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Erythrism in the Maritime Garter Snake, *Thamnophis sirtalis pallidulus*, in Nova Scotia

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The Maritime Garter Snake, *Thamnophis sirtalis pallidulus*, is highly variable in pattern and colour. Although this subspecies is largely defined on the basis of colour, four colour morphs have previously been described for the subspecies, including a melanistic form. Based on specimens from Nova Scotia, Canada, a fifth, uncommon erythristic variant is added to the complex colour variation known for the Maritime Garter Snake.

Key Words: Maritime Garter Snake, *Thamnophis sirtalis pallidulus*, erythrism, erythristic, ground colour, scarlet, northern mainland, Nova Scotia, Canada.

In his re-description of the Maritime Garter Snake, *Thamnophis sirtalis pallidulus*, Bleakney (1959) noted that the snakes of the genus *Thamnophis* are notoriously plastic in colour characters. Colour variation in the genus may be consistent and confined to a limited geographic region or a number of colour phases may occur in one area. In the Maritime Garter Snake, the colour shade often varies from light anteriorly to darker posteriorly. This plasticity in shade or colour intensity is further complicated in that it is influenced by the time before or after a snake has shed its skin. Rossman et al. (1996) also note that the dorsal colour pattern in *T. sirtalis* is the most variable of any species in the genus, although where geographically consistent it has been used to define the 11 subspecies currently recognized within *T. sirtalis*. While comparing the *T. s. pallidulus* with its close relative the Eastern Garter Snake, *T. s. sirtalis*, Bleakney (1959) examined 376 specimens of the former and identified three patterns of colouration [Bleakney (1959) follows Ridgeway (1912) for colour descriptors]:

1. A cinnamon-brown ground colour, cinnamon-buff lateral stripes, and with ventral scales colonial-buff anteriorly and olive-buff posteriorly;
2. Yellowish-olive ground colour, with chamois colour lateral stripes and with ventral scales changing from amber-yellow anteriorly to tea-green posteriorly;
3. Olive-grey ground colour with greyish lateral stripes and with olive-buff to French-grey ventral scales.

The ground colour is broken on each side by two rows of alternating spots composed of groups of two

to four scales which are hazel in colour with black margins. Furthermore, he found that approximately one third have a well defined gull-grey dorsal stripe, one-third have a short poorly delimited olive-yellow stripe, and the remaining one-third have no stripe at all.

Gilhen (1984) reported a fourth uncommon melanistic condition having a ground colour of black. I add an uncommon fifth condition which is distinctly scarlet in ground colour, or erythristic (Figure 1). Two adult female Maritime Garter Snakes which strikingly manifest erythrism were captured in Nova Scotia (Cover). The first one collected at Indian Brook IR 14, Hants County (45°05'00"N, 63°30'00"W), in August 2005 is approximately 72 centimeters in total length. The second was collected at West St. Andrews, Colchester County (45°06'00"N, 63°18'00"W), on 7 July 2009 and is approximately 77 cm in total length.

Both females are scarlet in ground colour (Table 1). With the overall colouration including a complex and subtle mix of orange and red that blend with the scarlet ground colour. The Indian Brook female has a distinct dorsal stripe. The West St. Andrews female has a delimited dorsal stripe which becomes darker and interrupted along its length by the top row of spots. The apparent rarity of this colour morph in Nova Scotia warrants a general description, which are provided here for both females. Since the body colour of Maritime Garter Snakes appear to be lighter anteriorly, becoming darker posteriorly, the detailed description of the erythristic specimens that follow include the head, about five centimeters of the mid section of the

trunk and the anterior tail. Colour name and number are after Smithe (1975). The colour number is given where it first appears in the text and in Table 1.

