

**ASSESSMENT OF BLACK CRAPPIE IN HARRISVILLE POND, HARRISVILLE
(2016)**

STATE: New Hampshire

GRANT: F-50-R-33

GRANT TITLE: Anadromous and Inland Fisheries Operational Management Investigations

JOB 9: Warmwater and Coolwater Fisheries Population Assessments

PERIOD COVERED: July 1, 2016 – June 30, 2017

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INTRODUCTION

Harrisville Pond is located in the town of Harrisville (Cheshire County), NH, and has a surface area of 49 hectares (121 acres). It is classified as mesotrophic with an average depth of 4.7 meters, a maximum depth of 12.5 meters, and is considered a warmwater fishery. Fish species present include: Black Crappie (*Pomoxis nigromaculatus*), Largemouth Bass (*Micropterus salmoides*), Smallmouth Bass (*Micropterus dolomieu*), Common White Sucker (*Catostomus commersoni*), Yellow Perch (*Perca flavescens*), Pumpkinseed (*Lepomis gibbosus*), Chain Pickerel (*Esox niger*), Brown Bullhead (*Ameiurus nebulosus*), and Golden Shiner (*Notemigonus crysoleucas*).

Black Crappie were stocked by the New Hampshire Fish and Game Department (NHFGD) into Tolman Pond, Nelson in 1992, which flows into Harrisville Pond. Black Crappie in Harrisville Pond were first reported from the local Conservation Officer in 2008 and it was reported that 12-inch fish were being caught.

The NHFGD currently has limited data on Black Crappie populations. Black Crappie have quickly become a very popular sport fish in NH in recent years. Accordingly, it is important for the NHFGD to learn more about their populations, age, and growth, in order to better manage these fisheries.

METHODS

From April 15 to May 20, 2016, five New Hampshire design fyke nets were fished in Harrisville Pond in order to assess the Black Crappie population (Figure 1). Nets were set in areas to intercept Black Crappie during their pre-spawning to spawning movements. Nets were checked 11 times.

Black Crappie along with any black bass (Largemouth Bass and Smallmouth Bass), were measured to the nearest millimeter, total length (TL), weighed to the nearest gram, marked (upper caudal fin clip on unclipped fish to identify recaptures), and checked for fin clips. Fish were processed shortly after capture and then released at least 200 yards from the fyke net. For aging purposes, scale samples were taken from Black Crappie and black bass in the region below the lateral line and slightly posterior to the pectoral fin on the left side of the fish. Scale samples were taken from a subsample (a maximum of 5 fish per 10 mm size class) of each species. Scales were cataloged, then permanently recorded in an acetate impression and aged using an Eyecom 1100 microfiche projector. In this report, only fish aged as ≤ 6 years of age and having scales with ageing confidence ratings of 1 or 2 (very confident or confident) were analyzed.

Proportional Stock Density (PSD) measures for Black Crappie and black bass were determined according to length categories (based on total length) described in Gablehouse (1984): for Black Crappie: stock 130-199 mm; quality 200-249 mm; preferred 250-299 mm; memorable 300-379 mm; and trophy > 380 mm; for Smallmouth Bass: stock 180-279 mm; quality 280-349 mm; preferred 350-429 mm; memorable 430-509 mm; and trophy > 510 mm; for Largemouth Bass:

stock 200-299 mm; quality 300-379 mm; preferred 380-509 mm; memorable 510-629 mm; and trophy > 630 mm.

$$PSD = \frac{\text{number of fish} \geq \text{quality}}{\text{number of fish} \geq \text{stock}} \cdot 100$$

Confidence intervals were calculated for PSD estimates at the 80% confidence level using formulas based on Zar, J.H. (1984). A PSD value ranging from 30 to 60 indicates a balanced fish population for Black Crappie; a balanced fish population is defined as one that is intermediate between the extremes of a large number of small fish and a small number of large fish and indicates that rates of recruitment, growth and mortality rates may be satisfactory (Gablehouse 1984). Values < 30 indicate an extreme number of small fish when compared to the number of large fish. Values > 60 indicate an extreme number of large fish when compared to the number of small fish.

