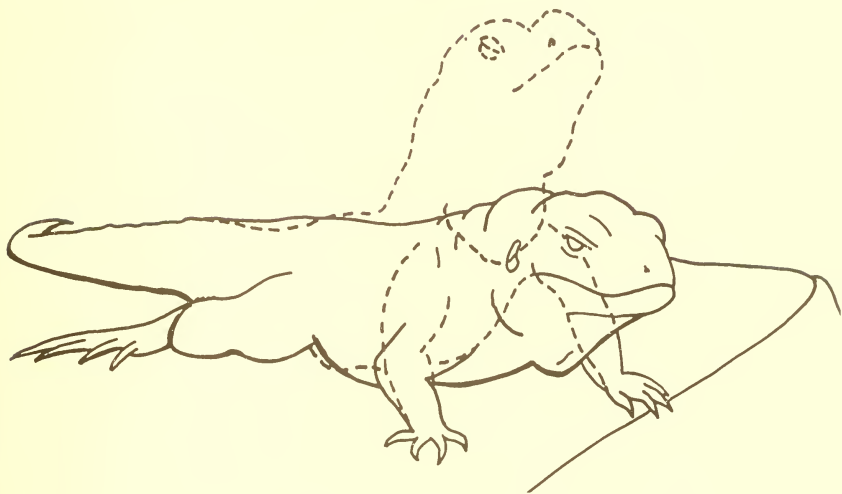




AN INVENTORY OF THE  
DISPLAY-ACTION-PATTERNS IN LIZARDS



CHARLES C. CARPENTER

Department of Zoology  
University of Oklahoma

SMITHSONIAN  
HERPETOLOGICAL INFORMATION  
SERVICE  
NO. 68

1986

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HERPETOLOGICAL  
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## INTRODUCTION

In 1961 I published a short paper on the aggressive display of the tree lizard, *Urosaurus ornatus*, as a time-motion event (Carpenter and Grubitz, 1961), indicating that the display of this action sequence was a species-specific behavioral character. Many earlier publications relate that certain iguanid lizard species performed movements while displaying, but made little attempt to describe their characteristics. During the 1960s a series of studies on iguanids, and later agamid lizards, was initiated at the University of Oklahoma and the University of Oklahoma Biological Station as my on going research program and involved many undergraduate and graduate students who produced numerous reports, masters theses and doctoral dissertations. These studies produced graphical representations of the display movements (display-action-patterns) called DAPgraphs (display-action-pattern graphs). By the late 1960s and early 1970s we had established the species-typical nature of the aggressive displays of iguanid and agamid lizards and many other herpetologists (and animal behaviorists) were following this lead and recording the display-action-patterns of these lizards from many parts of the world. One of our objectives at the beginning of these studies was to establish criteria for recording and measuring the parameters of the display-action-pattern and a terminology that could be used for making comparisons. From a crude beginning using a stop watch we have advanced to today's methods of precise motion picture and videotape analysis with computers handling the data.

The implications of using the display-action-patterns of these lizards in systematic, ecological, behavioral, physiological, neurological, genetic, etc., studies are indicated in many of the publications listed here.

This is an inventory of species for which a display-action-pattern graph (DAPgraph) or a similar graphical representation or description has been noted in the literature. Some of these references are marginal, but can lead the investigator to what little is known about the display-action-pattern of a species. Since DAPgraphs have also been published for chameleons, this family is included.

It is quite evident that we have only begun to record these display-action-patterns which I feel certain are present in the great majority (if not all) of the species of lizards in the Iguanidae, Agamidae, and Chameleontidae. If I have missed any references, I apologize, but nothing of this sort can ever be complete, or completely up to date. If this inventory stimulates others to add to the list and helps the investigator to find literature sources, my efforts have been worth while.

## IGUANIDAE

<u>Amblyrhynchus</u>	<u>cristatus</u>	Carpenter, 1966b Eibl-Eibesfeldt, 1966b
<u>Anolis</u>	<u>aeneus</u>	Gorman, 1968, 1969 Gorman and Stamm, 1975 Stamps, 1973, 1978 Stamps and Parlow, 1972
	<u>allisoni</u>	Ruibal, 1967
	<u>allogus</u>	Ruibal, 1967
	<u>anisolepis</u>	Fitch, et al., 1976
	<u>auratus</u>	Kastle, 1963
	<u>biscutiger</u>	Echelle, 1975 Fitch, et al., 1976
	<u>bonairensis</u>	Gorman, 1968 Gormann and Stamm, 1975
	<u>brevirostris</u>	Jenssen and Gladson, 1984
	<u>carolinensis</u>	Carpenter, 1983 Cooper, 1977 Crews, 1975, 1977, 1978 Gordon, 1956 Greenberg and Noble, 1944 Greenberg, 1977a Greenberg, et al., 1979 McCardell, 1971 Sigmund, 1979, 1983
	<u>carpenteri</u>	Echelle, et al., 1971a, 1971b Jenssen and Gladson, 1984
	<u>caudalis</u>	Garcea and Gorman, 1968
	<u>chlorocyanus</u>	Gorman, 1968
	<u>chrysolepis</u>	Garcea and Gorman, 1968
	<u>coelestinus</u>	Ortiz and Jenssen, 1982
	<u>cooki</u>	Echelle, 1975
	<u>crassulus</u>	Fitch, et al., 1976
	<u>cristatellus</u>	Ruibal, 1967 Ortiz and Jenssen, 1982
	<u>cupreus</u>	Echelle, 1975 Echelle, et al., 1971a
	<u>cuprinus</u>	Fitch, et al., 1976
	<u>cybotes</u>	Jenssen, 1983
	<u>distichus</u>	Jenssen, 1983
	<u>dollfusianus</u>	Echelle, 1975 Fitch, et al., 1976
	<u>dunni</u>	Fitch et al., 1976 Fitch and Henderson, 1976
	<u>extremus</u>	Gorman, 1968 Gorman and Stamm, 1975
	<u>gadovi</u>	Fitch and Henderson, 1976 Fitch, et al., 1976
	<u>garmani</u>	Jenssen, 1977a
	<u>grahami</u>	Jenssen, 1977b, 1981
	<u>griseus</u>	Gorman, 1968 Gorman and Stamm, 1975