Erythristic adult female from Indian Brook

From a distance, the ground colour is Scarlet (14). This snake (Cover and Table 1) has a contrasting Buff-Yellow (53) dorsal stripe, a thin Flame Scarlet (15) lateral stripe on the second row of dorsal scales on both sides, and two alternating rows of Burnt-Umber (22) square-shaped spots in a checkerboard pattern between the stripes. The top row of spots is slightly invasive of the dorsal stripe but does not completely interrupt the stripe anywhere along its length. The skin between the scales where the spots occur is Blackish Neutral Gray (82) and where there are no spots the skin is Geranium Pink (13).

The top of the head is Chrome Orange (16). The sides of the head covering the labials are glossy Cream Color (54). The pupils of the eyes are Sepia (119) with a Chrome Orange (16) iris. The underside of the head, and approximately one third of the anterior underside of the trunk, are Cream Color. The ventral scales anteriorly are bordered in Maroon (31), becoming darker Maroon on the remainder of the underside of the trunk and tail. The Hazel (35) spot on both sides of each ventral scale are obscured by the previous overlapping ventral scale. The tail is dark Scarlet above and dark Maroon on the underside. (Figure 2).

Erythristic adult female from West St. Andrews

From a distance the ground colour is Scarlet. It has a brief contrasting Buff-Yellow dorsal stripe which becomes darker and delimiting along its length, a thin bright Geranium (12) lateral stripe on the second dorsal scale row on both sides, and two rows of Chestnut (32) spots between the stripes. The top row of square-shaped spots are much smaller than the large, rectangular, bottom row of spots. The top row of spots overlap the midline of the back. The skin between the scales where spots occur is Blackish Neutral Gray and where there are no spots Geranium-Pink.

The top of the head is Crome Orange. The sides of the head covering the labials are a glossy Spectrum-Orange (17). The pupil of the eyes are Sepia with a Chrome Orange iris. With the exception of the chin, which is Cream in color, the remaining underside of the head and anterior one third of the trunk is glossy Spectrum-Orange bordered in Geranium. The underside is dappled with Geranium on Spectrum Orange. This individual has a Hazel spot highlighted in Orange Yellow (18) on both sides of the ventral scales. The tail is dark Scarlet above and dark Geranium on the underside.

Discussion

Webster's Dictionary defines erythrism as a condition marked by exceptional prevalence of red pigmen-



FIGURE 1. Erythristic adult female Maritime Garter Snake, *Thamnophis sirtalis pallidulus*, captured at West St. Andrews, Colchester County, Nova Scotia, on 7 July 2009.

tation (as in skin or hair) (Merriam 1967). Erythrism in the *T. s. pallidulus* represents an uncommon but naturally occurring colour condition found mostly in northern mainland Nova Scotia (Figure 3). Erythrism occurs in various shades and degrees of intensity but has not been previously reported in the Maritime Garter Snake in the Maritime Provinces of Canada (Jones 1865; Gilpin 1875; Bleakney 1958; Cook 1967; and Gilhen 1984). J. Sherman Bleakney, Francis R. Cook and John Gilhen have observed the Maritime Garter Snake in Nova Scotia, combined for more than 60 years. Some individuals with orange or red skin between the scales have been reported from New Brunswick (Cox 1907), Prince Edward Island (Cook 1967) and in *Thamnophis sitalis sitalis* in Ontario (Logier 1939). In Quebec (Desroches and Rodrigue 2004) and Ontario (Logier 1939) individuals with red

TABLE 1. Colour variation in two erythristic Maritime Garter Snakes (*Thamnophis sirtalis pallidulus*) from Nova Scotia. Colour descriptors with numbers in parentheses follow Smithe (1975).

