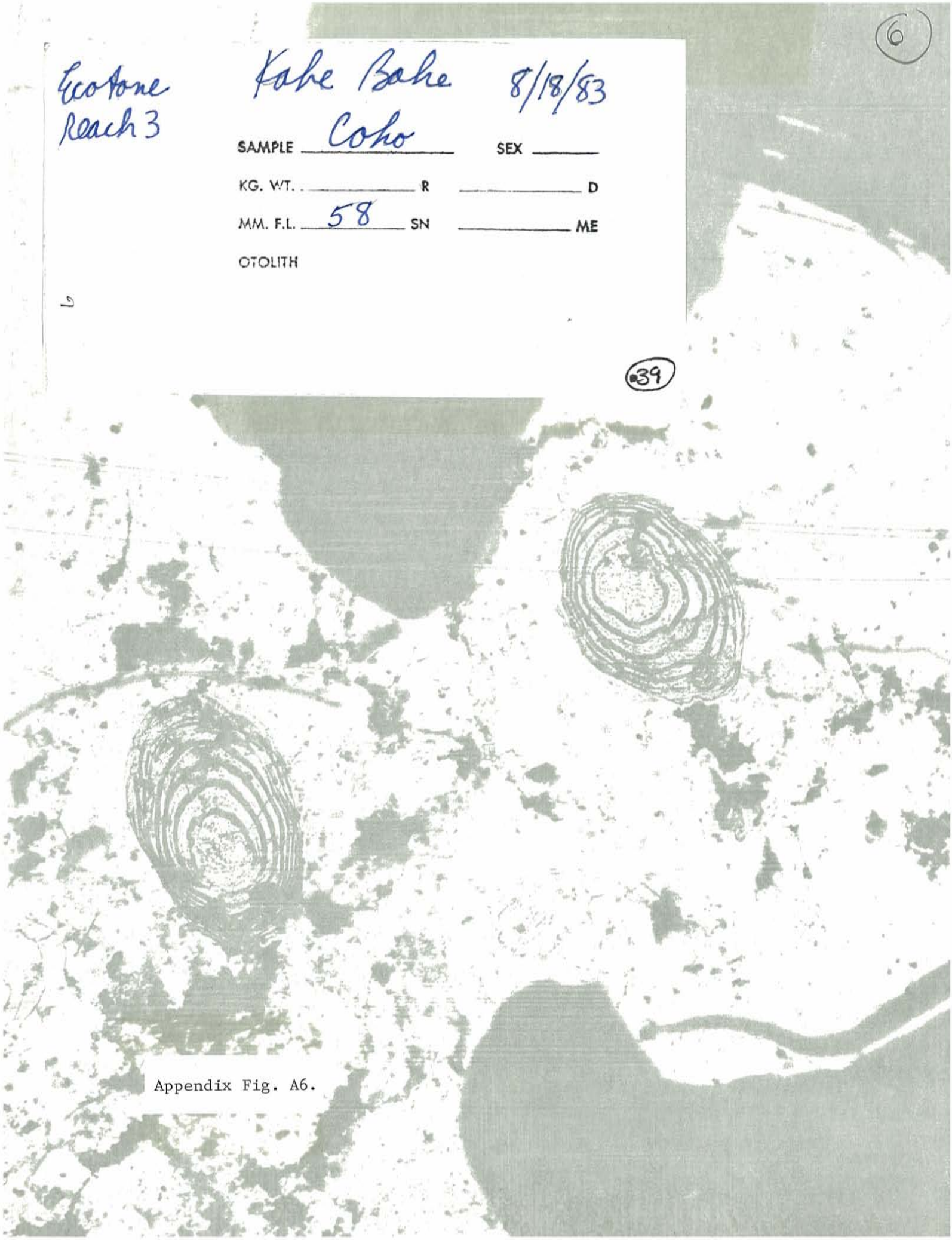
5

(5)

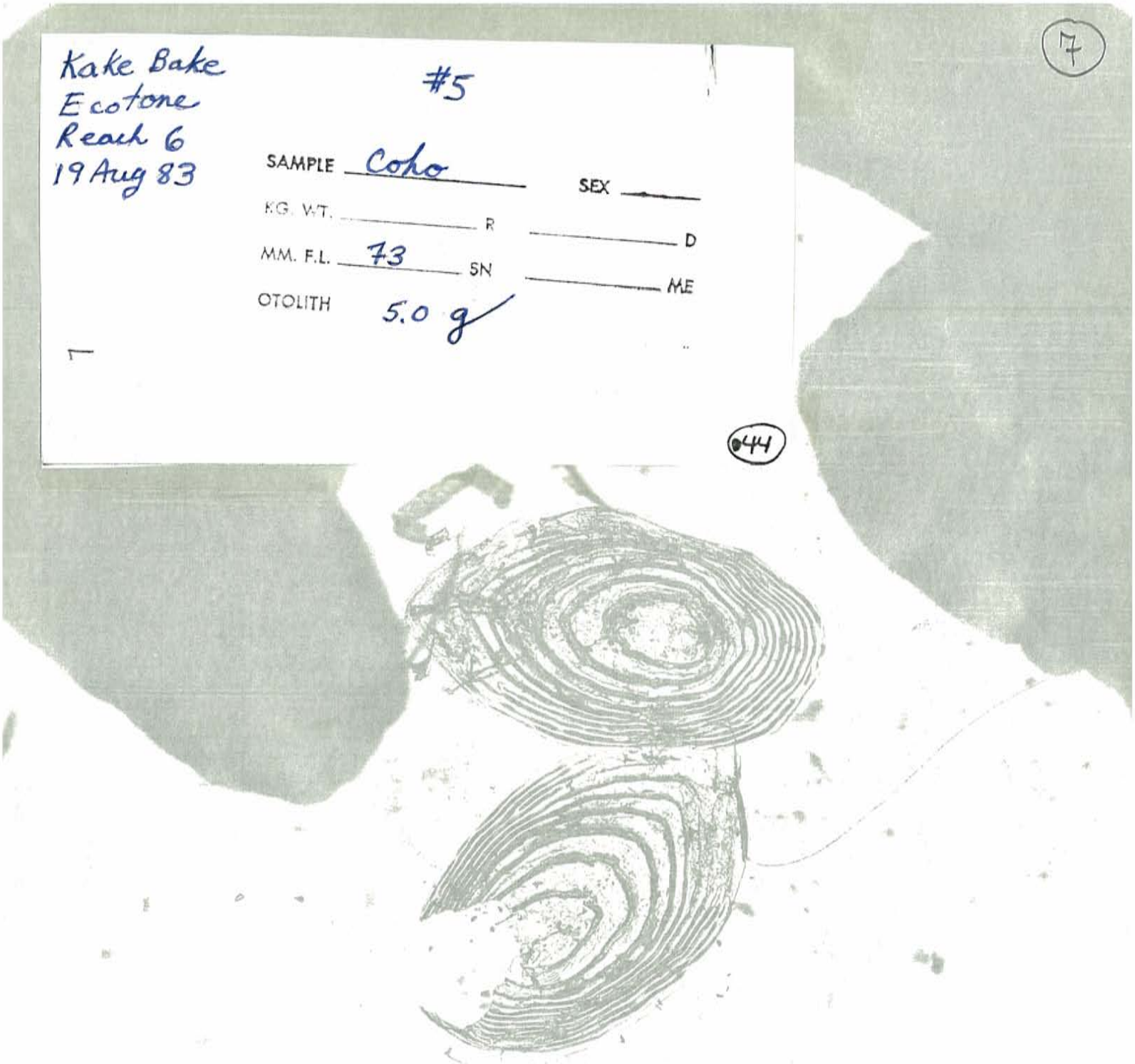
(34)



Appendix Fig. A5.



Appendix Fig. A6.



Appendix Fig. A7.

(8)

Kake Bake
Ecotone
Reach 6
19 Aug 83

#11

SAMPLE colo SEX ____

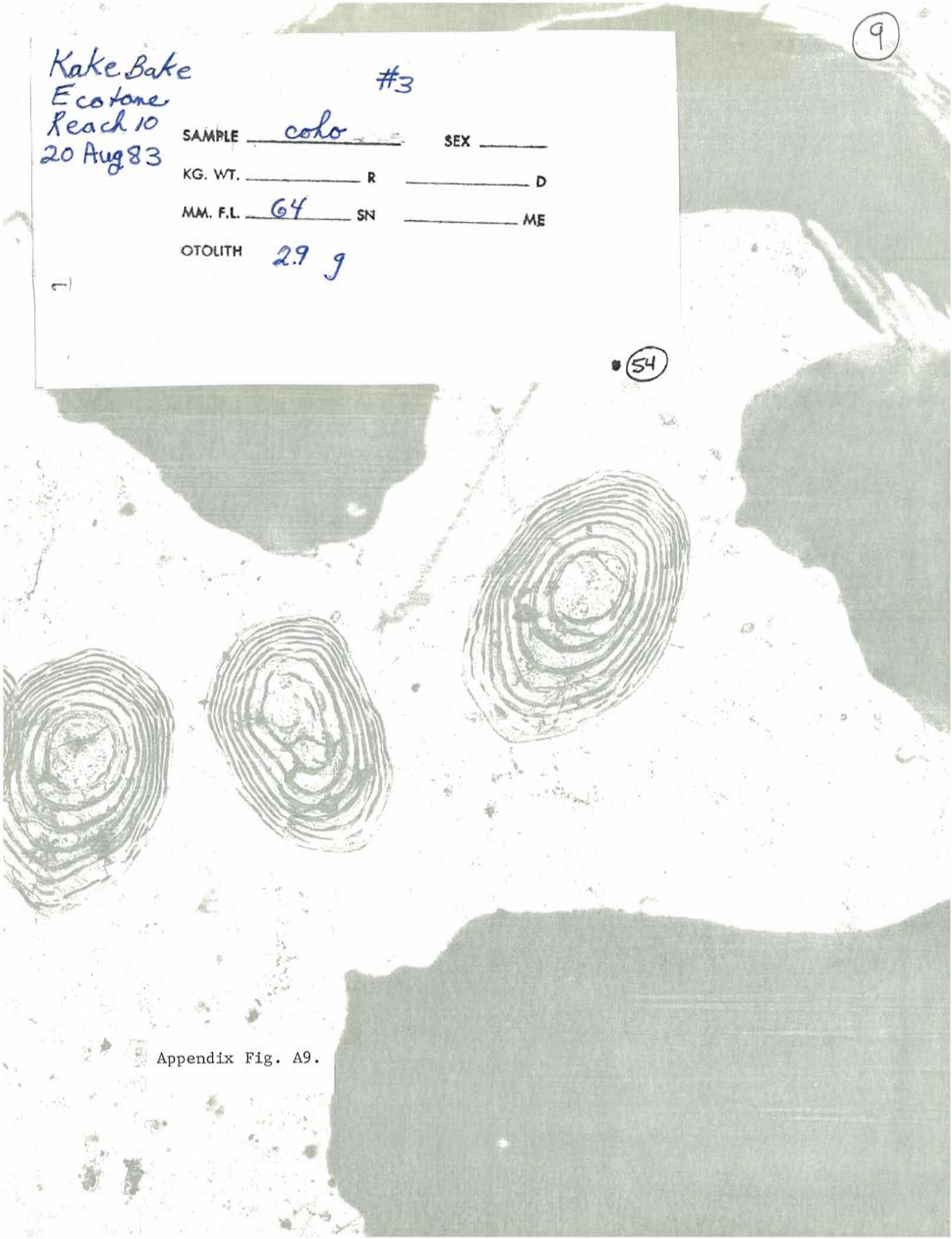
KG. WT. ____ R ____ D

MM. F.L. 68 SN ____ ME

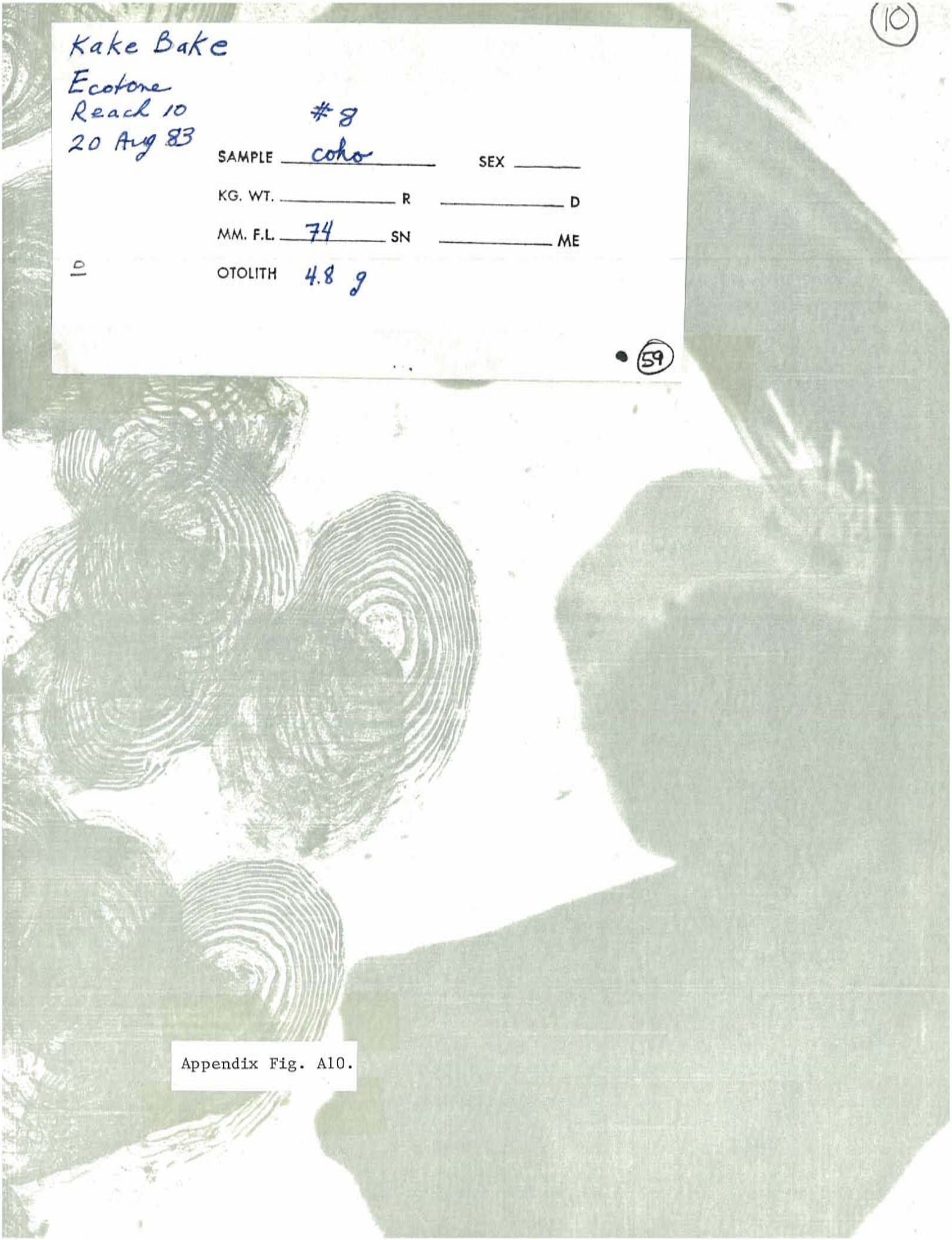
OTOLITH 3.3 g

(50)

Appendix Fig. A8.



Appendix Fig. A9.



Appendix Fig. A10.

Kake Bake
Old growth
Reach 2
20 Aug 83

#4

(11)

SAMPLE coho SEX

KG. WT. R b

MM. F.L. 88 SN ME

OTOLITH 7.3 gm

=

(65)

Appendix Fig. A11.

Kake Bake #3
Old growth
Reach 5 SAMPLE coho SEX
21 Aug 83 KG. WT. R D
MM. F.L. 78 SN ME
OTOLITH 5.8g

12

76

Appendix Fig. A12.