<u>gundlachi</u>	Ruibal, 1967
<u>haguei</u>	Fitch, et al., 1976
<u>homolechis</u>	Ruibal, 1967
<u>humilis</u>	Echelle, 1975
<u>insignis</u>	Echelle, et al., 1978
<u>intermedius</u>	Fitch, et al., 1976
<u>lemurinus</u>	Echelle, et al., 1971a
<u>limifrons</u>	Echelle, 1975
	Echelle, 1975
	Echelle, et al., 1971a
	Fitch, et al., 1976
	Hover and Jenssen, 1976
	Jenssen, 1977a, 1978, 1980
	Jenssen and Hover, 1976
<u>lineatopus</u>	Jenssen, 1977a, 1977b, 1978
	Ruibal, 1967
<u>luciae</u>	Gorman, 1968
	Gorman and Stamm, 1975
<u>lucius</u>	Ruibal, 1967
<u>maculiventris</u>	Fitch, et al., 1976
<u>monensis</u>	Gorman and Stamm, 1975
<u>nebulosus</u>	Jenssen, 1970a, 1970b, 1971
<u>nubilus</u>	Gorman and Stamm, 1975
<u>opalinus</u>	Hover and Jenssen, 1976
	Jenssen, 1978, 1979, 1980
<u>pentapriion</u>	Echelle, et al., 1971a
<u>polypepis</u>	Echelle, 1975
<u>porcatus</u>	Ruibal, 1967
<u>reconditus</u>	Hicks and Jenssen, 1973
<u>richardi</u>	Gorman, 1968
	Gorman and Stamm, 1975
<u>roquet</u>	Gorman, 1968
	Gorman and Stamm, 1975
<u>saqrei</u>	Ruibal, 1967
	Sigmund, 1979
<u>sericeus</u>	Echelle, et al., 1971a
	Jenssen, 1977a, 1978
<u>subocularis</u>	Fitch, et al., 1976
<u>taylori</u>	Echelle, 1975
	Fitch, et al., 1976
	Fitch and Henderson, 1976
<u>townsendi</u>	Carpenter, 1965
	Echelle, et al., 1971a
	Gorman, 1969
	Jenssen, 1977a
	Jenssen and Rothblum, 1977
<u>trinitatis</u>	Gorman, 1968, 1969
	Gorman and Stamm, 1975
<u>tropidolepis</u>	Echelle, et al., 1971a
<u>uniformis</u>	Echelle, et al., 1978
<u>valencienni</u>	Hicks and Trivers, 1983
<u>websteri</u>	Jenssen and Gladson, 1984

<u>Brachylophus</u>	<u>fasciatus</u>	Cahill, 1970 Carpenter and Murphy, 1978 Cogger, 1974 Gibbons, 1981 Gibbons and Watkins, 1982 Greenberg and Jenssen, 1982
	<u>vitiensis</u>	Gibbons, 1981 Gibbons and Watkins, 1982
<u>Callisaurus</u>	<u>crinitus</u>	Clarke and Carpenter, In Prep.
	<u>draconoides</u>	Clarke, 1963, 1965 Carpenter, 1983
<u>Chalarodon</u>	<u>madagascariensis</u>	Blanc, 1969, 1977 Blanc, et al., 1983 Blanc and Carpenter, 1969
<u>Conolophus</u>	<u>pallidus</u>	Carpenter, 1969 Werner, 1982
	<u>subcristatus</u>	Carpenter, 1969
<u>Cophosaurus</u>	<u>texana</u>	Clarke, 1963, 1965
<u>Crotaphytus</u>	<u>bicinctores</u>	Sanborn and Loomis, 1979
	<u>insularis</u>	Sanborn and Loomis, 1979
<u>Ctenosaura</u>	<u>acanthura</u>	Carpenter, 1982
	<u>hemilopha</u>	Carpenter, 1982
	<u>pectinata</u>	Carpenter, 1982
	<u>similis</u>	Carpenter, 1982 Henderson, 1973
<u>Cyclura</u>	<u>carinata</u> ( <u>baelopha</u> )	Iverson, 1977 Carpenter, 1982
	<u>cornuta</u>	Carpenter, 1982
	<u>cyclura</u>	Carpenter, 1982
<u>Dipsosaurus</u>	<u>dorsalis</u>	Carpenter, 1961b
<u>Enyaliosaurus</u>	<u>clarki</u>	Carpenter, 1977b, 1982
	<u>quinquicarinatus</u>	Carpenter, 1982
<u>Gambelia</u>	<u>silus</u>	Tollestrup, 1983
	<u>wislizenii</u>	Tollestrup, 1983
<u>Holbrookia</u>	<u>elegans</u>	Clarke and Carpenter, In Prep.
	<u>lacerata</u>	Clarke, 1963, 1965
	<u>maculata</u>	Clarke, 1963, 1965
	<u>propinqua</u>	Clarke, 1963, 1965

