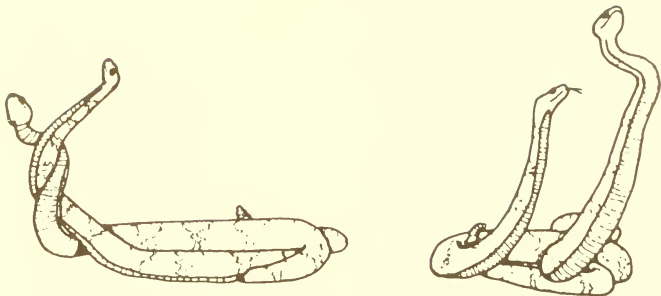




AN INVENTORY OF  
COMBAT RITUALS IN SNAKES



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One interpretation of the medical caduces symbol from antiquity is that it represents the lyre-shaped configuration of two snakes contesting one-another. Such a belief may have been derived from observing the combat ritual of Elaphe longissima which assumes a lyre-like posture during this type of interaction and is called the Aesculapian Snake after the God of Medicine. If this interpretation is correct then the presence of this combative behavior in snakes has been recognized since ancient times.

However, it is not until the early part of this century that references to combat rituals in snakes began to appear in the scientific literature, and in recent years the list of references has grown to now include a breadth of species in the families Boidae, Colubridae, Elapidae and Viperidae (Viperinae and Crotalinae).

It is the purpose of this inventory to bring together a list of the species of snakes for which, in my interpretation, the phenomenon of combat ritual has been authenticated via published literature sources. I also hope that this inventory will stimulate others to watch for this type of behavior, refer to some of the most recent descriptions for methods of observing and describing, and help to lengthen this list. In this way we will all contribute to grasping a better understanding of what snake combat rituals mean and how they may have evolved.

FAMILY AND GENUS	SPECIES	CITATION
BOIDAE		
<u>Corallus</u>	<u>canina</u>	Osborne, 1984
<u>Liasis</u>	<u>childreni</u>	Ross, 1973 Ross, 1978
<u>Morelia</u>	<u>spilotes</u>	Covacevich, 1975 Shine, et al., 1981
<u>Python</u>	<u>molurus</u>	Barker, et al., 1979
<u>Sanzinia</u>	<u>madagascariensis</u>	Carpenter, et al., 1978 Shine, et al., 1981
COLUBRIDAE		
<u>Coluber</u>	<u>constrictor</u>	Bogert and Roth, 1966 Shaw, 1951
	<u>gemonensis</u>	Davis, 1936 Shaw, 1951 Stemmler-Morath, 1935
	<u>viridiflavus</u>	Guibe and Saint Girons, 1955
<u>Coronella</u>	<u>austriaca</u>	Andren and Nilson, 1976 Bogert and Roth, 1966 Davis, 1936 Fitch, 1975 Rollinat, 1947 Shine, 1978 Smith, 1943 Smith, 1954
<u>Diadophis</u>	<u>punctatus</u>	Fitch, 1975
<u>Drymarchon</u>	<u>corais</u>	Bogert and Roth, 1966 Murphy, 1973 Shine, et al., 1981 Tinkle, 1951 Waide and Thomas, 1984

<u>Elaphe</u>	<u>guttata</u>	Murphy, 1973 Shaw, 1951
	<u>longissima</u>	Bellairs, 1970 Carpenter and Ferguson, 1978 Murphy, 1973 Pope, 1937 Shaw, 1951 Shine, et al., 1981 Stemmler-Morath, 1935
	<u>obsoleta</u>	Brecke, et al., 1977 Gillingham, 1980 Littleford and Keller, 1946 Mitchell, 1981 Rigley, 1971 Shine, 1978 Shine, et al., 1981 Stickel, et al., 1980
	<u>quadrivirgata</u>	Fukada, 1961 Shine, 1978
<u>Lampropeltis</u>		Carpenter, 1984
	<u>calligaster</u>	Moehn, 1967 Shine, et al, 1981
	<u>getulus</u>	Carpenter, 1977 Carpenter and Gillingham, 1977 Clark, et al., 1984 Lewke, 1979 Neitman, 1980
	<u>mexicana</u>	Murphy, et al., 1978 Shine, et al., 1981
	<u>pyromelana</u>	Martin, 1976
	<u>triangulum</u>	Fitch and Fleet, 1970 Murphy, 1973 Shaw, 1951 Shine, et al., 1978
<u>Malpolon</u>	<u>monspeulanus</u>	Shaw, 1951
<u>Masticophis</u>	<u>flagellum</u>	Kennedy, 1965
	<u>taeniatus</u>	Bennion and Parker, 1976 Parker, 1974 Shine, 1978 Shine, et al., 1981

