

SUMMARY OF OXYGEN TRANSPORT CHARACTERISTICS OF REPTILIAN BLOOD



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## INTRODUCTION

The data included here form the basis of a review of the adaptations of the reptilian blood system for oxygen transport and delivery (Pough in press a). Table 1 includes data directly related to oxygen transport (hematocrit, hemoglobin concentration, blood oxygen capacity) and Table 2 summarizes measurements of the Bohr Effect. Information on blood oxygen affinities and heats of oxygenation has been presented elsewhere and is not included (Pough 1977a, b, in press a).

The measurements included have been drawn from diverse sources and various techniques of measurement were used. I soon realized that it was not practical to make distinctions among different techniques or methods of reporting data because in many instances the original sources did not provide the necessary information. I have generally retained the taxonomic designation employed by the original source; a few major changes are explained in footnotes. To be consistent with papers based on this summary (Pough in press a, b) I have used *Chrysemys* in place of *Pseudemys* and *Nerodia* for New World *Natrix*.

This summary incorporates and extends data presented in two earlier summaries (Dessauer 1970, MacMahon & Hamer 1975a). In every case I attempted to verify those data and I was successful in most instances. (In some cases I have chosen to report different values from the same sources.) There were a few plausible records in the earlier summaries that I could not trace. In those instances I have included the datum and cited the summary as its source.

Ontogenetic variation in the oxygen transport characteristics of reptilian blood is widespread and may be reflected by ontogenetic changes in ecology or behavior. (See Frair 1977 and Pough 1977c, d, 1978 for examples and a review.) Altitudinal variation has also been noted (Vinegar & Hillyard 1972, Weathers & White 1972, Ballinger & Newlin 1975, Newlin & Ballinger 1976). To stress the occurrence of such variation I have, in a number of instances, presented a range of values rather than mean values. For statistical analysis I used the mean value if it was provided by the source or could be calculated from the data; failing that I used the midpoint of the range. Mean values were calculated for families and higher taxa in two ways: (1) *By source*, using a single value for a species from each source. Mean values for families are presented only in this form. (2) *By species*, using a single value for each species calculated as the mean of the values reported for that species by all sources. The mean values obtained in these two ways do not differ.

I am grateful to Martin E. Feder who supplied unpublished data for several species of snakes, and to Amanda Midori Pough who helped to organize the literature citations. My own work reported here was supported primarily by the National Science Foundation (Grant GB-18,985).

Table 1 — SUMMARY OF BLOOD MEASUREMENTS OF REPTILES

The number of species that have been sampled in each family is shown. In the family averages the sample size is the total number of measurements represented.

Taxon	Hematocrit (percent)	Hemoglobin (g/100 ml blood)	Oxygen capacity (ml/100 ml blood)	Source
TURTLES				
Chelidae (1 species)				
<i>Chelys fimbriata</i>	26	6.4	—	Lenfant et al. 1970
Cheloniidae (5 species)				
<i>Caretta caretta</i>	32	—	—	Thorson 1968
<i>C. caretta</i>	21	7.0	5.6	Palomeque et al. 1977
<i>C. caretta</i>	19-40	—	—	Frair 1977
<i>Chelonia mydas</i>	31,32	—	—	Thorson 1968
<i>C. mydas</i>	15-40	—	—	Frair 1977
<i>Eretmochelys imbricata</i>	15-43	—	—	Frair 1977
<i>Lepidochelys kempfi</i>	32	—	—	Thorson 1968
<i>L. kempfi</i> & <i>L. olivacea</i>	20-40	—	—	Frair 1977
<i>L. olivacea</i>	32	—	—	Thorson 1968
Mean ± s.e.	29.5±1.2	7.0	5.6	
Chelydridae (1 species)				
<i>Chelydra serpentina</i>	20	—	5.9	Henderson 1928
<i>C. serpentina</i>	21	12.3	—	Gaumer & Goodnight 1957
<i>C. serpentina</i>	—	—	5.4-7.5	Steggerda & Essex 1957
<i>C. serpentina</i>	27	—	—	Thorson 1968
<i>C. serpentina</i>	21	5.5	—	Horton et al. 1972
<i>C. serpentina</i>	—	—	3.7	Pough 1976
Mean ± s.e.	22.2±1.6	8.9	5.4±0.85	
Emydidae (10 species)				
<i>Chrysemys concinna</i>	20-22	—	9.5-10.8	Southworth & Redfield 1926
<i>C. concinna</i>	—	8.1	—	Goin & Jackson 1965
<i>C. nelsoni</i>	—	8.4	—	Goin & Jackson 1965
<i>C. picta</i>	28	11.2	—	Gaumer & Goodnight 1957
<i>C. picta</i> males	—	—	2.8-10.6	Payne & Burke 1964
<i>C. picta</i> females	—	—	4.4-13.3	
<i>C. picta</i>	24	5.6	—	Horton et al. 1972
<i>C. picta</i>	—	—	5.6	Pough 1976
<i>C. scripta</i>	24-27	—	3.8-4.1	Wilson 1939
<i>C. scripta</i>	35	11.1	—	Gaumer & Goodnight 1957
<i>C. scripta</i>	24	5.7	—	Sheeler & Barber 1964
<i>C. scripta</i>	—	8.9	—	Goin & Jackson 1965
<i>C. scripta</i>	31	—	14.9	Frankel et al. 1966