<u>Iguana</u>	<u>iguana</u>	Carpenter, 1982 Distel and Veazey, 1982 Dugan, 1982a, 1982b Hazlett, 1980 Henderson, 1974 Lazell, 1973 Mueller, 1972
<u>Leiocephalus</u>	<u>carinatus</u>	L. Clarke, 1982 Yoshida, 1966
	<u>schreibersi</u>	L. Clarke, 1982
<u>Oplurus</u>	<u>cuvieri</u>	Blanc, 1977, Blanc, et al., 1983 Brillet, 1981, 1982
	<u>cyclurus</u>	Blanc, 1977, Blanc, et al., 1983 Brillet, 1981, 1982
	<u>fierinensis</u>	Blanc, 1977, Blanc, et al., 1983 Brillet, 1981, 1982
	<u>grandidieri</u>	Blanc, 1977, Blanc, et al., 1983 Brillet, 1981, 1982
	<u>quadrimaculatus</u>	Blanc, 1977, Blanc, et al., 1983 Brillet, 1981, 1982
	<u>saxicola</u>	Blanc, 1977, Blanc, et al., 1983 Brillet, 1981, 1982
<u>Phenacosaurus</u>	<u>heterodermus</u>	Jenssen, 1975; 1978
	<u>richteri</u>	Kastle, 1965
<u>Phrynosoma</u>	<u>cornutum</u>	Lynn, 1963, 1965 Carpenter, 1983
	<u>coronatum</u>	Lynn, 1963, 1965 Tollestrup, 1981
	<u>douglassi</u>	Lynn, 1963, 1965
	<u>modestum</u>	Lynn, 1963, 1965
	<u>platyrhinos</u>	Lynn, 1963, 1965 Tollestrup, 1981
	<u>solare</u>	Lynn, 1963, 1965
<u>Polychrus</u>	<u>acutirostris</u>	Vitt and Lacher, 1981
<u>Sauromalus</u>	<u>ater</u>	Carpenter 1982
	<u>obesus</u>	Berry, 1974 Carpenter, 1982 Prieto and Ryan, 1978
	<u>varius</u>	Carpenter, 1982



<u>Sceloporus</u>	<u>acanthinus</u>	Bussjaeger, 1971 Carpenter, 1978a
	<u>aeneus</u>	Carpenter, 1978a
	<u>asper</u>	Bussjaeger, 1971 Carpenter, 1978a
	<u>cautus</u>	Bussjaeger, 1971 Carpenter, 1978a
	<u>chrysostictus</u>	Carpenter, 1978a Penner, 1970 Purdue and Carpenter, 1972a
	<u>clarki</u>	Bussjaeger, 1971 Carpenter, 1978a Purdue and Carpenter, 1972a
	<u>couchi</u>	Carpenter, 1978a, 1978b
	<u>cozumelae</u>	Carpenter, 1978a, 1978b Penner, 1970
	<u>cryptus</u>	Carpenter, 1978a
	<u>cyanogenys</u>	Carpenter, 1978a Greenberg, 1977b Hunsaker, 1962
	<u>dugesi</u>	Yoshida, 1966 Carpenter, 1978a Hunsaker, 1962 Purdue and Carpenter, 1972a Schwartz and Carpenter, 1969
	<u>edwardtaylori</u>	Bussjaeger, 1971 Carpenter, 1978a
	<u>formosus</u>	Carpenter, 1978a
	<u>graciosus</u>	Carpenter, 1978a Ferguson, 1971a; 1973
	<u>grammicus</u>	Carpenter, 1978a McKinney and Carpenter, 1966 Purdue and Carpenter, 1972a Yoshida, 1966
	<u>horridus</u>	Bussjaeger, 1971 Carpenter, 1978a
	<u>jalapae</u>	Carpenter, 1978a Purdue and Carpenter, 1972a
	<u>jarrovi</u>	Carpenter, 1978a Hunsaker, 1962
	<u>lunaei</u>	Carpenter, 1978a
	<u>lundelli</u>	Bussjaeger, 1971 Carpenter, 1978a
	<u>maculosus</u>	Carpenter, 1978a
	<u>magister</u>	Russjaeger, 1971 Carpenter, 1978a Purdue and Carpenter, 1972a
	<u>megalapidurus</u>	Carpenter, 1978a
	<u>melanorhinus</u>	Bussjaeger, 1971 Carpenter, 1978a
	<u>merriami</u>	Carpenter, 1961a, 1978a Purdue and Carpenter, 1972a

<u>mucronatus</u>	Carpenter, 1978a Hunsaker, 1962 Purdue and Carpenter, 1972a
<u>nelsoni</u>	Carpenter, 1978a Purdue and Carpenter, 1972a Yoshida, 1966
<u>occidentalis</u>	Carpenter, 1978a Purdue and Carpenter, 1972a Tarr, 1982
<u>olivaceus</u>	Bussjaeger, 1971 Carpenter, 1978a
<u>orcutti</u>	Russjaeger, 1971 Carpenter, 1978a Purdue and Carpenter, 1972a
<u>ornatus</u>	Carpenter, 1978a Hunsaker, 1962
<u>parvus</u>	Carpenter, 1978a, 1978b Purdue and Carpenter, 1972a
<u>poinsetti</u>	Carpenter, 1978a Hunsaker, 1962 Purdue and Carpenter, 1972a
<u>pyracephalus</u>	Carpenter, 1978a Purdue and Carpenter, 1972a
<u>scalaris</u>	Carpenter, 1978a Purdue and Carpenter, 1972a
<u>siniferus</u>	Carpenter, 1978a Purdue and Carpenter, 1972a
<u>spinosus</u>	Bussjaeger, 1971 Carpenter, 1978a Purdue and Carpenter, 1972a
<u>teapensis</u>	Carpenter, 1978a, 1978b Carpenter and Duvall, 1983 1972a Purdue and Carpenter, 1972a
<u>torquatus</u>	Carpenter, 1978a Hunsaker, 1962 Purdue and Carpenter, 1972a
<u>undulatus</u>	Carpenter, 1962, 1978a, 1983 Ferguson, 1971a, 1973 Griffith, 1966 Purdue and Carpenter, 1972a Rothblum and Jenssen, 1978 Yoshida, 1966
<u>utiformis</u>	Carpenter, 1978a Purdue and Carpenter, 1972a
<u>variabilis</u>	Carpenter, 1978a, 1978b Purdue and Carpenter, 1972a
<u>virgatus</u>	Vinegar, 1972, 1975
<u>woodi</u>	Carpenter, 1978a
<u>Streptosaurus mearnsi</u>	Carpenter, 1962b Ferguson, 1971b Purdue and Carpenter, 1972b

