Amphibian Monitoring on Mt. Mansfield, Vermont 1993-1999

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Background

Populations of amphibian species are monitored annually on Mount Mansfield using drift-fences. The goals of the monitoring are to (1) establish a baseline data set of abundance indices for the amphibian species caught in the fences, (2) monitor year-to-year changes in their abundance indices, (3) monitor changes in the number and type of obvious external abnormalities, (4) gather inventory data for the Vermont Herp Atlas, and (5) gather basic natural history information on the species present. Amphibians are targeted for this kind of study because their multiple habitat usage and permeable skin make them especially sensitive to changes in environmental conditions. Seven years of data have now been gathered at this site. This is the longest-running set of amphibian monitoring data in the state. Three fences are opened and checked up to five times per month during rain events throughout the field season (April through October excluding August). The abundance indices are generated using the three most successful trap-nights per month. For more detailed information on methods, locations of fences, and survey results, see the 1995 VMC annual report.

Changes in species composition

Despite a decline in numbers for American toad, Gray treefrog, and Spring peeper since last year (Table 1), increases in numbers of Green, Pickerel, and Wood frogs created the highest ever percentage of anurans at the fences (76%, Table 2). The Pickerel frog, absent from the fences last year, returned in 1999 for its second highest showing (9) since 1995 when this species was caught 20 times. The absence of Gray treefrogs this year is not a concern. This species' excellent climbing ability enables it to escape capture at the fences. Green frogs represented an all-time high of 21% of the frog population at these fences in 1999. American toads showed a decrease to 17%, which is down from their high of 35% of the frog population in 1998. This reflects both a short-term decrease in the number of toads as well as the relative increase in both Wood frogs and Green frogs.

In 1999 numbers of all salamander species either remained the same or declined. The most dramatic decline occurred with the Redback salamander which decreased to 41 %, down from its 1998 high point of 63% of the salamander population. This decline in Redbacks drove up the percentages for both the Eastern newt (20%) and the Spotted salamander (30%) despite no increase in numbers for either of these species (newts declined from 1.3 per trapping in 1998 to 0.8 in 1999, Spotteds held at 1.2 per trapping).

Young of the year and malformities

Although the number of young of the year for 1999 is slightly higher than for 1998, the number of malformities reported is lower (Table 2). No malformed amphibians had been caught in any of the fences at this site until 1998 when five were caught. During egg-mass counts in 1994, two metamorph Wood frogs were found with abnormalities. One was missing its right eye and a portion of its left rear leg and the other had a malformed and twisted toe on its rear foot. In 1999 three (~1.0%) out of a total of 296 individuals

caught in the fences were malformed. Two species were represented: Spotted salamander (1) and Spring peeper (2). Spring peepers were not among the four species with malformities found in 1998. Also unlike 1998, none of the malformities in 1999 occurred in young of the year. One of the peepers was missing a leg and the other had an abnormal digit. The Spotted salamander had shortened digits on one foot. The number of malformities is within the expected range. The increased number of reported malformities over the past 2 years may be due to more careful monitoring for them by the technicians.

Trends

Linear regressions most closely fit most of the data plots, so they were used to show potential trends in the abundance indices for all species caught from 1993-1999 (Figures 1-5). The data gathered suggest that four of the eight species abundant enough to monitor show an average increase over this seven year period: Wood frog, Green frog, American toad, and Redback salamander. In 1999 decreases in the number of American toads and Redback salamanders were observed, but the reduced numbers were not low enough to reverse the positive trends for these species. Both Wood frogs and Green frogs were caught in greater numbers this year than last year. For Green frogs this represents numbers per trapping (2.6) that are twice that of the next highest year (1995). The Spring peeper whose numbers showed a relative increase in 1998 resumed their decline in 1999, thus maintaining the only clear downward trend for species at this site. The fences are not located in the proper habitat to catch sufficient numbers of Northern two-lined salamanders to adequately monitor them, yet their numbers at the fences have held steady at ~0.2 individuals per trapping since its one-time high of 0.5 in 1993. Both the Spotted salamander and the Eastern newt have shown a great enough fluctuation in their numbers over this time period to prevent a long-term trend from being observed. However, Eastern newts have shown a decline over the past two years with 1999 yielding the lowest numbers yet (0.8 individuals per trapping).