Kake Bake
Old growth #4

SAMPLE coho SEX

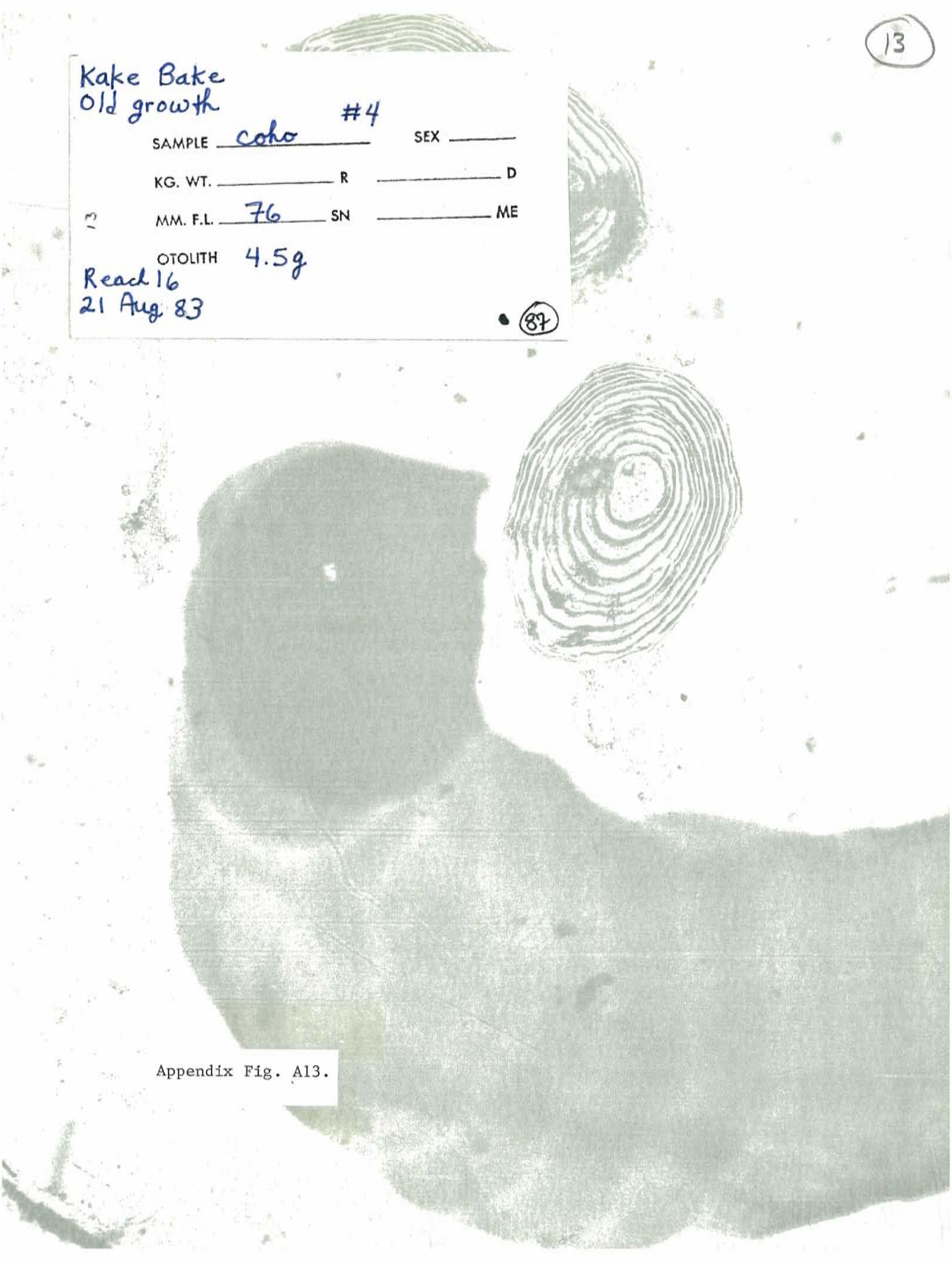
KG. WT. R D

MM. F.L. 76 SN ME

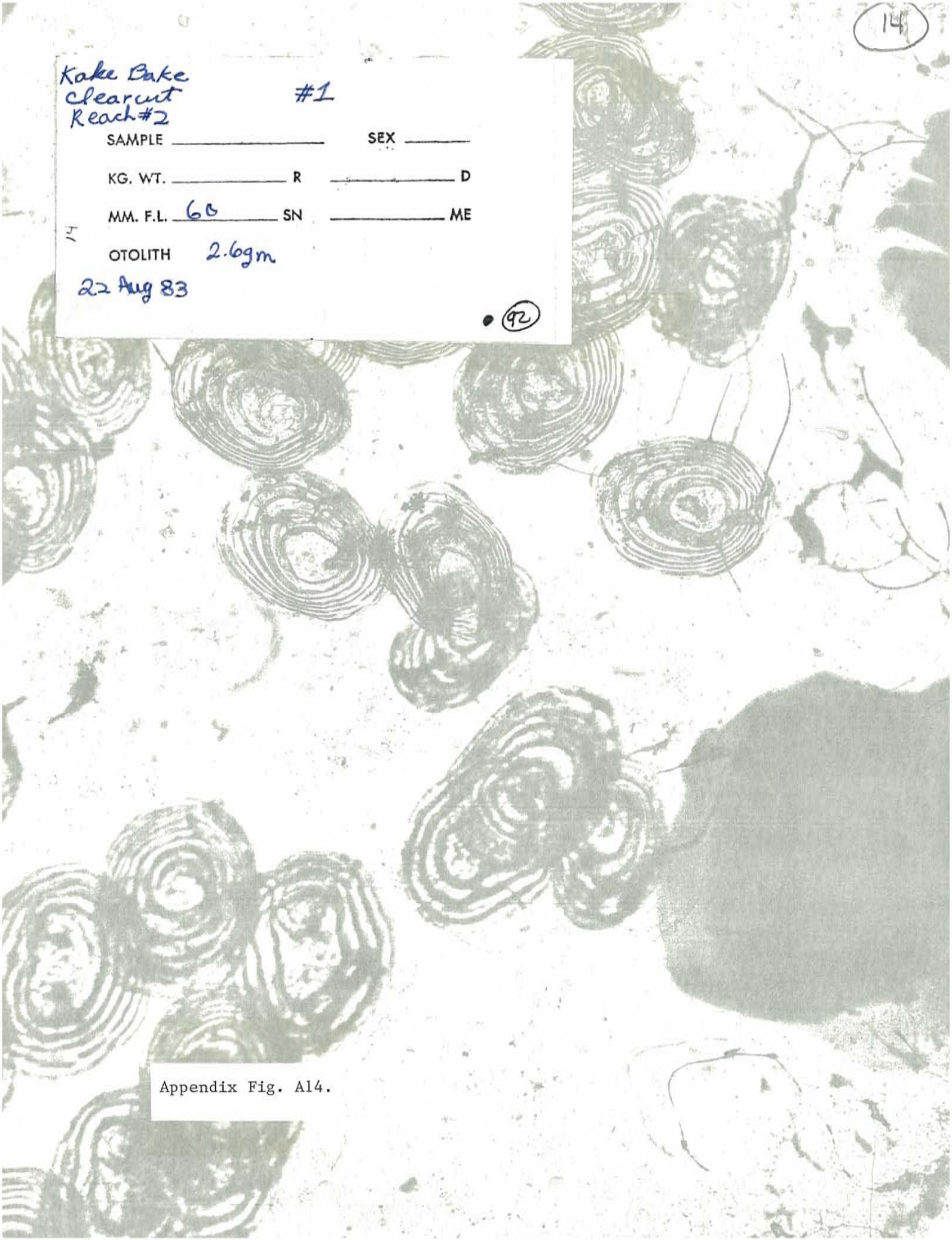
OTOLITH 4.5g

Read 16
21 Aug 83

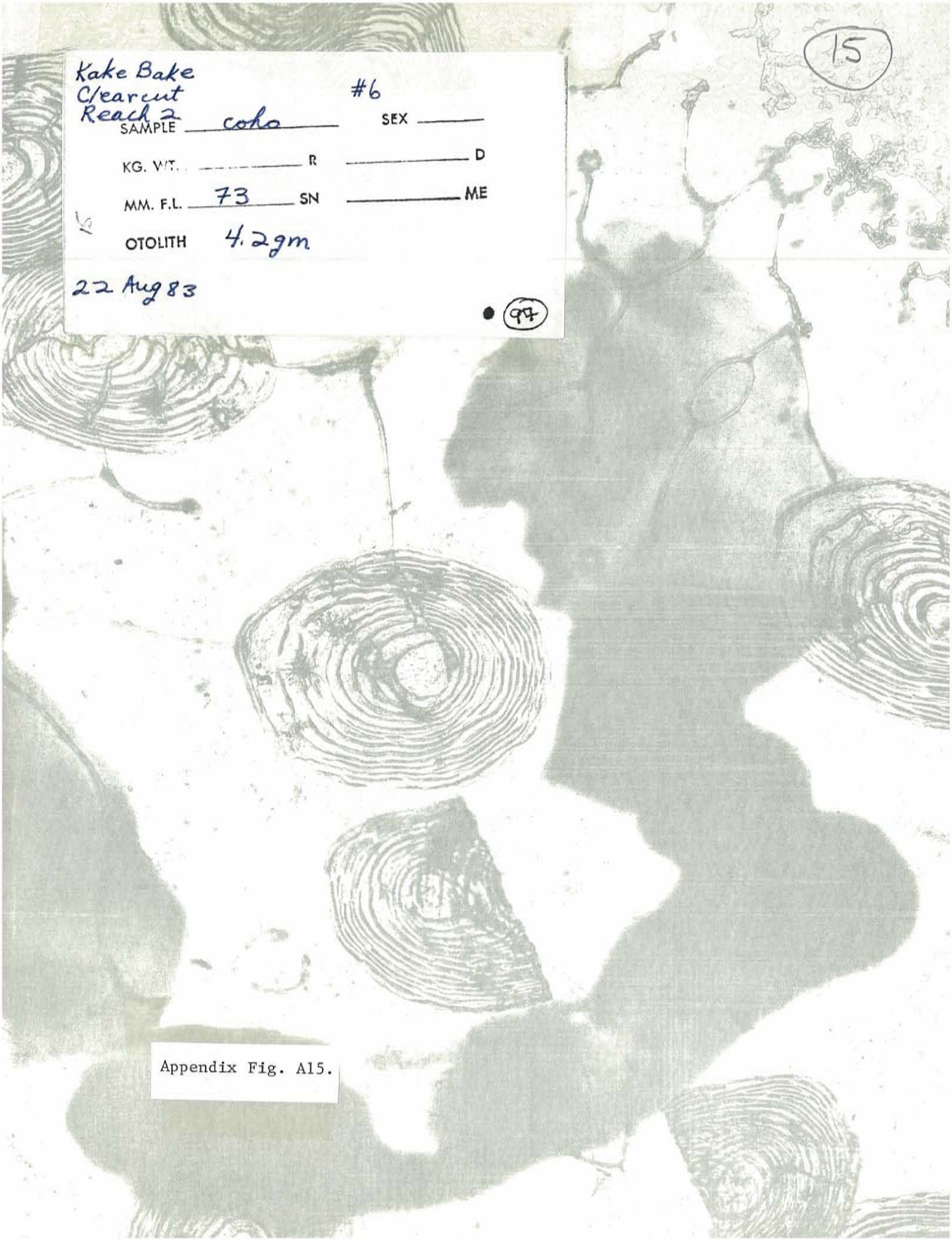
87



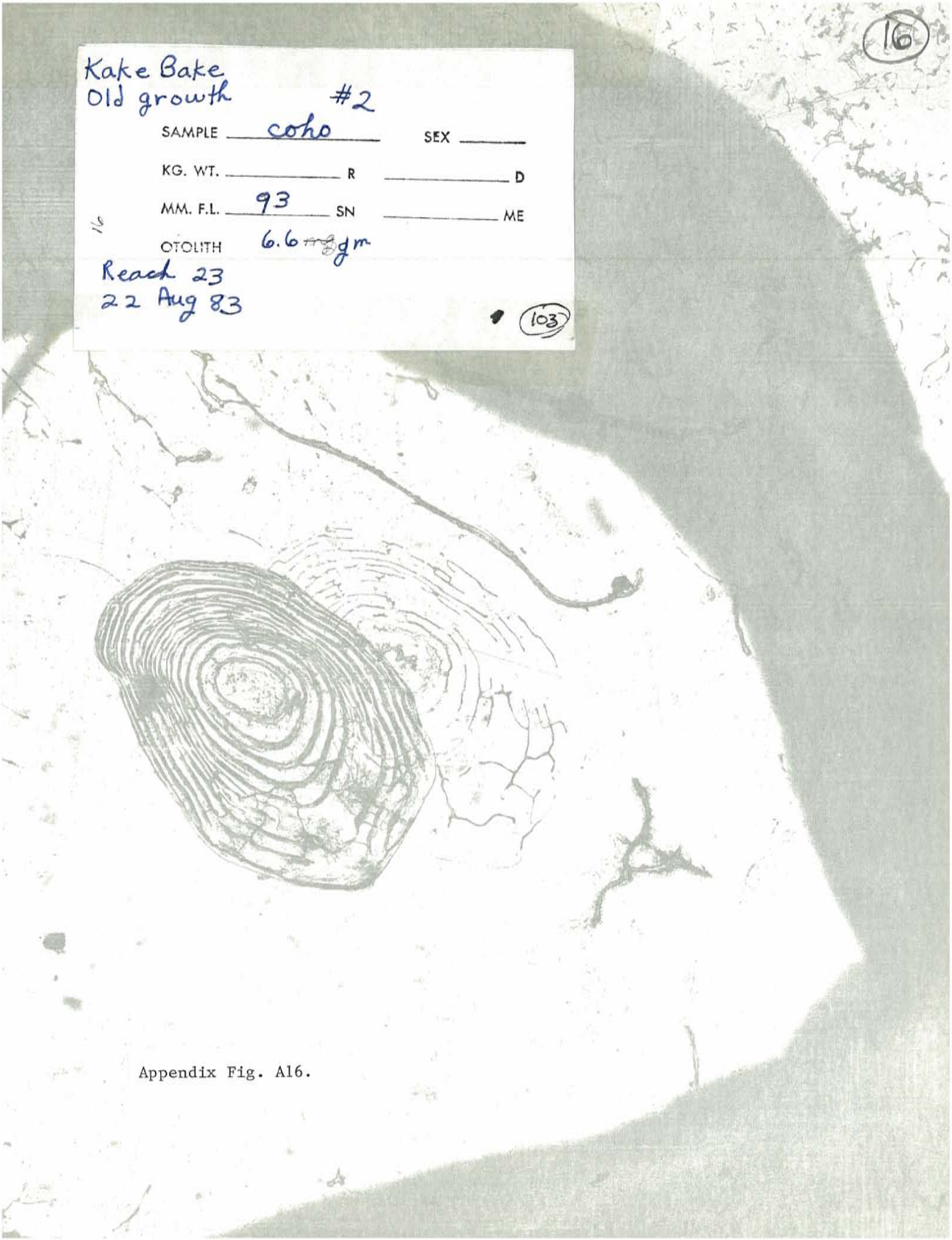
Appendix Fig. A13.



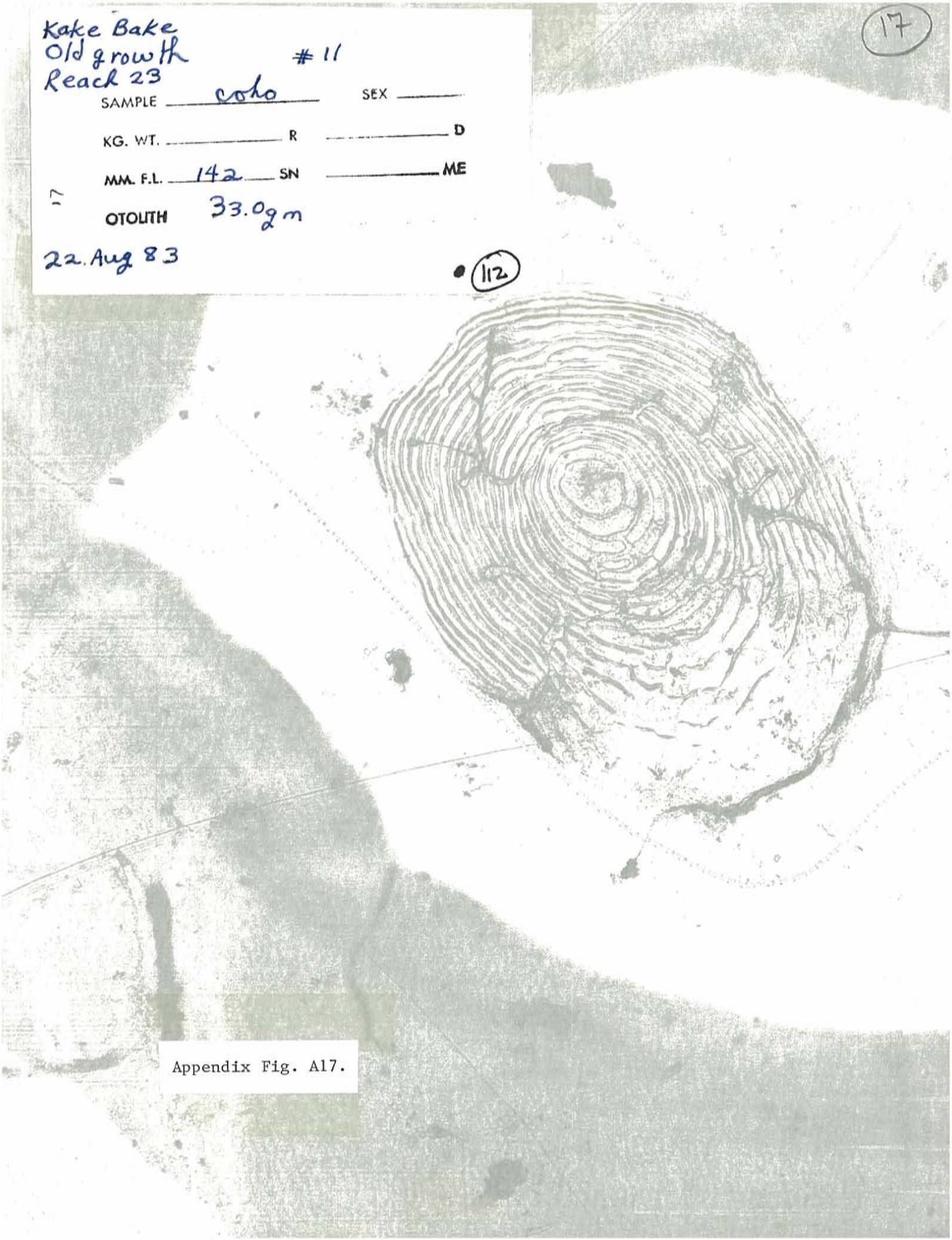
Appendix Fig. A14.



Appendix Fig. A15.



Appendix Fig. A16.



Appendix Fig. A17.

Kake Bake Ck
Reach 10, CC
8/24/83

#5

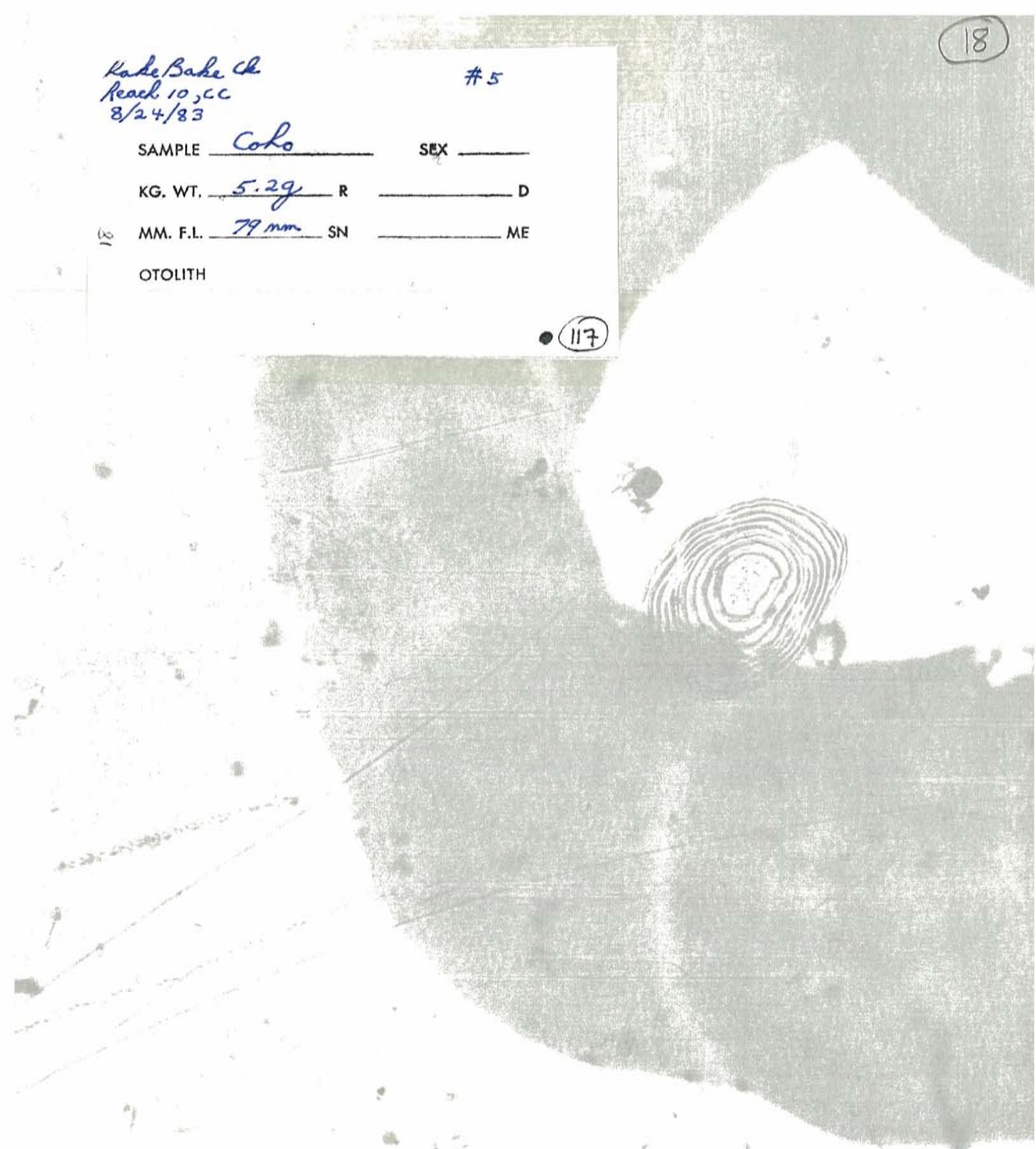
SAMPLE Coho SEX _____

KG. WT. 5.2g R _____ D

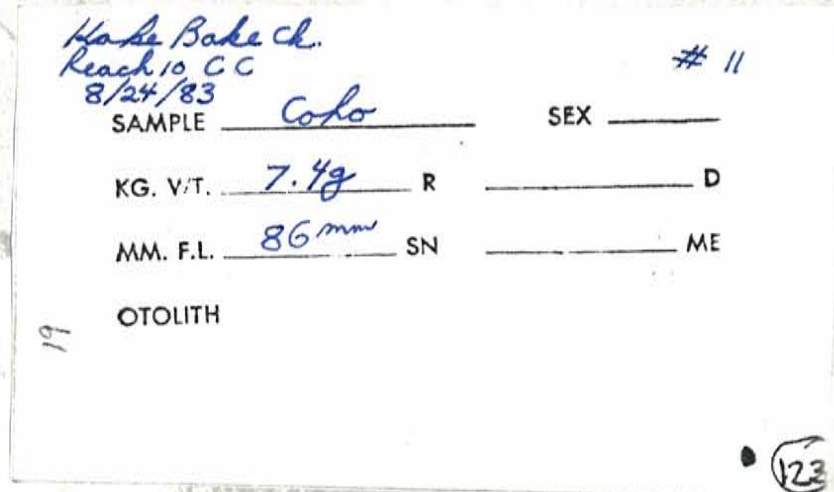
MM. F.L. 79 mm SN _____ ME

OTOLITH

117



Appendix Fig. A18.



Appendix Fig. A19.

Kake Bake
Reach 16, CC

SAMPLE coho SEX

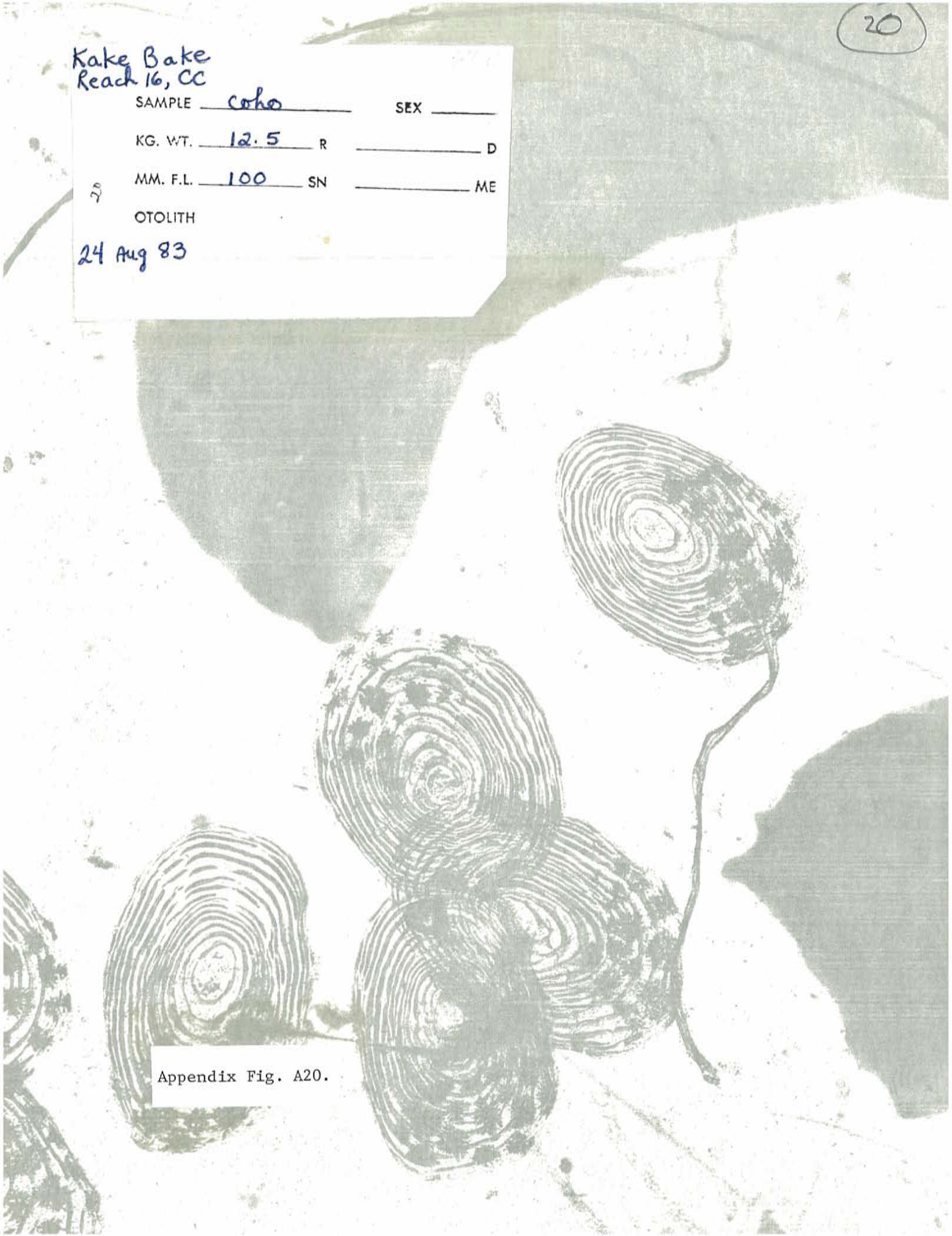
KG. WT. 12.5 R D

MM. F.L. 100 SN ME

20

OTOLITH

24 Aug 83



Appendix Fig. A20.

Kake Bake Ck, Reach 19, C.C. #2
8/24/83

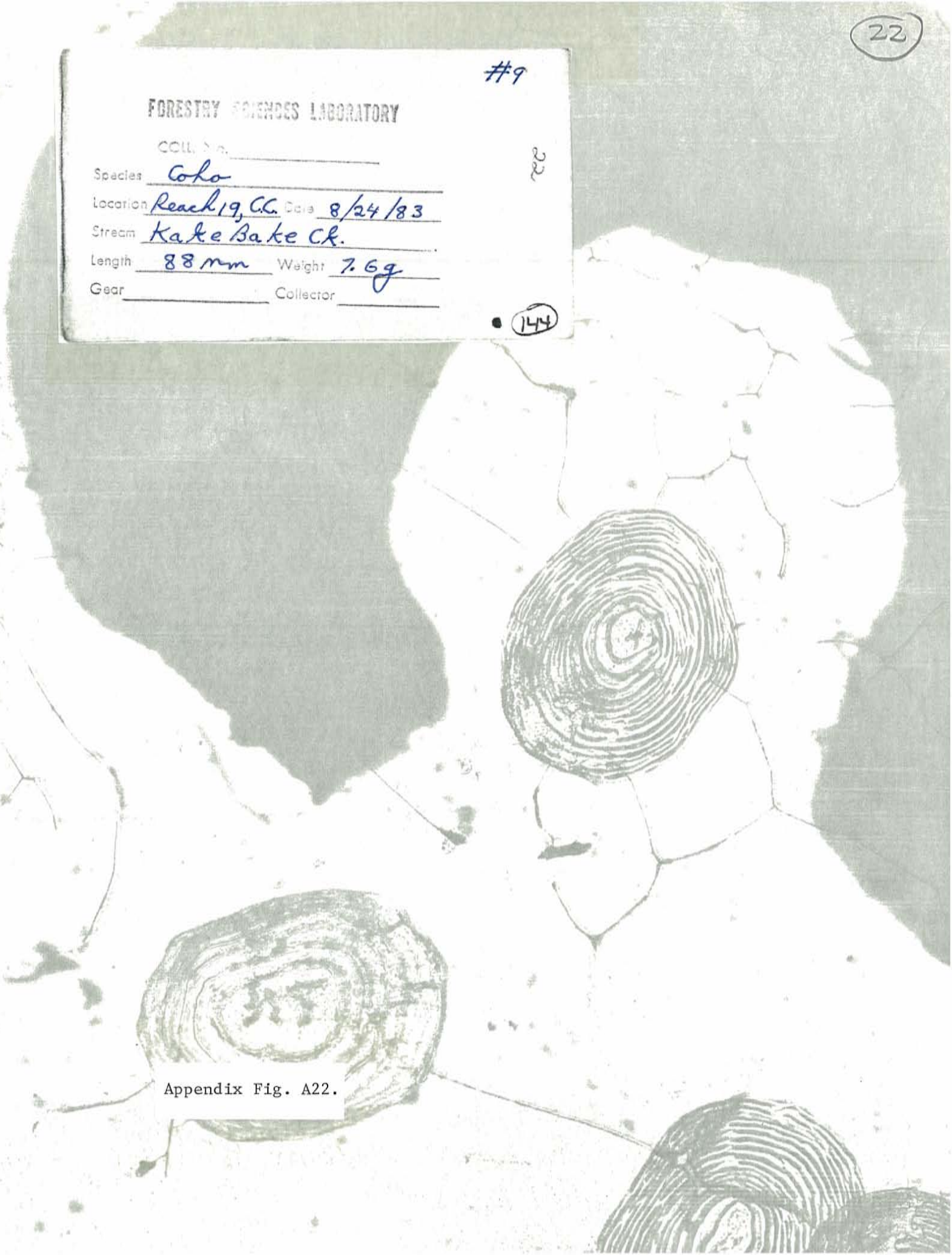
SAMPLE Coho SEX _____

KG. WT. 3.6g R _____ D

MM. F.L. 66 mm SN _____ ME

OTOLITH

Appendix Fig. A21.



Appendix Fig. A22.

ALASKA FISHERIES WORKING GROUP

Date 2 Nov 83 Sample No. 7

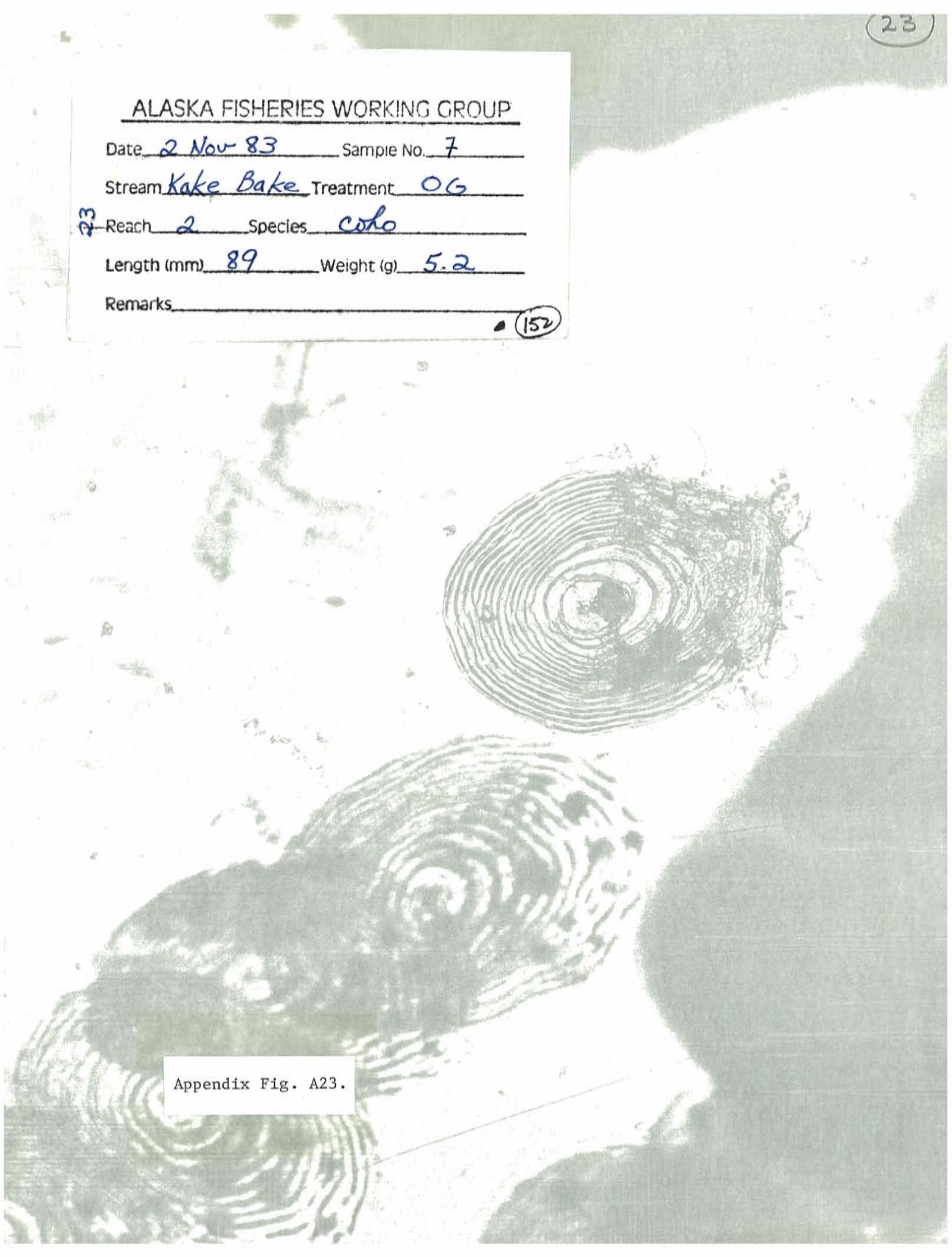
Stream Kake Bake Treatment OG

23 Reach 2 Species coho

Length (mm) 89 Weight (g) 5.2

Remarks

152



Appendix Fig. A23.

ALASKA FISHERIES WORKING GROUP

Date 3 Nov 83 Sample No. 6

Stream Kake Bake Treatment OG

Reach 5 Species coho

Length (mm) 92 Weight (g) 8.2

Remarks

162

Appendix Fig. A24.