<u>Tropidurus</u>	(By Galapagos Island)	
	<u>delanonis</u>	Carpenter, 1966a
	(Española=Hood)	Eibl-Eibesfeldt, 1966a
		Werner, 1978
	<u>grayi</u>	Carpenter, 1966a
	(Floreana=Charles)	
	<u>pacificus</u>	Carpenter, 1966a
	(Pinta=Abingdon)	
	<u>habellii</u>	Carpenter, 1966a
	(Marchena=Bindloe)	
	<u>bivittatus</u>	Carpenter, 1966a
	(San Cristobal=Chatham)	
	<u>duncanensis</u>	Carpenter, 1966a
	(Pinzon=Duncan)	
	<u>albemarlensis</u>	Carpenter, 1966a
	(Santiago=James)	
	<u>albemarlensis</u>	Carpenter, 1966a
	(Rabida=Jervis)	
	<u>albemarlensis</u>	Carpenter, 1966a
	(Santa Cruz=Indefatigable)	
	<u>albemarlensis</u>	Carpenter, 1966a
	<u>barringtonensis</u>	
	(Santa Fe=Barrington)	
	<u>albemarlensis</u>	Carpenter, 1966a
	(Isabela=Albemarl)	
	<u>albemarlensis</u>	Carpenter, 1966a
	(Fernandina=Narborough)	
	<u>hispidus</u>	Carpenter, 1977
	<u>occipitalis</u>	Carpenter, 1977a
	<u>torquatus</u>	Carpenter, 1977a
<u>Uma</u>	<u>exsul</u>	Carpenter, 1967
	<u>notata</u>	Carpenter, 1963
	<u>paraphygas</u>	Carpenter, 1967
	<u>scoparia</u>	Carpenter, 1963
<u>Urosaurus</u>	<u>bicarinatus</u>	Purdue and Carpenter, 1972b
	<u>graciosus</u>	Carpenter, 1962b
		Purdue and Carpenter, 1972b
	<u>microscutatus</u>	Purdue and Carpenter, 1972b
	<u>nigricaudus</u>	Purdue and Carpenter, 1972b
	<u>ornatus</u>	Carpenter, 1962b, 1983
		Carpenter and Grubitz, 1961
		Purdue and Carpenter, 1972b

Utaantiqua

Ferguson, 1971b  
Purdue and Carpenter, 1972b

nolacensis

Ferguson, 1971b  
Purdue and Carpenter, 1972b

palmeri

Ferguson, 1971b  
Purdue and Carpenter, 1972b

squamata

Ferguson, 1971b  
Purdue and Carpenter, 1972b

stansburiana

Carpenter, 1962b  
Ferguson, 1971b  
McKinney, 1971a, 1971b  
Purdue and Carpenter, 1972b

## AGAMIDAE

<u>Agama</u>	<u>agama</u>	Harris, 1964 Yoshida, 1966
<u>Amphibolurus</u>	<u>barbatus</u>	Brattstrom, 1971 Carpenter, et al., 1970 Sassaman, 1974
	<u>decrezii</u>	Gibbons, 1979
	<u>fionni</u>	Gibbons, 1979
	<u>fordi</u>	Cogger, 1978
	<u>muricatus</u>	Carpenter, 1979 Carpenter, et al., 1970 Yoshita, 1966
	<u>nuchalis</u>	Carpenter, et al., 1970
	<u>reticulatus</u>	Carpenter, et al., 1970
	<u>vadnappa</u>	Gibbons, 1979
<u>Calotes</u>	<u>mystsceus</u>	Carpenter and Clarke, In Press
	<u>versicolor</u>	Carpenter and Clarke, In Press
<u>Cophotis</u>	<u>ceylanica</u>	Kastle, 1966
<u>Hydrodsaurus</u>	<u>pustulatus</u>	Gonzales, 1974
<u>Otocryptis</u>	<u>weigmanni</u>	Matuschka, 1978
<u>Stellio</u>	<u>atricollis</u>	Schmidt, 1966
	<u>erythrogastrer</u>	Schleich, 1979

## CHAMELEONTIDAE

<u>Bradypodion</u>	<u>pumilus</u>	Kastle, 1967
<u>Chamaeleo</u>	<u>bitaeniatus</u>	Kastle, 1967
	<u>brevicornis</u>	Parcher, 1973
	<u>gastrotaenea</u>	Parcher, 1973
	<u>hoehnelii</u>	Kastle, 1967
	<u>nasutus</u>	Parcher, 1973
	<u>parsonii</u>	Parcher, 1973
	<u>willsii</u>	Parcher, 1973