Table 1

Taxon	Hematocrit (percent)	Hemoglobin (g/100 ml blood)	Oxygen capacity (ml/100 ml blood)	Source
Emydidae (continued)				
<i>C. scripta</i>	19	5.4	—	Horton et al. 1972
<i>C. scripta</i>	30	11.8	8.7	Burggren et al. 1977
<i>C. scripta</i>	—	—	5.8	Gatten 1975
<i>Deirochelys reticularia</i>	—	8.3	—	Goin & Jackson 1965
<i>Emys orbicularis</i>	25	6.9	9.4	Verjbiinskaya 1944
<i>E. orbicularis</i>	—	9.7	—	Kanungo 1961
<i>E. orbicularis</i>	—	7.2	—	Motelica et al. 1967
<i>E. orbicularis</i>				Palomeque et al. 1977
males	21	6.3	6.7	
females	18	6.9		
<i>Geomyda trijuga</i>	27	—	—	Nair 1955
<i>Malaclemys terrapin</i>	—	9.2	—	Goin & Jackson 1965
<i>M. terrapin</i>	31	—	—	Thorson 1968
<i>Terrapene carolina</i>	22	6.2	—	Wintrobe 1933
<i>T. carolina</i>	25	10.1	—	Gaumer & Goodnight 1957
<i>T. carolina</i>				Atland & Thompson 1958
males	27	6.2	—	
females	22	5.4	—	
<i>T. carolina</i>				Payne & Burke 1964
males	—	—	2.5-8.9	
	—	—	3.4-11.8	
<i>T. carolina</i>	—	9.0	—	Goin & Jackson 1965
<i>T. carolina</i>	29	4.8	—	Horton et al. 1972
<i>T. carolina</i>	—	—	7.6	Pough 1976
<i>T. carolina</i>	—	—	7.1-7.8	Pough, unpublished
<i>T. ornata</i>	—	—	5.1	Gatten 1975
Mean ± s.e.	25.9±1.1	8.0±0.47	7.7±0.83	
Kinosternidae (3 species)				
<i>Kinosternon subrubrum</i>	23	—	—	Dessauer 1970
<i>Sternotherus minor</i>	—	9.9	—	Goin & Jackson 1965
<i>S. odoratus</i>	—	11.2	—	Goin & Jackson 1965
Mean	23	10.6		
Pelomedusidae (1 species)				
<i>Pelomedusa subrufa</i>	—	—	8.3	Wood & Johansen 1974
Testudinidae (7 species)				
<i>Gopherus polyphemus</i>	30	—	—	Thorson 1968
<i>Malacochersus tornieri</i>	23,25	—	8.3,8.5	Wood et al. 1978
<i>Testudo graeca</i>	34	14.4	9.8	Burggren et al. 1977
<i>T. hermanni</i>				Palomeque et al. 1977
males	44	13.7	8.9	
females	27	8.8		