(25)

ALASKA FISHERIES WORKING GROUP

Date 3 Nov 83 Sample No. 10

Stream Kake Bake Treatment OG

Reach 5 Species coho

Length (mm) 81 Weight (g) 4.5

Remarks

(166)

Appendix Fig. A25.

ALASKA FISHERIES WORKING GROUP

Date 3 Nov 83 Sample No. 12

Stream Kake Bake Treatment OG

Reach 16 Species coho

Length (mm) 140 Weight (g) 29.0

Remarks

Appendix Fig. A26.

27

ALASKA FISHERIES WORKING GROUP

Date 3 Nov 83 Sample No. 5

Stream Kake Bake Treatment OG

Reach 16 Species Coho

Length (mm) 105 Weight (g) 11.0

Remarks

174

Appendix Fig. A27.

ALASKA FISHERIES WORKING GROUP

Date 4 Nov 83 Sample No. 16

Stream Kake Bake Treatment CC

Reach 2 Species coho

Length (mm) 100 Weight (g) 10.0

Remarks

Appendix Fig. A28.

ALASKA FISHERIES WORKING GROUP

Date 4 Nov 83 Sample No. 17

Stream Kake Bake Treatment CC

Reach 2 Species coho

Length (mm) 74 Weight (g) 4.4

Remarks P clip RV, UC.

199

Appendix Fig. A29.

ALASKA FISHERIES WORKING GROUP

Date 4 Nov 83 Sample No. 25

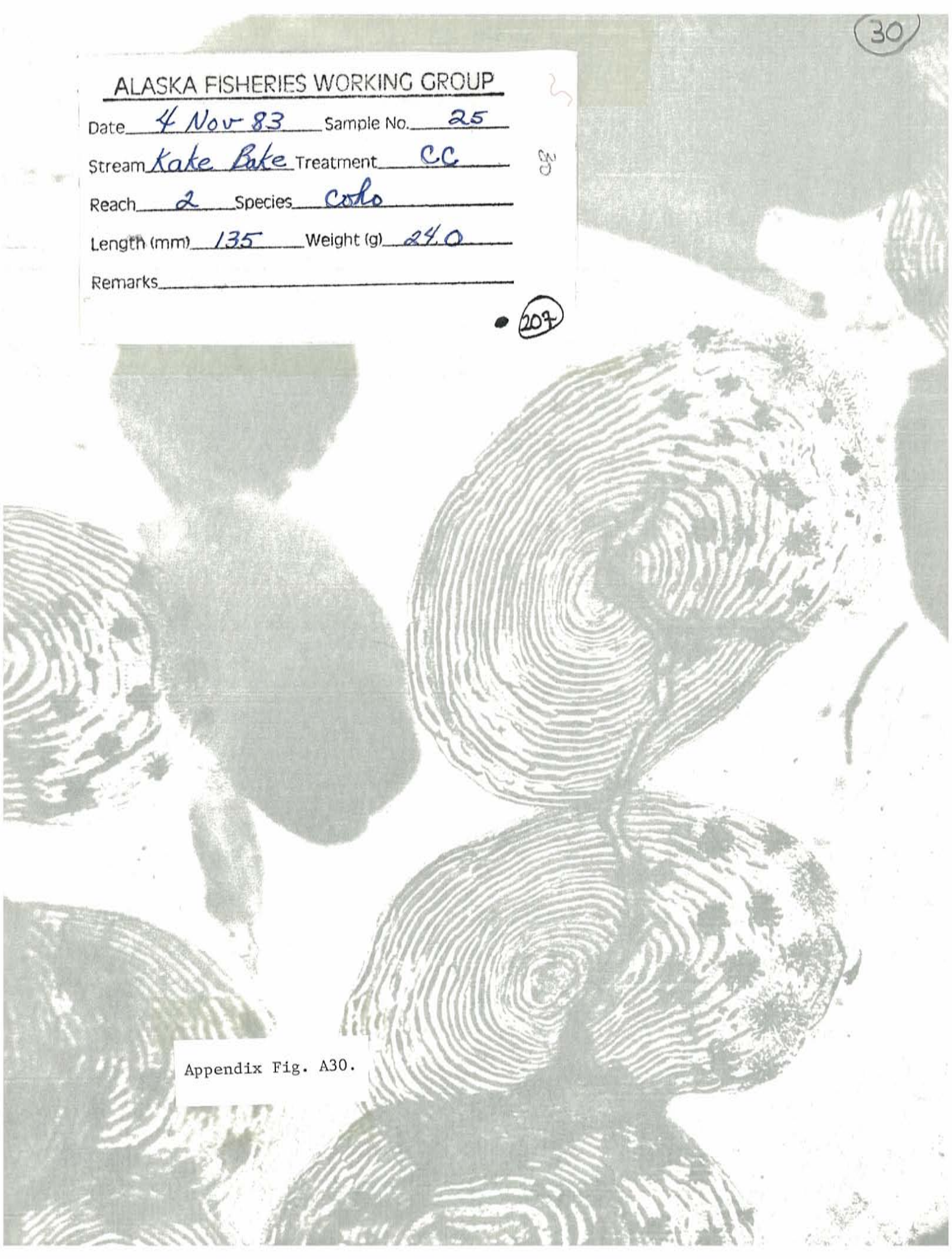
Stream Kake Bake Treatment CC

Reach 2 Species Coho

Length (mm) 135 Weight (g) 24.0

Remarks

207



Appendix Fig. A30.

ALASKA FISHERIES WORKING GROUP

Date 4 Nov 83 Sample No. 4

Stream Kake Bake Treatment OG

Reach 23 Species coho

31 Length (mm) 123 Weight (g) 19.0

Remarks

211

Appendix Fig. A31.

ALASKA FISHERIES WORKING GROUP

Date 4 Nov 83 Sample No. 15

Stream Kake Bake Treatment OG

Reach 23 Species coho

32 Length (mm) 71 Weight (g) 4.0

Remarks P Clip RV, LC

222

Appendix Fig. A32.

ALASKA FISHERIES WORKING GROUP

Date 4 Nov 83 Sample No. 20

Stream Kake Bake Treatment OG

Reach 23 Species Coho

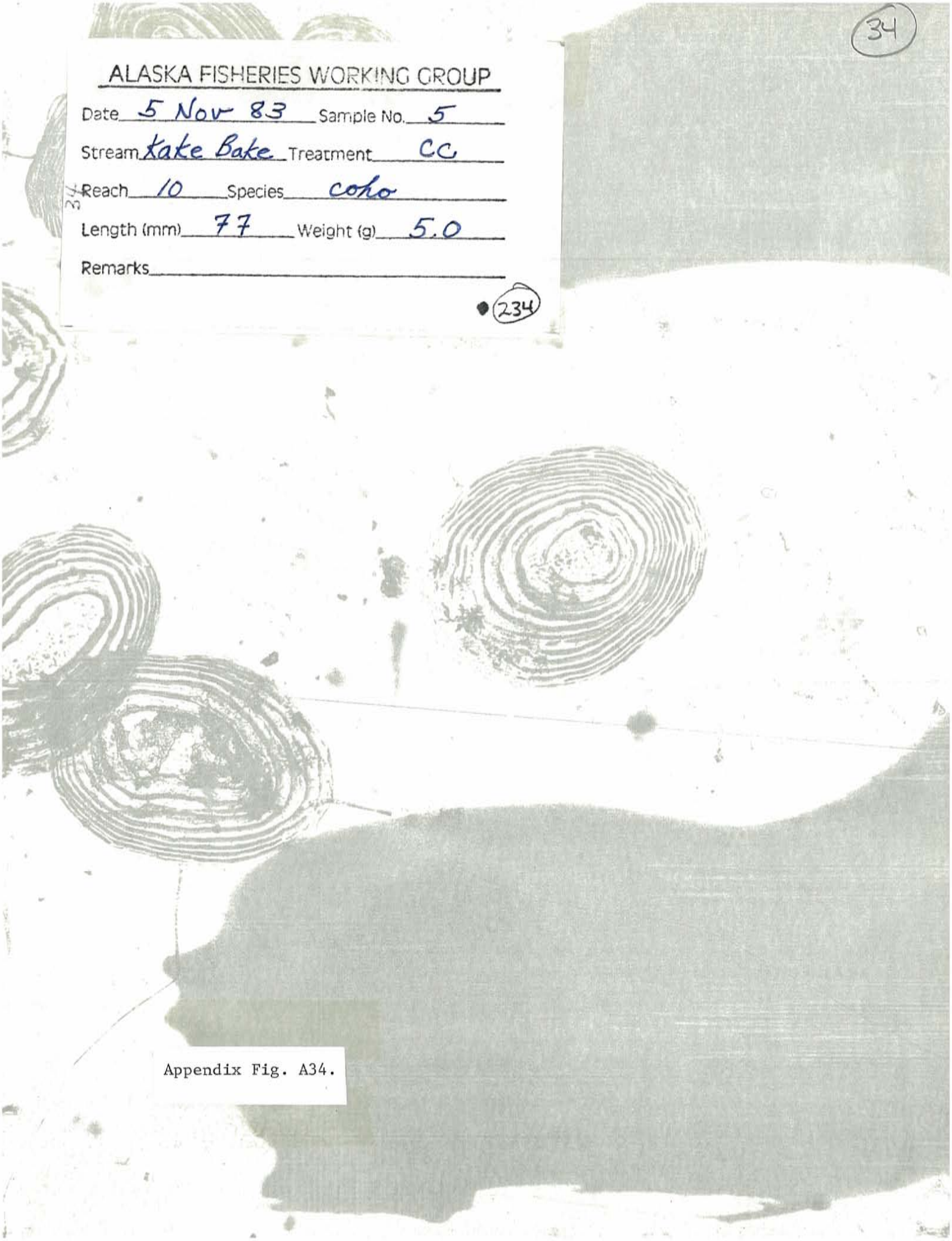
33

Length (mm) 121 Weight (g) 16.0

Remarks P Clip RV, LC

0 (227)

Appendix Fig. A33.



Appendix Fig. A34.

ALASKA FISHERIES WORKING GROUP

Date 5 Nov 83 Sample No. 7

Stream Kake Bake Treatment CC

Reach 10 Species coho

Length (mm) 120 Weight (g) 20.0

Remarks

(236)

Appendix Fig. A35.

ALASKA FISHERIES WORKING GROUP

Date 5 Nov 83 Sample No. 15

Stream Kake Bake Treatment CC

Reach 10 Species coho

Length (mm) 123 Weight (g) 20.0

Remarks

244

Appendix Fig. A36.

37

ALASKA FISHERIES WORKING GROUP

Date 11-5-83 Sample No. 5

Stream Kake Bake Treatment CC

37 Reach 16 Species Coho

Length (mm) 72 Weight (g) 4.1

Remarks

252

Appendix Fig. A37.

ALASKA FISHERIES WORKING GROUP

Date 11-5-83 Sample No. 10

Stream Kake Bake Treatment CC

Reach 16 Species Coho

38

Length (mm) 131 Weight (g) 22.5

Remarks

257

Appendix Fig. A38.

ALASKA FISHERIES WORKING GROUP

Date 5 Nov 83 Sample No. 10

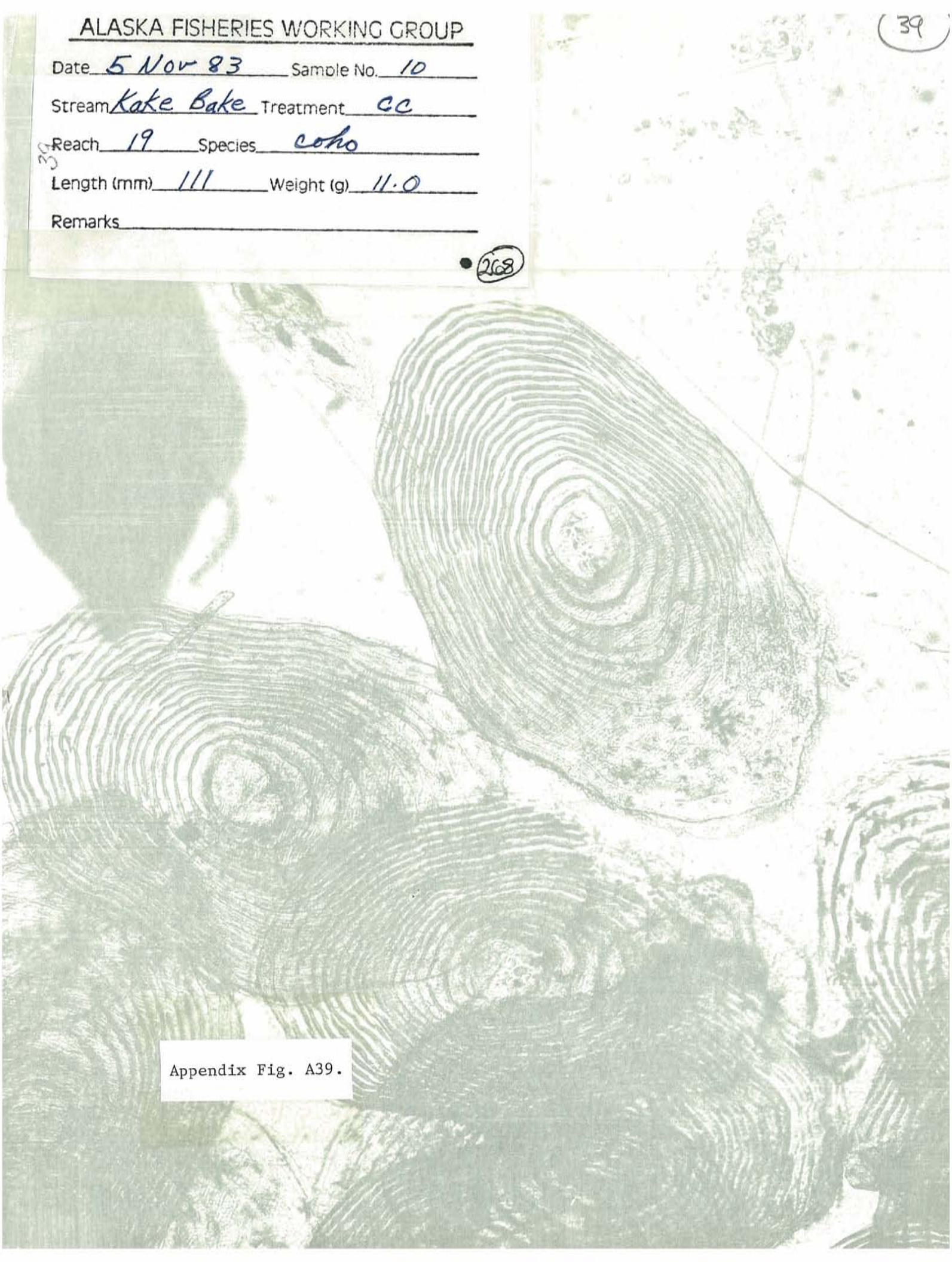
Stream Kake Bake Treatment CC

Reach 19 Species coho

Length (mm) 111 Weight (g) 11.0

Remarks

268



Appendix Fig. A39.

40

ALASKA FISHERIES WORKING GROUP

Date 5 Nov 83 Sample No. 12

Stream Kake Bake Treatment CC

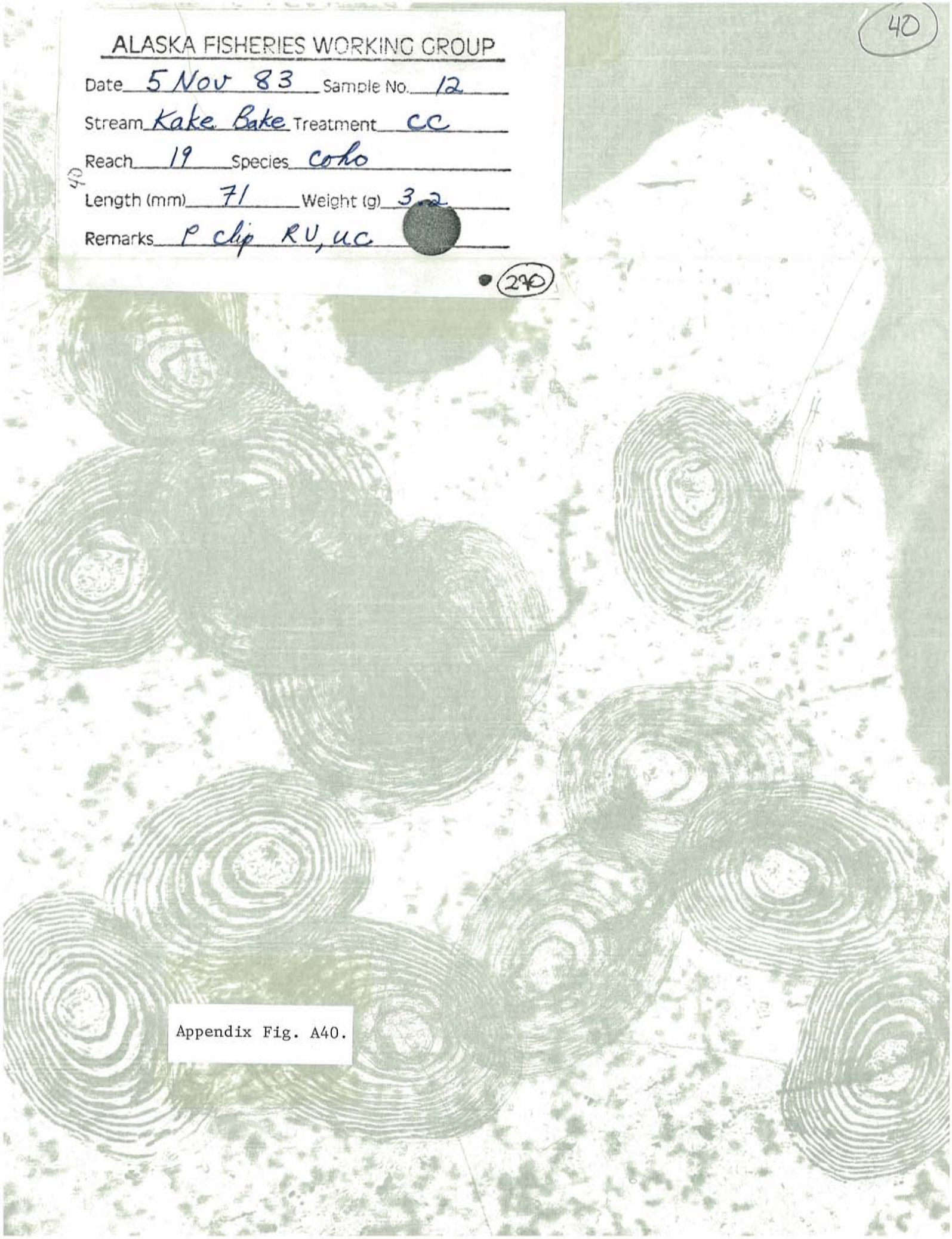
Reach 19 Species coho

40

Length (mm) 71 Weight (g) 3.2

Remarks P clip RV, uc

290



Appendix Fig. A40.

ALASKA FISHERIES WORKING GROUP

Date 11 Nov 83 Sample No. 10

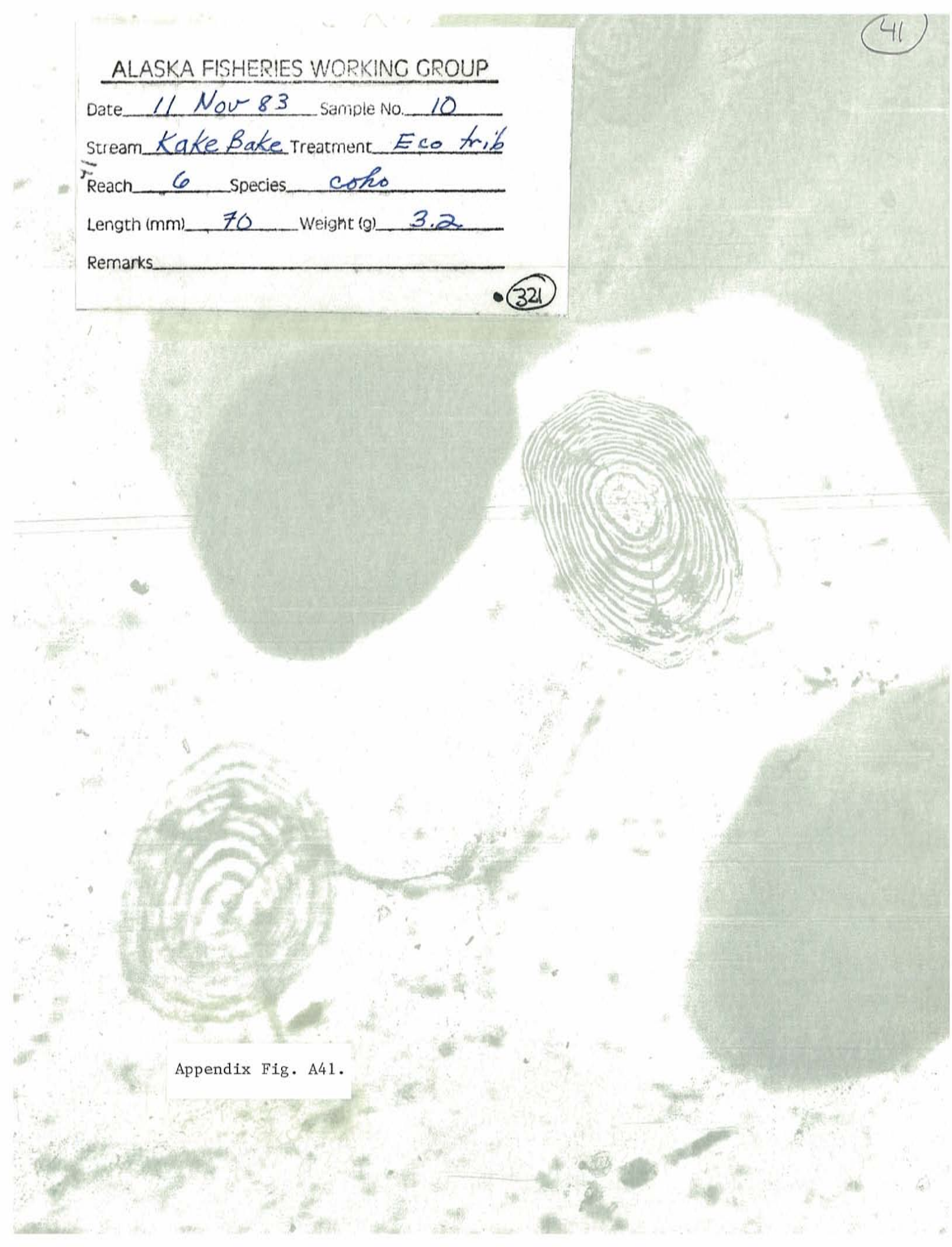
Stream Kake Bake Treatment Eco trib

Reach 6 Species coho

Length (mm) 70 Weight (g) 3.2

Remarks

321



Appendix Fig. A41.

ALASKA FISHERIES WORKING GROUP

Date 11 Nov 83 Sample No. 1

Stream Kake Bake Treatment Eco trib

Reach 6 Species coho

Length (mm) 90 Weight (g) 9.2

Remarks

312

Appendix Fig. A42.

ALASKA FISHERIES WORKING GROUP

Date 11 Nov 83 Sample No. 2

Stream Kake Bake Treatment Eco trib

Reach 6 Species coho

43 Length (mm) 86 Weight (g) 6.8

Remarks Previous clip RM LC

313

Appendix Fig. A43.

ALASKA FISHERIES WORKING GROUP

Date 11 Nov 83 Sample No. 5

Stream Kake Bake Treatment Eco trib

Reach 6 Species coho

Length (mm) 71 Weight (g) 3.9

Remarks

(316)

44

Appendix Fig. A44.

45

ALASKA FISHERIES WORKING GROUP

Date 11/12/83 Sample No. 1

Stream KAKE CAKE Treatment O.G. - TRIB

45 Reach 6 Species COHO

Length (mm) 92 Weight (g) 8.3

Remarks

323

Appendix Fig. A45.

ALASKA FISHERIES WORKING GROUP

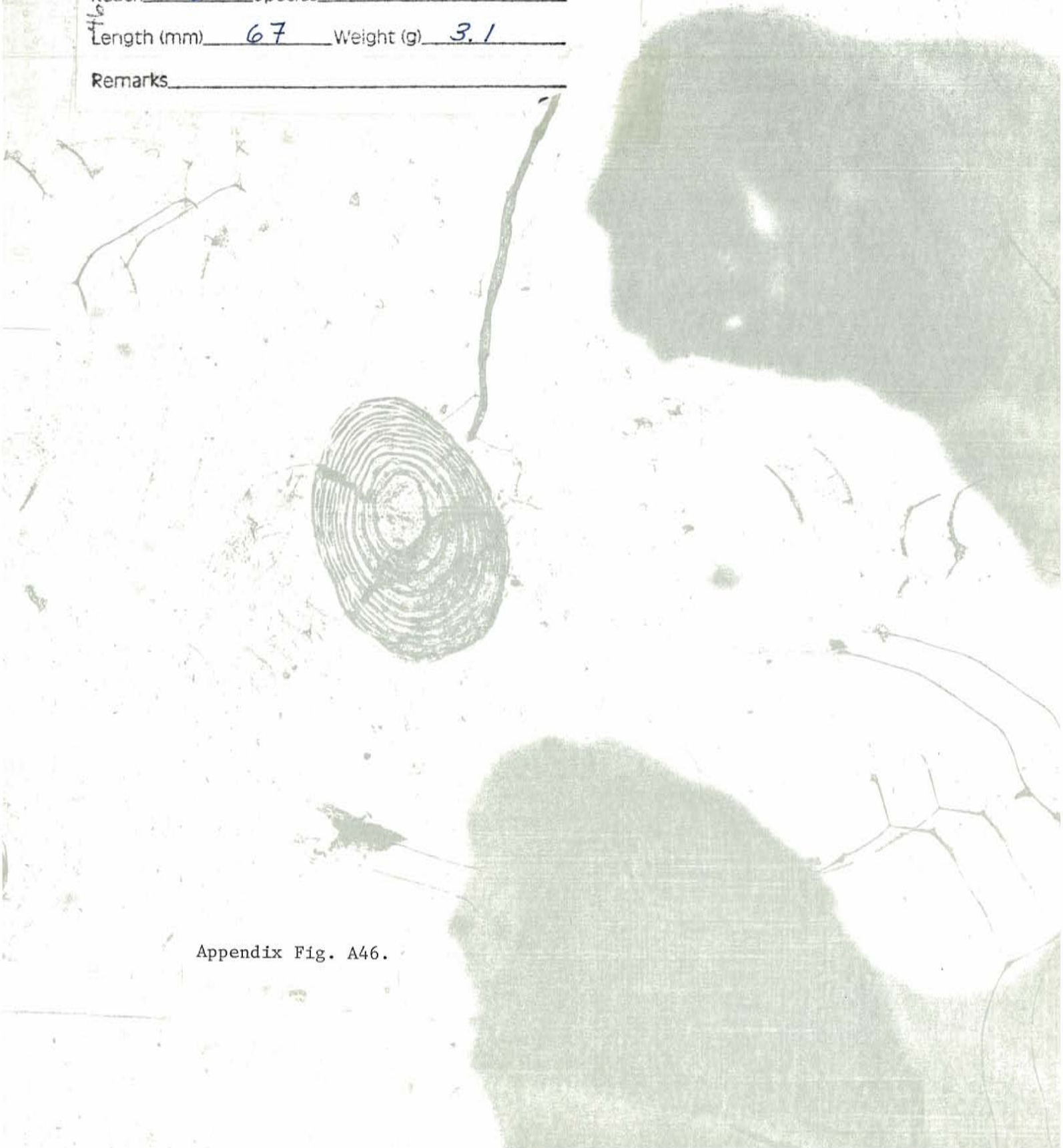
Date 12 Nov 83 Sample No. 4

Stream Kake Bake Treatment OG tr. 6

Reach 6 Species coho

Length (mm) 67 Weight (g) 3.1

Remarks



Appendix Fig. A46.