## LITERATURE CITED

- Berry, K. H. 1974. The ecology and social behavior of the chuckwalla, Sauromalus obesus obesus Baird. Univ. California Publ. Zool. 10:1-60.
- Blanc, C. P. 1969. Etudes sur les Iguanidae de Madagascar. II. Observations sur l'ecologie de Chalarodon madagascariensis Peters. Oecologia 2:292-318.
- Blanc, C. P. 1977. Fauna de Madagascar. Reptiles, Saurians, Iguanidae. Cent. Natl. Rech. Sci., Off. Rech. Sci. Techq. Outre-Mer; Paris.
- Blanc, C. P., F. Blanc and J. Roualt. 1983. The interrelationships of Malagasy iguanids. J. Herpetol. 17:129-136.
- Blanc, C. P. and C. C. Carpenter. 1969. Studies on the Iguanidae of Madagascar. III. Social and reproductive behavior of Chalarodon madagascariensis. J. Herpetol. 3:125-134.
- Brattstrom, B. H. 1971. Social and thermoregulatory behavior of the bearded dragon, Amphibolurus barbatus. Copeia 1971:484-497.
- Brillet, C. 1981. Parades d'alarm chez deux lézards de Malagaches: Oplurus grandidieri and Oplurus cyclurus (Sauria, Iguanidae). C. R. Acad. Sci.; Paris. t. 292: Serie III:893-896.
- Brillet, C. 1982. Contribution a l'etude des relations entre individus chez cinq especes d'iguanes Malagaches du genre Oplurus. Rev. Ecol. (Terre Vie) 36:79-148.
- Bussjaeger, L. J. 1971. Phylogenetic significance of the comparative ethology of the spinus group of Sceloporus (Iguanidae). Ph.D. Dissertation, Univ. Oklahoma, Norman.
- Cahill, C. 1970. The banded iguana. Fiji Mus. Educ. Ser. (2):1-14.
- Carpenter, C. C. 1960. Parturition and behavior at birth of Yarrow's spiny lizard (Sceloporus jarrovi). Herpetologica 16:137-138.
- Carpenter, C. C. 1961a. Patterns of social behavior of Merriam's canyon lizard (Sceloporus m. merriami- Iguanidae). Southwest. Natur. 6:138-148.
- Carpenter, C. C. 1961b. Patterns of social behavior in the desert iguana, Dipsosaurus dorsalis. Copeia 1961:396-405.
- Carpenter, C. C. 1962a. Patterns of behavior in two Oklahoma lizards. Amer. Midl. Natur. 67:132-152.
- Carpenter, C. C. 1962b. A comparison of the patterns of display of Urosaurus, Uta, and Streptosaurus. Herpetologica 18:145-152.
- Carpenter, C. C. 1963. Patterns of behavior in three forms of the fringe-toed lizards (Uma-Iguanidae). Copeia 1963:406-412.
- Carpenter, C. C. 1965. The display of the Cocos Island anole. Herpetologica 21:256-260.
- Carpenter, C. C. 1966a. Comparative behavior of the Galapagos lava lizards (Tropidurus). pp. 269-273. In R. J. Bowman (ed.) The Galapagos: Proceedings of the Galapagos International Scientific Project. Univ. California Press, ; Berkeley.

- Carpenter, C. C. 1966b. The marine iguana of the Galapagos Islands, its behavior and ecology. *Proc. California Acad. Sci.* 34:329-376.
- Carpenter, C. C. 1967. Display patterns of the Mexican iguanid lizards of the genus Uma. *Herpetologica* 23:285-293.
- Carpenter, C. C. 1969. Behavioral and ecological notes on the Galapagos land iguanas. *Herpetologica* 25:155-164.
- Carpenter, C. C. 1977a. The aggressive displays of three species of South American iguanid lizards of the genus Tropidurus. *Herpetologica* 33:285-289.
- Carpenter, C. C. 1977b. The display of Enyaliosaurus clarki (Iguanidae, Lacertilia). *Copeia* 1977:754-755.
- Carpenter, C. C. 1978a. Comparative display behavior in the genus Sceloporus (Iguanidae). Milwaukee Public Mus. *Contrib. Biol. Geol.* (18):1-71.
- Carpenter, C. C. 1978b. Ritualistic social behaviors in lizards. pp. 253-267. In N. Greenberg and P. D. Maclean, (eds.) *Behavior and Neurology of Lizards*. Natl. Inst. Mental Health.
- Carpenter, C. C. 1979. Photographic analysis. pp. 97-108. In M. Harless and H. Morlock, (eds.) *Turtles: Perspective and Research*. John Wiley and Sons, Inc.; NJ.
- Carpenter, C. C. 1982. The aggressive displays of iguanine lizards. pp. 215-231. In G. M. Burghardt and A. S. Rand, (eds.) *Iguanas of the World: Their Behavior, Ecology and Conservation*. Noyes Publ. Co.; Park Ridge, NJ.
- Carpenter, C. C. 1983. Communication signals in lizards. *Amer. Biol. Teach.* 45:306-309.
- Carpenter, C. C., J. A. Badham and B. Kimble. 1970. Behavior patterns of three species of Amphibolurus (Agamidae). *Copeia* 1970:497-505.
- Carpenter, C. C. and R. F. Clarke. In Press. Displays of two species of Calotes (Agamidae). *Herpetologica*.
- Carpenter, C. C. and G. W. Ferguson. 1977. 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; NY.
- Carpenter, C. C. and G. Grubitz III. 1961. Time-motion study of a lizard. *Ecology* 42:199-200.
- Carpenter, C. C. and J. B. Murphy. 1978. Aggressive behavior in the Fiji Island lizard Brachylophus fasciatus (Reptilia, Lacertilia, Iguanidae). *J. Herpetol.* 12:251-252.
- Carpenter, G. C. and D. Duvall. 1983. Motion picture and videotape analysis of behavior. *Amer. Biol. Teach.* 45:349-352.
- Clarke, L. D. 1982. Display behavior of Leiocephalus (Iguanidae). M. S. Thesis, Emporia State Univ., Emporia, Kansas.
- Clarke, R. F. 1963. An ethological study of the iguanid lizard genera, Callisaurus, Cophosaurus and Holbrookia. Ph. D. Dissertation, Univ. Oklahoma, Norman. 136 pp.
- Clarke, R. F. 1965. An ethological study of the iguanid genera, Callisaurus, Cophosaurus and Holbrookia. *Emporia State Res. Stud.* (Kansas) 13:1-66.
- Clarke, R. F. and C. C. Carpenter. 1985. The social behavior of Callisaurus crinitus and Holbrookia elegans (Lacertilia: Iguanidae). In Prep.