Relative weight (W_r) values were derived as a measure of condition of individual fish. Relative weight values were calculated for Black Crappie ≥ 100 mm (TL) and black bass ≥ 150 . This index compares the actual weight of an individual (W) with a standard weight (W_s) for a fish of the same length:

$$W_r = W/W_s \cdot 100$$

The standard weight equation used for Black Crappie was $\log_{10} W_s \text{ (g)} = - 5.618 + 3.345 \times \log_{10} \text{ TL (mm)}$, proposed by Neumann and Murphy (1991). The equation used for Largemouth Bass was $\log_{10} W_s \text{ (g)} = -5.316 + 3.191 \times \log_{10} \text{ TL (mm)}$, proposed by Wege and Anderson (1978). The equation used for Smallmouth Bass was $\log_{10} W_s \text{ (g)} = - 5.329 + 3.20 \times \log_{10} \text{ TL (mm)}$, proposed by Kolander et al. (1993). Relative weight values > 90 may be considered good, with values > 100 considered excellent.

All reported mean values include estimated standard deviations, unless otherwise noted. Linear regression was used to examine the relationship of fish total length to relative weight. The level of significance for all statistical analyses was 0.10.

RESULTS

A total of 39 Black Crappie were sampled (Figure 2). The PSD for Black Crappie was 97 (lower and upper 80% CI's: 90, 100; Table 1) compared to the statewide mean of 72. Mean relative weight values for Black Crappie were calculated by length category (Table 2). Mean relative weight values for Black Crappie were lower for stock, quality, and memorable size fish and higher for preferred size fish when compared to statewide mean values. The relationship between Black Crappie total length and relative weight was not significant with a negative trend ($P = 0.17$; $R^2 = 0.05$; Figure 2), but should be interpreted with caution due to the extremely low R^2 value.

Mean back-calculated length at age, total number of fish aged, logarithmic trendline correlation coefficient, and age at quality size for Black Crappie are presented in Table 3 and Figure 3. Black Crappie took an average of 2.71 years to reach quality size (200 mm). Average length at age was below statewide values (2013-2015) for age 1 and above statewide values for age 2-6 Black Crappie.

A total of 19 Largemouth Bass were sampled (Figure 4). Mean relative weight values for Largemouth Bass were calculated by length category (Table 4). Mean relative weight values for Largemouth Bass were lower for stock and quality size fish and were similar for preferred size fish when compared to statewide mean values. No memorable size fish were sampled. Largemouth Bass PSD values and growth data were not compared or categorized, and population estimates were not calculated due to low sample size.

A total of 7 Smallmouth Bass were sampled (Figure 5). Mean relative weight values for Smallmouth Bass were calculated by length category (Table 5). Mean relative weight values for Smallmouth Bass were below average for all size fish when compared to statewide mean values. Smallmouth Bass PSD values and growth data were not compared or categorized, and population estimates were not calculated due to a low sample size.

Fish species captured, but not processed included: Common White Sucker (*Catostomus commersoni*), Yellow Perch (*Perca flavescens*), Pumpkinseed (*Lepomis gibbosus*), Chain Pickerel (*Esox niger*), Brown Bullhead (*Ameiurus nebulosus*), and Golden Shiner (*Notemigonus crysoleucas*).

DISCUSSION

For Black Crappie, a PSD value ranging from 30 to 60 indicates a structurally balanced population. Values < 30 indicate an extreme number of small fish when compared to the number of large fish. Values > 60 indicate an extreme number of large fish when compared to the number of small fish. The PSD value calculated for Black Crappie in Harrisville Pond was 97, indicating an unbalanced population with an extreme number of large fish when compared to the number of small fish (Table 1).

Relative weight values > 90 may be considered good, with values > 100 considered excellent. Four out of the five size categories for Black Crappie had W_r value ≥ 90 (Table 2). One of the three size categories for Largemouth Bass had W_r values > 90 (Table 4). All four size categories of Smallmouth Bass had W_r values < 90 (Table 5). Observed values are acceptable from a management standpoint, as no exceptional values were documented. Small sample sizes must also be taken into consideration when looking at this data.

RECOMMENDATIONS

The NHFGD should continue to assess Black Crappie populations throughout the state and continue to update the statewide database. This database will allow biologists to target specific

water bodies for more detailed assessments and make well-informed management recommendations to preserve and improve the quality of Black Crappie populations state-wide.