(47)

ALASKA FISHERIES WORKING GROUP

Date 12 Nov 83 Sample No. 8

Stream Kake Bake Treatment OG trib

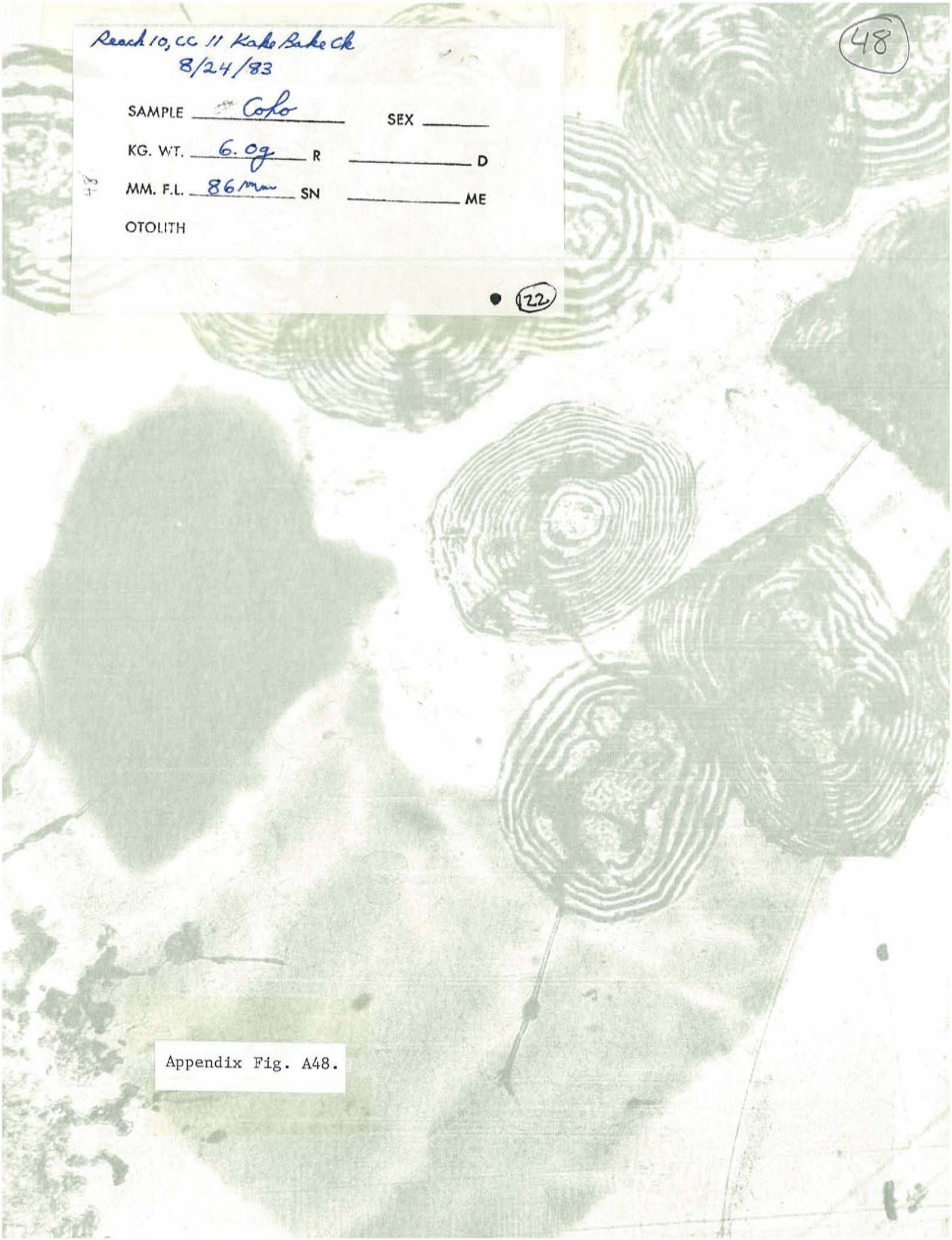
Reach 6 Species coho

47 Length (mm) 69 Weight (g) 3.2

Remarks

(330)

Appendix Fig. A47.



Appendix Fig. A48.

ALASKA FISHERIES WORKING GROUP

Date 4 Nov 83 Sample No. 6

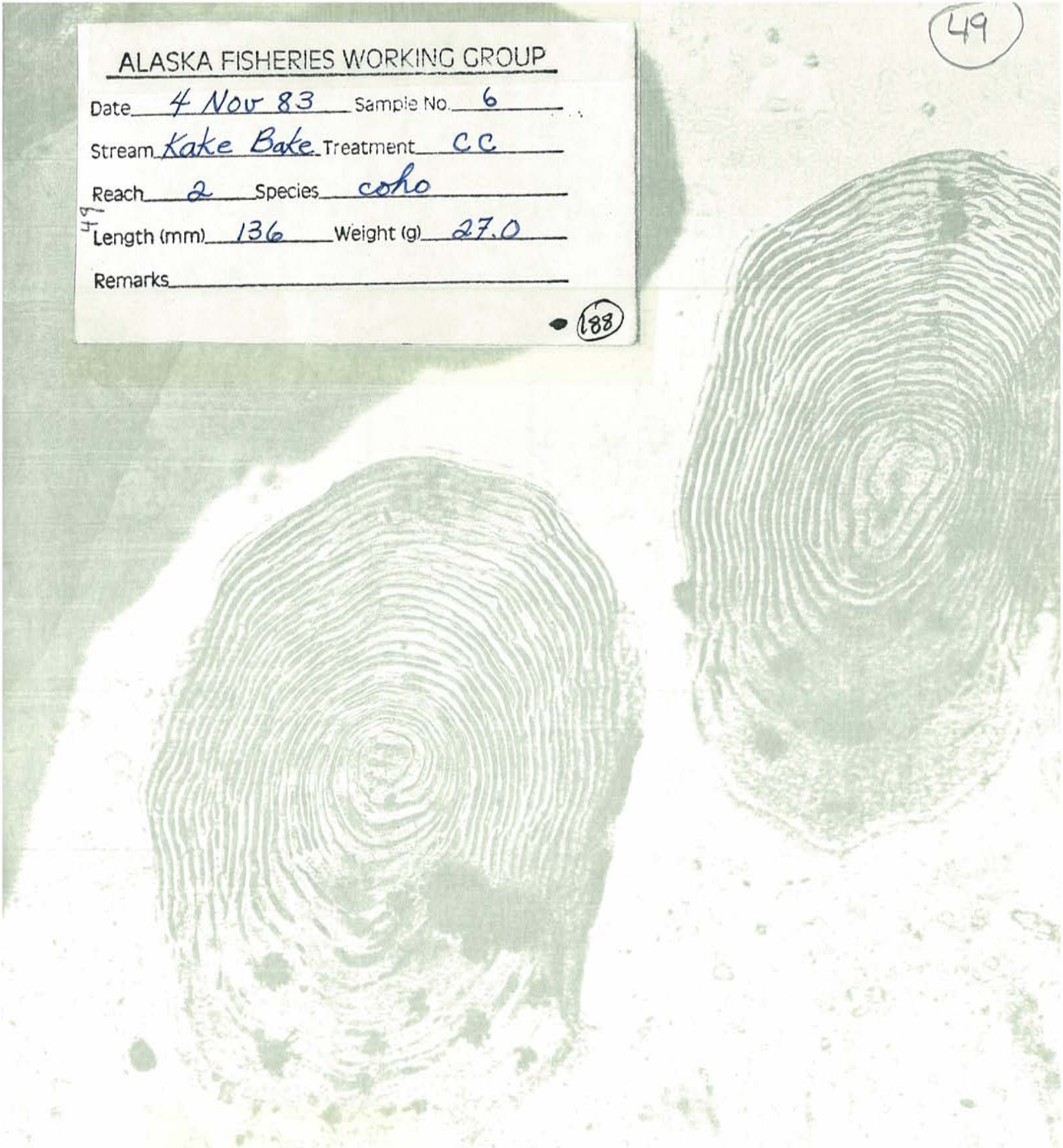
Stream Kake Bake Treatment CC

Reach 2 Species coho

49 Length (mm) 136 Weight (g) 27.0

Remarks

188



Appendix Fig. A49.

50

ALASKA FISHERIES WORKING GROUP

Date 2 Nov 83 Sample No. 4

Stream Kake Bake Treatment OG

Reach 2 Species Coho

Length (mm) 70 Weight (g) 3.6

Remarks

149

Appendix Fig. A50.

Sample No. (14) reach 30-60m mainstem clearcut 8/22/83

SAMPLE coho 73/4.1 mm/g SEX mort

KG. WT. _____ RG _____ D

MM. F.L. _____ SN _____ ME

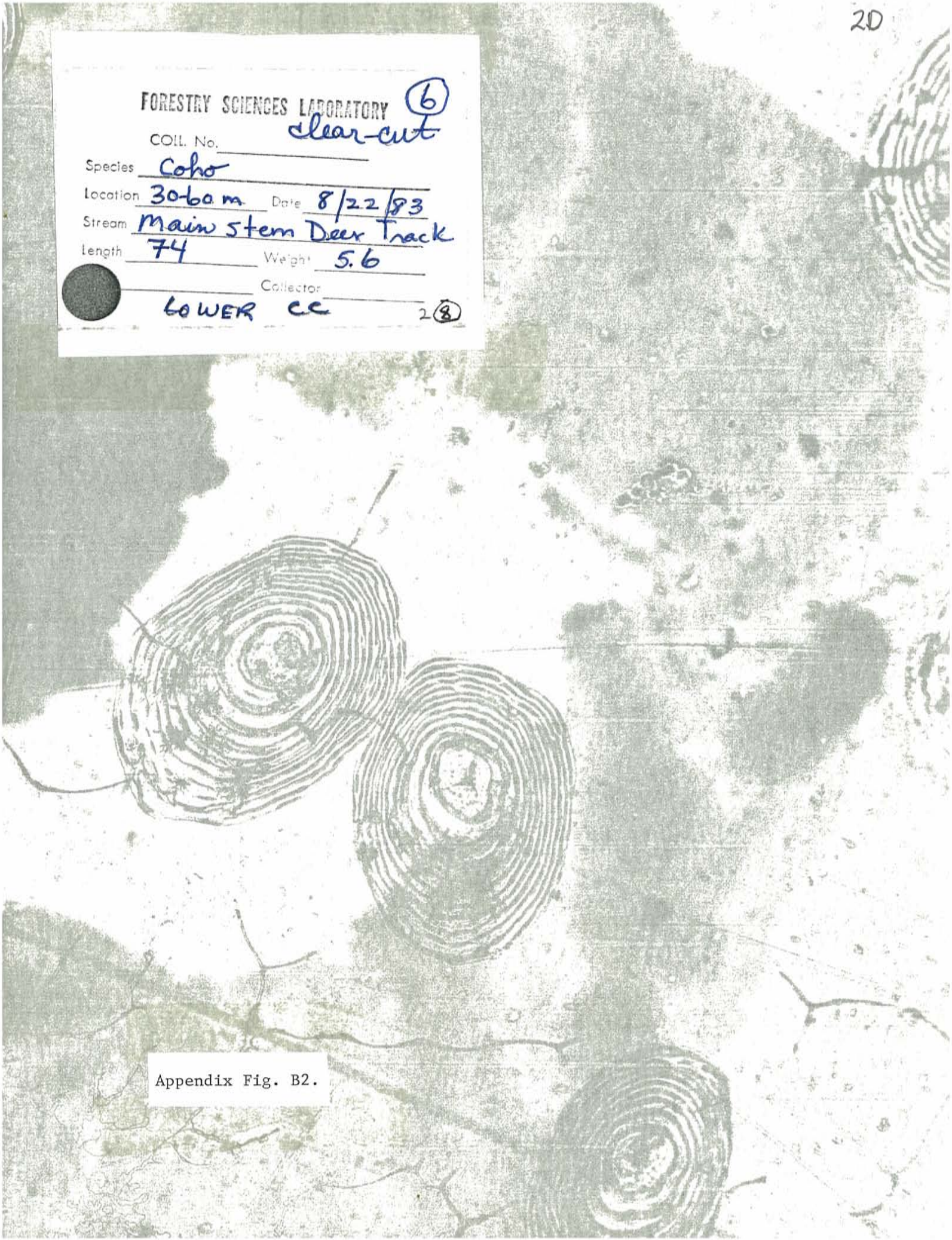
OTOLITH _____

Deer Track

LOWER CC

(10)

Appendix Fig. B1.



Appendix Fig. B2.

FORESTRY SCIENCES LABORATORY (30)

COLL. No. Buffer

Species Coho

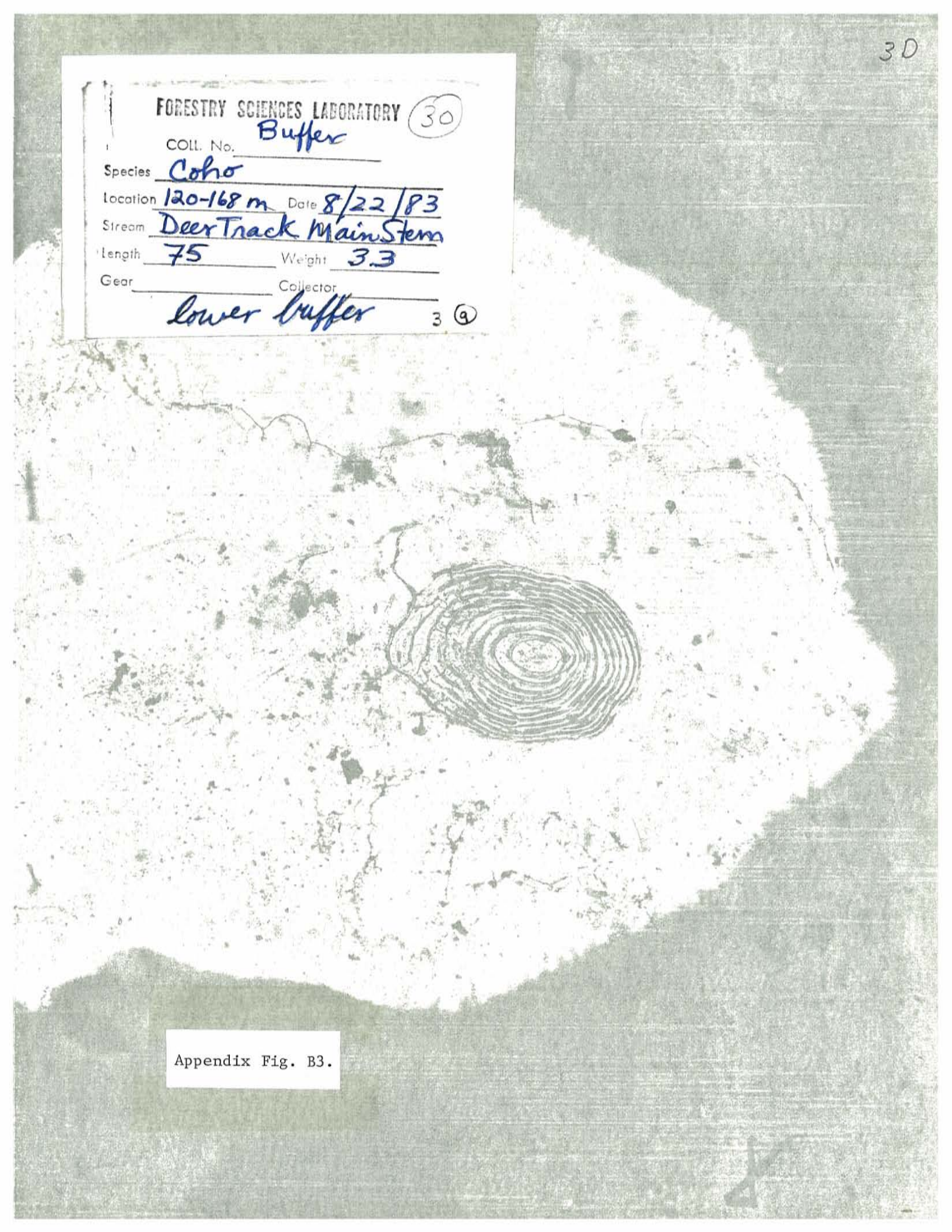
Location 120-168 m Date 8/22/83

Stream Deer Track Main Stem

Length 75 Weight 3.3

Gear _____ Collector _____

lower buffer 3 (9)



Appendix Fig. B3.

FORESTRY SCIENCES LABORATORY

COLL. No. Buffer ~~40-60 cm~~ (21)

Species Coho

Location 90-120 m Date 8/22/83

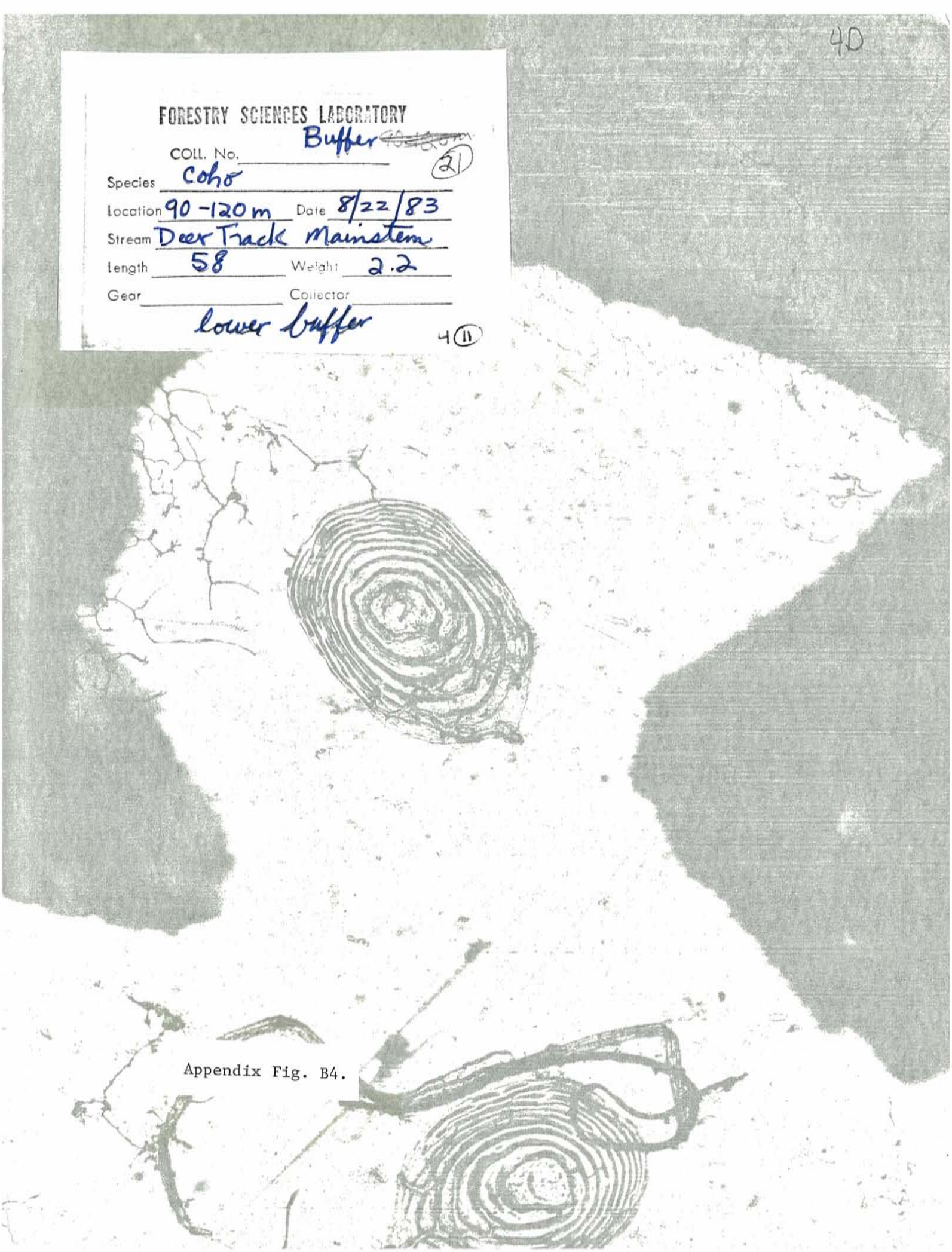
Stream Deer Track Mainstem

Length 58 Weight 2.2

Gear _____ Collector _____

lower buffer

4(11)



Appendix Fig. B4.

SU

FORESTRY SCIENCES LABORATORY 3

COLL. No. _____

Species Coho

Location P.O.W. Date 8-19-83

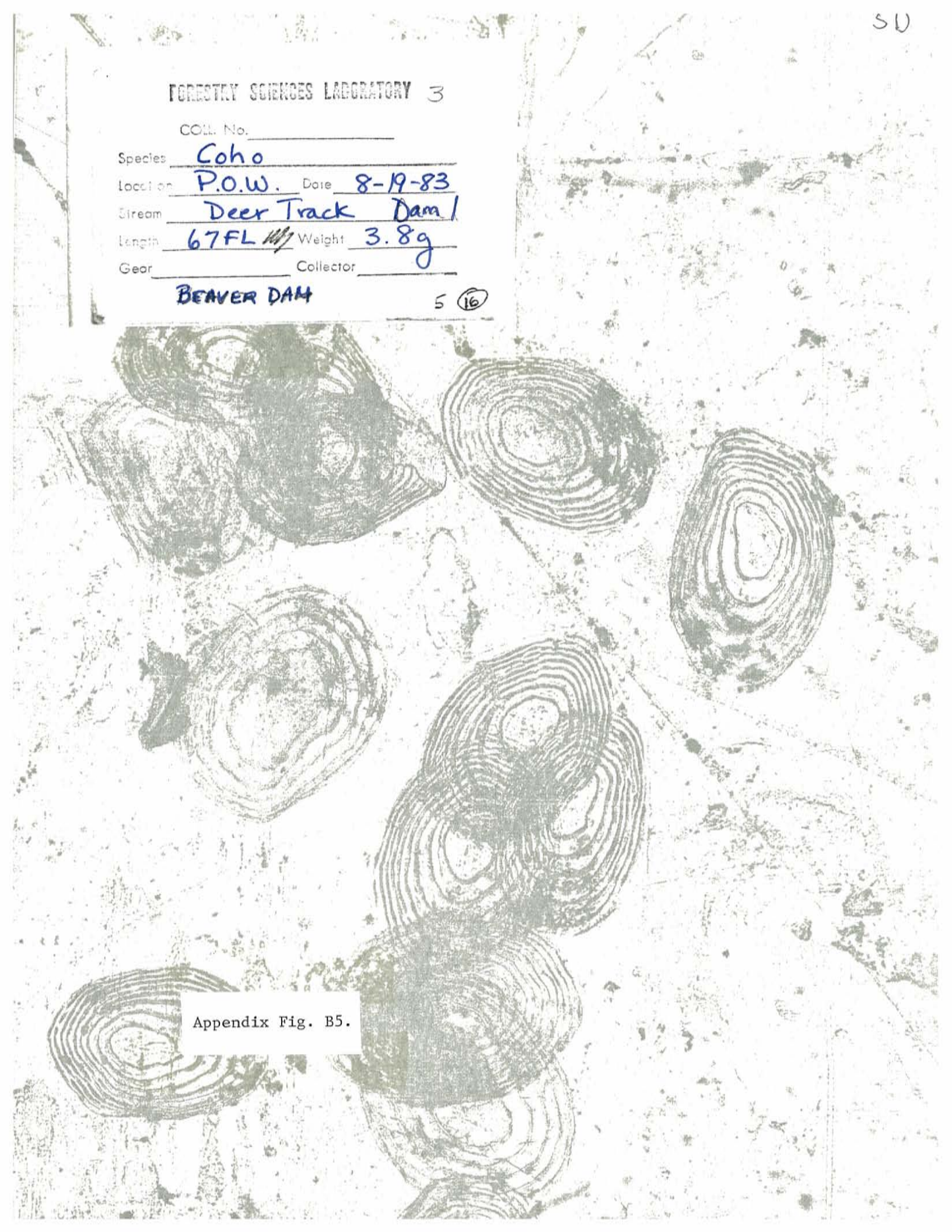
Stream Deer Track Dam 1

Length 67FL mm Weight 3.8g

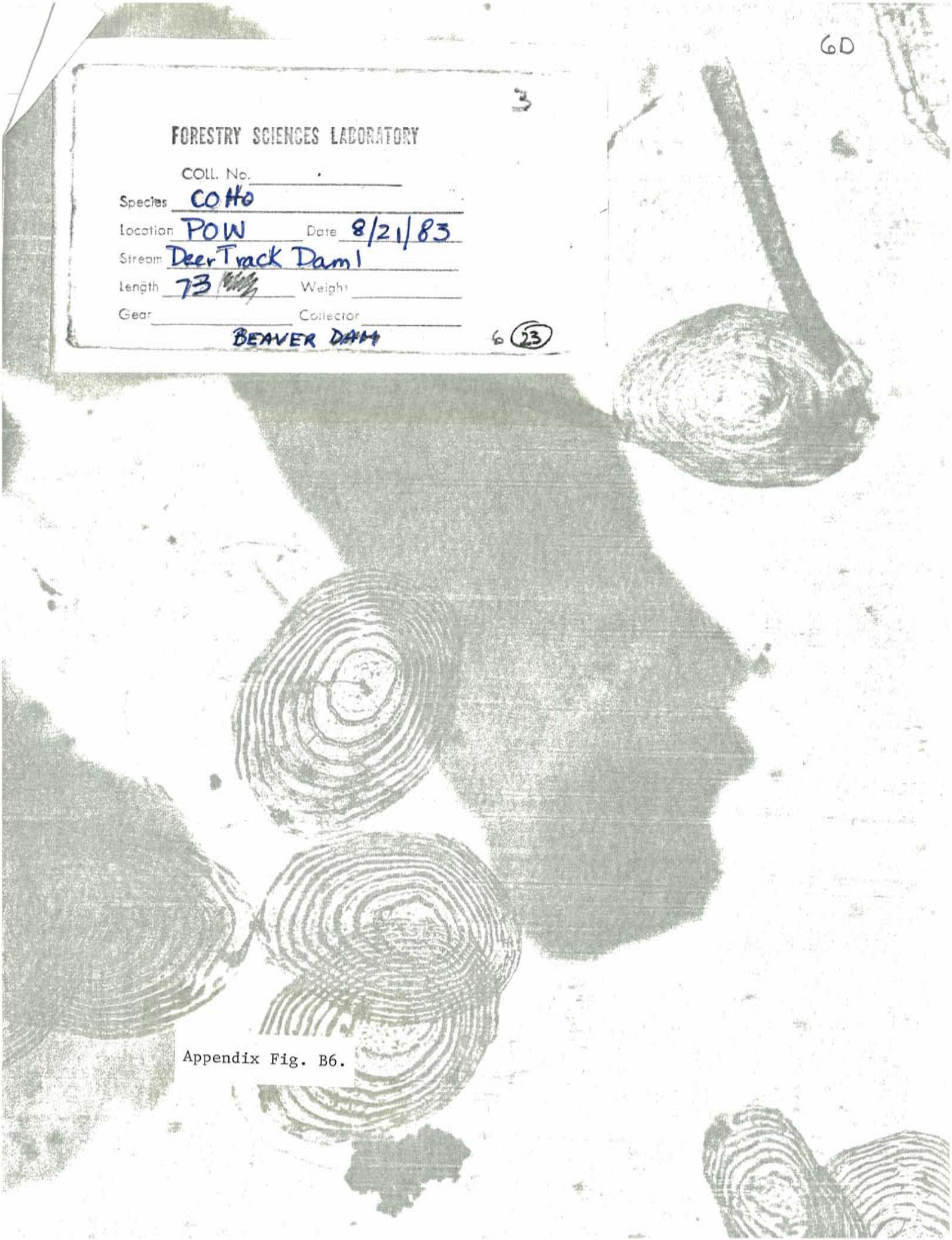
Gear _____ Collector _____

BEAVER DAM

5 (16)



Appendix Fig. B5.