- Cogger, H. G. 1974. Voyage of the banded iguana. Australian Natur. Hist. 18:144-149.
- Cogger, H. G. 1978. Reproductive cycles, fat body cycles and socio-sexual behavior in the Mallee dragon, Amphibolurus fordi (Lacertilia: Agamidae). Australian. J. Zool. 26:653-672.
- Cooper, W. E., Jr. 1977. Information analysis of agonistic behavioral sequences in male iguanid lizards, Anolis carolinensis. Copeia 1977:721-734.
- Crews, D. 1975. Inter- and intraindividual variation in display patterns in the lizard Anolis carolinensis. Herpetologica 31:37-47.
- Crews, D. 1977. The annotated anole: studies on the control of lizard reproduction. Amer. Sci. 65:428-434.
- Crews, D. 1978. Integration of internal and external stimuli in regulation of reproduction. pp. 149-171. In N. Greenberg and P. D. Maclean (eds.) Behavior and Neurology of Lizards. Natl. Inst. Mental Health.
- Distel, H. and J. Veasey. 1982. The behavioral inventory of the green iguana, Iguana iguana. pp. 252-270. In G. M. Burghardt and A. S. Rand (eds.) Iguanas of the World: Their Behavior, Ecology and Conservation. Noyes Publ. Co.; Park Ridge, NJ.
- Dugan, B. 1982a. The mating behavior of the green iguana, Iguana iguana. pp. 320-341. In G. M. Burghardt and A. S. Rand (eds.) Iguanas of the World: Their Behavior, Ecology, and Conservation. Noyes Publ. Co.; Park Ridge, NJ.
- Dugan, B. 1982b. A field study of the headbob displays of male green iguanas (Iguana iguana): variation in form and context. Anim. Behav. 30:327-338.
- Echelle, A. F. 1975. Dewlap size and growth characteristics in beta anoles (Sauria, Iguanidae) with preliminary description of aggressive displays. M. S. Thesis, Univ. Oklahoma, Norman.
- Echelle, A. A., A. F. Echelle and H. S. Fitch. 1971a. A comparative analysis of aggressive display in nine species of Costa Rican Anolis. Herpetologica 27:271-288.
- Echelle, A. A., A. F. Echelle, and H. S. Fitch. 1971b. A new anole from Costa Rica. Herpetologica 27:354-362.
- Echelle, A. F., A. A. Echelle and H. S. Fitch. 1978. Behavioral evidence for species status of Anolis uniformis (Cope). Herpetologica 34:205-207.
- Eibl-Eibesfeldt, I. 1966a. Beobachtungen über das innerartliche Kampfverhalten der Kielschwanzleguana (Tropidurus) des Galapagos-Archipels. Z. Tierpsychol. 23:672-676.
- Eibl-Eibesfeldt, I. 1966b. Das Verteidigen der Eiablageplätze bei der Hood-Meerechse (Amblyrhynchus cristatus venustissimus). Z. Tierpsychol. 23:627-631.
- Ferguson, G. W. 1971a. Observations on the behavior and interactions of two sympatric Sceloporus in Utah. (Iguanidae). Amer. Midl. Natur. 86:190-196.
- Ferguson, G. W. 1971b. Variation and evolution of the pushup displays of the side-blotched genus Uta (Iguanidae). Syst. Zool. 20:79-101.



- Ferguson, G. W. 1973. Character displacement of the push-up displays of two partially-sympatric species of the spiny lizards Sceloporus (Sauria:Iguanidae). Herpetologica 29:281-284.
- Fitch, H. S., A. F. Echelle and A. A. Echelle. 1976. Field observations on rare or little known mainland anoles. Kansas Sci. Bull. 51:91-128.
- Fitch, H. S. and R. Henderson. 1976. A field study of the rock anoles (Reptilia, Lacertilia, Iguanidae) of Southern Mexico. J. Herpetol. 10:303-312.
- Garcea, R. and G. Gorman. 1968. A difference in male territorial display behavior in two siblings of Anolis. Copeia 1968:419-420.
- Gibbons, J. R. H. 1979. The hind leg pushup display of the Amphibolurus decresii species complex (Lacertilia: Agamidae). Copeia 1979:29-40.
- Gibbons, J. R. H. 1981. The biogeography of Brachylophus (Iguanidae) including the description of a new species B. vitiensis from Fiji. J. Herpetol. 15:225-273.
- Gibbons, J. R. H. and I. F. Watkins. 1982. Behavior, ecology and conservation of South Pacific banded iguanas, Brachylophus, including a newly discovered species. pp. 418-441. In G. M. Burghardt and A.S. Rand (eds.) Iguanas of the World: Their Behavior, Ecology and Conservation. Noyes Publ. Co.; Park Ridge, NJ.
- Gonzales, R. B. 1974. Behavioral notes on captive sail-tail lizards (Hydrosaurus pustulosus Agamidae). Silliman J. 21:129-138.
- Gordon, R. E. 1956. The biology and biodemography of Anolis carolinensis Voigt. Ph.D. Dissertation, Tulane Univ., New Orleans.
- Gorman, G. C. 1968. The relationships of Anolis of the roquet group (Sauria, Iguanidae) - III. Comparative study of display behavior. Breviora (284):1-31.
- Gorman, G. C. 1969. Intermediate territorial display of a hybrid Anolis lizard (Sauria, Iguanidae). Z. Tierpsychol. 26:390-393.
- Gorman, G. C. and B. Stamm. 1975. The Anolis lizard of Mona, Redondo, and La Blanquilla: chromosomes, relationships, and natural history notes. J. Herpetol. 9:197-205.
- Greenberg, B. and G. K. Noble. 1944. Social behavior of the American chameleon (Anolis carolinensis Voigt). Physiol. Zool. 17:304-439.
- Greenberg, N. 1977a. A neuroethological study of display behavior in the lizard Anolis carolinensis (Reptilia, Lacertilia, Iguanidae). Amer. Zool. 17:191-201.
- Greenberg, N. 1977b. An ethogram of the blue spiny lizard, Sceloporus cyanogenys (Reptilia, Lacertilia, Iguanidae). J. Herpetol. 11:177-195.
- Greenberg, N. and T. A. Jenssen. 1982. Displays of captive banded iguanas, Brachylophus fasciatus. pp. 232-251. In G. M. Burghardt and A. S. Rand (eds.) Iguanas of the World: Their Behavior, Ecology and Conservation. Noyes Publ. Co.; Park Ridge, NJ.