Summary

Half of the amphibian species which can be reliably monitored at these fences at this time appear to be increasing in population. Until this year, the American toad showed the largest and most consistent increase. The apparent decline of the Spring peeper has resumed in 1999. Pickerel frogs returned with a strong showing this year. Malformities were observed again this year, but in lower numbers than last year. Next year it will be very interesting to see the rate at which malformities continue to be found, whether the American toad's dramatic increase is at an end, whether the downward trend for Spring peepers persists, and whether anurans continue to dominate at the fences.

Acknowledgments

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Table 1. A comparison of drift-fence data from the 1993 through 1999 field seasons at Mt. Mansfield, Underhill, Vermont. Data used are from two fences at 1,200 ft. and one fence at 2,200 ft. in elevation.

Species name	# per trapping[1]							% of total catch						
	93	94	95	96	97	98	99	93	94	95	96	97	98	99
Caudates (Salamanders)														
Spotted salamander	1.7	1.0	1.4	2.0	1.4	1.2	1.2	12%	10%	9%	12%	8%	6%	7%
Dusky salamander	0.3	0.3	0.3	0.0	0.0	0.6	0.1	2%	3%	2%	0%	0%	3%	1%
N. two-lined salamander	0.5	0.1	0.2	0.1	0.2	0.2	0.2	4%	1%	1%	1%	1%	1%	1%
Spring salamander	< 0.1	0.0	0.0	0.1	0.0	0.0	0.0	< 1%	0%	0%	< 1%	0%	0%	0%
Eastern newt	1.3	1.2	1.7	1.4	1.8	1.3	0.8	10%	12%	11%	8%	10%	7%	5%
Redback salamander	1.2	4.2	1.3	2.5	3.3	5.4	1.6	9%	40%	9%	14%	18%	29%	10%
Group totals	5.1	6.8	4.9	6.1	6.8	8.6	3.9	38%	66%	32%	36%	37%	46%	24%
Anurans (Frogs and Toads)														
American toad	0.7	0.6	1.5	2.2	2.5	3.6	2.1	5%	5%	10%	13%	14%	19%	13%
Gray treefrog	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0%	0%	0%	0%	0%	< 1%	0%
Spring peeper	1.7	1.1	2.2	0.9	0.3	1.1	0.5	13%	10%	14%	5%	2%	6%	3%
Green frog	< 0.1	0.2	0.9	0.6	1.3	0.8	2.6	< 1%	2%	6%	3%	7%	4%	16%
Pickerel frog	0.1	0.0	1.1	0.3	0.3	0.0	0.5	1%	0%	7%	2%	1%	0%	30%
Wood frog	5.6	1.7	4.4	6.8	7.0	4.7	6.5	42%	16%	29%	40%	39%	25%	41%
Group totals	8.2	3.6	10.1	10.8	11.3	10.1	12.2	62%	33%	66%	64%	63%	54%	76%
Amphibian totals	13.4	10.4	15.0	16.8	18.1	18.7	16.1	100%	100%	100%	100%	100%	100%	100%

[1] Numbers per trapping are rounded to the nearest 0.1. All other figures are rounded to the nearest whole number. There were a total of 15 trappings in 1993, 14 in 1994, 18 in 1995, 17 in 1996, 12 in 1997, 18 in 1998, and 17 in 1999. Trappings counted were on those nights when at least 2 of the three traps were opened under appropriate weather conditions for amphibian movement.