<u>Pituophis</u>	<u>melanoleucus</u>	Bogert and Roth, 1966 Carpenter and Ferguson, 1978 Lowe, 1948 Murphy, 1973 Parker, 1974, 1980 Shaw, 1951 Shaw and Campbell, 1974 Shine, 1978 Shine, et al, 1981 Woodbury, 1941
<u>Pseudaspis</u>	<u>cana</u>	FitzSimons, 1962 Shine, 1978
<u>Ptyas (Zamenis)</u>	<u>mucosus</u>	Abdulali, 1941 Beadon, 1910 Bhattacharya and Bhatnager, 1968 Davis, 1936 Lowe, 1948 McCann, 1935 Millett, 1909 Pope, 1937 Prater, 1933 Shaw, 1951 Shine, 1978 Wall, 1921
<u>Rhinocheilus</u>	<u>lecontei</u>	Osborne, 1984
<u>Sonora</u>	<u>episcopa (semianulata)</u>	Kassing, 1961 Kroll, 1971 Shaw and Campbell, 1974 Shine, 1978 Shine, et al., 1981
<u>Theltornis</u>	<u>capensis</u>	Bennefield, 1982
ELAPIDAE		
<u>Australelaps</u>	<u>superbus</u>	Shine and Allen, 1980 Shine, et al., 1981
<u>Bungarus</u>	<u>candidus</u>	Shine, 1978 Taylor, 1965 Wall, 1921 Whitaker, 1971
<u>Cryptophis</u>		Shine and Allen, 1980
<u>Demansia</u>	<u>atra</u>	Shine, 1980 Shine and Allen, 1980

<u>Dendroaspis</u>		Bogert and Roth, 1966 Grant, 1956 Leloup, 1964
	<u>jamesoni</u>	Bogert and Roth, 1966 Leloup, 1964 Shine, 1978
	<u>polylepis</u>	Carpenter, and Ferguson, 1978 Broadley and Cock, 1975 Leloup, 1964 Shine, 1978
<u>Hemiaspis</u>	<u>damelii</u>	Shine and Allen, 1980
<u>Naja</u>		Richards, 1885
	<u>haje</u>	FitzSimons, 1962 Shine, 1978
	<u>naja</u>	Bogert and Roth, 1966 Pope, 1935 Shine 1978 Thomas, 1970 Wall, 1921
	<u>tripudians</u>	Deoras, 1971 Kopstein, 1914 Shine, 1978
<u>Notechis</u>	<u>scutatus</u>	Shine, 1977, 1978
<u>Ophiophagus</u>	<u>hannah</u>	Oliver, 1956
<u>Oxyuranus</u>	<u>scutellatus</u>	Hosmer, 1953 Shine and Allen, 1980 Shine, et al., 1981 Worrell, 1963
<u>Pseudechis</u>	<u>porphyriacus</u>	Baker, 1968 Carpenter and Ferguson, 1978 Fleay, 1937a, 1951 Lowe, 1948 Shaw, 1951 Shine, 1977, 1978 Shine, et al, 1981 Worrell, 1963
<u>Pseudonaja</u> (= <u>Demansia</u> )	<u>textilis</u>	Carpenter, and Ferguson, 1978 Fleay, 1937a, 1937b, 1951 Shaw, 1951 Shine, 1978 Shine and Allen, 1980 Worrell, 1963



VIPERIDAE  
VIPERINAE

<u>Bitis</u>	<u>arietans</u>	Bogert and Roth, 1966 Carpenter, 1977 Harvey, 1964 Pitman, 1974 Rose, 1962 Shine, 1978 Thomas, 1959, 1960, 1972
	<u>caudalis</u>	Akester, 1983
	<u>gabonica</u>	Akester, 1979a, 1979b
<u>Causus</u>		Bogert and Roth, 1966
	<u>defilippi</u>	Akester, 1979a
	<u>lichtensteinii</u>	Loveridge, 1942 Schmidt and Inger, 1957
	<u>resimus</u>	Bogert and Roth, 1966 Curry-Lindahl, 1956
	<u>rhombeatus</u>	Broadley and Cock, 1975
<u>Vipera</u>		Bogert and Roth, 1966 Davis, 1936 Froesch-Franzon, 1971 Noble, 1937 Pope, 1937 Prior, 1933
	<u>ammodytes</u>	Carpenter, 1977 Laue, 1974 Shine, 1978 Steward, 1971 Thomas, 1959, 1960, 1961, 1969, 1971
	<u>aspis</u>	Baumann, 1929 Bogert and Roth, 1966 Duguy, 1958 Guibe and Saint Girons, 1955 Koster, 1932 Naulleau, 1967 Reuss, 1926 Saint Girons, 1949 Shine, 1978 Steward, 1971

- berus Andren, 1975, 1976, 1981  
 Baumann, 1929  
 Bernstrom, 1958  
 Bogert and Roth, 1966  
 Carpenter and Ferguson,  
 1978  
 Davis, 1936  
 Hajek-Halke, 1941  
 Heilborn, 1930  
 Kellaway, 1982  
 Lotherington, 1934  
 Nilson and Andren, 1982  
 Prestt, 1971  
 Prior, 1933  
 Reuss, 1923, 1926  
 Saint-Girons, 1952  
 Schmidt and Inger, 1957  
 Shine, 1978  
 Smith, 1954  
 Thomas, 1955, 1959, 1960  
 Viitanen, 1967  
 Volsoe, 1944
- lebatina Carpenter, 1984  
 Stemmler, 1967
- macrops Kopstein, 1914
- russelli Laue, 1974