ACKNOWLEDGMENTS

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Table 1. Proportional Stock Density (80% confidence intervals) of Black Crappie assessed in Harrisville Pond 2016.

Water body	Sample Date	Lower CI 80%	PSD	Upper CI 80%	≥ Quality Size	≥ Stock Size
Harrisville Pond	April-May 2016	90	97	100	38	39
Statewide average	1997-2015	63	72	66	111	138

Table 2. Sample size, mean relative weight value and one standard deviation by length category for Black Crappie assessed in Harrisville Pond 2016.

Water body		Sample		Total Length Interval (mm)												
				Stock 130-199			Quality 200-249			Preferred 250-299			Memorable 300-379			Trophy 380 +
Date	n	Wr	SD	n	Wr	SD	n	Wr	SD	n	Wr	SD	n	Wr	SD	
Harrisville Pond	April-May 2016	1	90.1	-	14	92.1	4.2	11	96.4	3.4	12	90.0	6.8	1	82.5	-
Statewide average	1997-2015	28 ^b	97.1	11.4	31 ^b	97.8	11.9	30 ^b	89.3	4.7	13 ^b	91.3	3.8	-	-	-

^b n represents the number of waterbodies (some waterbodies provided more than one sample)

Table 3. Mean back-calculated length at age, total number of fish aged, logarithmic trendline correlation coefficient and age at quality size for Black Crappie in Harrisville Pond 2016.

Water body	Sample Year(s)	Species	Maximum age used for back-calculations	Mean back-calculated length (mm) at age						Number of fish aged		R ^{2b}	Age at quality size 200 mm
				1	2	3	4	5	6	≥1	5-6		
Harrisville Pond	2016	BC	6	61	140	225	270	285	303	30	6	0.99	2.71
Statewide Average	2013-2015	BC		70	138	203	243	265	277				3.09

b. Correlation coefficient for logarithmic trendline.

Table 4. Sample size, mean relative weight value and one standard deviation by length category for Largemouth Bass assessed in Harrisville Pond 2016.

		Total Length Interval (mm)											
Sample		Stock 200-299			Quality 300-379			Preferred 380-509		Memorable 510-629			
Water body	Date	<i>n</i>	Wr	SD	<i>n</i>	Wr	SD	<i>n</i>	Wr	SD	<i>n</i>	Wr	SD
Harrisville Pond	April-May 2016	3	80.6	9.3	8	84.9	5.7	7	93.4	9.5	-	-	-
Statewide average ^a	1997-2005	115 ^b	99.1	12.4	118 ^b	93.2	8.2	112 ^b	93.4	8.5	40 ^b	97.3	12.4

^a. Reprinted from Racine (2006).

^b. *n* represents the number of waterbodies.

Table 5. Sample size, mean relative weight value and one standard deviation by length category for Smallmouth Bass assessed in Harrisville Pond 2016.

		Total Length Interval (mm)											
Sample		Stock 180-279			Quality 280-349			Preferred 350-429		Memorable 430-509			
Water body	Date	<i>n</i>	Wr	SD	<i>n</i>	Wr	SD	<i>n</i>	Wr	SD	<i>n</i>	Wr	SD
Harrisville Pond	April-May 2016	1	78.8	-	3	84.7	4.5	2	72.2	9.2	1	84.7	-
Statewide average ^a	1997-2005	48 ^b	96.2	8.6	41 ^b	90.1	9.2	34 ^b	86.9	7.7	14 ^b	86.9	8.6

^a. Reprinted from Racine (2006).

^b. *n* represents the number of waterbodies.



Figure 1. Fyke net locations on Harrisville Pond 2016.