Table 2. Monitoring results from the two drift-fences at 1,200 ft. and one at 2,200 ft. on Mt. Mansfield, Underhill, Vermont during 1999. Traps were opened whenever conditions were appropriate for amphibian movement from April through October excluding August. Data used are from the three most successful trappings (2 in April) per month (± 7 days): April 17 and May 6; May 9, 20, and 25; June 7, 15, and 29; July 2, 6, 25; September 9, 11, and 30; and October 9, 14, and November 3. Data from 17 of 26 trap-efforts are used. Trapping on April 17 was possible at the lower two drift-fences only. Malformity, maximum size, and first metamorph data are taken from all 26 trappings.

Common name	Scientific name	# of all ages	# of young of the year [1]	% young of the year	date of first metamorph [2]	largest adult (total length in mm)	# per trapping [3]	% of group	% of total catch	# malformed/ total [4]
Salamanders										
Redback salamander	*Plethodon cinereus*	27	0	0%	NA	96	1.6	41%	10%	0 / 29
Spotted salamander	*Ambystoma maculatum*	20	0	0%	NA	195	1.2	30%	7%	1 / 21
Eastern newt	*Notophthalmus viridescens*	13	0	0%	NA	78	0.8	20%	5%	0 / 13
Northern two-lined	*Eurycea bislineata*	4	0	0%	NA	81	0.2	6%	1%	0 / 4
Dusky salamander	*Desmognathus fuscus*	2	0	0%	NA	98	0.1	3%	1%	0 / 2
Group totals		66	0	0%	NA	NA	3.9	100%	24%	1 / 69
Frogs and Toads										
Wood frog	*Rana sylvatica*	111	38	34%	Jun-26	59	6.5	53%	41%	0 / 125
Green frog	*Rana clamitans*	44	27	61%	Jun-29	93	2.6	21%	16%	0 / 47
American toad	*Bufo americanus*	35	2	6%	Sep-8	97	2.1	17%	13%	0 / 37
Spring peeper	*Pseudacris crucifer*	9	0	0%	NA	37	0.5	4%	3%	2 / 9
Pickerel frog	*Rana palustris*	9	0	0%	NA	36	0.5	4%	3%	0 / 9
Group totals		208	67	32%	NA	NA	12.2	100%	76%	2 / 227
Amphibian totals		274	67	24%	NA	NA	16.1	NA	100%	3 / 296

[1]For each species, individuals under a given total length were considered potential young of the year. The chosen length was based on the timing of their appearance, gaps in their size continuum, and records in the literature. The cutoff sizes used were A. maculatum (70 mm), D. fuscus (30 mm), E. bislineata (60 mm), N. viridescens (45 mm), P. cinereus (32 mm), B. americanus (23 mm), H. versicolor (26 mm), P. crucifer (20 mm), R. clamitans (44 mm), R. palustris (34 mm), and R. sylvatica (27 mm). In addition, it was necessary to examine the minimum possible development time for each species. Individuals shorter than the cutoff lengths clearly overwinter (possibly as larvae for N. viridescens and A. maculatum) and show up in very early spring. These are not counted as young of the year.

[2]No trapping took place in August.

[3]Numbers per trapping are rounded to the nearest 0.1. All other figures are rounded to the nearest whole number.

[4] These may contain old deformities (traumatic) as well as malformities (developmental). Salamanders missing all or portions of their