## CROTALINAE

Agkistrodon

- Bogert and Roth, 1966  
 Carpenter and Gillingham,  
 In press  
 Fitch, 1960  
 Gloyd, 1947  
 Noble, 1937  
 Ramsey, 1948
- bilineatus Burchfield, 1982  
 Carpenter and Gillingham,  
 In press

- contortrix Bogert and Roth, 1966  
Carpenter and Gillingham,  
In press  
Fitch, 1960  
Gloyd, 1947  
Life, 1950  
Mitchell, 1981  
Shaw, 1948, 1951  
Shine, 1978  
Shine, et al., 1981  
Stewart, 1984  
Sutherland, 1958
- piscivorus Allen and Swindell, 1948  
Bogert and Roth, 1966  
Burkett, 1966  
Carpenter, 1977  
Carpenter and Ferguson,  
1978  
Carpenter, et al., 1976  
Carpenter and Gillingham,  
In press  
Carr, 1963  
Carr and Carr, 1942  
Davis, 1936  
Ellis, 1979  
Martin, 1984  
Perry, 1978  
Ramsey, 1948  
Shine, 1978  
Shine, et al., 1981  
Wharton, 1966, 1969  
Wright and Wright, 1957
- Bothrops      godmani      Carpenter, 1984
- moojeni      Leloup, 1975
- Calloselasma    rhodostoma      York, 1984  
Carpenter and Gillingham,  
In Press
- Crotalus      Arnold, 1935  
Bogert and Roth, 1966  
Carpenter, 1984  
Crites, 1952  
Gloyd, 1947, 1948  
Klauber, 1956  
Lowe, 1942  
Lowe and Norris, 1950  
Shaw, 1948  
Shine, et al., 1981  
Sutherland, 1958  
Wagner, 1962  
Wright and Wright, 1957

- adamanteus Bogert and Roth, 1966  
Klauber, 1956  
Shine, 1978  
Wagner, 1962
- atrox Bellairs, 1970  
Carpenter, 1977, 1984  
Carpenter and Ferguson,  
1978  
Foree, 1949  
Gillingham, et al., 1983  
Gloyd, 1948  
Grimpe, 1984  
Jenni, 1966  
Kennedy, 1942  
Klauber, 1956  
Lowe, 1942  
Murphy, 1973  
Shaw and Campbell, 1974  
Shine, 1978  
Wagner, 1962  
Whisenhunt, 1949
- basiliscus Davis, 1936
- cerastes Bogert and Roth, 1966  
Klauber, 1956  
Lowe and Norris, 1950  
Shaw and Campbell, 1974  
Shine, 1978  
Shine, et al., 1981
- durissus de Langlada, 1975  
Shine, 1978
- horridus Bogert and Roth, 1966  
Klauber, 1956  
Murphy, 1973  
Shine, 1978  
Shine, et al, 1981  
Sutherland, 1958
- lepidus Carpenter, 1977  
Carpenter, et al., 1976  
Shine, 1978
- mitcheli Bogert and Roth, 1966  
Klauber, 1956  
Shaw and Campbell, 1974  
Shine, 1978  
Sutherland, 1958

<u>ruber</u>	Carpenter and Ferguson, 1978 Eibl-Eibesfeldt, 1961 Evans, 1955 Hediger, 1955 Klauber, 1956 Pequegnat, 1945 Shaw, 1948 Shaw and Campbell; 1974 Shine, 1978 Shine, et al., 1981
<u>scutulatus</u>	Klauber, 1956 Shine, 1978
<u>tigris</u>	Shaw and Campbell, 1974
<u>triseriatus</u>	Carpenter, 1984
<u>viridis</u>	Bogert and Roth, 1966 Bromley, 1934 Carpenter, 1977, 1984 Dayton, 1949 Gehlbach, 1965 Gloyd, 1947 Klauber, 1956 Shaw, 1948 Shine, 1978 Shine, et al., 1981 Staley, 1983 Sutherland, 1958 Thorne, 1977
<u>Sistrurus</u>	
<u>miliarius</u>	Carpenter, 1977, 1979 Lindsey, 1979 Palmer and Williamson, 1971 Shine, 1978 Shine, et al., 1981