Specimen Location:	Indian Brook	West St. Andrews
Ground Color:	Scarlet (14)	Scarlet
Head:		
Above	Crome Orange (16)	Crome Orange
Supralabials	Cream Color (54)	Spectrum Orange (17)
Underside		
Infralabials	Cream Color	Spectrum Orange
Chin	Cream Color	Cream Color
Eyes: Pupil	Blackish Neutral Gray (82)	Blackish Neutral Gray
Eyes: Iris	Crome Orange	Crome Orange
Tongue: Fork	Black: Scarlet	Black: Scarlet
Trunk:		
Above Scarlet with		
Dorsal Stripe	Buff-Yellow (53)	N/A
Lateral Stripes	Flame Scarlet (15)	Geranium (12)
Spots	Burnt Umber (22)	
Skin:	Chestnut (32)	
Between dorsal scales.		
Where there are Spots	Blackish Neutral Gray (82)	Blackish Neutral Gray
Where there are no Spots	Geranium Pink (13)	Geranium Pink
Underside: Ventral Scales	Maroon (31)	Geranium
Ventral Scale Side Spots	Hazel (35)	Hazel, highlighted in Orange Yellow (18)
Anal Plate:	Maroon	Geranium
Subcaudal Scales	Maroon	Geranium
Tail:		
Above	Scarlet	Scarlet
Underside	Maroon	Geranium



FIGURE 2. Underside of erythristic Maritime Garter Snake from Indian Brook IR 14, Hants County, Nova Scotia.

rather than yellow lateral stripes have been reported, and from Manitoba to British Columbia western subspecies of *Thamnophis sirtalis* have of red lateral barring on scales and skin which increases in extent to the west (Cook 1984; Rossman et al. 1996). None matches the overall erythristism reported here.

It was not until the late 1980s that I observed orange-brown individuals that would be considered approaching erythristism or part-erythristic.

In July 1989, while visiting Georges Island, Halifax Harbour, Halifax County, Nova Scotia, I noted that not only were Maritime Garter Snakes very common but

the variation in colour and pattern was exceptionally high for such a small (five hectare) drumlin landscape. There were four different adult individuals under one board. One brown male had orange ventral scales, posteriorly, as well as the anal plate and sub-caudal scales. Brown individuals with orange ventral and sub-caudal scales were also observed on Georges Island in 1993 by Suzanne Barnes (Barnes 1994 and Barnes et al 2006).

On 21 August 1993, I was asked to investigate a snake home invasion by snakes in Sunnybrae, Pictou County, Nova Scotia. It became obvious, from two freshly killed snakes near the front door, the species involved was the Maritime Garter Snake. Both snakes were orange-brown above with bright orange posterior ventral scales, anal plate, and sub-caudal scales. On the underside, the chin and labials were yellowish-orange. Each ventral scale anteriorly was yellowish-grey bordered in orange. The author considered both of these snakes more approaching erythrism than the Georges Island individual.

In the summer of 2004 Robert March photographed an adult orange-brown Maritime Garter Snake with a Buff Yellow dorsal stripe at Crescent Beach, Lunenburg County, Nova Scotia the colour photograph is on file at the Nova Scotia Museum of Natural History. This individual may be part-erythristic but the colour of the underside is not known. During May and June 2008 Jody MacKenzie and the author observed a number of Maritime Garter Snakes that were orange-brown in colour near a pond in a Stellarton wetland, Pictou County, Nova Scotia. The general colour was bright orange-brown. The ventral scales were yellowish-grey bordered in orange. The sub-caudal scales were uniform orange. A few individuals were photographed by Jody MacKenzie. These images are on file at the Nova Scotia Museum of Natural History. On 10 August 2008 Derek Bridgehouse photographed an adult female Maritime Garter Snake catching and eating an Eastern American Toad, *Anaxyrus a. americanus*, and he provided the image to the author for Nova Scotia Museum of Natural History records. This snake was also orange-brown above but the underside was not noted.

Acknowledgments

I am indebted to Andrew Hebda, Curator of Zoology, Nova Scotia Museum of Natural History, and Francis R. Cook reviewed the draft manuscript and I value their useful comments and suggestions. I am pleased to acknowledge Michael W. McDonald, Indian Brook, Nova Scotia, who provided the erythristic striped female from Indian Brook and Laura Briggs, West St. Andrews, Nova Scotia, for giving me the opportunity to collect the erythristic female from West St. Andrews. I thank Kimberly A George, Regional Biologist, Nova Scotia Department of Natural Resources, who first reported to me the female from West St. Andrews. Roger Lloyd, did the professional photo-