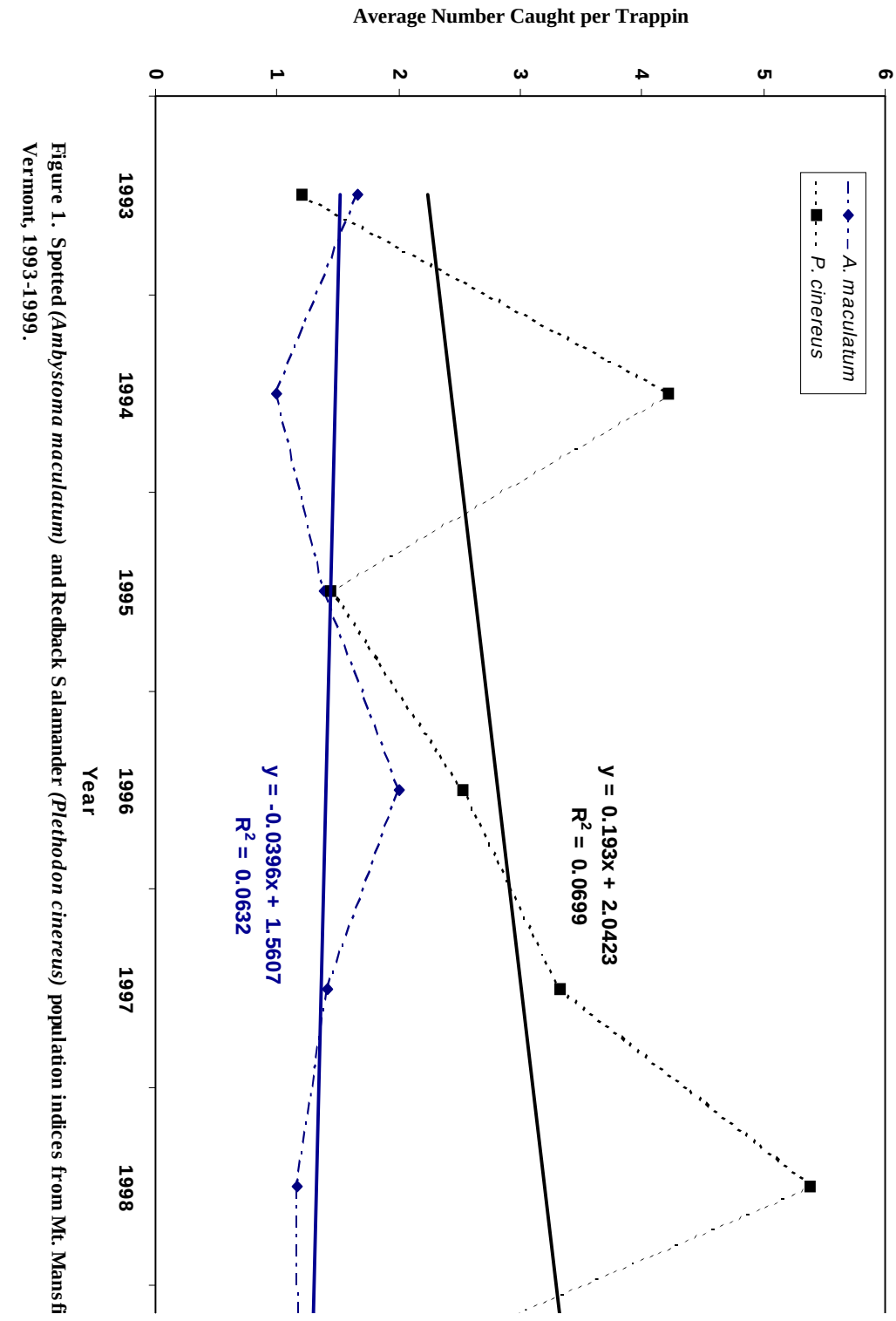

Figure 1. Spotted *(Ambystoma maculatum)* and Redback Salamander *(Plethodon cinereus)* population indices from Mt. Mansfi Vermont, 1993-1999.