## LITERATURE CITED

- Abdulali, H. 1941. Rat snakes fighting. J. Bombay Natur. Hist. Soc. 42:666.
- Akester, J. 1979a. Male combat in captive gaboon vipers. Herpetologica 35:124-128.
- Akester, J. 1979b. Successful mating and reproduction by a gaboon viper, Bitis gabonica gabonica, in captivity. Arnoldia (Rhodesia) 8:1-5.
- Akester, J. 1983. Male combat and reproductive behavior in captive Bitis caudalis (A. Smith). British. J. Herpetol. 6:329-333.
- Allen, E. R. and D. Swindell. 1948. Cottonmouth moccasin of Florida. Herpetologica 4(1st suppl.)1-16.
- Andren, C. 1975. Social behavior of Vipera berus during the reproductive period. Proc. 1st Nordic Symposium on Herpetology, Norwegian J. Zool. 24:234-235.
- Andren, C. 1976. Reproductive behavior of Vipera berus berus (L.). Bull. Soc. Zool. France 100:683-684.
- Andren, C. 1981. Behavior and population dynamics in the adder, Vipera berus (L.). Doctoral Dissertation, Univ. Goteborg, Goteborg, Sweden.
- Andren, C. and G. Nilson. 1976. Hasselsnoken (Coronella austriaca)-en utrottningshotad ormart. Fauna Flora 2:61-76.
- Arnold, O. 1935. Wildlife in the Southwest. B. Upshaw and Co.; Dallas.
- Baker, A. B. 1968. Snakes in combat. Proc. Roy. Soc. New South Wales 1966-67:29-31.
- Barker, D. G., J. B. Murphy and K. W. Smith. 1979. Social behavior in a captive group of Indian pythons, Python molurus (Serpentia, Boidae) with formation of a linear hierarchy. Copeia 1979:466-471.
- Baumann, F. 1929. Experimente uber den Geruchssinn und den Beuteerwerb der Viper (Vipera aspis L.). Z. Vgl. Psychol. 10:36-119.
- Beadon, C. 1910. A snake flirtation. J. Bombay Natur. Hist. Soc. 20:288.
- Bellairs, A. 1970. The Life of Reptiles. Universe Books, New York (2 vols).
- Bennefield, B. L. 1982. Combat and mating in the vine snake (Theltonia capensis mossabicana). J. Herpetol. Assoc. Africa 28:13-14.
- Bennion, R. S. and W. S. Parker. 1976. Field observations on courtship and aggressive behavior in desert striped whip-snakes, Masticophis t. taeniatus. Herpetologica 32:30-35.
- Bernstrom, J. 1958. Huggormorna vid Tido. pp. 193-206. In: B. Walden and K. Curry-Lindahl (eds.) Natur: Vastmanland. Uppsala, Sweden.
- Bhattacharya, B. H. and R. K. Bhatnager. 1968. Unusual behavior of two rat snakes, Ptyas mucosus (Linn.). J. Bombay Natur. Hist. Soc. 65:492.
- Bogert, C. M. and V. D. Roth. 1966. Ritualistic combat of male gopher snakes, Pituophis melanoleucus affinis (Reptilia, Colubridae). Amer. Mus. Novit. (2245):1-27.

- Brecke, B., J. B. Murphy and W. Seifert. 1977. An inventory of reproduction and social behavior in captive Baird's rat snakes. *Herpetologica* 32:389-394.
- Broadley, D. G. and E. V. Cock. 1975. Snakes of Rhodesia. Longman Rhodesia, Ltd.; Salisbury.
- Bromley, R. 1934. Rattlesnake combat. *Nature*. Mag. 24:45.
- Burchfield, P. M. 1982. Additions to the natural history of the crotaline snake Agkistrodon piscivorus (Reptilia). *J. Herpetol.* 16:376-382.
- Burkett, D. R. 1966. Natural history of cottonmouth moccasin, Agkistrodon piscivorus (Reptilia). Univ. Kansas Publ. Mus. Natur. Hist. 17:435-491.
- Carpenter, C. C. 1977. Communication and displays of snakes. *Amer. Zool.* 17:217-224.
- Carpenter, C. C. 1979. A combat ritual between two male pygmy rattlesnakes (Sistrurus miliarius). *Copeia* 1979:638-642.
- Carpenter, C. C. 1984. Dominance in snakes. pp. 195-202. In R. A Siegel, L. E. Hunt, J. L. Knight, L. Malaret. N. L. Zuschlag (eds.) Vertebrate Ecology and Systematics - A Tribute to Henry S. Fitch. Univ. Kansas Mus. Nat. Hist. Spec. Publ. 10.
- Carpenter, C. C. and G. W. Ferguson. 1978. Variation and evolution of stereotyped behavior in reptiles. pp. 335-554. In C. Gans and D. W. Tinkle (eds.) *Biology of the Reptilia*. Vol. 7. Academic Press, New York.
- Carpenter, C. C. and J.C. Gillingham. 1977. A combat ritual between two male speckled kingsnakes (Lampropeltis getulus holbrooki: Colubridae, Serpentes) with indications of dominance. *Southwest. Natur.* 22:517-524.
- Carpenter, C. C. and J. C. Gillingham. 1985. (In Press) Ritualized behavior in Agkistrodon and allied genera. In R. Conant and H. K.Gloyd (eds.) *Monograph on Agkistrodon and Allied Genera*. Soc. Study Amphib. Rept. Spec. Publ.
- Carpenter, C. C., J. C. Gillingham and J.B. Murphy. 1976. The combat ritual of the rock rattlesnake (Crotalus lepidus). *Copeia* 1976:764-780.
- Carpenter, C. C., J. B. Murphy and L. A. Mitchell. 1978. Combat bouts with spur use in the Madagascan boa (Sanzinia madagascariensis). *Herpetologica* 34:207-212.
- Carr, A. 1963. *The Reptiles*. Time Inc.; New York.
- Carr, A. and M. H. Carr. 1942. Notes on the courtship of the cottonmouth moccasin. *Proc. New England Zool.Club.* 20:1-6.
- Clark, D. L., J. C. Gillingham and A. Rebeschke. 1984. Notes on the combat behavior of the California kingsnake, Lampropeltis getulus californiae, in captivity. *British J. Herpetol.* 6:380-382.
- Covacevich, J. 1975. Snakes in combat. *Victorian Natur.* 92:252-253.
- Crites, A. S. 1952. *A Hunter's Tale of the Great Outdoors*. Ward Ritchie Press; Los Angeles.
- Curry-Lindahl, K. 1956. Mambas in combat. *African Wildl.* 10:340-341.
- Davis, D. D. 1936. Courtship and mating behavior in snakes. *Field Mus. Natur. Hist. Zool. Ser.* 20:257-290.