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axon	Hematocrit (percent)	Hemoglobin (g/100 ml blood)	Oxygen capacity (ml/100 ml blood)	Source
testudinidae (continued)				
<i>T. horsfieldi</i>	28	8.0	—	Korshuev et al. 1957
<i>T. kleinmanni</i> <sup>1</sup>	27	—	—	Khalil & Abdel-Messeih 1963
<i>T. pardalis</i>	—	—	10.0	Burggren et al. 1977
Mean ± s.e.	29.8±1.8	11.2±1.85	9.3±0.40	

Table 1

Taxon	Hematocrit (percent)	Hemoglobin (g/100 ml blood)	Oxygen capacity (ml/100 ml blood)	Source
CROCODILIANS				
Alligatoridae (2 species)				
<i>Alligator mississippiensis</i>	14	—	12.0	Hopping 1923
<i>A. mississippiensis</i>	30	8.2	—	Wintrobe 1933
<i>A. mississippiensis</i>	26-31	—	7.7-14.6 <sup>2</sup>	Dill & Edwards 1935
<i>A. mississippiensis</i>	16-29	5.0-9.2	—	Coulson et al. 1950
<i>A. mississippiensis</i>	—	—	8.1-10.5	Andersen 1961
<i>A. mississippiensis</i>	25	—	—	Thorson 1968
<i>A. mississippiensis</i>	20	—	—	Dessauer 1970
<i>Caiman fuscus</i>	—	—	8.2-9.0 <sup>2</sup>	Dill & Edwards 1931
<i>C. fuscus</i>	26	—	—	Thorson 1968
Mean ± s.e.	23.5±2.0	7.6	10.3±0.80	
Crocodylidae (3 species)				
<i>Crocodylus acutus</i>	—	—	8.2-10.1 <sup>2</sup>	Dill & Edwards 1931
<i>C. acutus</i>	26	—	—	Thorson 1968
<i>C. morleti</i>	26	—	—	Thorson 1968
<i>C. niloticus</i>	35	—	—	Khalil & Abdel-Messeih 1961
Mean ± s.e.	29.0±1.8	—	10.1	



Table 1

Taxon	Hematocrit (percent)	Hemoglobin (g/100 ml blood)	Oxygen capacity (ml/100 ml blood)	Source
LIZARDS				
Agamidae (5 species)				
<i>Agama atra</i>	32	7.5-8.0	—	Villiers Pienaar 1962
<i>A. caucasica</i>	28	8.2	11.7	Verjbiinskaya 1944
<i>A. lehmani</i>	24	7.5	—	Korshuev et al. 1957
<i>Calotes versicolor</i>	—	8.6	—	Banerjee & Sharau 1972
<i>Uromastyx</i> sp.	—	4.6	—	Dessauer 1970
<i>Uromastyx hardwickii</i>	34	—	—	Menon 1954
Mean ± s.e.	29.5±2.2	7.3±0.71	11.7	
Anguillidae (5 species)				
<i>Anguis fragilis</i>	—	11.3	—	Dessauer 1970
<i>Gerrhonotus coeruleus</i>	—	—	6.8	Pough, unpublished
<i>G. multicarinatus</i>	—	—	12.6	Dawson & Poulson 1962
<i>G. multicarinatus</i>	—	—	6.7	Pough 1976
<i>Ophisaurus apodus</i>	24	7.8	9.8	Verjbiinskaya 1944
<i>O. apodus</i>	22	4.7	—	Korshuev et al. 1957
<i>O. ventralis</i>	31	6.9	—	Dessauer 1970
Mean ± s.e.	25.7±2.7	7.7±1.38	9.0±1.41	
Cordylidae (2 species)				
<i>Cordylus giganteus</i>	35	9.0	—	Villiers Pienaar 1962
<i>C. vittifer</i>	32	8.0	—	Villiers Pienaar 1962
Mean	33.5	8.5		
Hemidactylidae (3 species)				
<i>Coleonyx variegatus</i>	—	6.7	—	Ryerson 1949
<i>Hemidactylus flaviviridis</i>	10-15	11.7	—	Banerjee & Banerjee 1965
<i>H. turcicus</i>	—	10.8	—	Goin & Jackson 1965
Mean ± s.e.	12.5	9.7±1.54	—	
Helodermatidae (2 species)				
<i>Heloderma horridum</i>	21,30	6.8,9.0	—	Zarafonetis & Kalas 1960
<i>H. suspectum</i>	25-42	—	9.7-11.9 <sup>2</sup>	Edwards & Dill 1935
<i>H. suspectum</i>	—	7.2	—	Ryerson 1949
Mean	29.8	7.6	10.8	
Iguanidae (27 species)				
<i>Anolis carolinensis</i>	—	12.0	—	Goin & Jackson 1965
<i>A. carolinensis</i>	28	—	—	Dessauer 1970
<i>Crotaphytus collaris</i>	—	—	10.4	Dawson & Poulson 1962
<i>Ctenosaura acanthura</i>	35	—	—	Hernandez & Coulson 1951