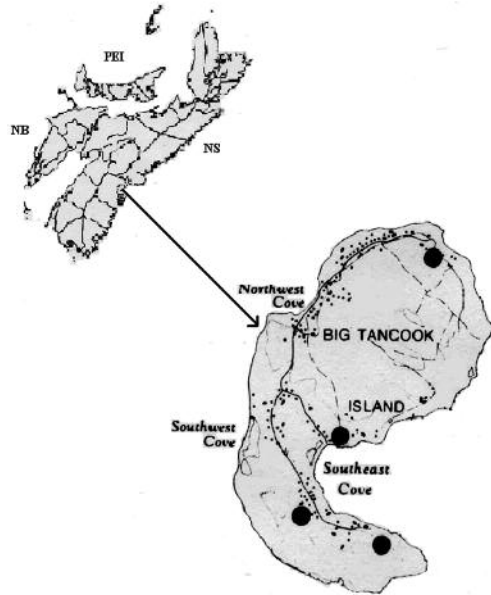


FIGURE 3. Distribution of erythristic Maritime Garter Snakes (*Thamnophis sirtalis pallidulus*), in Nova Scotia: Closed circles represent localities where two erythristic adult females were captured. Closed squares represent localities where part-erythristic individuals were captured. Open squares represent localities where only the dorsal colour patterns of two part-erythristic individuals were documented.

graphy. Katherine Ogden, Assistant Curator/Registrar and Christina McCorry, Acting Assistant Curator/Registrar, Nova Scotia Museum, prepared the map in Figure 3. I am grateful to Mary MacDonald, Acting Assistant Co-ordinator of Interpretation, Museum Naturalist, Nova Scotia Museum of Natural History, for her assistance taking colour notes. At the time of writing both snakes are alive and on display at the Nova Scotia Museum of Natural History, in the dedicated professional care of M. MacDonald.

Literature Cited

- Barnes, S. M. 1994. Status and management of Maritime Garter Snakes (*Thamnophis sirtalis pallidula*) on George's Island, Halifax Harbour, Nova Scotia. MSc thesis, Acadia University, Wolfville, Nova Scotia.
- Barnes, S. M., C. M. Dubesky, and T. B. Herman. 2006. Ecology and Morphology of *Thamnophis sirtalis pallidulus* (Maritime Garter Snake) on Georges Island, Nova Scotia. *Northeastern Naturalist* 13(1): 73-82.
- Bleakney, J. S. 1958. A zoogeographical study of the amphibians and reptiles of eastern Canada. *National Museums of Canada Bulletin*. 155: 199 pages.
- Bleakney, J. S. 1959. *Thamnophis sirtalis sirtalis* (Linnaeus) in eastern Canada, redescription of *T. s. pallidula* Allen. *Copeia*. 1959(1): 52-56.

- Cook, F. R.** 1967. An analysis of the Herpetofauna of Prince Edward Island. National Museum of Canada. Bulletin 212. Ottawa. 60 pages.
- Cook, F. R.** 1984. An introduction to Canadian amphibians and reptiles of Canada. National Museum of Natural Sciences, National Museums of Canada, Ottawa, Ontario.
- Cox P.** 1903. The snakes of the Maritime Provinces of Canada. Proceedings of the Miramichi Natural History Association 3: 11–20.
- Desroches J-F,** and **D. Rodrigue.** 2004. Amphibiens et reptiles du Québec et des Maritimes. Waterloo, Editions Michel Quintin Quebec.
- Gilhen, J.** 1984. Amphibians and reptiles of Nova Scotia. Nova Scotia Museum. Halifax. 162 pages
- Gilpin, J. B.** 1875. On the serpents of Nova Scotia. Transactions Nova Scotian Institute of Science, IV: 80–88.
- Logier, E. B. S.** 1939. The reptiles of Ontario. Royal Ontario Museum Handboon (4).
- Jones, J. M.** 1865. Contributions to the natural history of Nova Scotia: Reptilia. Transactions Nova Scotian Institute Science, I (iii): 114–128.
- Merriam, G.** and **C.** 1967. Webster's Seventh New Collegiate Dictionary. Thomas Allen & Son Limited, Toronto, Ontario. Page 282 (1221).
- Ridgeway, R.** 1912. Colour standards and nomenclature. Washington, D. C.
- Rossman, D. A, N. B. Ford,** and **R. A. Seigel.** 1996. The garter snake: Evolution and ecology. Norman. University of Oklahoma Press.
- Smithe, Frank B.** 1975. Naturalist's colour guide. Part I, The colour guide. Part II, the colour guide supplement (Color work by Hale Color Consultants, Baltimore). The American Museum of Natural History. New York.