- Dayton, J. 1949. Snake dance. Wyoming Wildl. 13:31-32.
- de Langlada, F. G. 1975. Combat-dance between males of Brazilian Crotalus durissus. J. Herpetol. 9:349-351.
- Deoras, P. J. 1971. The story of some poisonous snakes. pp. 19-34. In W. Bucher, E. E. Buckley (eds.) Venomous animals and their venoms. Vol. II. Academic Press, New York.
- Dugay, R. 1958. La comportement de printemps chez Vipera aspis. Vie Milieu 9:200-210.
- Eibl-Eibesfeldt, I. 1961. The fighting behavior of animals. Sci. Amer. 205:112-122.
- Ellis, J. E. 1979. Observations on the combative behavior in the cottonmouth. Unpublished manuscript.
- Evans, L. T. 1955. Group processes in lower vertebrates. pp. 268-289. In B. Schaffner (ed.) Group Processes: Transact. First Conf. Madison Printing Co.; Madison, NJ
- Fitch, H. S. 1960. Autecology of the copperhead. Univ. Kansas Publ. Mus. Natur. Hist. 13:85-288.
- Fitch, H. S. 1975. A demographic study of the ringneck snake (Diadophis punctatus) in Kansas. Univ. Kansas Mus. Natur. Hist. Misc. Publ. 62:1-53.
- Fitch, H. S. and R. R. Fleet. 1970. Natural history of the milk snake (Lampropeltis triangulum) in northeastern Kansas. Herpetologica 26:387-396.
- FitzSimmons, V. F. M. 1962. Snakes of Southern Africa. Macdonald and Co., Ltd.; London.
- Fleay, D. 1937a. Black snakes in combat. Proc. Roy. Zool. Soc., New South Wales 1936-37:40-42.
- Fleay, D. 1937b. The scaled wrestlers of the Australian bush. Anim. Kingdom. 54:84-88.
- Fleay, D. 1951. Savage battle between snakes. Walkabout 17:10-13.
- Foree, K. 1949. Dallas trio witness rare spectacle rattlesnake courtship or death battle. Dallas Morning News. Jan.16:2,5.
- Froesch-Franzon, P. 1971. Kommentkämpfe bei jungen Schlangen. Aquarien Terrarien 30:393-394.
- Fukada, H. 1961. Biological studies on snakes. VIII. On the growth formulae of snakes and their applications to other reptiles. Bull. Kyoto Gakugei Univ., Ser. B. 17:16-40.
- Gehlbach, F. R. 1965. Herpetology of the Zuni Mountains region of northwestern New Mexico. Proc. U. S. Natl. Mus. 116:243-332.
- Gillingham, J. C. 1980. Communication and combat behavior of the black rat snake (Elaphe obsoleta). Herpetologica 36:120-127.
- Gillingham, J. C., C. C. Carpenter and J. B. Murphy. 1983. Courtship, male combat and dominance in the western diamond-back rattlesnake, Crotalus atrox. J. Herpetol. 17:265-270.
- Gloyd, H. K. 1947. Notes on the courtship and mating behavior of certain snakes. Natur. Hist. Misc. (Chicago) (12):1-4.
- Gloyd, H. K. 1948. Another account of the "dance" of the western diamond rattlesnake. Natur. Hist. Misc. (Chicago) (34):1-3.