Table 1

Taxon	Hematocrit (percent)	Hemoglobin (g/100 ml blood)	Oxygen capacity (ml/100 ml blood)	Source
Iguanidae (continued)				
<i>Dipsosaurus dorsalis</i>	—	—	9.6	Dawson & Poulson 1962
<i>D. dorsalis</i>	—	—	9.3	Pough 1976
<i>Gambelia wislizeni</i>	—	—	10.4	Dawson & Poulson 1962
<i>Holbrookia texana</i>	—	—	7.8	Dawson & Poulson 1962
<i>Iguana iguana</i>	25-36	3.8-12.0	5.1-16.1	Hernandez & Coulson 1951
<i>I. iguana</i>	31	—	8.4	Tucker 1966
<i>I. iguana</i>	30	—	—	Thorson 1968
<i>I. iguana</i>	33	8.4	10.5	Wood & Moberly 1970
<i>I. iguana</i>	—	—	7.9	Pough 1976
<i>Liolaemus multiformis</i>	34	10.1	—	Engbretson & Hutchison 197
<i>Phrynosoma cornutum</i>	—	—	9.3	Dawson & Poulson 1962
<i>P. douglassi</i>	—	—	10.2	Dawson & Poulson 1962
<i>P. modestum</i>	—	—	12.1	Dawson & Poulson 1962
<i>P. solare</i>	—	7.5	—	Ryerson 1949
<i>Sauromalus hispidus</i>	33	—	9.7	Bennett 1973
<i>S. obesus</i>	29-33	—	10.1-12.7 <sup>2</sup>	Dill et al. 1935
<i>S. obesus</i>	—	—	9.8	Pough 1976
<i>S. obesus</i>	—	—	10.8	Pough, unpublished
<i>Sceloporus clarki</i>	—	—	8.3	Dawson & Poulson 1962
<i>S. graciosus</i>	—	—	10.9	Dawson & Poulson 1962
<i>S. jarrovi</i>	—	—	—	Dawson & Poulson 1962
5100 ft above sea level	—	—	7.7	
8600 ft above sea level	—	—	8.3	
<i>S. jarrovi</i>	—	7.2-9.3	—	Vinegar & Hillyard 1972
<i>S. jarrovi</i>	—	9.0-12.4	—	Ballinger & Newlin 1975
<i>S. magister</i>	—	—	10.9	Ryerson 1949
<i>S. magister</i>	—	—	8.9	Pough 1976
<i>S. occidentalis</i>	—	—	9.5	Dawson & Poulson 1962
<i>S. occidentalis</i>	—	—	—	Weathers & White 1972
sea level	31	9.1	—	
2750-3200 m	39	9.7	—	
<i>S. occidentalis</i>	—	—	7.5-9.7	Vinegar & Hillyard 1972
<i>S. occidentalis</i>	—	—	5.8	Pough 1976
<i>S. orcutti</i>	—	—	8.0	Pough 1976
<i>S. poinsetti</i>	—	—	10.0	Dawson & Poulson 1962
<i>S. poinsetti</i>	—	6.6	—	Newlin & Ballinger 1976
<i>S. scalaris</i>	—	12.2	—	Newlin & Ballinger 1976
<i>S. virgatus</i>	—	—	9.6	Dawson & Poulson 1962
<i>S. virgatus</i>	—	8.9	—	Newlin & Ballinger 1976
<i>Uma notata</i>	—	—	9.1	Pough 1976
<i>U. scoparia</i>	—	—	6.8	Pough 1976
<i>Urosaurus ornatu</i>	—	9.6, 8.5	—	Newlin & Ballinger 1976
<i>Uta stansburiana</i>	—	—	8.7	Dawson & Poulson 1962
<i>U. stansburiana</i>	—	—	9.2	Pough 1976
Mean ± s.e.	32.0±0.80	9.1±0.52	9.2±0.25	