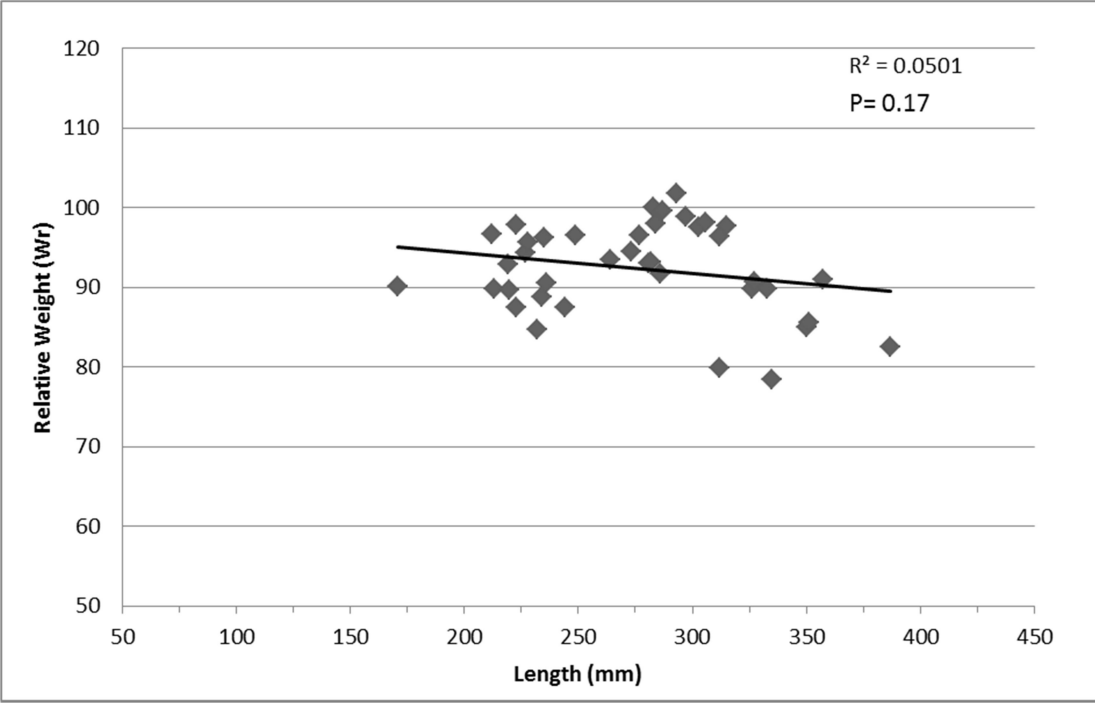
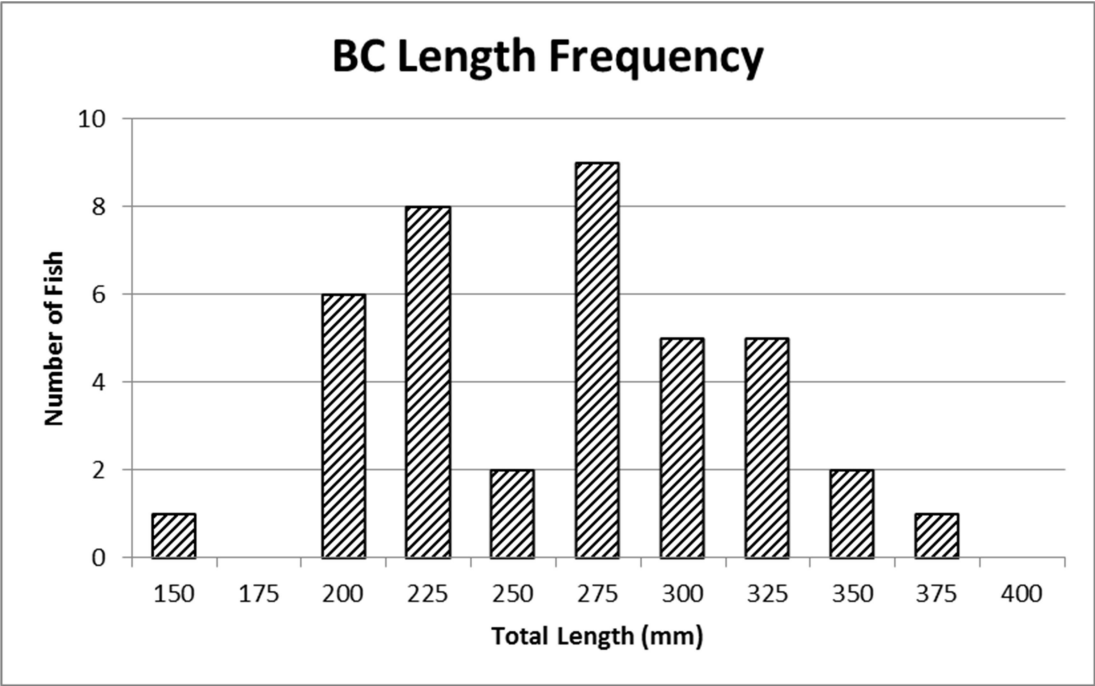


Figure 2. Length-frequency distribution ($n = 39$) and relationship of total length to relative weight (Wr ; $n = 39$) for Black Crappie assessed in Harrisville Pond 2016.