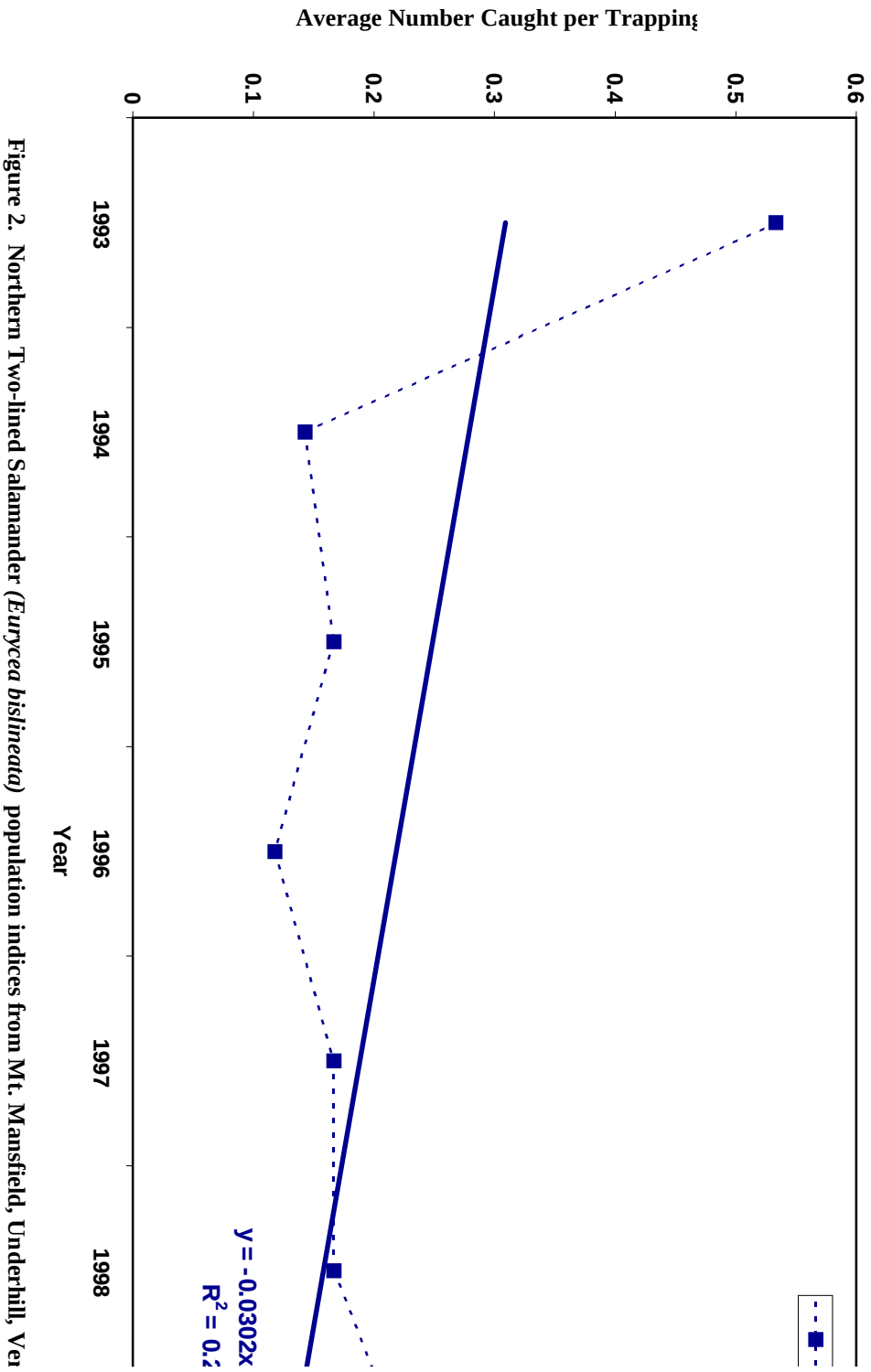

Figure 2. Northern Two-lined Salamander (*Eurycea bislineata)* population indices from Mt. Mansfield, Underhill, Ver