Table 1

taxon	Hematocrit (percent)	Hemoglobin (g/100 ml blood)	Oxygen capacity (ml/100 ml blood)	Source
<b>lacertidae (5 species)</b>				
<i>Acanthodactylus erythrurus</i>	—	—	4.7	Pough, unpublished
<i>Lacerta agilis</i>	24	8.7	—	Korshuev et al. 1957
<i>L. muralis</i>	—	9.0	—	Dessauer 1970
<i>L. viridis</i>	—	12.5	—	Motelica et al. 1967
<i>Psammodormus algericus</i>	—	—	4.0	Pough, unpublished
Mean ± s.e.	24	10.1±1.22	4.4	
<b>cincidae (2 species)</b>				
<i>Egernia cunninghami</i>	23	7.6	—	Maclean et al. 1975
<i>Eumeces obsoletus</i>	—	—	10.8-14.4	Dawson 1960
Mean	23	7.6	12.5	
<b>teiidae (4 species)</b>				
<i>Cnemidophorus inornatus</i>	—	—	10.8	Dawson & Poulson 1962
<i>C. sacki</i>	—	—	11.6	Dawson & Poulson 1962
<i>C. tigris</i>	—	—	9.6	Dawson & Poulson 1962
<i>Tupinambis teguixin</i>	—	—	9.5	Pough 1976
Mean ± s.e.	—	—	10.4±0.50	
<b>varanidae (5 species)</b>				
<i>Varanus exanthematicus</i>	—	—	10.1	Wood et al. 1977
<i>V. gouldi</i>	29	—	8.0	Bennett 1973
<i>V. griseus</i>	35	—	—	Nair 1955
<i>V. griseus</i>	27-36	—	6.0-6.8	Khalil & Abdel-Messeih 1961
<i>V. griseus</i>	27	—	—	Khalil & Abdel-Messeih 1963
<i>V. monitor</i>	—	—	—	Banerjee 1966
males	36	12.3	—	
females	30	10.6	—	
<i>V. monitor</i>	—	10.0-13.0	—	Banerjee & Banerjee 1969
<i>V. niloticus</i>	24	7.1	9.3	Wood & Johansen 1974
Mean ± s.e.	30.0±1.7	10.0±1.43	8.4±0.81	