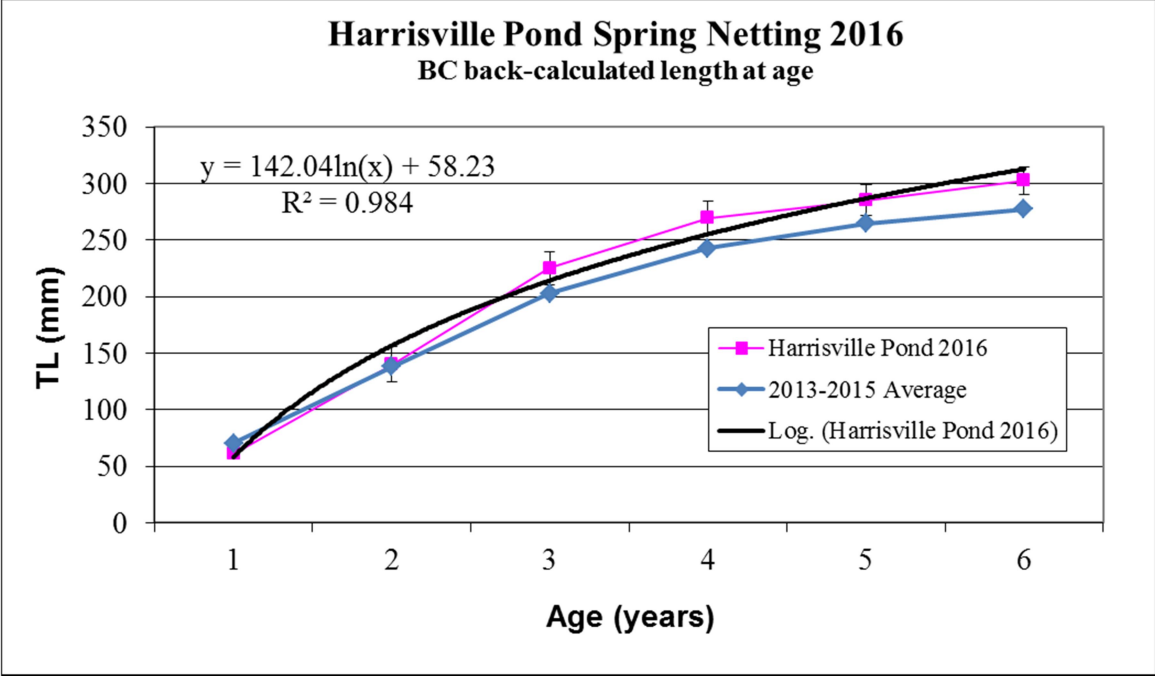


Figure 3. Average back-calculated length at age for Black Crappie sampled in Harrisville Pond 2016 (± 1 SD), and corresponding logarithmic trendline and equation.