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Errata for The Canadian Field-Naturalist 124(1) and 124(2)

Erratum 124(1): 97

The January-March 2010, Volume 124, Number 1 issue of *The Canadian Field-Naturalist*. In a brief notice on page 97, News and Comment, re Hue MacKenzie's death; the death date is incorrect. It should be 9 November 2009, not December. Also, the retirement location is given as "...South Surry, Vancouver, British Columbia..." It should read "Surrey, British Columbia..." perhaps with some reference to Surrey being a suburb of Vancouver. The location as shown in the death notice doesn't exist.

JO ANN MACKENZIE

Erratum 124(2): 113, 115, 117

In authors' line on 113 the last author "Powers" should be "Power". The error is repeated in the citation strip on the same page and in the headers on subsequent uneven numbered pages (115, 117).

Erratum 124(2): 119, 121

In headers on pages 119 and 121 "Keven" should be "Kevan".

Erratum 124(2): 196

In notice of Brenda Carter's death, the date of Tom Manning's passing should be 1998 not 1968.

DAN BRUNTON

Erratum 124(2): 141

Corrected table for paper by Dawson et al. on Wolverine

TABLE 1. Home range size (HR) based on minimum convex polygons (MCP) derived from all VHF radio telemetry locations for the period 25 February – 8 April 2004 for radio-collared Wolverines (*Gulo gulo*) in northwestern Ontario, Canada.

Animal	Estimated Age (yrs)	Number of Days Located	N	100% MCP	95% MCP	50% MCP
F01	1	30	33	316	235	41
F02 ¹	1	0	0	–	–	–
F03	1	24	27	495	453	38
F04	3+	14	29	348	332	3
Mean (SE)				386 (55)	340 (63)	27 (12)
M01	2	29	39	1898	1434	247
M02	1	13	15	2509	2509 ²	182
M03	3–4	29	40	1685	1308	209
Mean (SE)				1791 (106)	1371 (63)	228 (19)

¹ F02 was killed prior to the VHF monitoring period.

² Due to the low number of locations for this animal analysis results for 95 MCP was the same as for 100 MCP and all results for M02 are not included in the mean HR calculations

Erratum 124(2): 102

Corrected map in lead paper by Gilhen

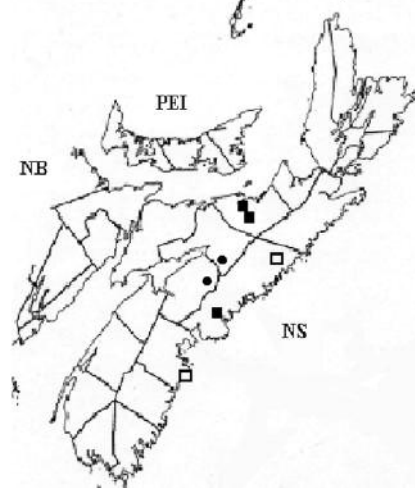


FIGURE 3. Distribution of erythristic Maritime Garter Snakes (*Thamnophis sirtalis pallidulus*), in Nova Scotia: Closed circles represent localities where two erythristic adult females were captured. Closed squares represent localities where part-erythristic individuals were captured. Open squares represent localities where only the dorsal colour patterns of two part-erythristic individuals were documented.