Table 1

Taxon	Hematocrit (percent)	Hemoglobin (g/100 ml blood)	Oxygen capacity (ml/100 ml blood)	Source
SNAKES				
Acrochordidae (2 species)				
<i>Acrochordus granulatus</i>	41	—	16.2	Feder, personal communication
<i>A. javanicus</i>	21	6.0	9.3	Johansen & Lenfant 1972
Mean	31	6.0	12.8	
Boidae (5 species)				
<i>Constrictor constrictor</i>	29	—	—	Thorson 1968
<i>C. constrictor</i>	27	9.1	13.5	Johansen & Lenfant 1972
<i>Eryx jaculus</i>	25	6.9	—	Korshuev et al. 1957
<i>E. johni</i>	—	—	6.4	Pough, unpublished
<i>Python molurus</i>	—	—	5.7	Pough, unpublished
<i>P. reticulatus</i>	—	—	7.1	Pough, unpublished
Mean ± s.e.	27.0±1.2	8.0	8.2±1.80	
Colubridae (26 species)				
<i>Cerberus rhynchops</i>	32	—	3.6	Feder, personal communication
<i>Coluber constrictor</i>	26	—	—	Hutton 1958
<i>C. flourentus</i>	26	—	—	Khalil & Abdel-Messeih 196
<i>Drymarchon corais</i>	—	—	4.2	Pough, unpublished
<i>Elaphe guttata</i>	33	—	4.2	Pough, unpublished
<i>E. obsoleta</i>	26-34	—	6.7	Pough, unpublished
<i>Farancia abacura</i>	—	7.5	—	Goin & Jackson 1965
<i>Heterodon platyrhinos</i> <sup>3</sup>	13,24	3.7,7.5	—	Wintrobe 1933
<i>Lampropeltis getulus</i>	22	—	—	Hutton 1958
<i>L. getulus</i>	—	—	4.5	Pough, unpublished
<i>L. triangulum</i>	—	—	8.7	Pough 1976
<i>Liodytes alleni</i>	—	13.0	—	Goin & Jackson 1965
<i>Masticophis flagellum</i>	28-32	—	—	Pough, unpublished
<i>Natrix natrix</i>	32-34	—	—	Binyon & Twigg 1965
<i>N. natrix</i>	—	10.4	—	Motelica et al. 1967
<i>N. natrix</i>	37	—	—	Munday & Blane 1961
<i>N. piscator</i>	24	—	—	Nair 1955
<i>N. tessellatus</i>	33	—	—	Khalil & Abdel-Messeih 196
<i>Nerodia cyclopion</i>	—	6.5	—	Goin & Jackson 1965
<i>N. fasciata</i> <sup>4</sup>	22	—	—	Hutton 1958
<i>N. rhombifera</i>	—	—	7.6	Pough, unpublished
<i>N. sipedon</i>	36	10.0	—	Wintrobe 1933
<i>N. sipedon</i>	—	7.5	—	Goin & Jackson 1965
<i>N. sipedon</i>	23	—	—	Dessauer 1970
<i>N. sipedon</i>	—	—	11.1	Pough 1976
<i>N. sipedon</i>	—	—	3.1-11.9	Pough 1978
<i>Pituophis melanoleucus</i>	—	8.8	—	Ryerson 1949