- Grant, G. A. 1956. The mating of black mambas. *African Wildl.* 10:111-113.
- Grimpe, R. 1984. Food induced combat in western diamondback rattlesnake (Crotalus atrox). *Bull. Oklahoma Herpetol. Soc.* 9:1-3.
- Guibe, J. and H. Saint Girons. 1955. Espace vital et territoire chez les reptiles. *La Nature* (3245):358-262).
- Hajek-Halke, H. 1941. Brunst-kampfe bei Vipera b. berus Wschr. Bl. Aquar. Terrarienk. 38:303-305.
- Harvey, E. 1964. Snake "dance". *Africana* 2:49.
- Hediger, H. 1955. Studies on the Psychology and Behavior of Captive Animals in Zoos and Circuses. Butterworths Scientific Publ.; London.
- Heilborn, A. 1930. Liebensspiele der Tiere. Berlin.
- Hosmer, W. 1953. An account of supposed mating of the taipan, Oxyuranus scutellatus. *North Queensland Natur.* 22:1-3.
- Jenni, B. 1966. Combat dance of the male rattlesnake rarely seen by man. *Outdoor Oklahoma* 22:6-7.
- Kassing, E. F. 1961. A life history study of the Great Plains ground snake (Sonora episcopa episcopa Kennicott). *Texas J. Sci.* 13:185-203.
- Kellaway, L. G. 1982. Competition for mates and food items in Vipera berus (L.). *British J. Herpetol.* 5:225-230.
- Kennedy, B. 1942. The Lady and the Lions. McGraw-Hill; New York.
- Kennedy, J. P. 1965. Territorial behavior in the eastern coach-whip, Masticophis flagellum. *Anat. Rec.* 151:499 (abst).
- Klauber, L. M. 1956. Rattlesnakes, their habits, life histories and influence on mankind. Vol. I. Univ. California Press; Berkeley.
- Kopstein, F. 1914. Vipera macrops Mehely in Freiheit und im Aquarium. Bl. Aquar. Terrarienk. 25:589-596.
- Koster, K. 1932. Kreuzotterzucht. *Aquarien Terrarien* 29:310-311.
- Kroll, J. C. 1971. Combat behavior in male Great Plains ground snakes (Sonora episcopa episcopa). *Texas J. Sci.* 23:300.
- Laue, H. 1974. Beobachtungen beim Beutestreit von Schlangen am Beispiel von Vipera ammodytes und Vipera russeli. *Aquarien Terrarien* 21:172.
- Leloup, P. 1964. Observations sur la reproduction du Dendroaspis jamesoni kaimosae (Loveridge). *Bull. Soc. Roy. Zool. Anvers* 33:13-27.
- Leloup, P. 1975. Observations sur la reproduction de Bothrops moojeni Hoge en captivite. *Acta Zool. Pathol. Antverp.* 62:173-201.
- Lewke, R. E. 1979. Neck-biting and other aspects of reproductive biology of the Yuma kingsnake (Lampropeltis getulus). *Herpetologica* 35:154-158.
- Life (Magazine). 1950. American Snakes. 28(May):49-52.
- Lindsey, P. 1979. Combat behavior in the dusky pygmy rattlesnake, Sistrurus miliaris barbouri, in captivity. *Herpetol. Rev.* 10:93-94.

- Littleford, R. A. and W. F. Keller. 1946. Observations on captive pilot blacksnakes and common watersnakes. *Copeia* 1946:160-167.
- Lotherington, E. B. 1934. A courtship incident in Vipera berus. *Naturalist* (London) 1934:129-130.
- Loveridge, A. 1942. Scientific results of the fourth expedition to forested areas of East and Central Africa. IV. Reptiles. *Bull. Mus. Comp. Zool.* 91:235-273.
- Lowe, C. H. Jr. 1942. Notes on the mating of desert rattlesnakes. *Copeia* 1942:261-262.
- Lowe, C. H. Jr. 1948. Territorial behavior in snakes and the so called courtship dance. *Herpetologica* 4:129-135.
- Lowe, C. H. Jr. and K. S. Norris. 1950. Aggressive behavior in male sidewinders, Crotalus cerastes, with a discussion of aggressive behavior and territoriality in snakes. *Natur. Hist. Misc.* (Chicago) (66):1-13.
- Martin, B. E. 1976. Notes on breeding behavior in a captive pair of Sonoran mountain kingsnakes (Lampropeltis pyromelana). *Bull. Maryland Herpetol. Soc.* 12:23-24.
- Martin, D. L. 1984. An instance of sexual defense in the cottonmouth, Agkistrodon piscivorus. *Copeia* 1984:772-774.
- McCann, C. 1935. Male rat snake (Zamenis mucosus) fighting. *J. Bombay Natur. Hist. Soc.* 39:843-848.
- Millett, G. P. 1909. A snake flirtation. *J. Bombay Natur. Hist. Soc.* 19:758-759.
- Mitchell, J. C. 1981. Notes on male combat in two Virginia snakes, Agkistrodon contortrix and Elaphe obsoleta. *Catesbeiana, Bull. Virginia Herpetol. Soc.* 1:7-9.
- Moehn, L. D. 1967. A combat dance between two prairie kingsnakes. *Copeia* 1967:480-481.
- Murphy, J. B., B. W. Tryon and B. J. Brecke. 1978. An inventory of reproduction and social behavior in captive gray-banded kingsnakes, Lampropeltis mexicana alterna (Brown). *Herpetologica* 34:84-93.
- Murphy, J. 1973. Combat behavior in male snakes. *Bull. Chicago Herpetol. Soc.* 8:34-38.
- Nauelleau, G. 1967. Le comportement de predation chez Vipera aspis. *Rev. Comport. Anim.* 2:41-96.
- Neitman, K. 1980. Captive reproduction in Sonoran black kingsnakes. *Herpetol. Rev.* 11:78-79.
- Nilson, G. and C. Andren. 1982. Renal secretion and male hierarchy in the adder, Vipera berus, during reproduction. *Horm. Behav.* 16:404-413.
- Noble, G. K. 1937. The sense organs involved in the courtship of Storeria, Thamnophis and other snakes. *Bull. Amer. Mus. Natur. Hist.* 73:673-725.
- Oliver, J. A. 1956. Reproduction in the king cobra, Ophiophagus hannah Cantor. *Zoologica* (New York) 41:145-152.
- Osborne, S. T. 1984. Rhinocheilus lecontei (Mexican long-nosed snake). Behavior. *Herpetol. Rev.* 15:50.
- Osborne, S. T. 1984. Corallus canina (Emerald Tree Boa). Behavior. *Herpetol. Rev.* 15:50