- Greenberg, N., P. D. MacLean and J. L. Ferguson. 1979. Role of the paleostriatum in species-typical display behavior of the lizard (Anolis carolinensis). Brain Res. 172:229-241.
- Griffith, S. J. 1966. Display variation and behavior associated with dominance of Sceloporus undulatus, Iguanidae. Ph.D. Dissertation, Univ. Oklahoma, Norman.
- Harris, V. 1964. The Life of the Rainbow Lizard. Hutchinson & Co., Ltd.; London.
- Hazlett, B. A. 1980. Temporal pattern of the assertion display of the lizard Iguana iguana. Herpetologica 36:221-225.
- Henderson, R. W. 1973. Ethological observations of Ctenosaura similis (Sauria: Iguanidae) in British Honduras. J. Herpetol. 7:27-33.
- Henderson, R. W. 1974. Aspects of the ecology of the juvenile common iguana (Iguana iguana). Herpetologica 30:327-332.
- Hicks, R. A. and T. A. Jenssen. 1973. New studies on a montane lizard of Jamaica, Anolis reconditus. Breviora (404):1-23.
- Hicks, R. A. and R. L. Trivers. 1983. The social behavior of Anolis valencienni. pp. 570-595. In A. G. J. Rhodin and K. Miyata (eds.) Advances in Herpetology and Evolutionary Biology. Mus. Comp. Zool., Harvard Univ.
- Hover, E. and T. A. Jenssen. 1976. Descriptive analysis and social correlates of agonistic displays of Anolis limifrons (Sauria, Iguanidae). Behaviour 58:173-191.
- Hunsaker, D. II. 1962. Ethological isolating mechanisms in the Sceloporus torquatus group of lizards. Evolution 16:62-74.
- Iverson, J. B. III. 1977. Behavior and ecology of the rock iguana Cyclura carinata. Ph.D. Dissertation, Univ. Florida, Gainesville.
- Jenssen, T. A. 1967. Ethoecology and display analysis of Anolis nebulosus (Sauria, Iguanidae). Ph.D. Dissertation, Univ. Oklahoma, Norman.
- Jenssen, T. A. 1970a. The ethoecology of Anolis nebulosus, Sauria, Iguanidae. J. Herpetol. 4:1-38.
- Jenssen, T. A. 1970b. Female response to filmed displays of Anolis nebulosus (Sauria, Iguanidae). Anim. Behav. 18:640-647.
- Jenssen, T. A. 1971. Display analysis of Anolis nebulosus (Sauria, Iguanidae). Copeia 1971:197-209.
- Jenssen, T. A. 1975. Display repertoire of a male Phenacosaurus heterodermus (Sauria, Iguanidae). Herpetologica 31:48-55.
- Jenssen, T. A. 1977a. Evolution of anoline lizard display behavior. Amer. Zool. 17:203-216.
- Jenssen, T. A. 1977b. Morphological, behavioral and electrophoretic evidence of hybridization between the lizards, Anolis grahami and Anolis lineatopis neckeri, on Jamaica. Copeia 1977:270-276.
- Jenssen, T. A. 1978. Display diversity in anoline lizards and problems in interpretation. pp. 269-285. In N. Greenberg and P. D. MacLean (eds.) Behavior and Neurology of Lizards. Natl. Inst. Mental Health.

- Jenssen, T. A. 1979. Display modifiers of Anolis opalinus (Lacertilia: Iguanidae). Herpetologica 35:21-30.
- Jenssen, T. A. 1980. Description and function of Anolis limifrons social displays. Natl. Geog. Soc. Res. Reports 12:377-388.
- Jenssen, T. A. 1981. Unusual display behavior of Anolis grahami from western Jamaica. Copeia 1981:728-733.
- Jenssen, T. A. 1983. Display behavior of two Haitian lizards, Anolis cybotes and Anolis distichus. pp. 552-569. In A. G. J. Rhodin and K. Miyata (eds.) Advances in Herpetology and Evolutionary Biology. Mus. Comp. Zool., Harvard Univ.
- Jenssen, T. A. and N. L. Gladson. 1984. A comparative display analysis of the Anolis brevirostris complex in Haiti. J. Herpetol. 18:217-230.
- Jenssen, T. A. and E. Hover. 1976. Display analysis of the signature display of Anolis limifrons (Sauria: Iguanidae). Behaviour. 57:227-240.
- Jenssen, T. A. and L. M. Rothblum. 1977. Display repertoire analysis of Anolis townsendi (Sauria, Iguanidae). Copeia 1977:103-109.
- Kastle, W. 1963. Zur Ethologie des Grasanolis (Norops auratus) (Daudin). Z. Tierpsychol. 20:16-33.
- Kastle, W. 1965. Zur Ethologie des Anden-Anolis, Phenacosaurus richteri. Z. Tierpsychol. 22:751-769.
- Kastle, W. 1966. Beobachtungen an ceylonesischen Taubagamen (Cophotis ceylanica). Salamandra 2:78-87.
- Kastle, W. 1967. Soziale Verhaltensweisen von Chamaleonen aus der pumilus- und bitaeniatus - Gruppe. Z. Tierpsychol. 24:313-341.
- Kiester, A. R. 1977. Communication in amphibians and reptiles. pp. 519-544. In T. A. Sebeok, (ed.) How Animals Communicate. Indiana Univ. Press, ; Bloomington.
- Lazell, J. D. Jr. 1973. The lizard genus Iguana in the Lesser Antilles. Bull. Mus. Comp. Zool. 145:1-25.
- Lynn, R. T. 1963. Comparative behavior of the horned lizards, genus Phrynosoma, of the United States. Ph.D. Dissertation, Univ. of Oklahoma, Norman.
- Lynn, R. T. 1965. A comparative study of display behavior in Phrynosoma (Iguanidae). Southwest. Natur. 10:25-30.
- Matuschka, F.-R. 1978. Beobachtungen bei der Haltung von Otocryptis weigmanni (Reptilia: Sauria: Agamidae). Salamandra 14:207-211.
- McCardell, J. H. 1971. The influence of temperature on the duration of the aggressive display of Anolis carolinensis. M. S. Thesis, Univ. Oklahoma, Norman.
- McKinney, C. O. 1971a. Individual and intrapopulation variations in the pushup display of Uta stansburiana. Copeia 1971:159-160.
- McKinney, C. O. 1971b. An analysis of zones of intergradation in the side-blotched lizard, Uta stansburiana (Sauria: Iguanidae). Copeia 1971:596-613.