Table 1

Taxon	Hematocrit (percent)	Hemoglobin (g/100 ml blood)	Oxygen capacity (ml/100 ml blood)	Source
Colubridae (continued)				
<i>P. melanoleucus</i>	30	—	—	Thorson 1968
<i>P. melanoleucus</i>	24	—	9.3	Greenwald 1971
<i>P. melanoleucus</i>	—	—	11.4	Pough 1976
<i>P. melanoleucus</i>	29-33	—	—	Smeller et al. 1978
<i>Ptyas mucosus</i>	52	—	—	Nair 1955
<i>Storeria dekayi</i>	—	10.8	—	Goin & Jackson 1965
<i>Thamnophis couchi</i>	—	—	9.0	Pough, unpublished
<i>T. elegans</i>	25	—	—	Dessauer 1970
<i>T. sauritus</i>	30	—	—	Dessauer 1970
<i>T. sirtalis</i>	19,37	5.8,11.3	—	Wintrobe 1933
<i>T. sirtalis</i>	—	8.1	—	Isaacs 1938
<i>T. sirtalis</i>	33	—	—	Dessauer 1970
<i>T. sirtalis</i>	—	—	9.5	Pough 1976
<i>T. sirtalis</i>	13-30	7.2-12.7	3.9-9.9	Pough 1977
Mean ± s.e.	29.2±1.4	8.9±0.59	7.4±0.69	
Elapidae (2 species)				
<i>Naja naja</i>	24	—	—	Nair 1955
<i>Pseudechis porphyriacus</i>	28	8.6	10.9	Seymour 1976
Mean	26	8.6	10.9	
Hydrophiidae (8 species)				
<i>Acalyptophis peronii</i>	—	10.7	—	Seymour & Webster 1975
<i>Aipsyurus laevis</i>	—	6.4	—	Seymour & Webster 1975
<i>Emydocephalus annulatus</i>	—	7.3	—	Seymour & Webster 1975
<i>E. annulatus</i>	31	—	6.5	Feder, personal communication
<i>Hydrophis cyanocinctus</i> <sup>5</sup>	32	—	—	Nair 1955
<i>H. elegans</i>	—	14.3	—	Seymour & Webster 1975
<i>H. melanocephalus</i> <sup>6</sup>	—	8.9	—	Seymour & Webster 1975
<i>Lapemis hardwicki</i>	—	11.7	—	Seymour & Webster 1975
<i>Laticauda colubrina</i>	24	6.2	9.3	Seymour 1976
<i>L. colubrina</i>	35	—	11.0	Feder, personal communication
Mean ± s.e.	30.5±2.3	9.4±1.14	8.9±1.31	
Viperidae (8 species)				
<i>Agkistrodon contortrix</i>	28	—	—	Dessauer 1970
<i>A. piscivorus</i>	18	—	—	Hutton 1958
<i>A. piscivorus</i>	19	—	—	Dessauer 1970
<i>Bitis arietans</i>	16-24	5.0-7.2	—	Otis 1973
<i>Bothrops</i> sp.	—	7.8	—	MacMahon & Hamer 1975a
<i>Crotalus cerastes</i>	22-31	6.4-8.1	7.6-10.8 <sup>7</sup>	MacMahon & Hamer 1975a,b
<i>C. horridus</i>	45	8.6	—	Dessauer 1970
<i>Vipera aspis</i>	—	10.5	—	Dessauer 1970

Table 1

Taxon	Hematocrit (percent)	Hemoglobin (g/100 ml blood)	Oxygen capacity (ml/100 ml blood)	Source
Viperidae (continued)				
<i>V. berus</i>	—	12.3	—	Motelica et al. 1967
<i>V. russelli</i>	22	—	—	Nair 1955
Mean ± s.e.	25.5±3.6	8.8±0.93	9.2	
Xenopeltidae (1 species)				
<i>Xenopeltis unicolor</i>	—	—	10.0	Pough. unpublished

<sup>1</sup>Identified as *Testudo leithii* in source.

<sup>2</sup>Calculated from a unit weight of 17,000 for hemoglobin. 1 mM/l or 1 meq/l = 2.24 vol%.

<sup>3</sup>Identified as *Heterodon contortrix* in source.

<sup>4</sup>Identified as *Natrix sipedon pictiventris* in source.

<sup>5</sup>Identified as *Distira cyanocincta* in source.

<sup>6</sup>Identification corrected from *Hydrophis belcheri* by Seymour (1978).

<sup>7</sup>Correct mean value is 10.75 vol% (J. A. MacMahon, personal communication).

## Mean Values of All Records (n = number of records)

	<u>Hematocrit</u>	<u>Hemoglobin</u>	<u>Blood Oxygen Capacity</u>
ALL TURTLES (59 records)			
Mean $\pm$ s.e. (n)	26.9 $\pm$ 0.7(38)	8.5 $\pm$ 0.46(29)	7.6 $\pm$ 0.55(21)
ALL CROCODYLIANS (13 records)			
Mean $\pm$ s.e. (n)	25.2 $\pm$ 1.8(10)	7.6(2)	10.1 $\pm$ 0.65(5)
ALL LIZARDS (84 records)			
Mean $\pm$ s.e. (n)	29.4 $\pm$ 0.9(30)	8.8 $\pm$ 0.34(36)	9.2 $\pm$ 0.27(49)
ALL SNAKES (72 records)			
Mean $\pm$ s.e. (n)	28.5 $\pm$ 1.1(42)	8.8 $\pm$ 0.42(29)	8.4 $\pm$ 0.58(26)
ALL REPTILES (228 records)			
Mean $\pm$ s.e. (n)	27.9 $\pm$ 0.5(120)	8.7 $\pm$ 0.23(96)	8.7 $\pm$ 0.24(101)