- Palmer, W. M. and G. M. Williamson. 1971. Observations on the natural history of the Carolina pigmy rattlesnake, Sistrurus miliarius miliarius Linnaeus. J. Elisha Mitchell Sci. Soc. 87:20-25.
- Parker, W. S. 1974. Comparative ecology of two colubrid snakes, Masticophis t. taeniatus (Hallowell) and Pituophis melanoleucus deserticola Stejneger, in northern Utah. Ph.D. Dissertation, Univ. Utah.
- Parker, W. S. 1980. Comparative ecology of two colubrid snakes, snakes, Masticophis t. taeniatus (Hallowell) and Pituophis melanoleucus deserticola Stejneger, in northern Utah. Publ. Milwaukee Public Mus. Biol. Geol. (7):1-104.
- Pequegnat, W. E. 1945. A report upon the biota of the Santa Ana Mountains. Entomol. Zool. (Pamona College) 37:1-7.
- Perry, J. 1978. An observation of "dance" behavior in the western cottonmouth, Agkistrodon piscivorus leucostoma (Reptilia, Serpentes, Viperidae). J. Herpetol. 12:429-431.
- Pitman, C. R. S. 1974. A Guide to the Snake of Uganda. Wheldon and Wesley; Glasgow.
- Pope, C. H. 1935. The Reptiles of China. Amer. Mus. Natur. Hist.; New York
- Pope, C. H. 1937. Snakes Alive and How They Live. Viking Press; New York.
- Prater, S. H. 1933. The social life of snakes. J. Bombay Natur. Hist. Soc. 36:469-476.
- Prestt, I. 1971. An ecological study of the viper Vipera berus in southern Britain. J. Zool. (London.) 164:373-418.
- Prior, H. T. J. 1933. The dance of the adders. Countryside 9:492-493.
- Ramsey, L. W. 1948. Combat dance and range extension of Agkistrodon piscivorus leucostoma. Herpetologica 4:228.
- Reuss, T. 1923. Systematische beoachtungen an Vipera (Pelias) berus L. in Gefangenschaft. Aquarien Terrarien 20:295-296.
- Reuss, T. 1926. Kalz kampfe der Kreuzottern. Koralle 1:42-49.
- Richards, V. 1885. Theland-marks of snake poison literature. Calcutta.
- Rigley, L. 1971. "Combat dance" of the black rat snake, Elaphe o. obsoleta. J. Herpetol. 5:65-66.
- Rollinat, R. 1947. La Vie des Reptiles de la France Centrale. Delagrave; Paris.
- Rose, W. 1962. The Reptiles and Amphibians of Southern Africa. Maskew Miller; Capetown.
- Ross, R. 1973. Successful mating and hatching of Children's python, Liasis childreni. Herpetol. Inf. Search Syst. News J. 1:181-182.
- Ross, R. 1978. The python breeding manual. Inst. Herpetol. Res. 51 p.
- Saint Girons, H. 1949. Les moeurs nuptials de la vipere aspic. Terre Vie 96:103-113.
- Saint Girons, H. 1952. Ecologie et ethologie des viperes de France. Ann. Sci. Natur. Zool. Biol. Anim., 11e Ser., 14:263-343.