Appendix Fig. B6.

Meadow Mainstem 320-350M
8-24-83 Coho

SAMPLE 10 SEX

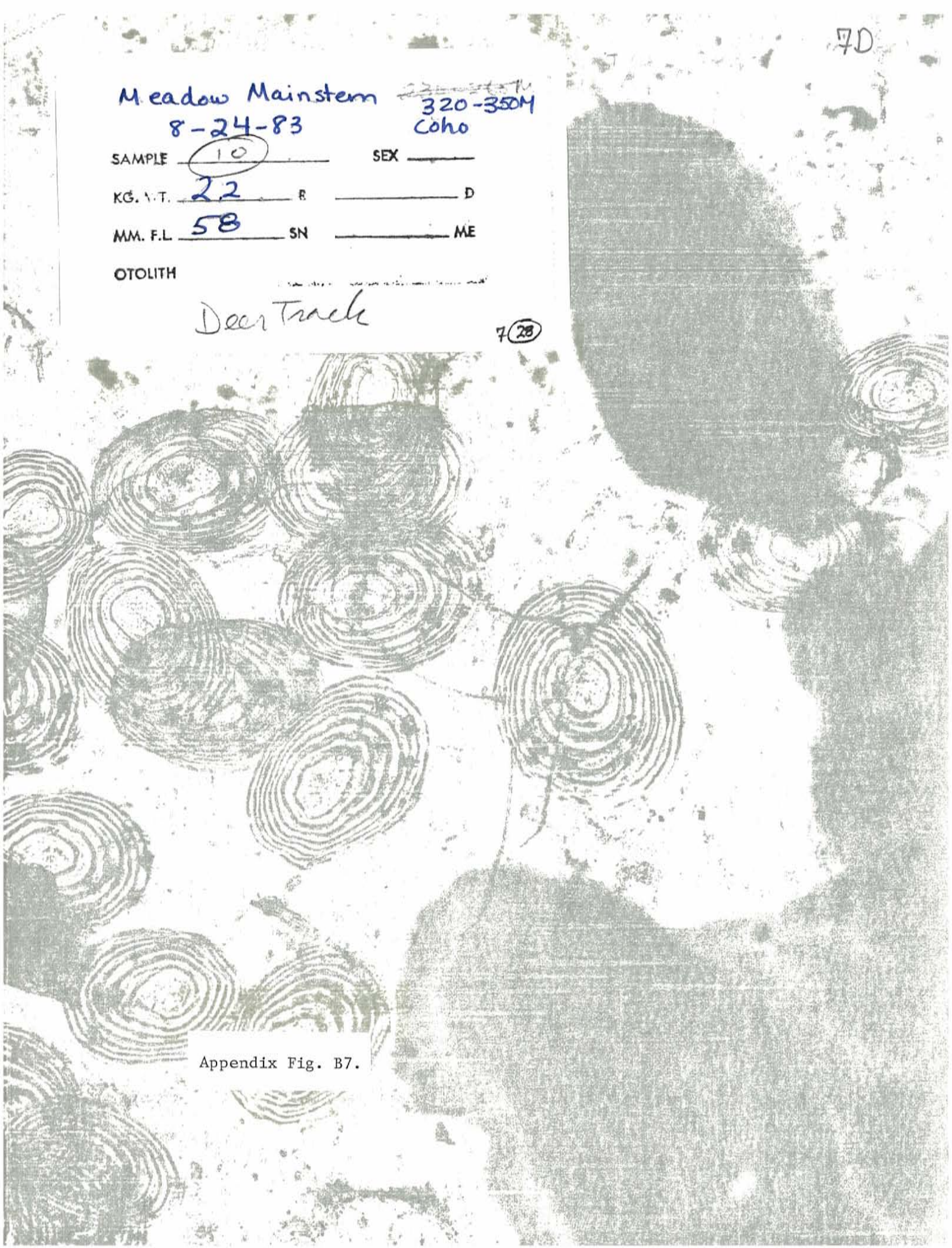
KG. W.T. 22 R D

MM. F.L. 58 SN ME

OTOLITH

Deer Track

7(28)



Appendix Fig. B7.

Meadow Mainstem 350-380m
Deer Track
8/25/83

SAMPLE coho SEX _____

KG. WT. _____ R _____ D

MM. F.L. 61 SN _____ ME

OTOLITH

8 (42)

Appendix Fig. B8.

Deer Track Cr. Meadow
230 - 260m

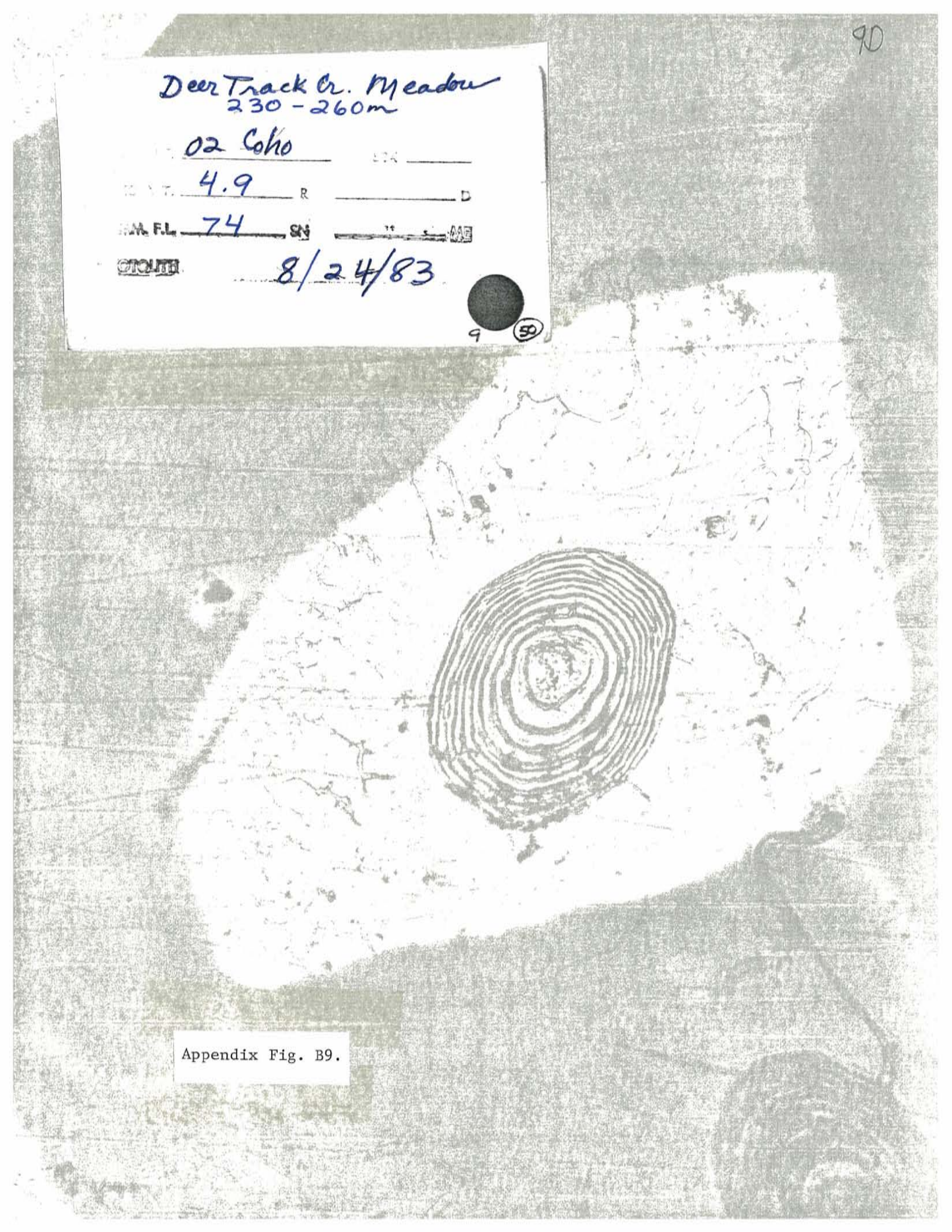
02 Coho

T. 4.9 R D

F.L. 74

8/24/83

9 50



Appendix Fig. B9.

FORESTRY SCIENCES LABORATORY

440-470

COLL. No. 01

Species Coho 01

Location Deer Track Date 8/25/83

Stream Buffer 440-470

Length 57 Weight 2.5g

Gear _____ Collector _____

Upper Buffer - steep 10 (57)

Appendix Fig. B10.

Deer Trail - Buffer
420-500
SAMPLE Coho-08 8/25/83
SEX
KG. WT. 2.5
R
D
MM. F.L. 60
SN
ME
OTOLITH
Upper Buffer - steep
II (60)

Appendix Fig. B11.

Deertrack Buffer 500 - 530
8-26-83

SAMPLE #12 Coho SEX _____

KG. WT. 2.2g R _____ D

MM. F.L. 56 SN _____ ME

OTOLITH

Upper Buffer - FLAT

12 (63)

Appendix Fig. B12.

Deertrack Buffer 500-530

7-26-83

SAMPLE #6 Coho SEX _____

KG. W.T. _____ R _____ D

MM. F.L. 71 SN _____ ME

OTOLITH

Upper Buffer - FLAT

13 (67)

Appendix Fig. B13.

Deertrack, Buffer 500 - 530
8-26-83

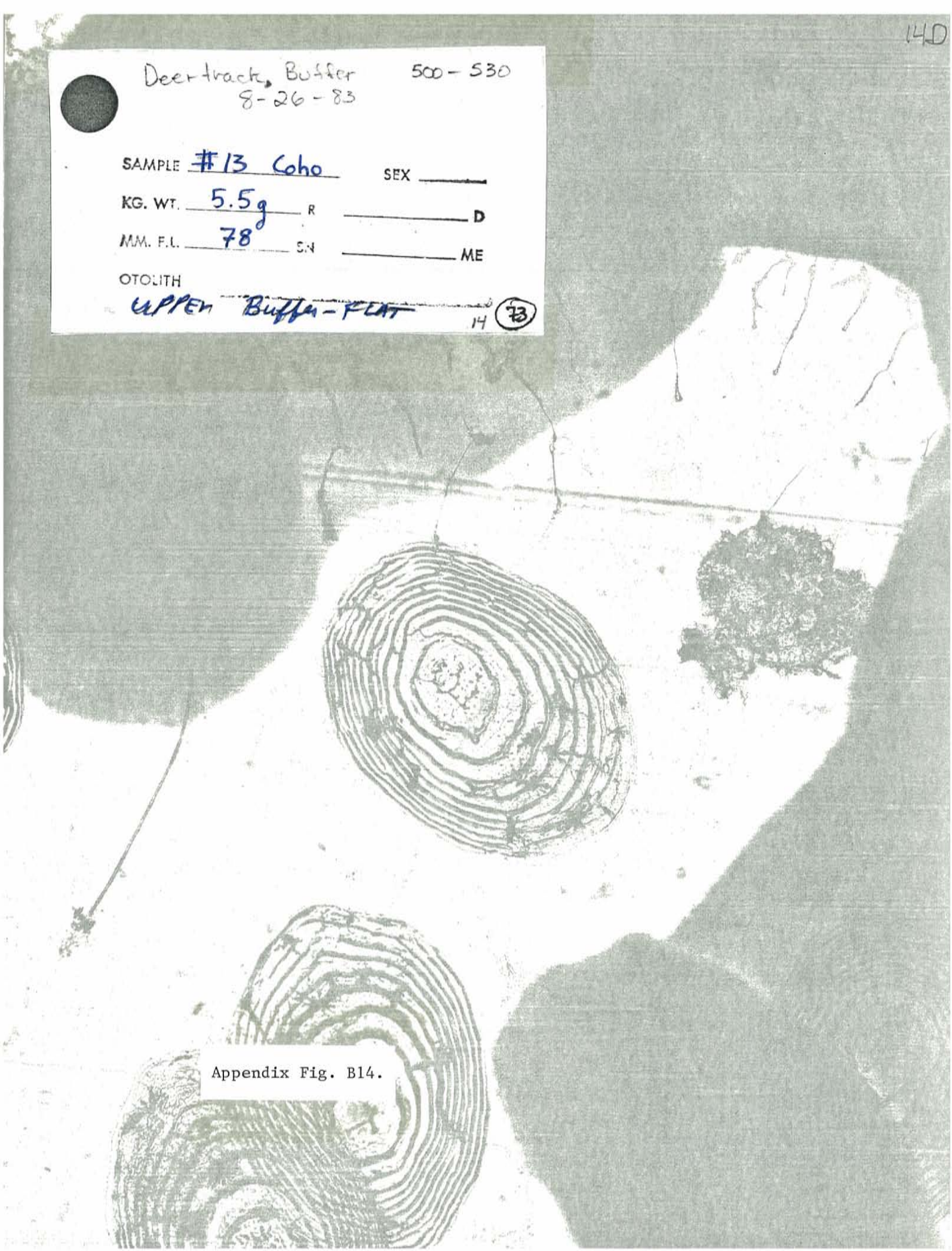
SAMPLE #13 Coho SEX _____

KG. WT. 5.5g R _____ D

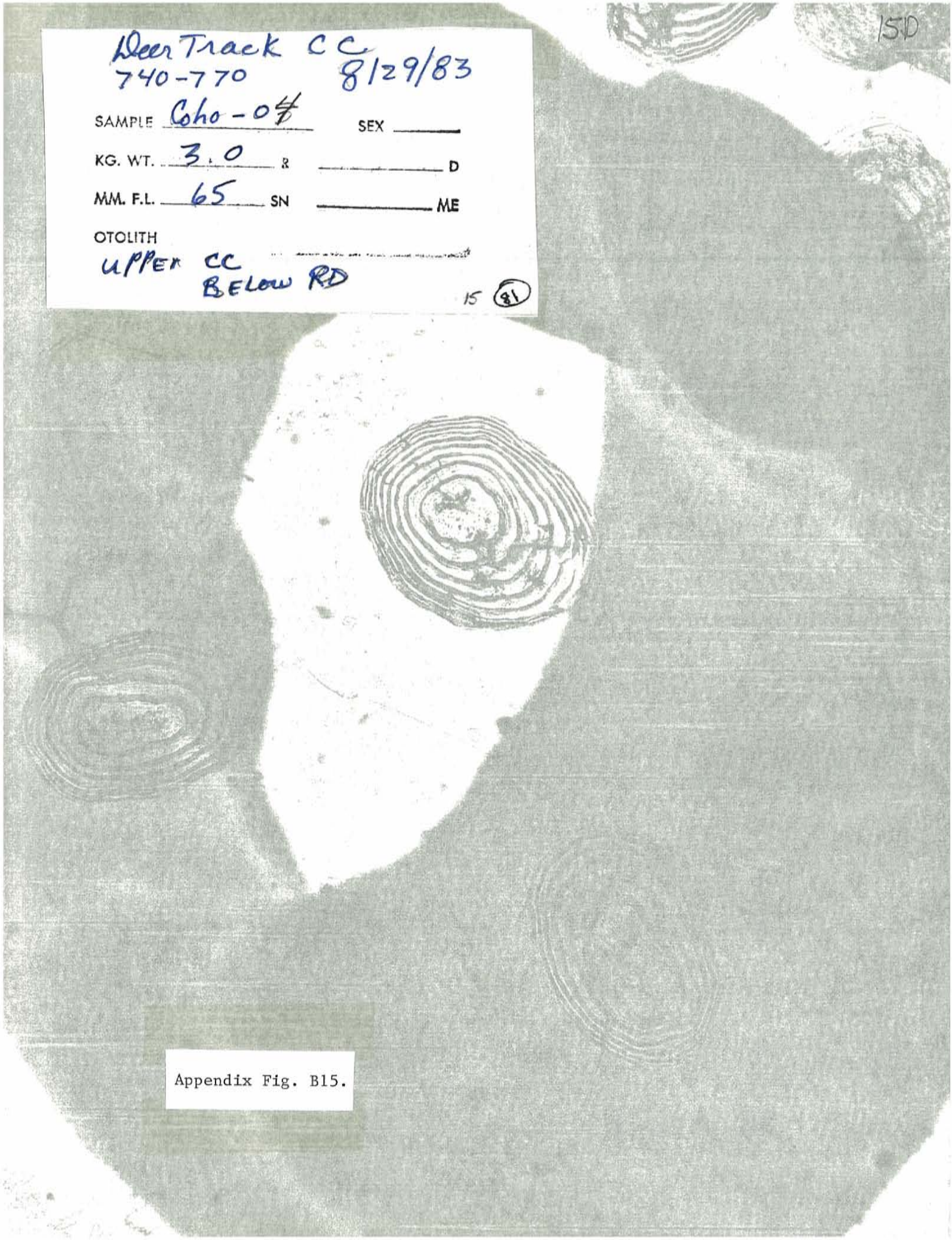
MM. F.L. 78 S:N _____ ME

OTOLITH

UPPER Buffer - FLAT 14 (73)



Appendix Fig. B14.



Appendix Fig. B15.

Deer TK.C.C.
830 - 850

SAMPLE Coho #9 SEX

KG. WT 3.6 I 8/29/83 D

M.M. F.L. 69 SN ME

OTOLITH

UPPER CC
BELOW RD 16 (89)

Appendix Fig. B16.

DeerTrack CC 860-910
8-30-83

SAMPLE ① Coho SEX

KG. WT. R D

MM. F.L. 80 SN ME

OTOLITH

UPPER CC
BELOW RD

17 (109)

Appendix Fig. B17.

8/29/83 Deer Track Clearcut 910-970m

SAMPLE (11) Coho SEX ____

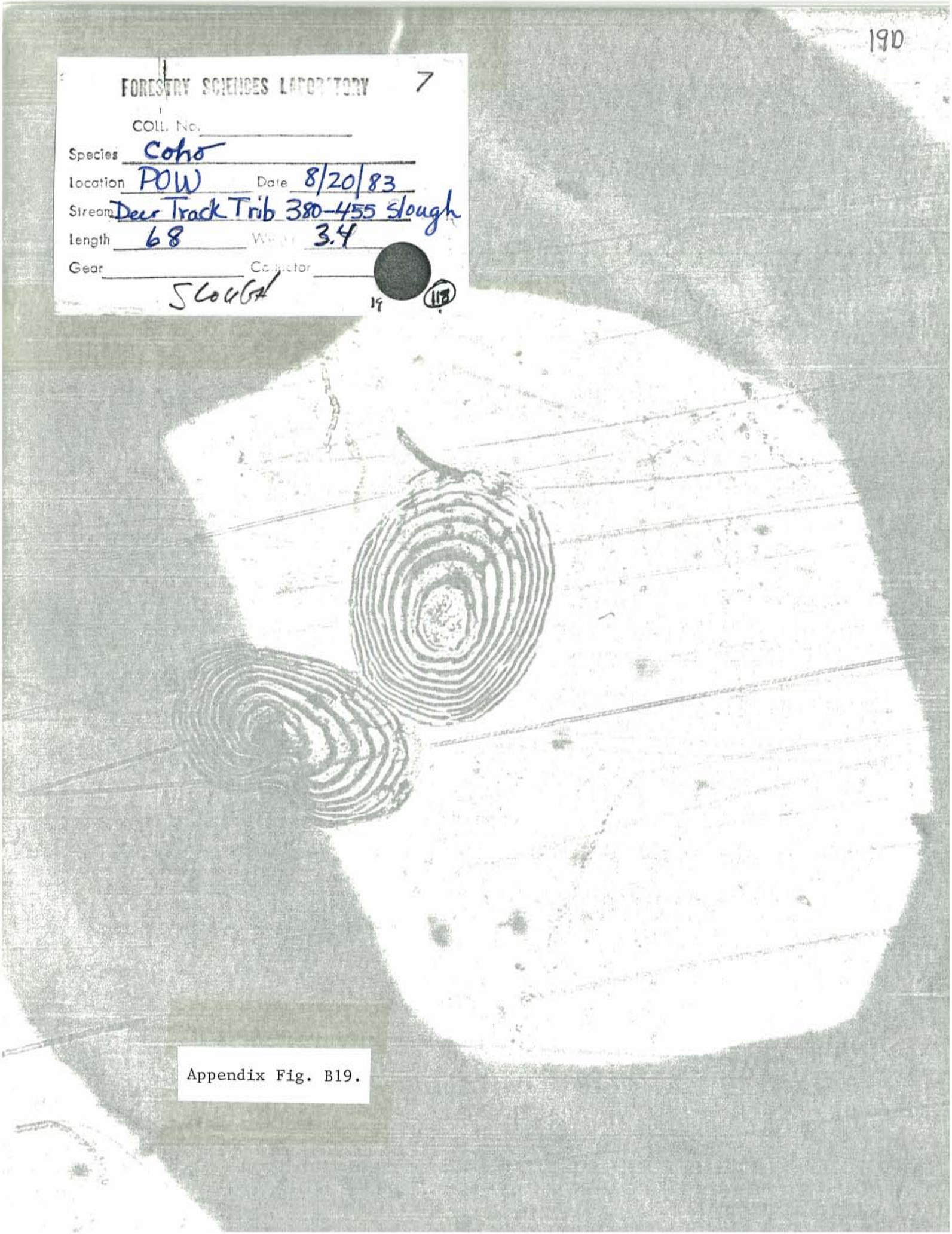
KG. WT. 3.6 R ____ D

MM. F.L. 63 SN ____ ME

OTOLITH 18

UPPER CC ABOVE RD (113)

Appendix Fig. B18.



Appendix Fig. B19.

FORESTRY SCIENCES LABORATORY

COLL. No. 9

Species COHO

Location PON 8/22/83

Stream Deer Track Slough Trib 375-450m

Length 84 mm 8.1

Gear _____ Collector _____

SloughT

Appendix Fig. B20.

FORESTRY SCIENCES LABORATORY

5

COLL. No.