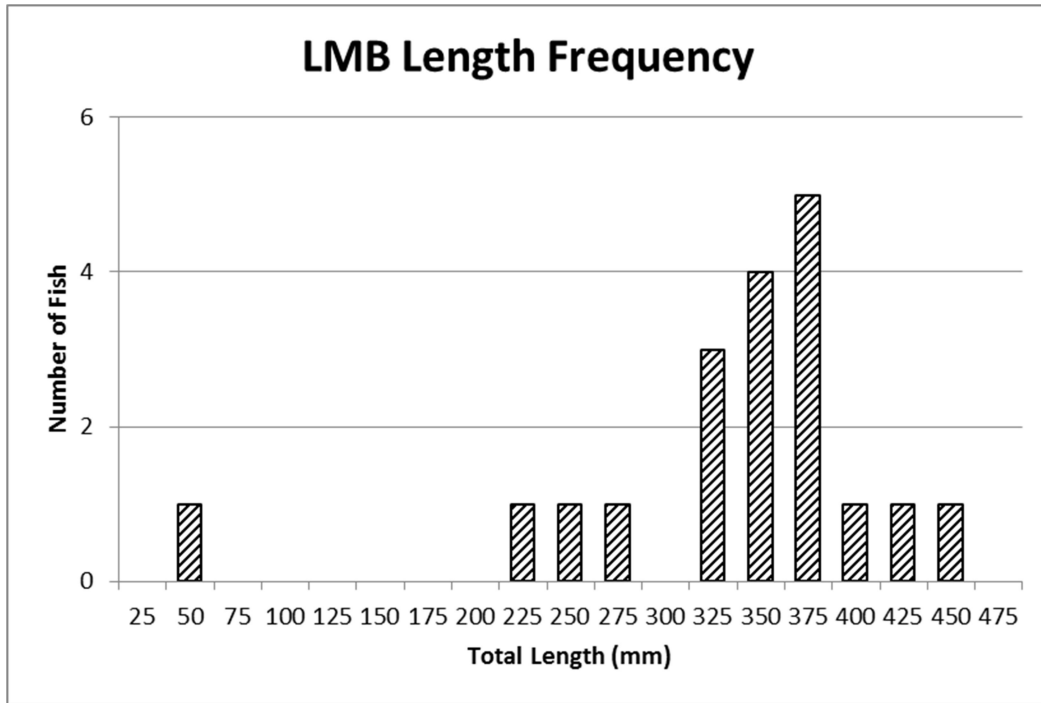


Figure 4. Length frequency distribution ($n = 19$) for Largemouth Bass assessed in Harrisville Pond 2016.

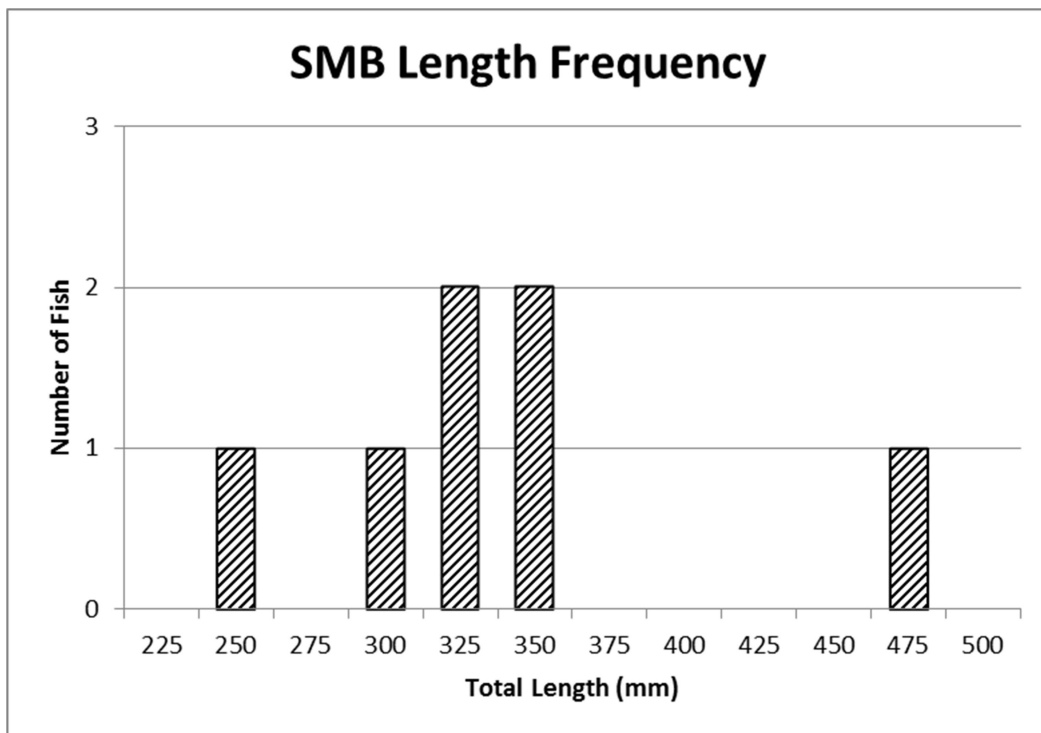


Figure 5. Length frequency distribution ($n = 7$) for Smallmouth Bass assessed in Harrisville Pond 2016.