- Mueller, H. 1972. Ecological and ethological studies on Iguana iguana L. (Reptilia: Iguanidae) in Columbia. Zool. Beitr. 18:109-131.
- Ortiz, P. R. and T. A. Jenssen. 1982. Interspecific aggression between lizard competitors, Anolis cooki and Anolis cristatellus. Z. Tierpsychol. 60:227-238.
- Parcher, S. R. 1973. Observations on the natural histories of six Malagasay Chamaeleontidae. Z. Tierpsychol. 34:500-523.
- Penner, J. E. 1970. The ecology and behavior of two lizards of the genus Sceloporus (Iguanidae) from Yucatan, Mexico. M. S. Thesis, Univ. Oklahoma, Norman.
- Prieto, A. A. and M. J. Ryan. 1978. Some observations on the social behavior of the Arizona chuckwalla, Sauromalus obesus tumidus (Reptilia, Lacertilia, Iguanidae). J. Herpetol. 12:327-336.
- Purdue, J. R. 1970. A comparative study of the body movements of displaying males of the lizard genus Sceloporus (Iguanidae). M. S. Thesis, Univ. of Oklahoma, Norman.
- Purdue, J. R. and C. C. Carpenter. 1972a. A comparative study of the body movements of displaying males of the lizard genus Sceloporus (Iguanidae). Behaviour 41:68-81.
- Purdue, J. R. and C. C. Carpenter. 1972b. A comparative study of the display motion in the iguanid genera Sceloporus, Uta, and Urosaurus. Herpetologica 28:137-141.
- Rothblum, L. and T. A. Jenssen. 1978. Display repertoire analysis of Sceloporus undulatus hyacinthinus (Sauria: Iguanidae) of southwestern Virginia. Anim. Behav. 26:130-137.
- Ruibal, R. 1967. Evolution and behavior of West Indian anoles. pp. 116-140. In W. E. Milstead (ed.) Lizard Ecology: A Symposium. Univ. Missouri Press, Columbia.
- Sanborn, S. R. and R. B. Loomis. 1979. Systematics and behavior of collared lizards (Crotaphytus, Iguanidae) in southern California. Herpetologica 35:101-107.
- Sassaman, J. F. 1974. Heart rate of lizards of the families Iguanidae and Agamidae as an indicator of behavioral response to social stimuli. Ph.D. Dissertation, Univ. Oklahoma, Norman.
- Schleich, H.-H. 1979. Feldherpetologische Beobachtungen in Persien nabst morphologischen Daten den Aqamen Agama agilis, A. caucasica und A. erythrogastrer. Salamandra 15:237-253.
- Schmidt, H. 1966. Agama atricollis susp. inc. aus der Serengeti. Salamandra 2:57-68.
- Sigmund, W. R. 1979. The analysis of visual displays in the lizard, Anolis carolinensis. Ph.D. Dissertation, Indiana Univ., Bloomington.
- Sigmund, W. R. 1983. Female preference for Anolis carolinensis males as a function of dewlap color and background coloration. J. Herpetol. 17:137-143.

- Stamps, J. A. 1973. Displays and social organization in female Anolis aeneus (Sauria: Iguanidae). Copeia 1973:264-271.
- Stamps, J. A. 1978. A field study of the ontogeny of social behavior in the lizard Anolis aeneus. Behaviour 66:1-31.
- Stamps, J. A. and G. W. Barlow. 1972. Variation and stereotypy in the displays of Anolis aeneus (Sauria: Iguanidae). Behaviour 47:67-94.
- Tarr, R. S. 1982. Species typical display behavior following stimulation of the reptilian striatum. Physiol. Behav. 29:615-620.
- Tollestrup, K. 1981. The social behavior and displays of two species of horned lizards, Phrynosoma platyrhinos and Phrynosoma coronatum. Herpetologica 37:130-141.
- Tollestrup, K. 1983. The social behavior of two species of closely related leopard lizards, Gambelia silus and Gambelia wislizenii. Z. Tierpsychol. 62:307-320.
- Vinegar, M. B. 1972. The function of breeding coloration in the lizard, Sceloporus virgatus. Copeia 1972:660-664.
- Vinegar, M. B. 1975. Comparative aggression in Sceloporus virgatus, S. undulatus consobrinus, and S. u. tristichus (Sauria: Iguanidae). Anim. Behav. 23:279-286.
- Vitt, L. J. and T. E. Lacher. 1981. Behavior, habitat, diet, and reproduction of the iguanid lizard Polychrus acutirostris in the Caatinga of northeastern Brazil. Herpetologica 37:53-63.
- Werner, D. I. 1978. On the biology of Tropidurus delanonis, Baur (Iguanidae). Z. Tierpsychol. 47:337-395.
- Werner, D. I. 1982. Social organization and ecology of land iguanas, Conolophus subcristatus, on Isla Fernandina, Galapagos. pp. 342-363. In G. M. Burghardt and A. S. Rand (eds.) Iguanas of the World: Their Behavior, Ecology and Conservation. Noyes Publishing Co.; Park Ridge, NJ;
- Yoshida, J. K. 1966. Studies on the development of social behavior in some hatchling and juvenile iguanid and agamid lizards. M. S. Thesis, Univ. Oklahoma, Norman.