Species Coho

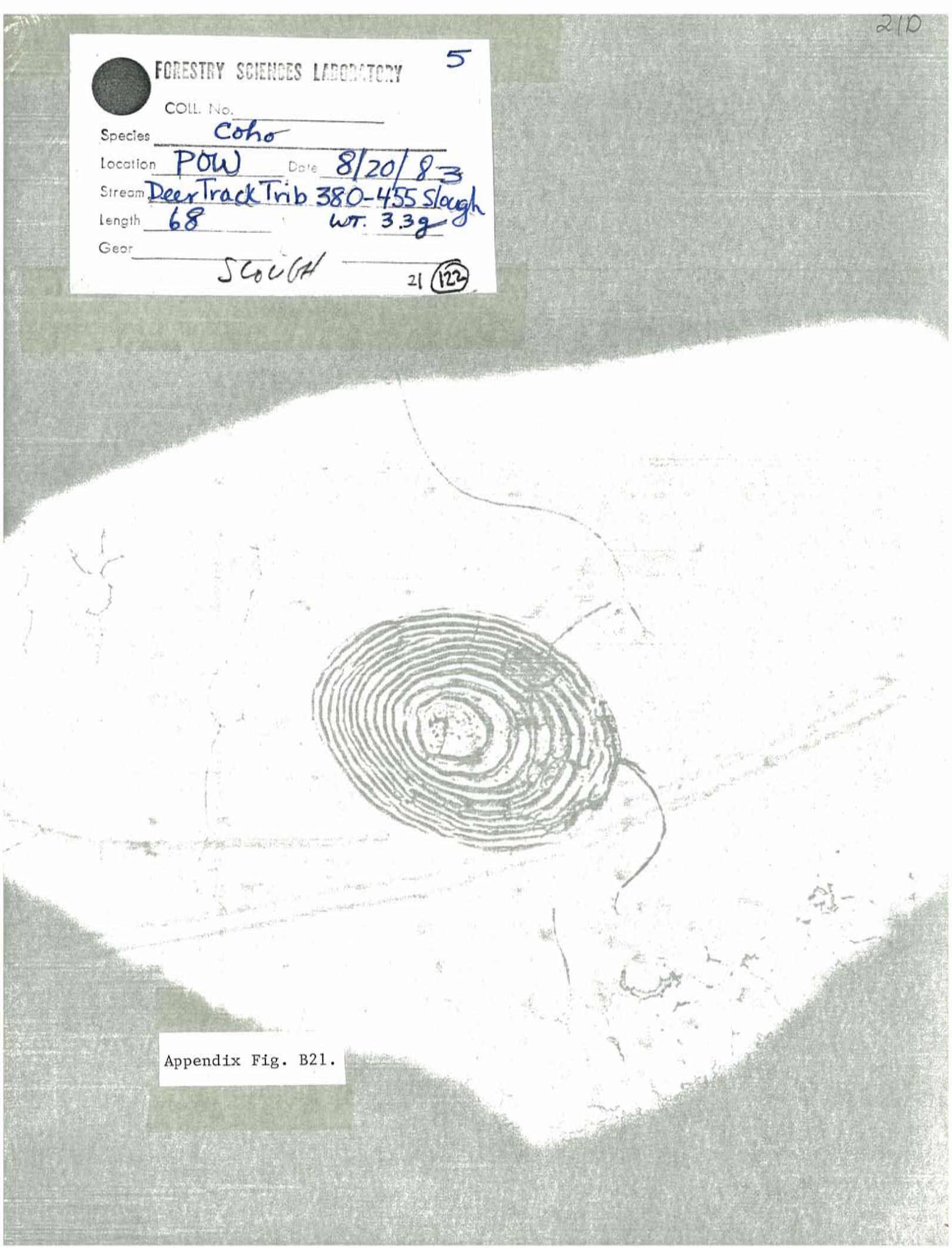
Location POW Date 8/20/83

Stream Deer Track Trib 380-455 Slough

Length 68 WT. 3.3g

Gear Slough

21 (122)



Appendix Fig. B21.

Deer Track Fork Trib 60-90

8-27-83

SAMPLE Coho 07 SEX

3.6 R D

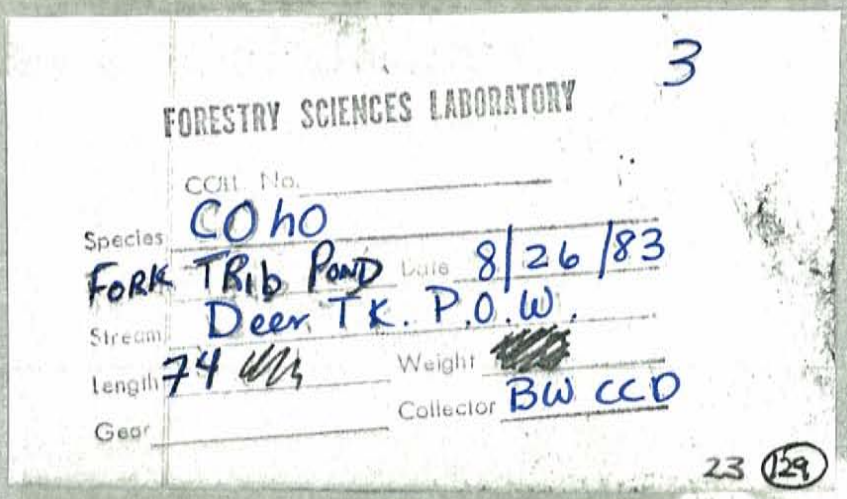
69 AE

MOUTH

Fork TRIB
BELOW RD

22 (125)

Appendix Fig. B22.



Appendix Fig. B23.

FOREST[illegible] SCIENCES LABORATORY

37

Coll No. 37

Species COHO

Location Pond Date 8/28/83

Stream Deer Track Fork Trib POND

Length 64 Mm Weight 2.7

Gear _____ Collector _____

24 (132)

Appendix Fig. B24.

250

FORESTRY SCIENCES LABORATORY

38

COLL. No. 38

Species Coho

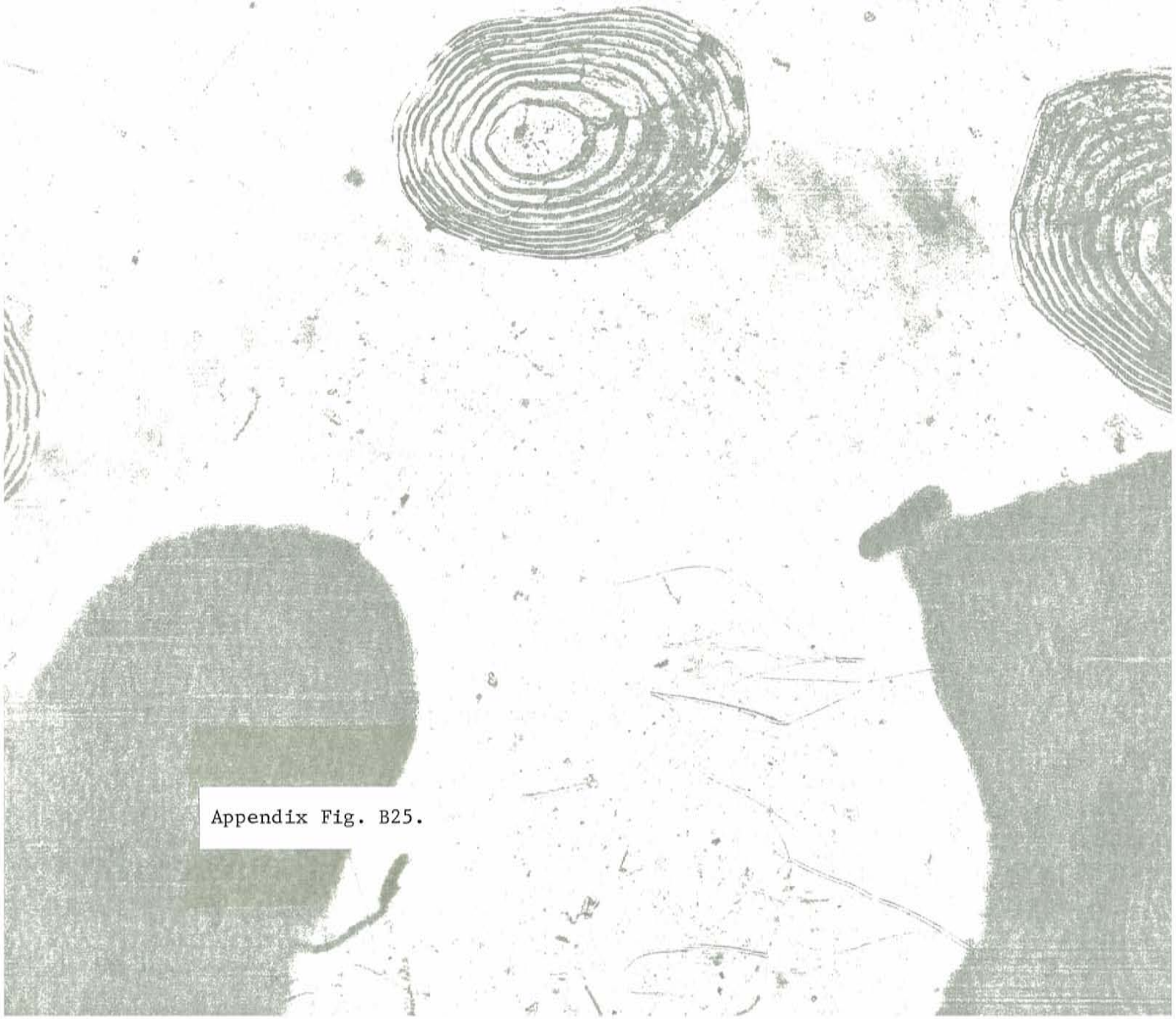
Location Pond Date 8/28/83

Stream Deer Track Fork Trib POND

Length 84 mm Weight 6.8

Gear _____ Collector _____

25 (35)



Appendix Fig. B25.

ALASKA FISHERIES WORKING GROUP

Date 11/4/83 Sample No. 7

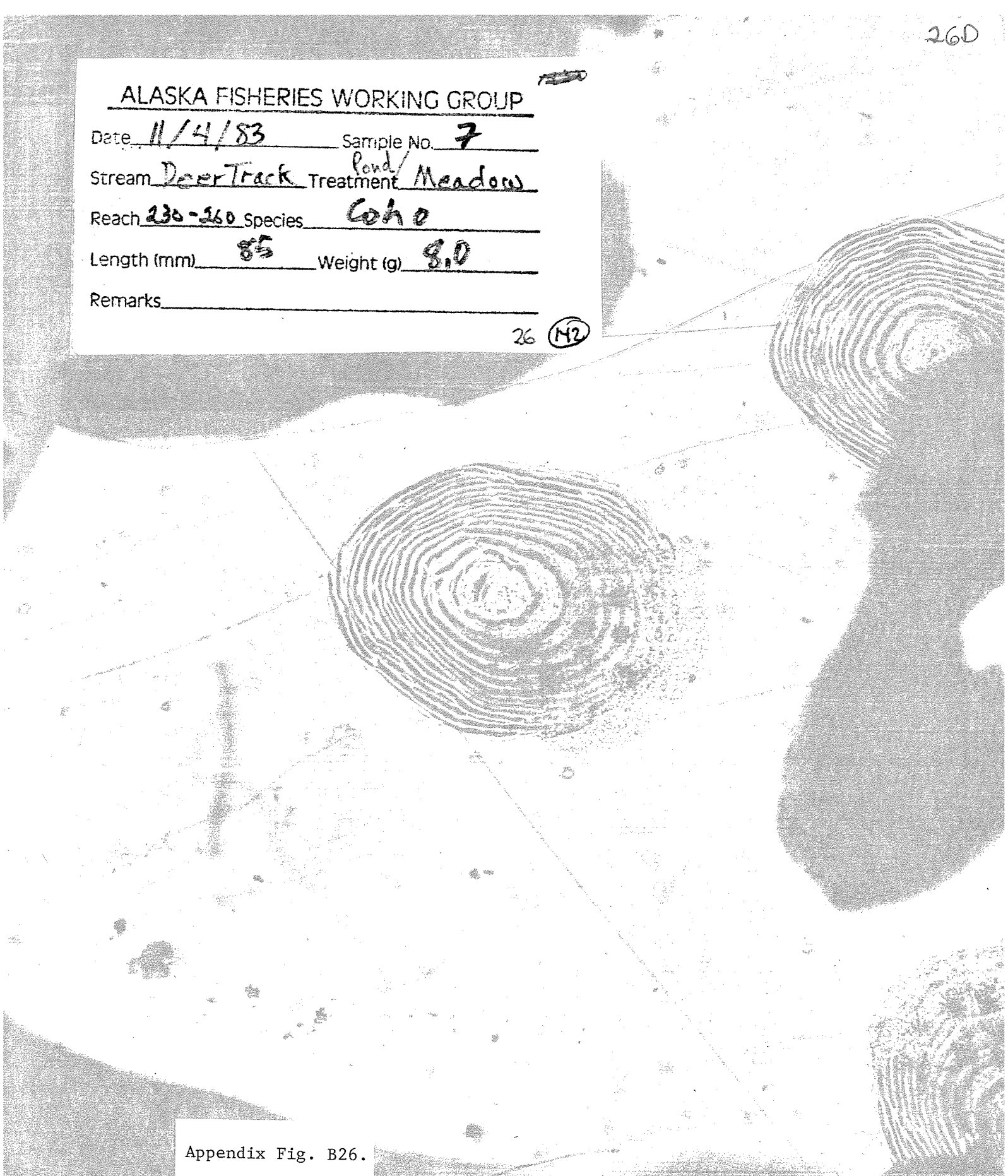
Stream Deer Track Treatment Pond/Meadow

Reach 230-260 Species Coho

Length (mm) 85 Weight (g) 8.0

Remarks

26 (M2)



Appendix Fig. B26.

ALASKA FISHERIES WORKING GROUP

Date 11/4/83 Sample No. 10

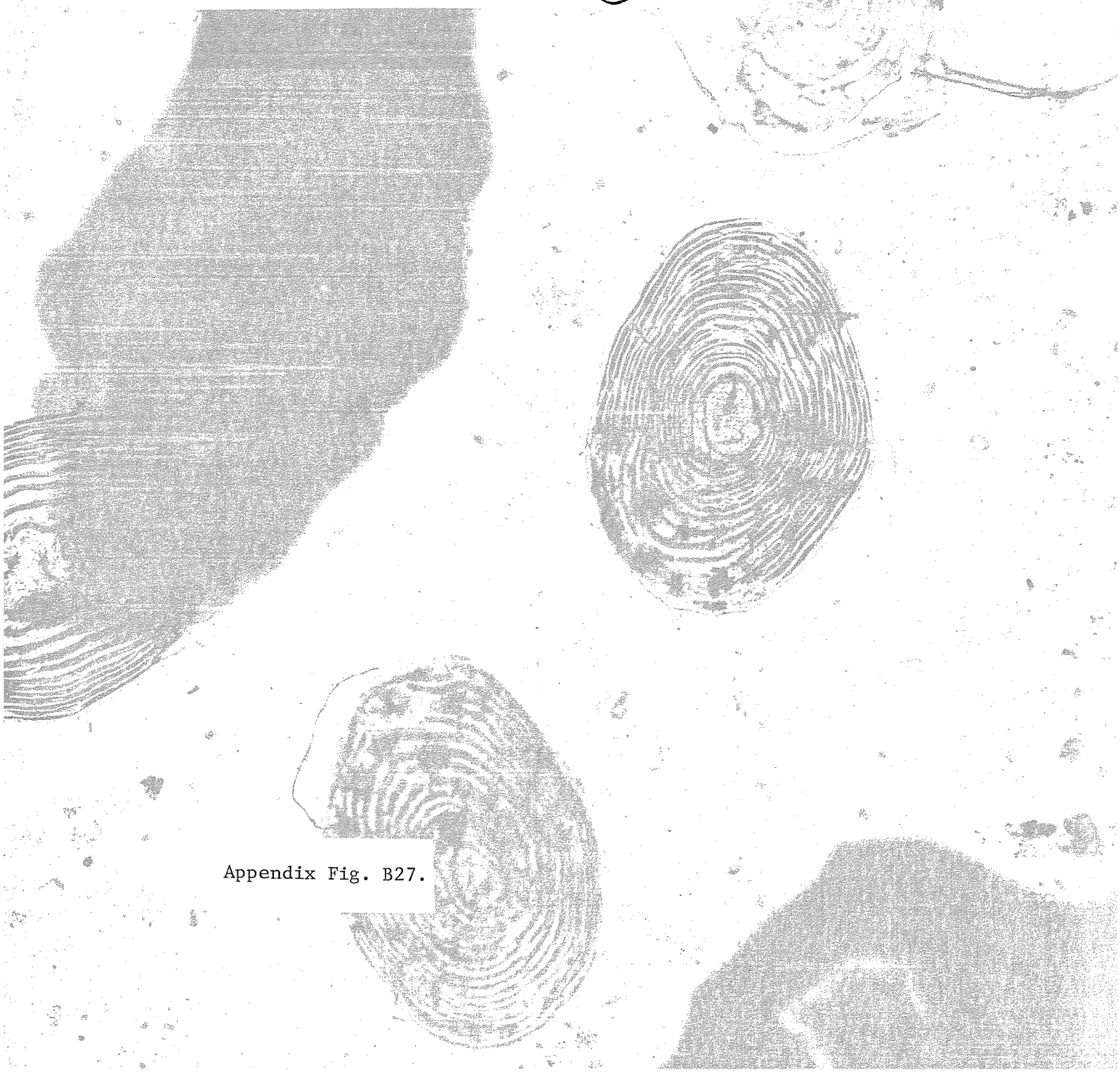
Stream Deer Track Treatment Pond/Meadow

Reach 230-160 Species Coho

Length (mm) 110 Weight (g) 14.0

Remarks lower jaw split

27 (145)



Appendix Fig. B27.

ALASKA FISHERIES WORKING GROUP

Date 11/4/83 Sample No. 21

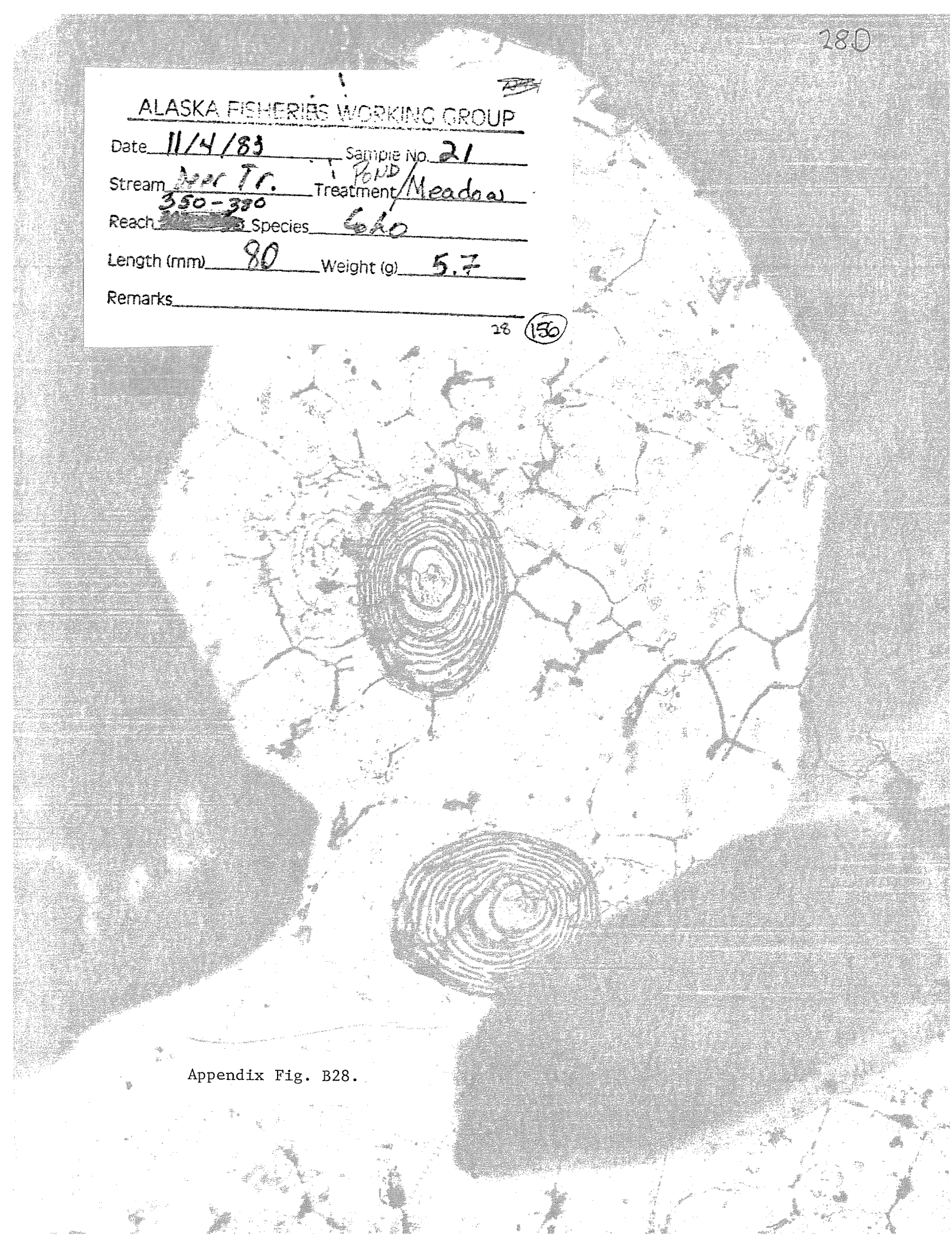
Stream Deer Tr. Treatment Pond/Meadow

Reach 350-330 Species Coho

Length (mm) 80 Weight (g) 5.7

Remarks

28 (156)



Appendix Fig. B28.

ALASKA FISHERIES WORKING GROUP

Date 11/5/83 Sample No. 40

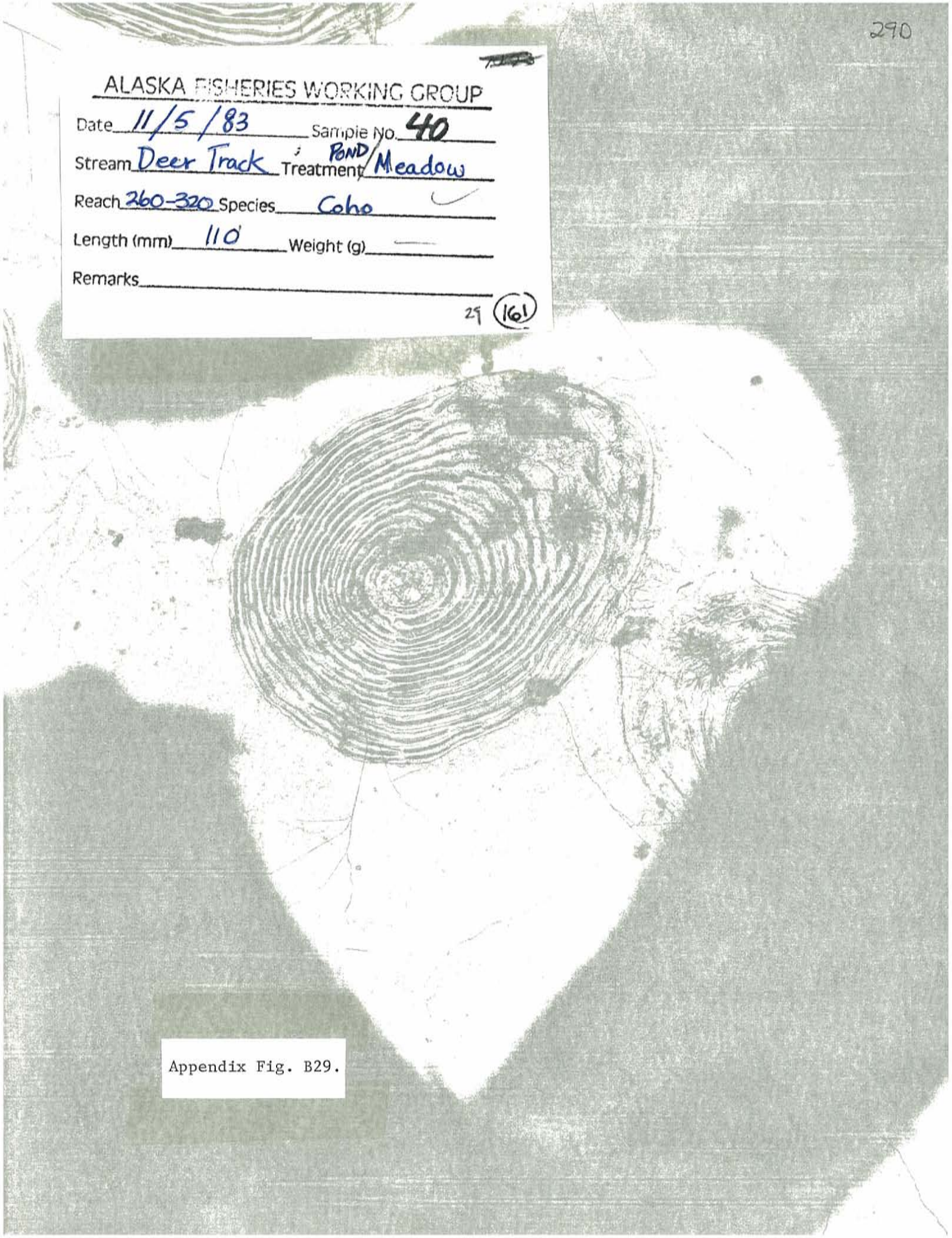
Stream Deer Track Treatment POND/Meadow

Reach 260-320 Species Coho

Length (mm) 110 Weight (g) —

Remarks

29 (161)



Appendix Fig. B29.