## Mean Values of All Species (n = number of species tested)

	<u>Hematocrit</u>	<u>Hemoglobin</u>	<u>Blood Oxygen Capacity</u>
ALL TURTLES (28 species)			
Mean $\pm$ s.e. (n)	27.6 $\pm$ 0.9(21)	8.9 $\pm$ 0.50(16)	7.8 $\pm$ 0.48(13)
ALL CROCODYLIANS (5 species)			
Mean $\pm$ s.e. (n)	27.2 $\pm$ 2.0(5)	7.6(1)	9.5 $\pm$ 0.66(3)
ALL LIZARDS (60 species)			
Mean $\pm$ s.e. (n)	29.3 $\pm$ 1.1(24)	8.7 $\pm$ 0.35(32)	9.2 $\pm$ 0.30(38)
ALL SNAKES (52 species)			
Mean $\pm$ s.e. (n)	28.6 $\pm$ 1.3(33)	8.8 $\pm$ 0.44(27)	8.3 $\pm$ 0.72(20)
ALL REPTILES (145 species)			
Mean $\pm$ s.e. (n)	28.4 $\pm$ 0.6(83)	8.8 $\pm$ 0.24(76)	8.7 $\pm$ 0.27(74)

Table 2 — BOHR EFFECT IN WHOLE BLOOD OF REPTILES

Species	Bohr Effect ( $\Delta P_{50}/\Delta pH$ )	Source
TURTLES		
<i>Chelys fimbriata</i>	-0.56	Lenfant et al. 1970
<i>Caretta caretta</i>	-0.55	Palomeque et al. 1977
<i>Emys orbicularis</i>	-0.62	Palomeque et al. 1977
<i>Chrysemys scripta</i>	-0.28	Burggren et al. 1977
<i>Pelomedusa subrufra</i>	-0.45	Wood & Johansen 1974
<i>Malacochersus tornieri</i>		Wood et al. 1978
acclimated and tested at 20 C	-0.37	
acclimated and tested at 35 C	-0.54	
<i>Testudo graeca</i>	-0.28	Burggren et al. 1977
<i>Testudo hermanni</i>	-0.67	Palomeque et al. 1977
<i>Testudo pardalis</i>	-0.30	Burggren et al. 1977
CROCODILIANS		
<i>Alligator mississippiensis</i>	-0.80	Dill & Edwards 1935
<i>Crocodylus acutus</i>	-0.76	Dill & Edwards 1931
<i>Crocodylus porosus</i>		Bauer & Jelkman 1977
[H <sup>+</sup> ] varied	-0.43	
pCO <sub>2</sub> varied	-0.66	
LIZARDS		
<i>Heloderma suspectum</i>	-0.53	Dill & Edwards 1935
<i>Iguana iguana</i>	-0.52	Wood & Moberly 1970
<i>Sauromalus hispidus</i>	-0.65	Bennett 1973
<i>Varanus exanthematicus</i>	-0.30	Wood et al. 1977
<i>Varanus niloticus</i>	-0.48	Wood & Johansen 1974
SNAKES		
<i>Aerochordus javanicus</i>	-1.64	Johansen & Lenfant 1972
<i>Constrictor constrictor</i>	-0.40	Johansen & Lenfant 1972
<i>Pseudechis porphyriacus</i>	-0.62	Seymour 1976
<i>Aipysurus laevis</i>	-0.05	Seymour & Webster 1975
<i>Emydocephalus annulatus</i>	-0.12	Seymour & Webster 1975
<i>Hydrophis elegans</i>	+0.01	Seymour & Webster 1975
<i>Hydrophis melanocephalus</i> <sup>1</sup>	-0.01	Seymour & Webster 1975
<i>Lapemis hardwickii</i>	+0.08	Seymour & Webster 1975
<i>Laticauda colubrina</i>	-0.25	Seymour 1976

<sup>1</sup>Corrected from *H. belcheri* by Seymour (1978).



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