- Schmidt, K. P. and R. F. Inger. 1957. Living Reptiles of the World. Hamish Hamilton; London.
- Shaw, C. E. 1948. The male combat "dance" of some crotalid snakes. *Herpetologica* 4:137-145.
- Shaw, C. E. 1951. Male combat in American colubrid snakes with remarks on combat in other colubrid and elapid snakes. *Herpetologica* 7:149-168.
- Shaw, C. E. and S. Campbell. 1974. Snakes of the American West. Alfred A. Knopf; New York.
- Shine, R. 1977. Reproduction in Australian elapid snakes. I. Testicular cycles and mating seasons. *Australian J. Zool.* 25:647-653.
- Shine, R. 1978. Sexual size dimorphism and male combat in snakes. *Oecologia* (Berlin) 33:269-277.
- Shine, R. 1980. Ecology of eastern Australian whipsnakes of the genus Demansia. *J. Herpetol.* 14:381-389.
- Shine, R. and S. Allen. 1980. Ritual combat in the Australian copperhead, Austrelaps superbus, (Serpentes, Elapidae). *Victorian Natur.* 97:188-190.
- Shine, R., G. D. Grigg, T. G. Shine and P. Harlow. 1981. Mating and male combat in Australian blacksnakes, Pseudechis porphyriacus. *J. Herpetol.* 15:101-107.
- Smith, M. A. 1943. The Fauna of British India. Vol.III. Serpentes. Taylor and Francis; London.
- Smith, M. A. 1954. The British Amphibians and Reptiles. Collins; London.
- Staley, K. 1983. Combat ritual. Prairie rattlesnake. *Funct. Photogr.* 18:23.
- Stemmler, O. 1967. Der Kommentkampf von Vipera lebetina schweizeri. *Aquarien Terrarien* 4:89-91.
- Stemmler-Morath, C. 1935. Beitrag zur Fortpflanzungsbiologie europaischer Colubridae. *Zool. Gart.* 8:38-41.
- Steward, J. 1971. The Snakes of Europe. Newton Abbot; London.
- Stewart, B. 1984. Agkistrodon contortrix laticinctus (Broad-banded copperhead). *Combat. Herpetol. Rev.* 15:17.
- Stickel, L. F., W. H. Stickel and F. C. Schmid. 1980. Ecology of Maryland population of black rat snakes (Elaphe o. obsoleta). *Amer. Midl. Natur.* 103:1-14.
- Sutherland, I. D. W. 1958. The "combat dance" of the timber rattlesnake. *Herpetologica* 14:23-24.
- Taylor, E. H. 1965. The serpents of Thailand and adjacent waters. *Univ. Kansas Sci. Bull.* 45:609-1096.
- Thomas, E. 1955. Der Kommentkampf der Kreuzotter (Vipera berus L.). *Naturwissenschaften.* 42:539.
- Thomas, E. 1959. Kommentkampf der Mannchen. E. 269. Bitis arietans. (Viperidae). *Research film* 3:256.
- Thomas, E. 1960. Kommentkampf bei Vipern. *Zool. Anz. (Suppl.)* 23:111-116.
- Thomas, E. 1961. Fortpflanzungskampfe bei Sandottern (Vipera ammondytes). *Zool. Anz. (Suppl.)* 24:502-505.
- Thomas, E. 1969. Jungtierkämpfe bei Vipera a. ammondytes (Serpentes, Viperidae). *Salamandra* 5:141-142.
- Thomas, E. 1970. Kämpfe junger Brillenschlangen (Naja naja kaouthia). *Salamandra* 6:52-54.

- Thomas, E. 1971. Vipera ammodytes montandoni (Viperidae). Kommentkampf der Mannchen. Publ. Wiss. Film Sekt. (Biol.) 4:178-188.
- Thomas, E. 1972. Bitis arietans (Viperidae). Kommentkampf der Mannchen. Publ. Wiss. Film Sekt. (Biol.) 5:291-299.
- Thorne, E. T. 1977. Sybille Creek snake dance. Wyoming Wildl. 42:14.
- Tinkle, D. W. 1951. Peculiar behavior of indigo snakes in captivity. Copeia 1951:77-78.
- Viitanen, P. 1967. Hibernation and seasonal movements of the viper Vipera berus berus (L.) in southern Finland. Ann. Zool. Fenn. 4:472-546.
- Volsoe, H. 1944. Structure and seasonal variation of the male reproductive organs of Vipera berus. Spolia Zool. Mus. Hauniensis 5:1-157.
- Wagner, R. T. 1962. Notes on the combat dance in Crotalus adamanteus. Bull. Philadelphia Herpetol. Soc. 10:7-8.
- Waide, R. B. and R. Thomas. 1984. Aggression between two Drymarchon corais melanurus in Campeche, Mexico. Herpetol. Rev. 15:10.
- Wall, F. 1921. Ophidia Taprobanica, or the Snakes of Ceylon. Govt. Printer; Colombo.
- Wharton, C. H. 1966. Reproduction and growth in the cottonmouths, Agkistrodon piscivorus Lacepede, of Cedar Keys. Copeia 1966:149-161.
- Wharton, C. H. 1969. The cottonmouth moccasin on Sea Horse Key, Florida. Bull. Florida State Mus. (Biol. Sci.) 14:227-272.
- Whisenhunt, M. H. 1949. An account of copulation of the western diamond rattlesnake. Natur. Hist. Misc. (Chicago) (49):1-2.
- Whitaker, R. 1971. Notes on Indian snakes. J. Bombay Natur. Hist. Soc. 68:461-463.
- Woodbury, A. M. 1941. Copulation in gopher snakes. Copeia 1941:54.
- Worrel, E. 1963. Reptiles of Australia. Halstead Press; Sydney.
- Wright, A. H. and A. A. Wright. 1957. Handbook of Snakes of the United States and Canada. 2 vols. Comstock Publ. Assoc., Cornell Univ. Press; Ithaca.
- York, D. S. 1984. The combat ritual of the Malayan pit viper (Calloselasma rhodostoma). Copeia 1984:770-772.