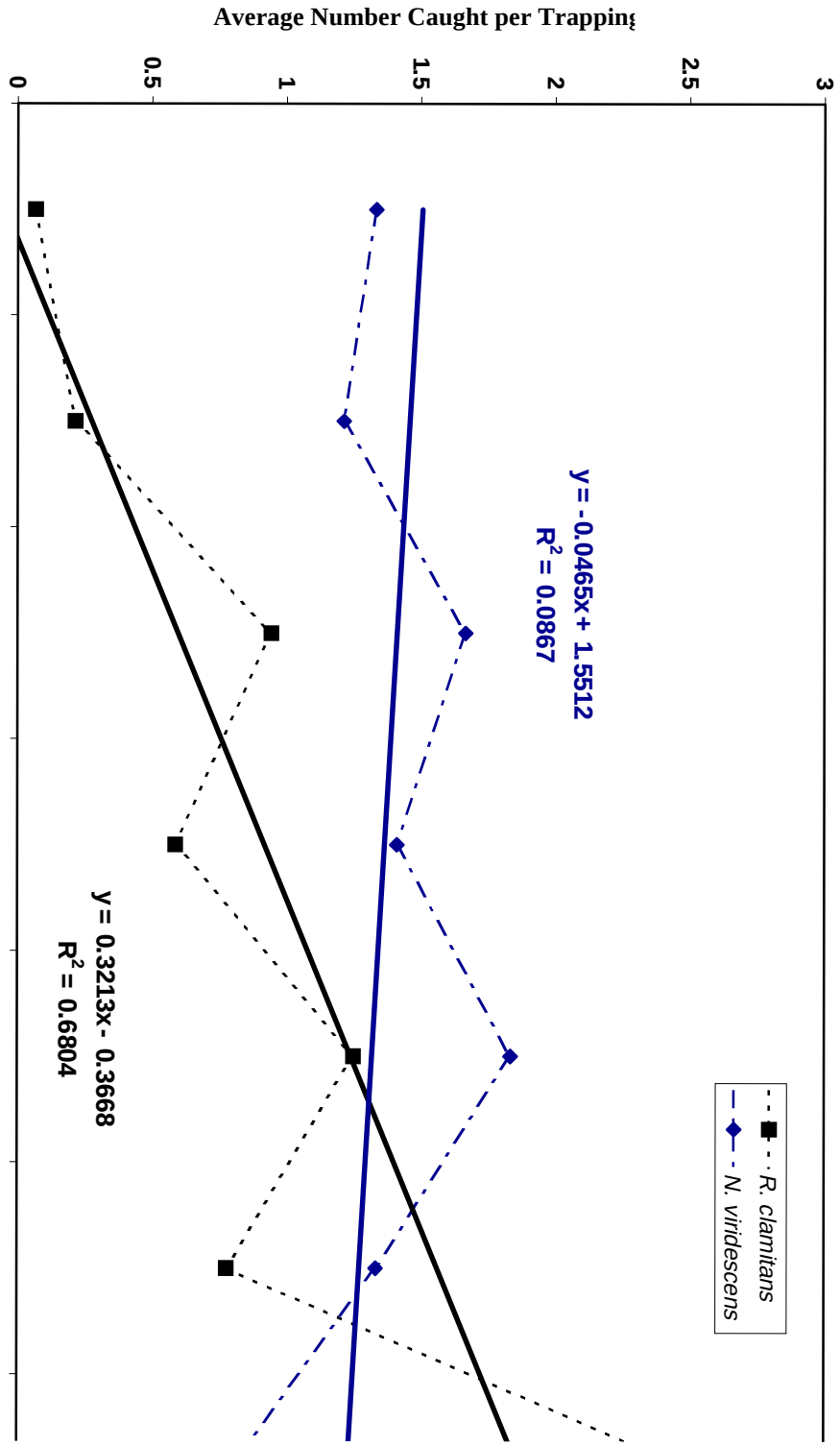

Figure 3. Eastern Newt *(Notophthalmus viridescens)* and Green Frog *(Rana clamitans)* population indices from Mt. Mansfie Vermont, 1993-1999.