D ALASKA FISHERIES WORKING GROUP

Date 11-7-83 Sample No. 15

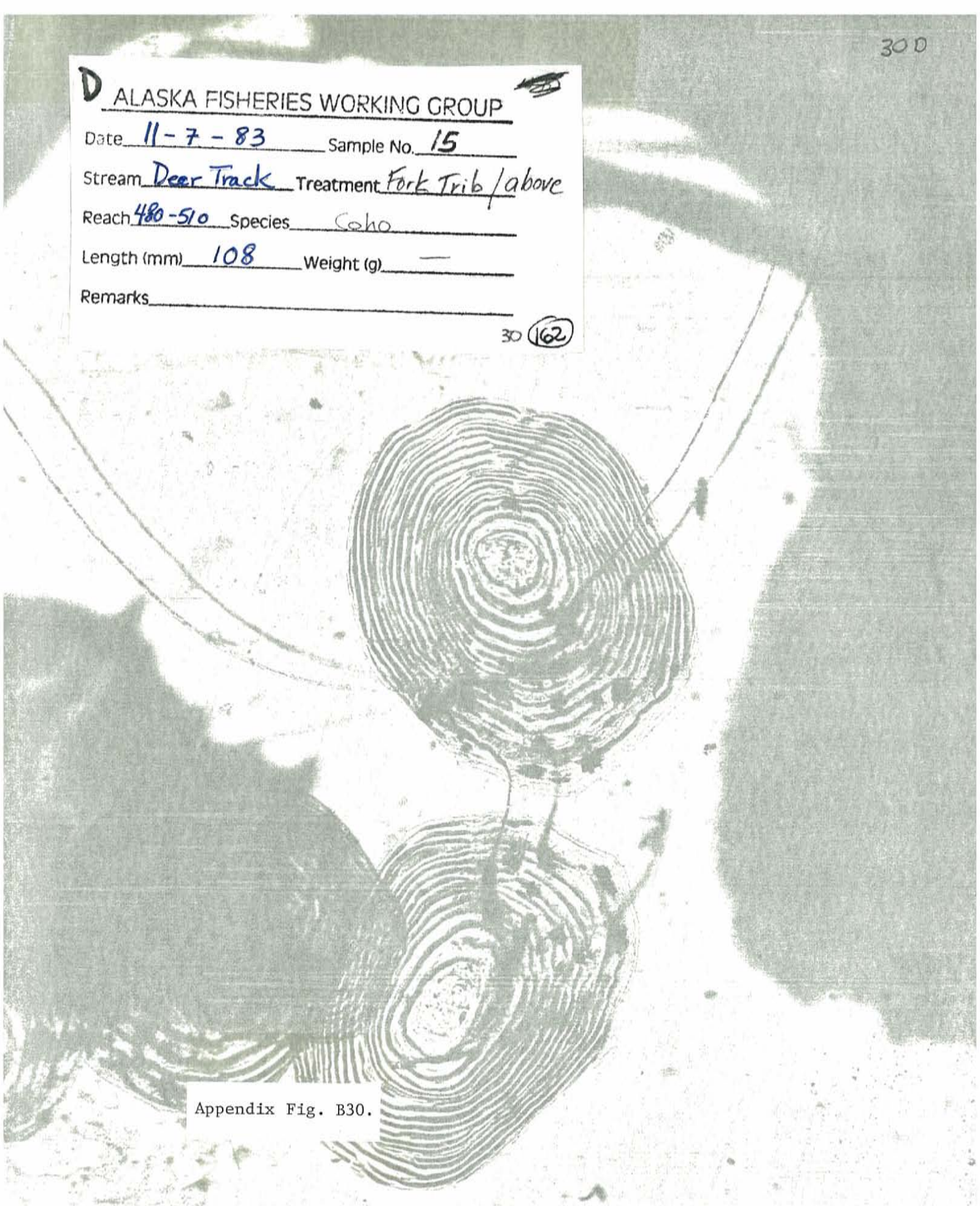
Stream Deer Track Treatment Fork Trib / above

Reach 480-510 Species Coho

Length (mm) 108 Weight (g) —

Remarks

30 (162)



Appendix Fig. B30.

N74

ALASKA FISHERIES WORKING GROUP

Date 11-783 Sample No. 14

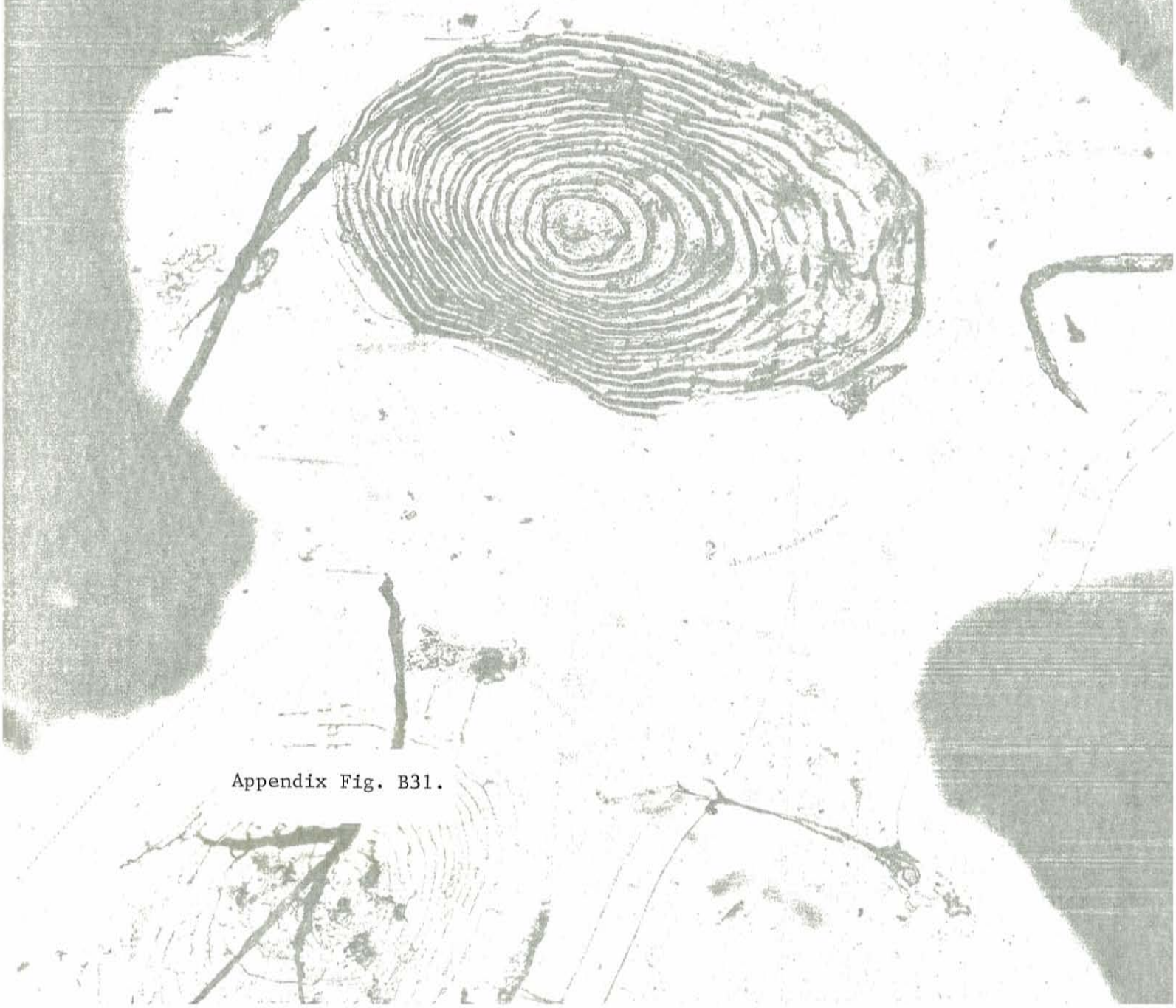
Stream Deer Track Treatment Fork Trib/above

Reach 480-510 Species Coho

Length (mm) 94 Weight (g) —

Remarks

31 (165)



Appendix Fig. B31.

ALASKA FISHERIES WORKING GROUP

Date 11/8/83 Sample No. 39

Stream Deer Tr. Treatment upper CC / below

Reach 680-710 Species Coho

Length (mm) 80 Weight (g) 6.2

Remarks RV ?

32 (175)

Appendix Fig. B32.

ALASKA FISHERIES WORKING GROUP

Date 11/3/83 Sample No. 12

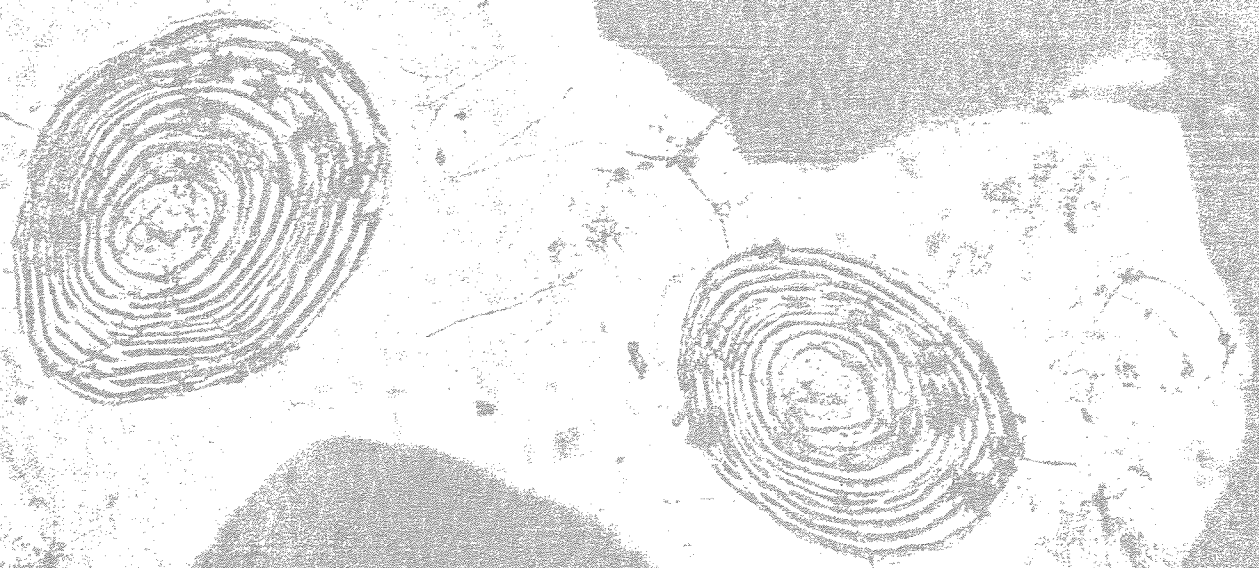
Stream Deer Track Treatment Low. Buffer

Reach 90-120 Species Coho

Length (mm) 74 Weight (g) 4.3

Remarks

33 (176)



Appendix Fig. B33.

ALASKA FISHERIES WORKING GROUP

Date 11-03-83 Sample No. 29 Lower

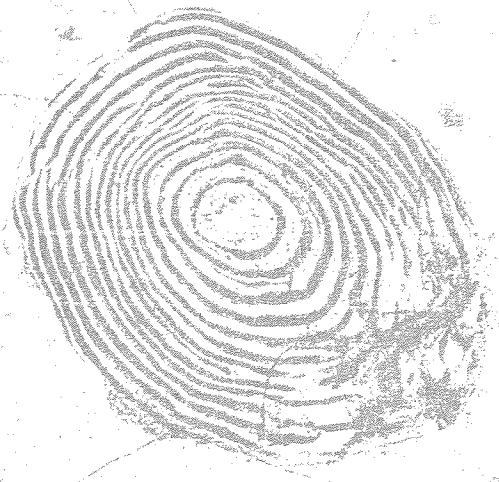
Stream Deer Tr. Treatment 120 - 160 Buff.

Reach _____ Species Coho

Length (mm) 87 Weight (g) —

Remarks _____

34 1782



Appendix Fig. B34.

ALASKA FISHERIES WORKING GROUP

Date 11-3-83 Sample No. 32 Lower

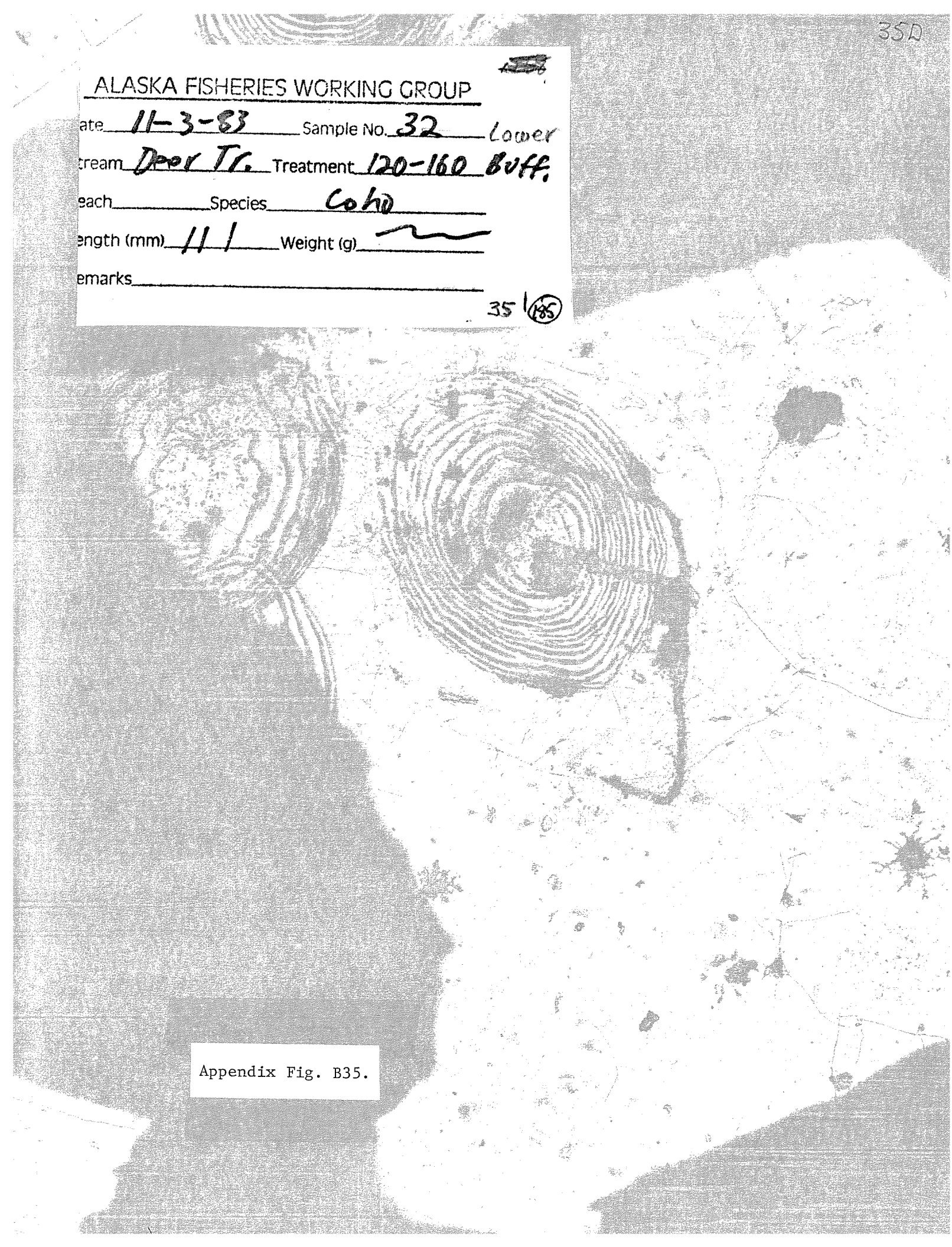
Stream Deer Tr. Treatment 120-160 Buff.

Reach _____ Species Coho

Length (mm) 111 Weight (g) ~~~

Remarks _____

35 1 (185)



Appendix Fig. B35.

ALASKA FISHERIES WORKING GROUP

Date 11-03-83 Sample No. 38 Lower

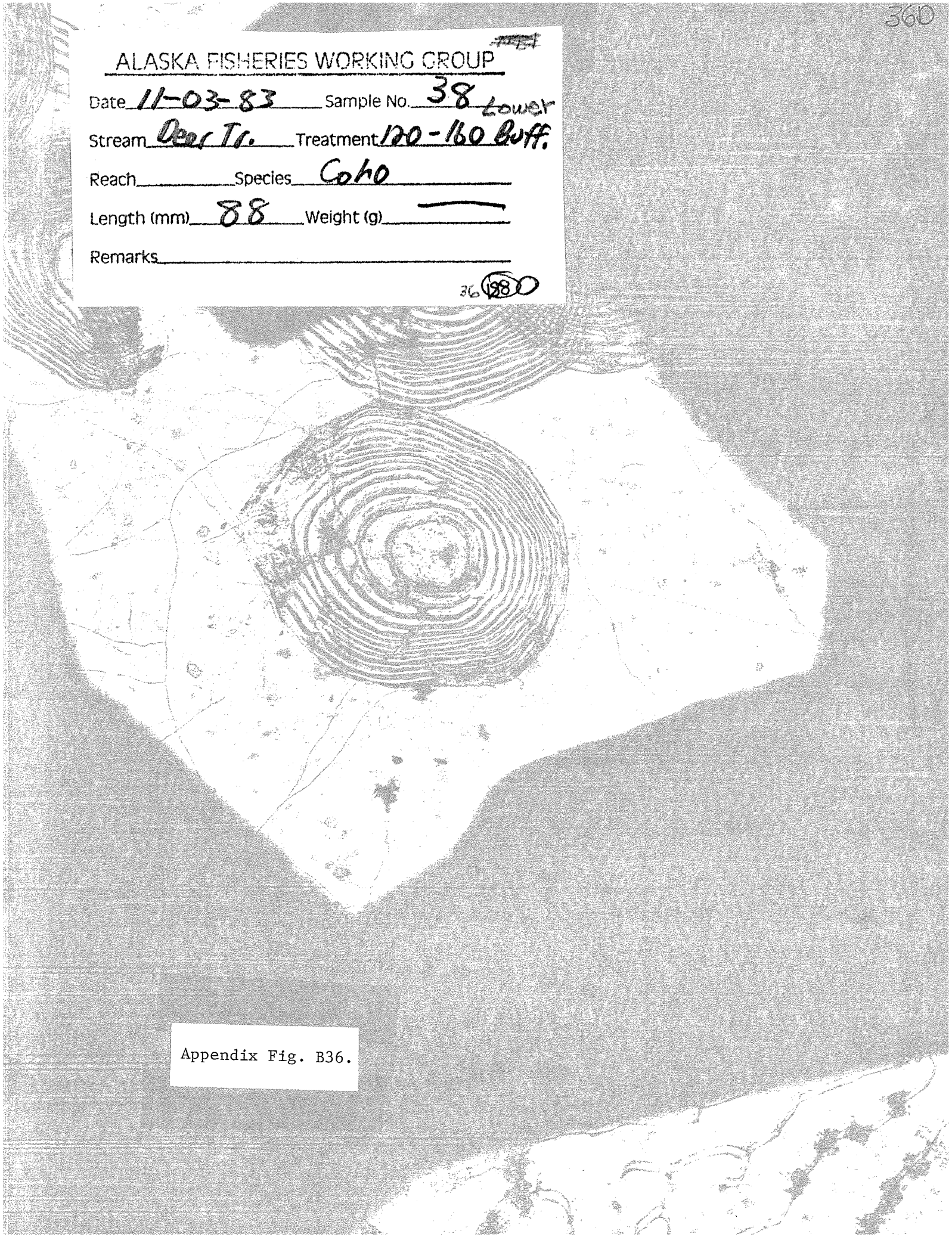
Stream Deer Tr. Treatment 120-160 Buff.

Reach _____ Species Coho

Length (mm) 88 Weight (g) ———

Remarks _____

36 (1980)



Appendix Fig. B36.

ALASKA FISHERIES WORKING GROUP

Date 11-7-83 Sample No. 21

Stream Deer Track upper Treatment Buffer/flat

Reach 500-530 Species Coho

Length (mm) 72 Weight (g) 4.2

Remarks RV UC MORT Bullet

? Besore to use
Deer Track Fin Clip code = 3

37 (40)

Appendix Fig. B37.

ALASKA FISHERIES WORKING GROUP

Date 11-7-83 Sample No. 26

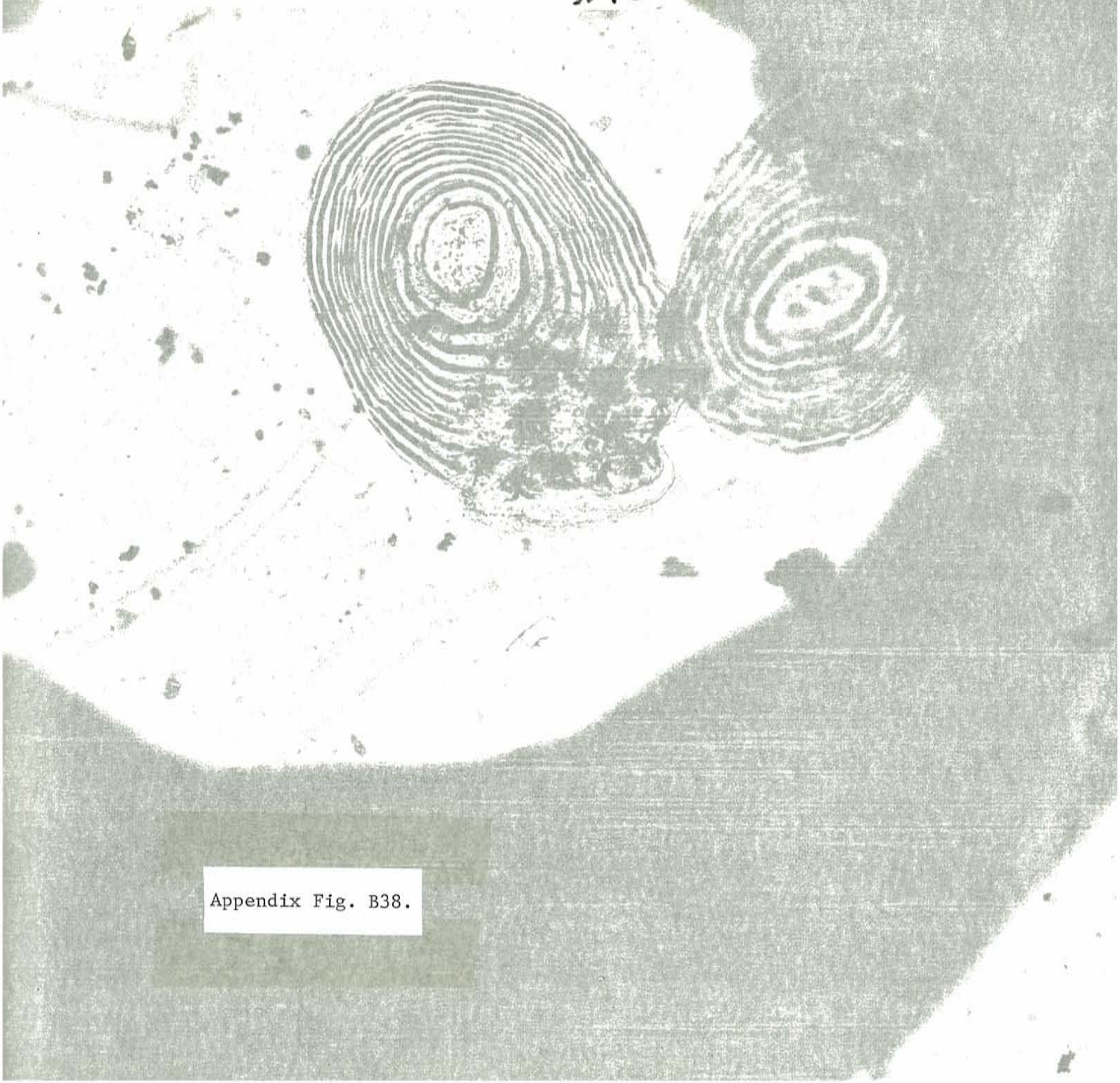
Stream Deer Track Treatment upper Buffer/flat

Reach 500-530 Species Coho

Length (mm) 112 Weight (g) 13.5

Remarks

38 1 (142)



Appendix Fig. B38.

ALASKA FISHERIES WORKING GROUP

Date 11-7-83 Sample No. 16

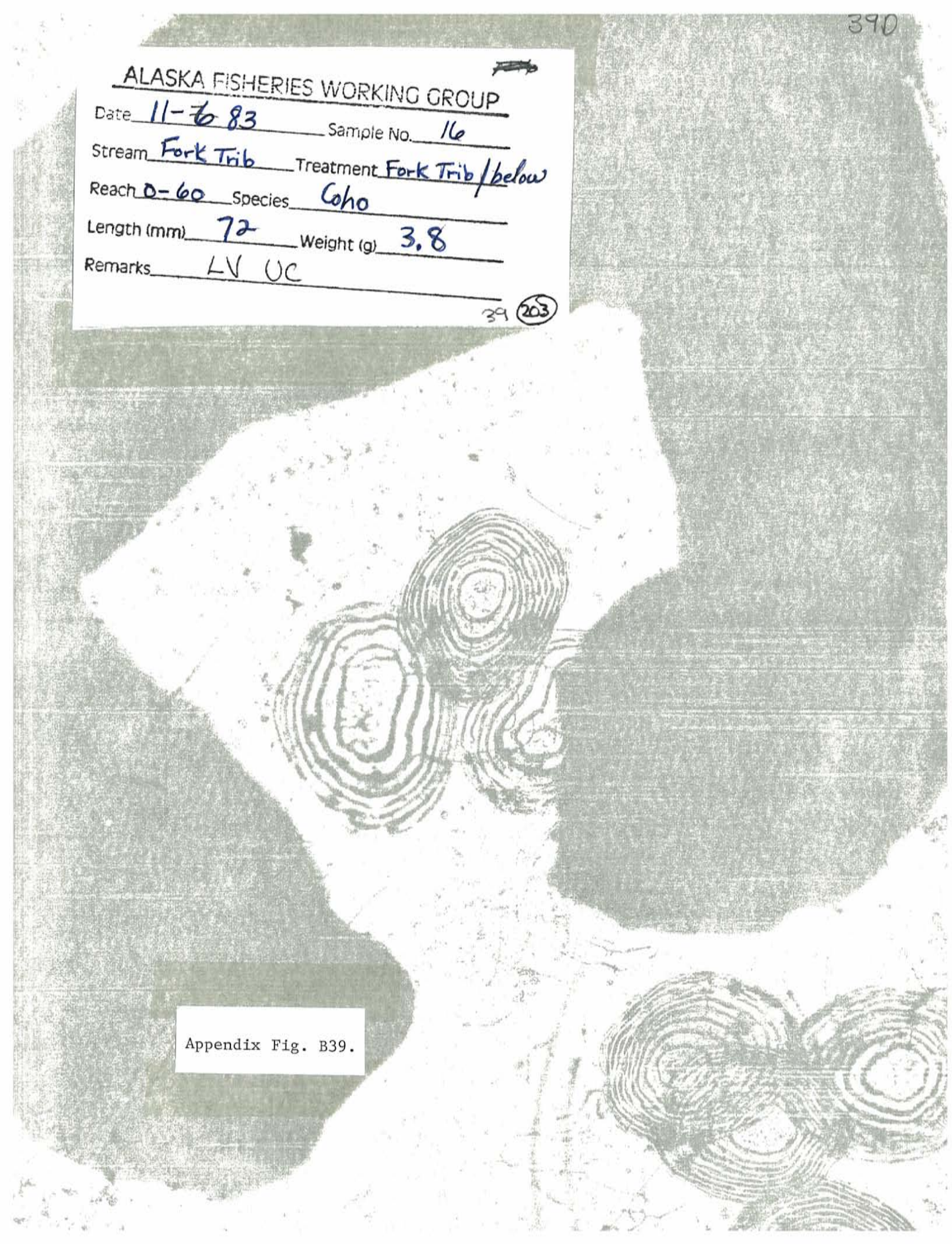
Stream Fork Trib Treatment Fork Trib/below

Reach 0-60 Species Coho

Length (mm) 72 Weight (g) 3.8

Remarks LV UC

39 (203)



Appendix Fig. B39.