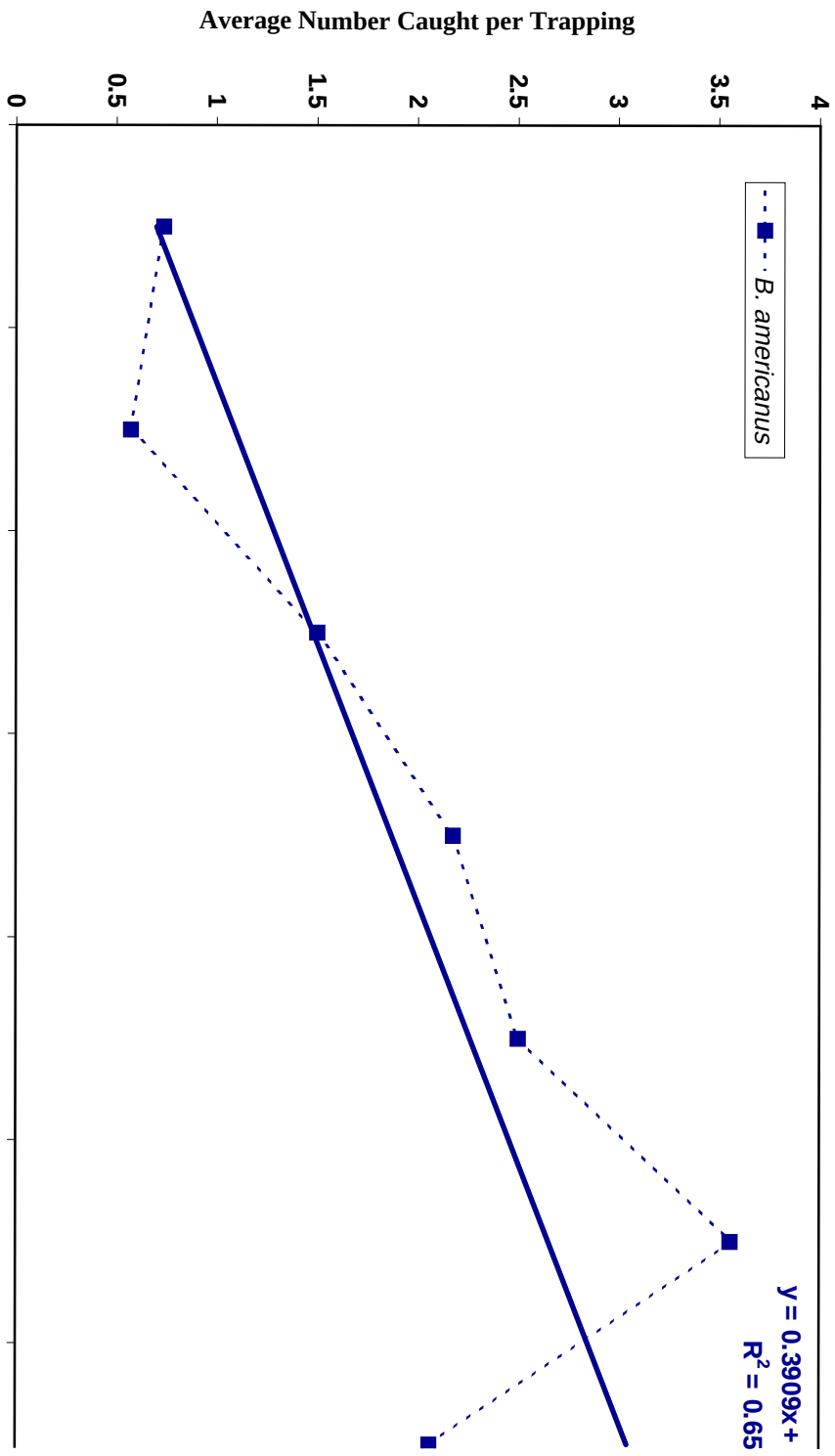

Figure 4. American Toad *(Bufo americanus)* population indices from Mt. Mansfield, Underhill, Vermont, 1993-