N22

ALASKA FISHERIES WORKING GROUP

Date 11-6-83 Sample No. 32

Stream Deer Track Treatment Fork Trib/above

Reach 270-330 Species Coho

Length (mm) 111 Weight (g) 16.5

Remarks Mortality

40 (206)

Appendix Fig. B40.

ALASKA FISHERIES WORKING GROUP

Date 11/11/83 Sample No. 38

Stream D. Thach Treatment upper CC/above

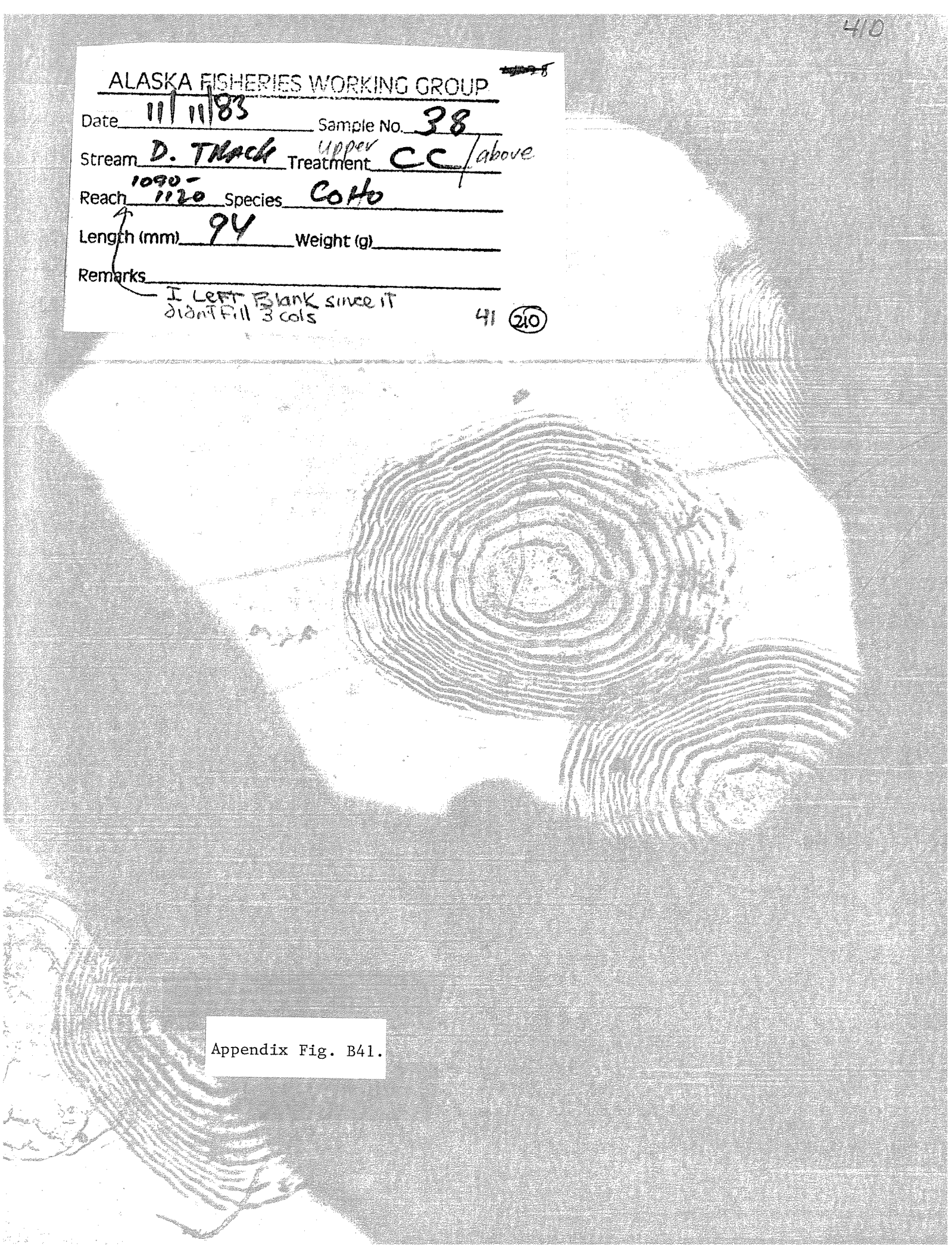
Reach 1090-1120 Species Coho

Length (mm) 94 Weight (g) _____

Remarks _____

I left Blank since it didn't fill 3 cols

41 (210)



Appendix Fig. B41.

ALASKA FISHERIES WORKING GROUP

Date 11-5-83 Sample No. 33

Stream Deer Track Treatment Buffer (upper)/steel

Reach 470-500 Species Coho

Length (mm) 85 Weight (g) 7.6

Remarks RV LC (cc)

42 (215)

Appendix Fig. B42.

ALASKA FISHERIES WORKING GROUP

Date 11-03-83 Sample No. 2

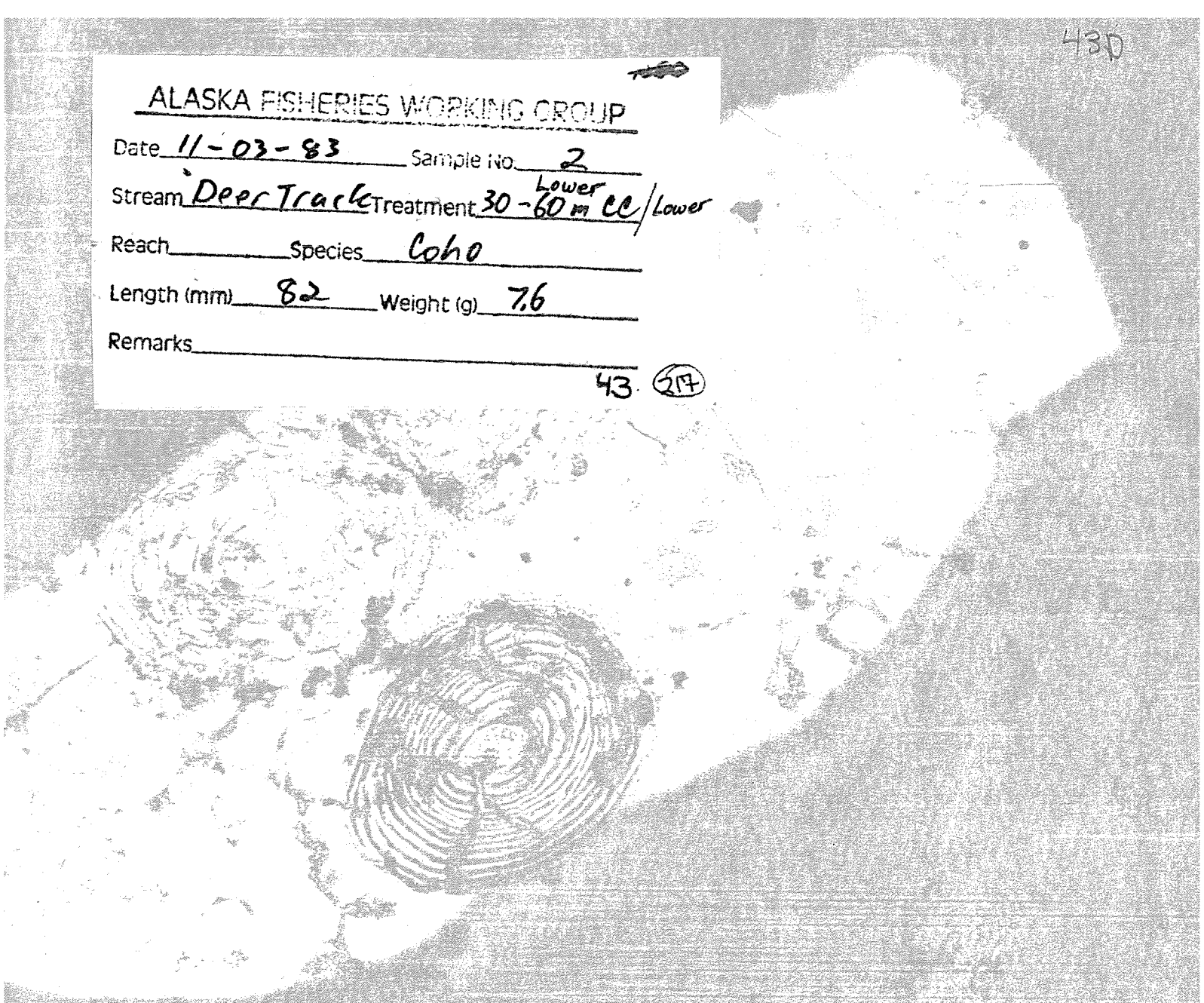
Stream Deer Track Treatment 30-60 m Lower CC/Lower

Reach _____ Species Coho

Length (mm) 82 Weight (g) 7.6

Remarks _____

43 (217)



Appendix Fig. B43.

ALASKA FISHERIES WORKING GROUP

Date 08 11-3-83 Sample No. 6

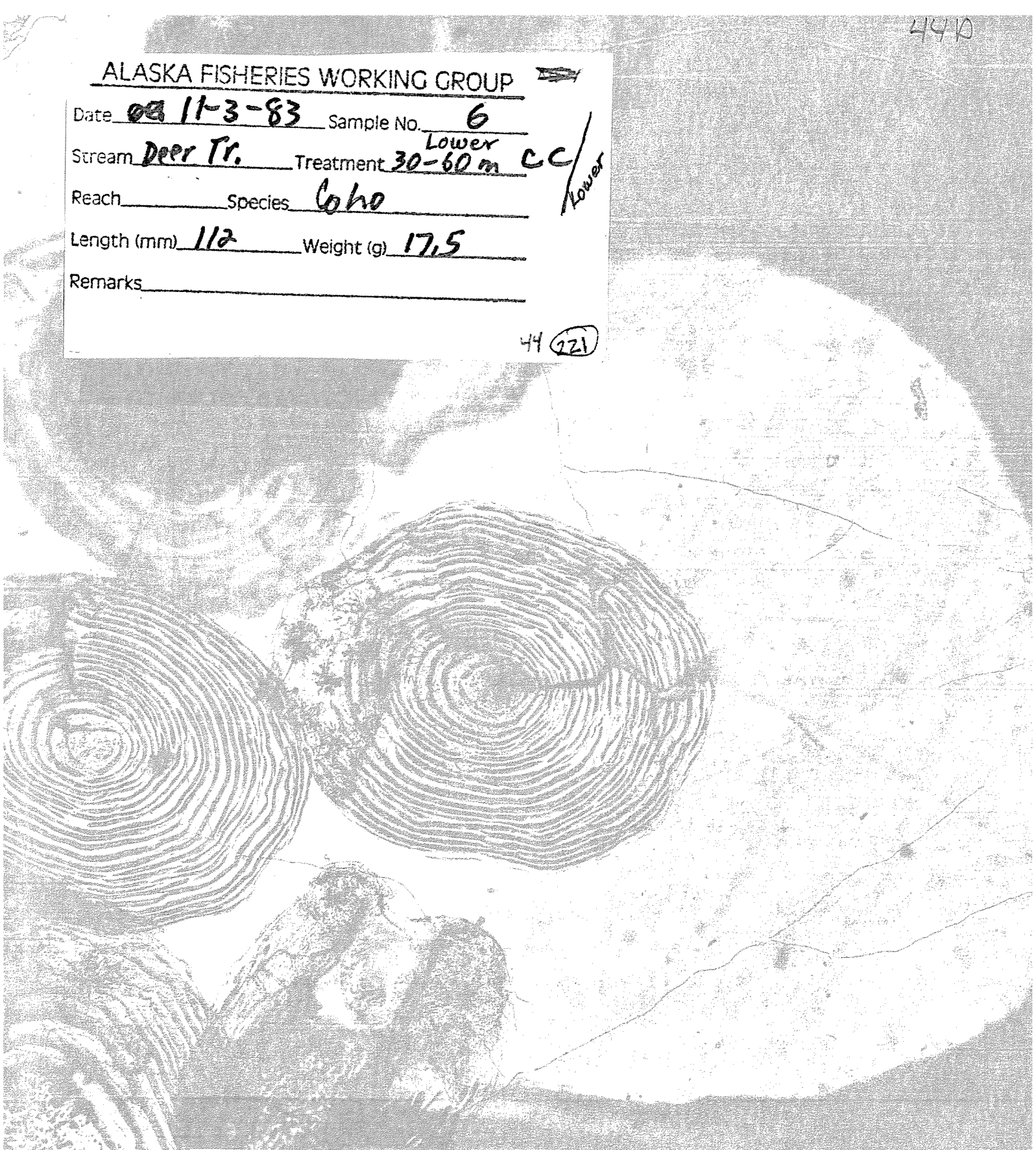
Stream Deer Tr. Treatment 30-60 m Lower CC/Lower

Reach _____ Species Coho

Length (mm) 112 Weight (g) 17.5

Remarks _____

44 (221)



Appendix Fig. B44.

ALASKA FISHERIES WORKING GROUP

Date 11/10/83 Sample No. 39

Stream Deer Tr. Treatment upper CC/below

Reach 860-910 Species Coho

Length (mm) 79 Weight (g)

Remarks RV, LC CC

45 (234)

Appendix Fig. B45.

D+ ALASKA FISHERIES WORKING GROUP

Date 11/10/83 Sample No. 60

Stream Deer Tr. Treatment upper C/below

Reach 1000-1030 Species Cutthroat

Length (mm) 75 Weight (g) 4.4

Remarks

left blank since not enough columns

46 (239)

Appendix Fig. B46.

D ALASKA FISHERIES WORKING GROUP

Date 11/9/83 Sample No. 8

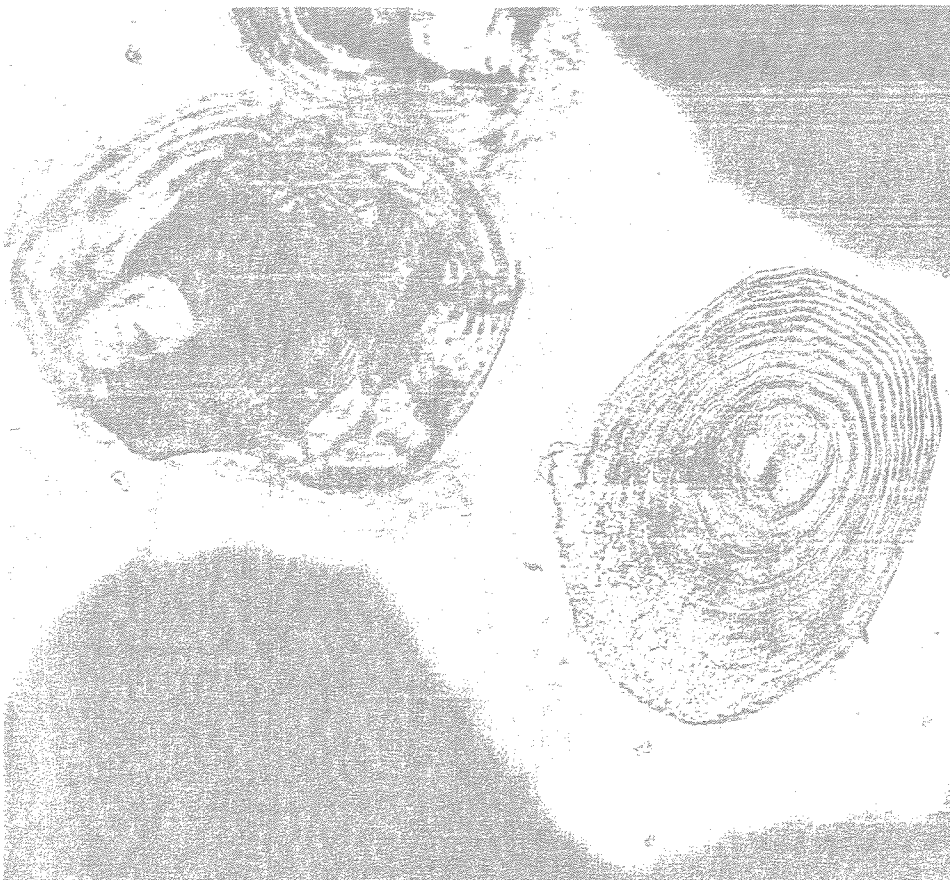
Stream D. Track Treatment upper CC/below

Reach 740-770 Species Coho

Length (mm) 70 Weight (g) 3.9

Remarks

47 (247)



Appendix Fig. B47.

ALASKA FISHERIES WORKING GROUP

Date 11/9/83 Sample No. 18

Stream D. Thack Treatment upper CC/below

Reach 740-779 Species Coho

Length (mm) 107 Weight (g) 13.6

Remarks

48 (253) 1

Appendix Fig. B48.

D+ N2

ALASKA FISHERIES WORKING GROUP

Date 11-8-83 Sample No. 7

Stream Deer Track Treatment lower Buffer/flat

Reach 560-590 Species Coho

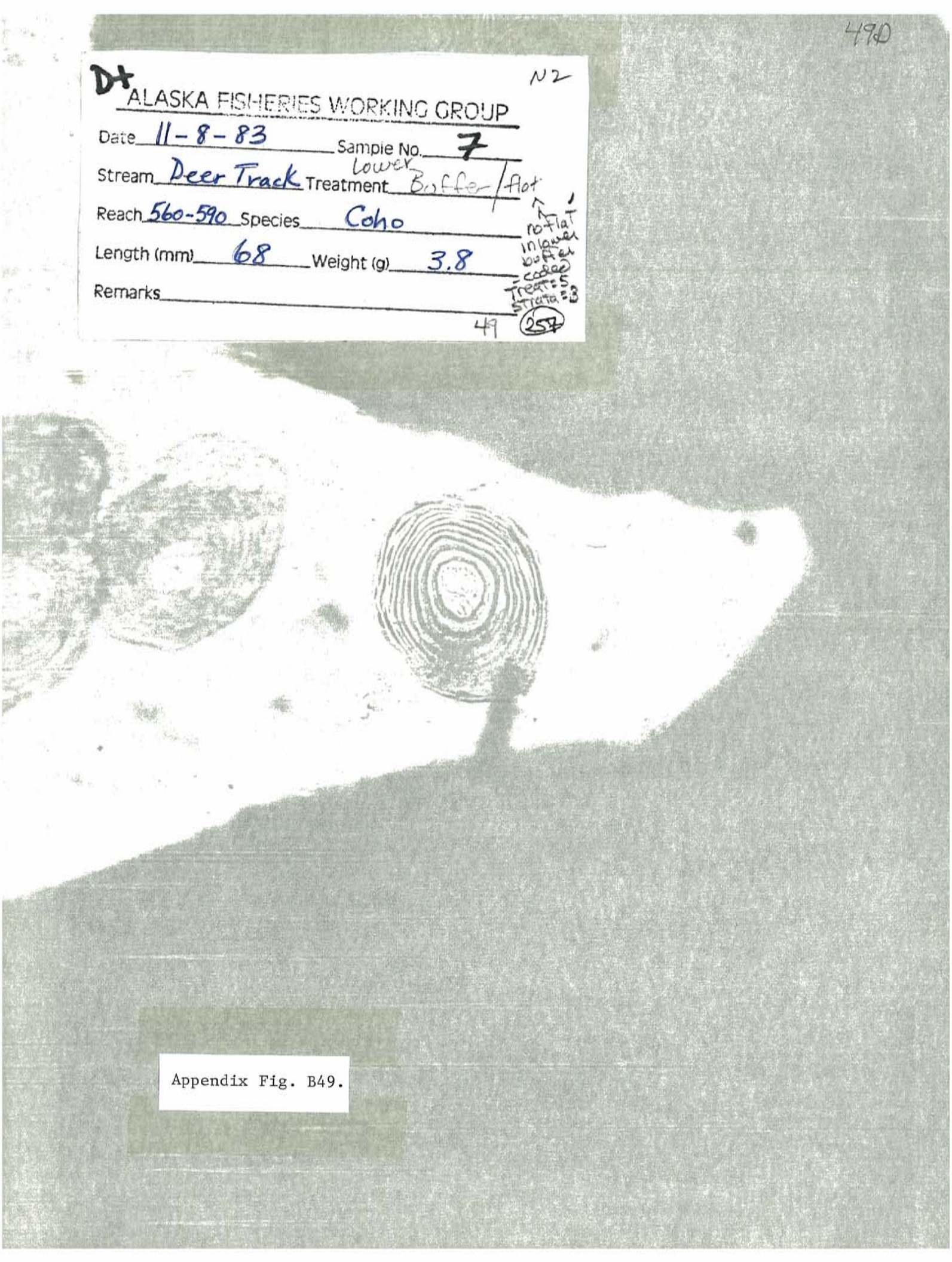
Length (mm) 68 Weight (g) 3.8

Remarks

49

257

no flat in lower buffer coded Treat = 5 Strata = 3



Appendix Fig. B49.

D+

ALASKA FISHERIES WORKING GROUP

Date 11/8/83 Sample No. 18

Stream Deer Track Treatment lower Buffer/flat

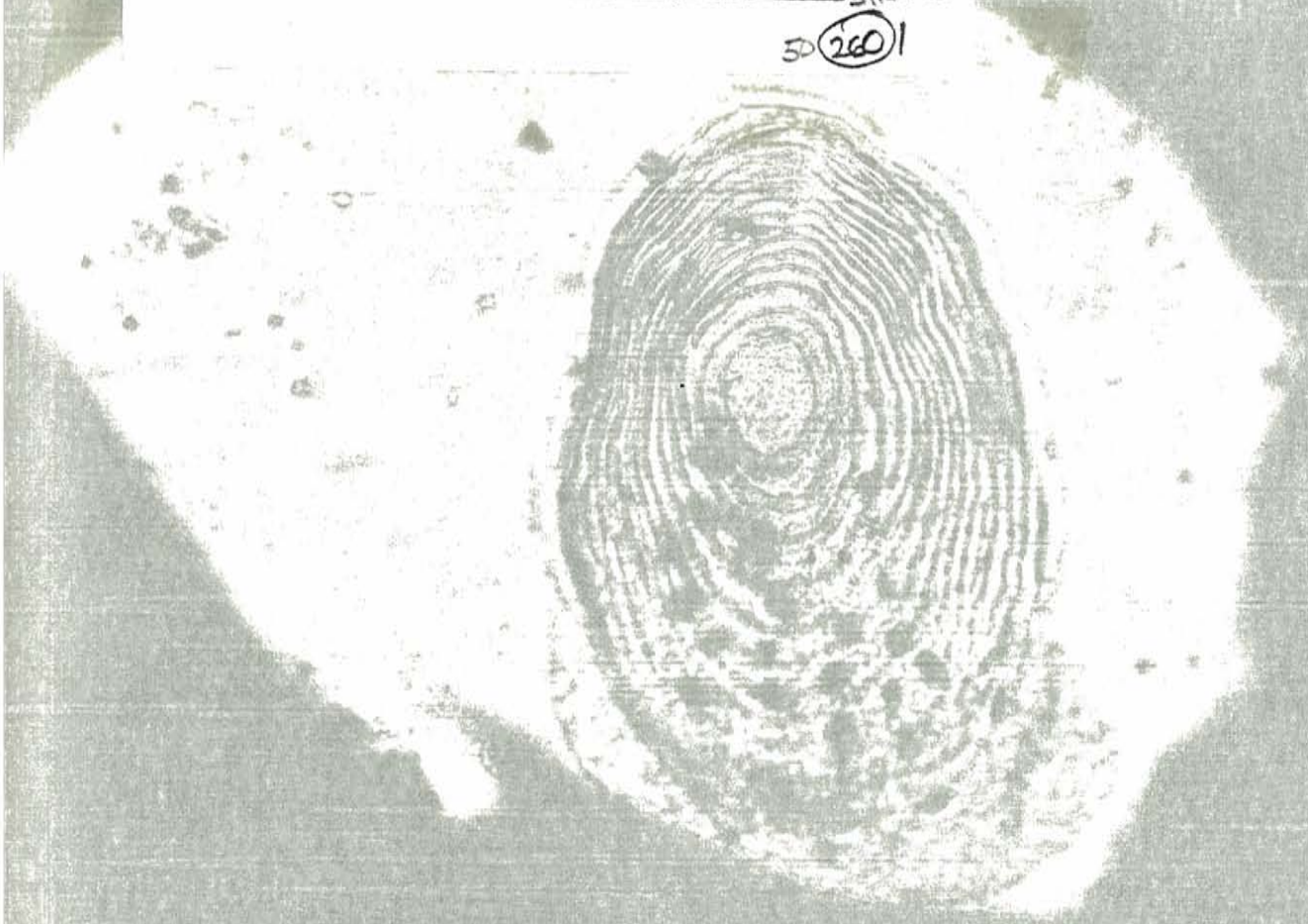
Reach 620-640 Species Coho

Length (mm) 99 Weight (g) _____

Remarks _____

no flag in lower Buffer. Coded Treat.:5 Strata:3

50 260 1



Appendix Fig. B50.