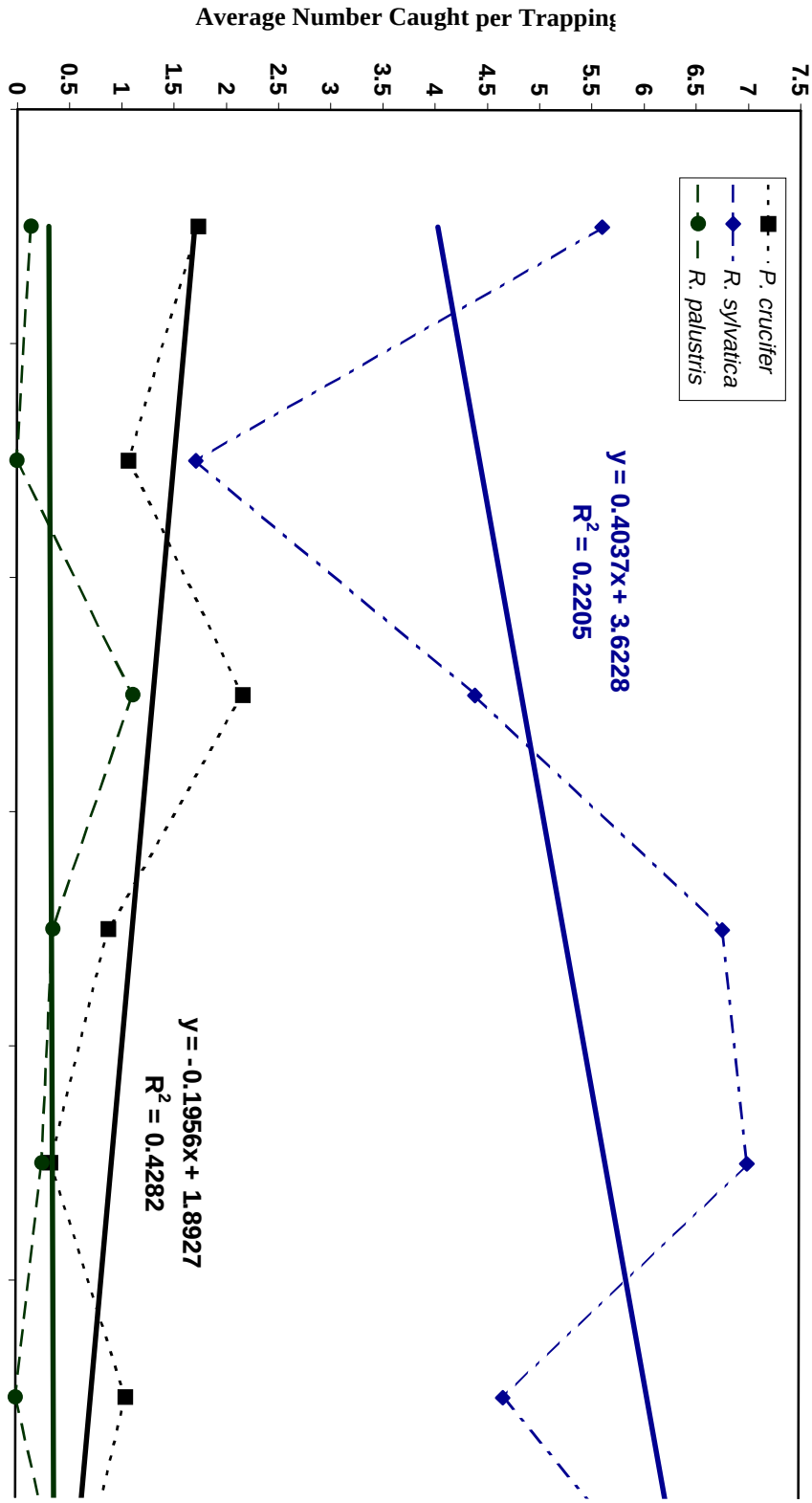

Figure 5. Wood Frog *(Rana sylvatica)*, Spring Peeper *(Pseudacris crucifer)*, & Pickerel Frog *(Rana palustris)* indices from Underhill, Vermont, 1993-1999.